Neurodiversity: Is It Real? Examining the Science Behind Learner Variability

Jack A. Naglieri, Ph.D.

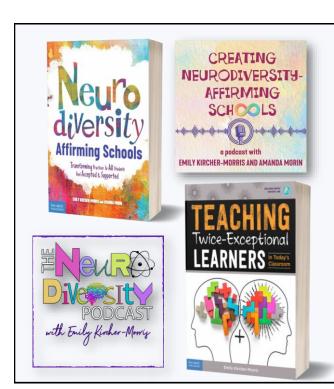
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FOR MORE INFORMATION PLEASE GO TO MY WEB PAGES THE PAGE AND THE PAGE



Emily Kircher-Morris

https://bit.ly/ND-Pod



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Goals:

- Connect neurodiversity to learner variability and brain-based processing.
- Understand how the PASS Model and CAS2 provide scientific evidence for neurodiversity.
- Apply cognitive profiles to practical strategies for supporting gifted, 2e, ADHD, autistic, and dyslexic learners.



What People Think Neurodiversity Means...

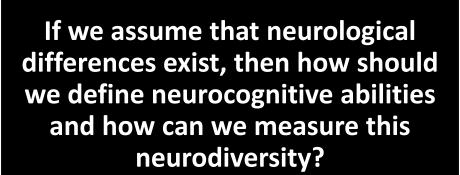
- A modern word for disorders or labels
- A social movement or identity category
- "Everyone's brain is just different."

What the Science Shows It Means...

- Cognitive variability is real and quantifiable
- Differences in how the brain plans, attends, sequences, and integrates information
- Neurodiversity = measurable diversity in brain function (not just an opinion or philosophy)

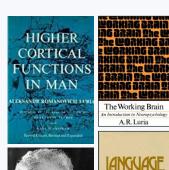
Part 1 How Do We Define and Measure Neurocognitive Diversity?

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Use the PASS neurocognitive theory and the Cognitive Assessment System

PASS Neurocognitive Theory



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

PASS theory can be used to define **NEURODIVERSITY**

These are easy to understand definitions of basic psychological processes that are measured with the Cognitive Assessment System – Second Edition

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PASS Theory and CAS2 Information

PASS Theory of Intelligence and the CAS2

JACK A. NAGLIERI & TULIO M. OTERO





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.

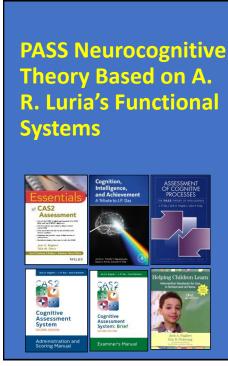
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Free CAS2 Access for Univ Professors



Neurodiversity Podcast





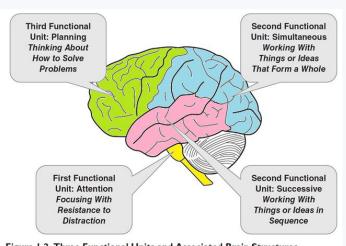
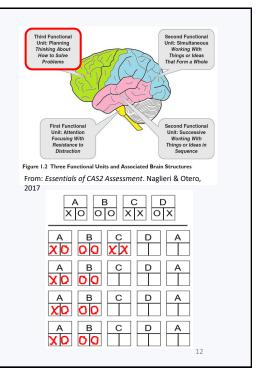


Figure 1.2 Three Functional Units and Associated Brain Structures From: Essentials of CAS2 Assessment. Naglieri & Otero, 2017

PASS Theory: Planning

- Planning is a neurocognitive ability that a person uses to determine, select, and use efficient solutions to problems
 - problem solving
 - · developing plans and using strategies
 - · retrieval of knowledge
 - · impulse control and self-control
 - · control of processing
 - Planning tests measure Executive Function



PASS Theory: Attention

- Attention is a basic psychological process we use to attend to some stimuli and ignore others
 - · Focus our cognitive activity
 - Selective attention
 - Resistance to distraction
 - · Listening, as opposed to hearing
- All academic tasks demand attention but some more than others

