Executive Function from Assessment to Intervention

SOUTHWESTERN SCHOOL FOR BEHAVIORAL HEALTH STUDIES

LA FRONTERA ARIZONA
EMPACT - SUICIDE PREVENTION CENTER

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Welcome !

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DISCLOSURES

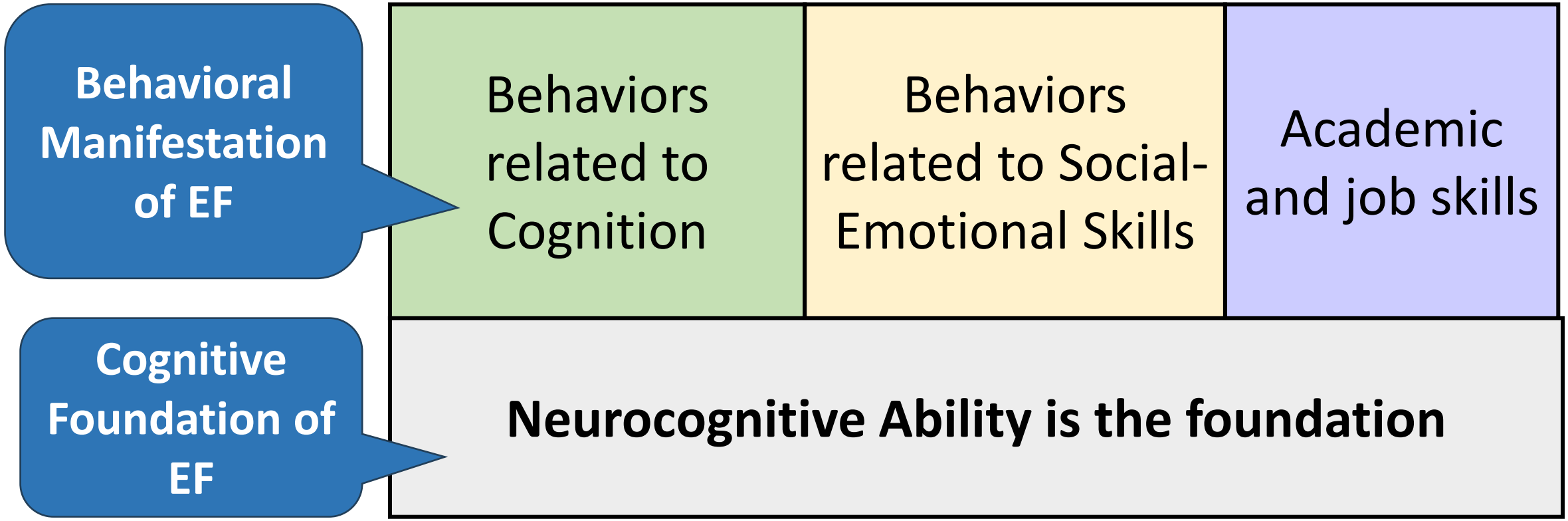
Presentation Outline

- Introduction to Executive Function (EF)
- EF Behaviors
- EF and Cognition (intelligence)
- EF and Social Emotional Skills
- EF and Academic/Job Performance
- Research about EF as ability, behavior, and SE
- Conclusions

Why this session on EF?

- Executive Function (EF) is the most important ability we have, because it provides us a way to decide ***how to do what we choose to do to achieve a goal***
- The best news is that EF **can be taught (encouraged)**
- Instruction that improves EF will affect a person's ability to learn, their behavior, and their social skills.
- Improving EF will change an individual's life