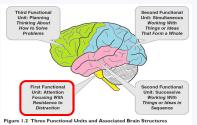
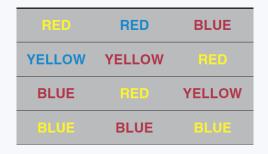


Figure 1.2 Three Functional Units and Associated Brain Structures
From: Essentials of CAS2 Assessment. Naglieri & Otero, 2017



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PASS Theory: Simultaneous

- **Simultaneous** processing is used to integrate stimuli into groups
 - 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

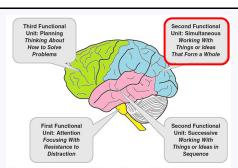
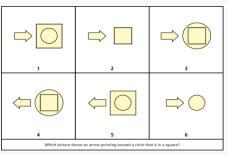


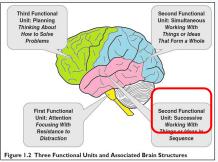
Figure I.2 Three Functional Units and Associated Brain Structures From: Essentials of CAS2 Assessment. Naglieri & Otero, 2017



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PASS Theory: Successive

- Successive processing is a basic psychological process we use to manage stimuli in a specific serial order
 - 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



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

Recall of Numbers in Order Successive Processing



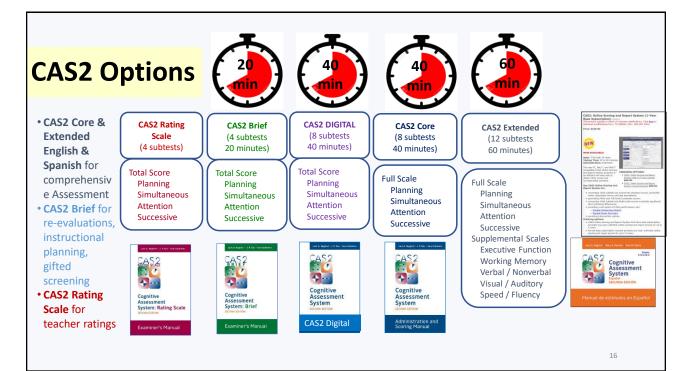






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Which intelligence test scores have enough specific variance to be interpreted?

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.

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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!

- 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) exception
- 10. Kaufman Assessment Battery for Children-II (McGill & Spurgin, 2017)
- 11. CHC model Carroll's Factor-Analytic Studies (Benson, et al. (2018)

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CAS is an

Comparing a Child to Themselves (Not Norms) – AKA Ipsative Profiles

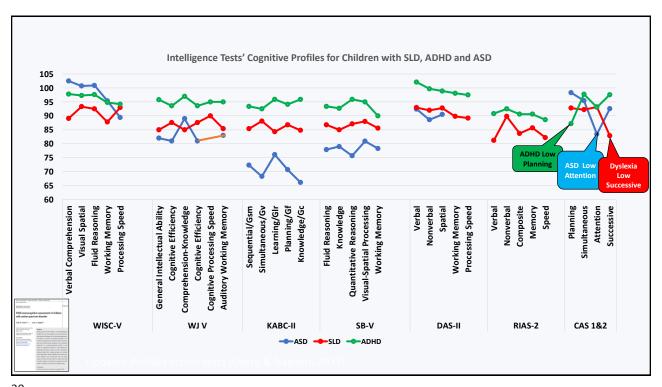
- Traditional assessments compare students to age-based norms (standard scores).
- Ipsative analysis compares a student's own cognitive strengths and weaknesses against their personal average.
- Critical for identifying neurodivergent profiles and twice-exceptionality.
- Example: A student with average scores overall, but significantly lower planning compared to their other scores the *variability* matters.

How smart are they?



How is their brain wired?

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Neurodiversity Among the General Population

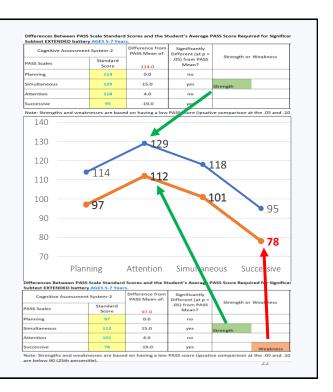
Percentages of Children in the CAS, CAS2 & CAS2:Brief Normative Samples that have a PASS Score that is a Significant Strength and/or Weakness in Relation to the Child's Average PASS Score.

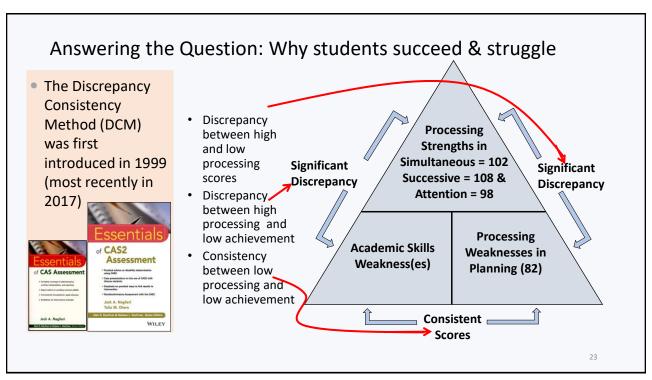
	Planning	Simultaneous	Attention	Successive
CAS (N = 2,200)	22 %	27 %	22 %	33 %
CAS2 (N = 1,342)	33 %	42 %	39 %	39 %
CAS2: Brief (N = 1,417)	40 %	36 %	31 %	31 %
Overall Average (N = 4,959)	33 %			

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Neurodiversity is Real

- 36% of students in the CAS2 normative sample had significant variability on their Planning, Attention, Simultaneous or Successive scale scores
 - Significant variation in relation to student's average has instructional relevance
 - If the lowest score is <85 then evidence of a disability is found

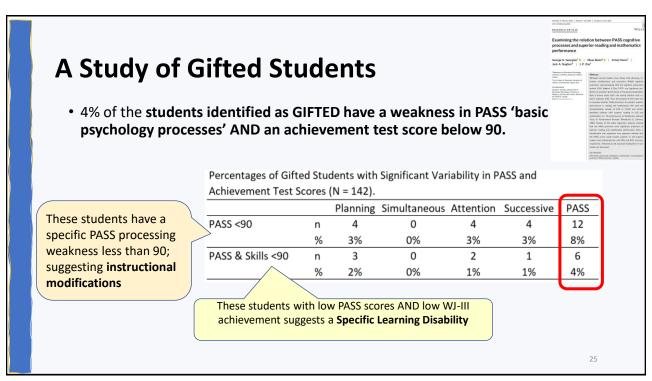




A Study of Gifted Students (Neurocognitive Profiles of Intellectually Gifted Children: A Pilot Study, In press, 2022).

- N = 142
 - Similar numbers of girls and boys in Grade 4, 5 and 6.
 - all native speakers of English
 - from middle to upper-middle socioeconomic families
- Gifted definition:
 - "Giftedness is exceptional potential and/or performance across a wide range of abilities in one or more of the following areas: general intellectual, specific academic, creative thinking, social, musical, artistic and kinesthetic" (Alberta Education, 2012, p. 6).

- Tests given
 - WASI –II (Vocabulary and Matrix Reasoning)
 - Woodcock-Johnson III Broad Reading score from: Letter-Word Identification, Reading Fluency, and Passage Comprehension
 - Cognitive Assessment System (CAS; Naglieri & Das, 1997) to measure PASS neurocognitive processes



Part 2 From Profiles to Practice: What This Looks Like in the Classroom

But what if I don't have access to assessment results or diagnosis?

- You already see neurodivergence in your classroom through:
 - Behavior
 - · Problem-solving
 - Frustration
 - Communication
 - Creativity
 - Mistakes



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PASS to Practice: Impacts in the Classroom

PASS Process	Common Presentations
Planning	 Trouble starting tasks despite understanding them Needs prompting or structure to begin work Rigid thinking or difficulty shifting from original plan May appear "lazy," "unmotivated," or "oppositional" when overwhelmed Executive function lag
Attention	 Hyperfocus on interests but inconsistent attention to assigned tasks Overload or shutdown in noisy, bright, or unpredictable environments Difficulty shifting between activities or topics Sensory sensitivities (light, sound, textures) impact focus Fatigue, burnout, or meltdowns after sustained effort

PASS to Practice: Impacts in the Classroom

PASS Process	Common Presentations
Simultaneous	 Strong detail focus but misses main idea or overall concept Struggles to integrate multiple viewpoints or steps into a coherent whole Literal interpretation of language, sarcasm/hidden meaning missed Trouble with visual-spatial tasks (maps, geometry, multi-step problems) Overwhelmed by open-ended or abstract tasks
Successive	 Difficulty processing step-by-step verbal instructions Struggles with phonics, decoding, spelling, or ordered recall Mixes up steps in procedures (math, writing, routines) May rely on scripts instead of spontaneous language Needs steps broken into clear, concrete chunks

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Low Planning = Difficulty Organizing, Starting, and Strategizing Tasks

Looks Like:	Support With:
Knows what to do but doesn't start; "staring at the paper"	Use visual checklists, timers, or partner start
Forgets materials, loses papers, misses deadlines	Provide external structure: folders, digital planners, color-coded systems
Avoids long-term tasks until last minute	Break large tasks into mini-deadlines with feedback checkpoints
Gives up quickly when tasks require sustained effort or planning	Model strategic thinking aloud: "Here's how I'd break this down"
Writes without planning \rightarrow disorganized or incomplete work	Teach "pause and plan": mind maps, outlines, bullet lists before writing

Low Attention = Inconsistent Focus, Mental Fatigue, Sensory Overload

Looks Like:	Support With:
Appears "zoned out" or hyper-focused, but not on the assigned task	Use short, clear task segments: "Do this part first," visual timers
Struggles to shift between subjects, transitions, or routines	Provide predictable routines; give verbal cues and countdowns before transitions
Overwhelms/shuts down in noisy, busy classrooms	Reduce sensory input: quiet corner, noise buffers, sunglasses/hood
Looks like ADHD, but may be autistic burnout, anxiety, or sensory fatigue	Offer movement or regulation tools without punishment or stigma
Jumps from task to task or gets "stuck" in one area	Avoid rapid-fire transitions or multitasking demands; allow completion or closure

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Low Successive = Trouble with Order, Phonics, and Step-by-Step Information

Looks Like:	Support With:
Difficulty decoding words sound-by- sound	Explicit phonics instruction, tapping/clapping syllables, Orton-Gillingham-like routines
Forgets or mixes steps in multi-step math problems or directions	Provide step-by-step visual sequences (written or graphic)
Reverses letters/numbers, struggles with left-right or order-based memory	Use rhythm, repetition, multisensory sequencing strategies
Can explain ideas but writing is out of order or jumbled	Offer sentence frames, graphic sequencing, or speech-to-text pre-writing
Gets lost when verbal instructions are long	Give instructions one step at a time + written backup

Low Simultaneous = Hard to See the "Whole," Organize Ideas, or Process Visual Information

Looks Like:	Support With:
Remembers details but misses the main idea in reading	Start with a summary or visual organizer before reading
Struggles with geometry, maps, word problems (visual organization)	Use visual models, manipulatives, diagrams made explicit
Overwhelmed by open-ended assignments ("Just write a paragraph")	Give templates, models, and exemplars of completed work
Can write strong sentences but cannot structure essays or arguments	Teach whole → part writing with outlines, boxes, and frames
Gets stuck when too many instructions are presented at once	Break tasks into visual chunks; color-code related parts

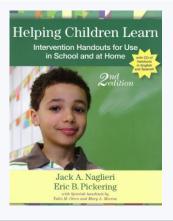
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High-Ability + Specific Weakness = Masked Learning Needs

Looks Like:	Support With:
Bright, verbal, creative, but missing work or inconsistent performance	Combine enrichment with structure: planning tools, check-ins
Adults say "They're so smart, they just don't try"	Avoid "lazy" labels; assume lagging skills, not missing willpower
High test scores but low writing output or disorganized work	Allow alternative formats: typing, recording, visuals, dictation
Meltdowns, perfectionism, shutdown when effort is required	Normalize mistakes, offer "draft passes," reduce performance pressure
Uses strengths to compensate and hide weaknesses until it breaks	Make cognitive profile explicit to student; teach self-awareness + advocacy

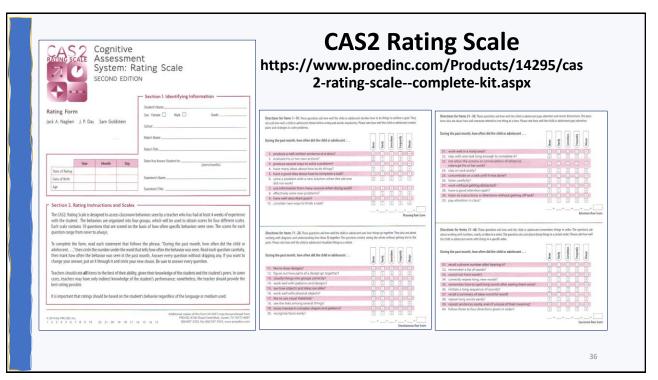
PASS Rating Scale (PRS) Child's name: Person completing the form: Directions: This scale contains descriptions of behaviors that can help determine how well the child can use important cognitive processes. To use this scale, rate the questions on the basis of your knowledge of the child. Read each statement and put a checkmark under the word that tells how often you observed the behavior. If you want to change your answer, cross out your first response and fill in your new choice. Answer every question. During the past 2 months, how often did the child 1. Work in a well-organized and neat way 2. Use strategies and plans when doing work 3. Evaluate his or her own behavior 4. Think before acting 5. Have many ideas about how to do things Perform well on spatial activities (e.g., maps diagrams) 8. Understand how things go together See the big picture 10. Understand complex verbal instructions 11. Work well with patterns 12. Like to use visual materials Work without being distracted by people or noises 15. Pay close attention 16. Listen to instructions without being distracted 17. Work well for a long time 18. Work well in a noisy environment19. Work well with information in sequence 20. Do well with things presented step by step 21. Remember the order of information 22. Understand directions presented in 23. Do well working with sounds in order 24. Closely follow directions presented in order Copyright © 1997 by Jack A. Naglieri. In Helping Children Learn: Intervention Handouts for Use in School and at Home Second Edition, by Jack A. Naglieri & Eric B. Pickering. (2010, Paul H. Brockes Publishing Co., Inc.) Figure 2.11. The PASS Rating S

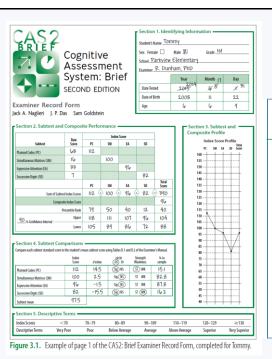
PASS Rating Scale in Helping Children Learn



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CAS2 Brief

https://www.proedinc.com/Produc ts/14285/cas2-brief-completekit.aspx

CAS2: Brief

Subtest

Planned Codes

Simultaneous Matrices

Expressive Attention

Successive Digits

Composite

Total Score

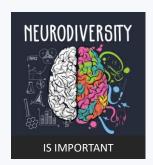
QUALIFICATIONS OF USERS All those who use the CAS2: Brief should be knowledgeable about testing; procedures related to using, scoring, and interpreting test results; and the PASS theory. This would include educational diagnosticians, school psychologists, speech and language specialists, special ed teachers with testing backgrounds.

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Key Points

- Neurodiversity is real and measurable. It shows up in cognitive patterns, not just diagnoses.
 Sometimes this variability suggests a disability.
- Support should match processing, not labels. Gifted doesn't mean independent; ADHD doesn't mean lazy; autism doesn't mean uninterested.
- Approximately 35% of the time students showed variability in the PASS brain-based scales on the CAS2. Variability is not a flaw, it's information. It tells us how to teach, not just what to fix.



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