Behavioral and/or Cognitive Explanation for EF Symptoms

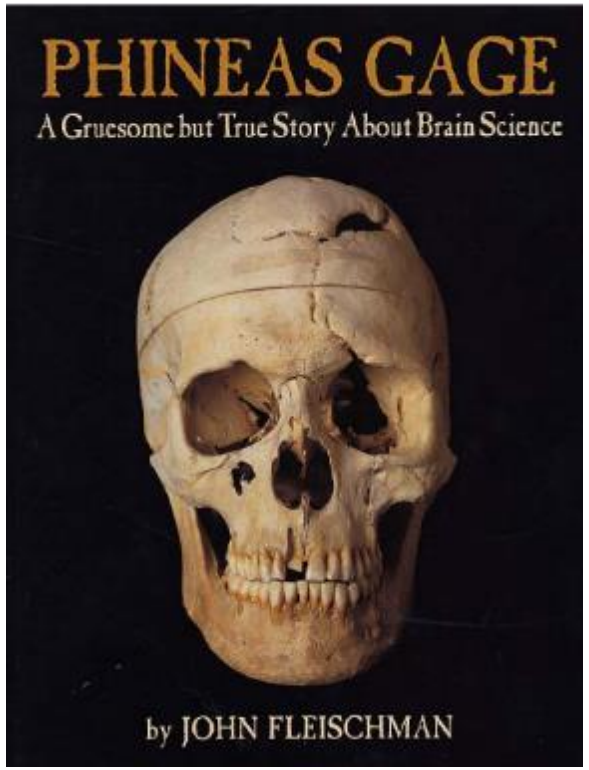


Neuropsychological *Conceptualization* of EF

- If a person's frontal lobes are impaired that person would likely get low scores on:
  1. Behaviors related to Executive Function
  2. Performance measures of Executive Function
  3. Rating scales of social emotional behaviors
  4. Academic tasks that require HOW to do things
- If a person has problems in all of the above except cognitive processes related to EF, the cause is likely an environmental issue

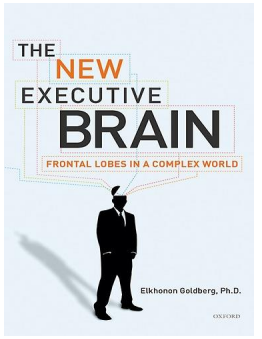
The Curious Story of Phineas Gage

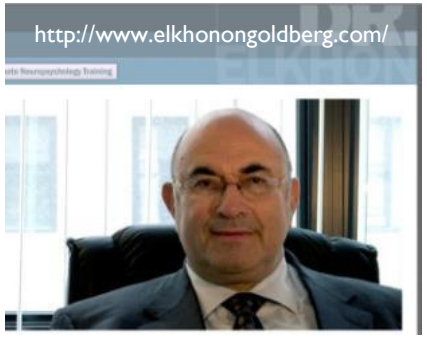
- **Before** the accident ‘he possessed a well-balanced mind, was seen as a shrewd, smart businessman, very energetic and persistent in executing all his plans of operation (p 59)
- **After** the accident his ability to direct others was gone, he had considerable trouble with:
  - Thinking, Behaviors, Work and Social Interactions

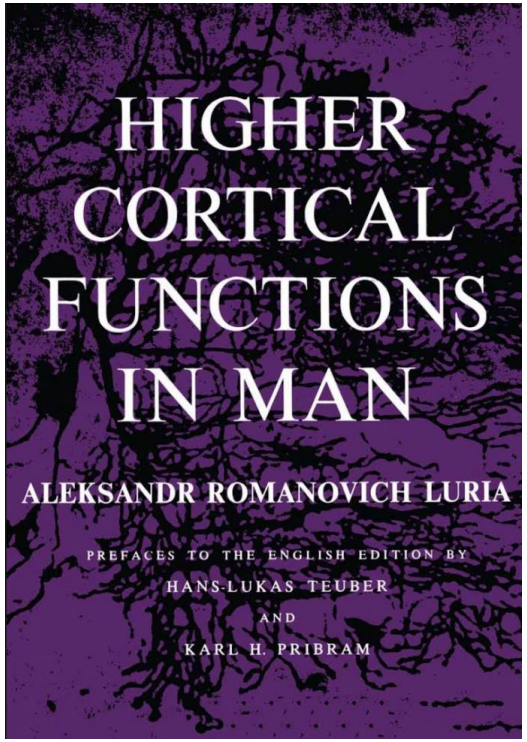


Executive Functions

- In 1966 Luria first wrote and defined the concept of Executive Function (EF) and described the frontal lobes as “the organ of civilization”
- Luria’s student, Nick Goldberg states that the frontal lobes are about …”leadership, motivation, drive, vision, self-awareness, and awareness of others, success, creativity, sex differences, social maturity, cognitive development and learning…”

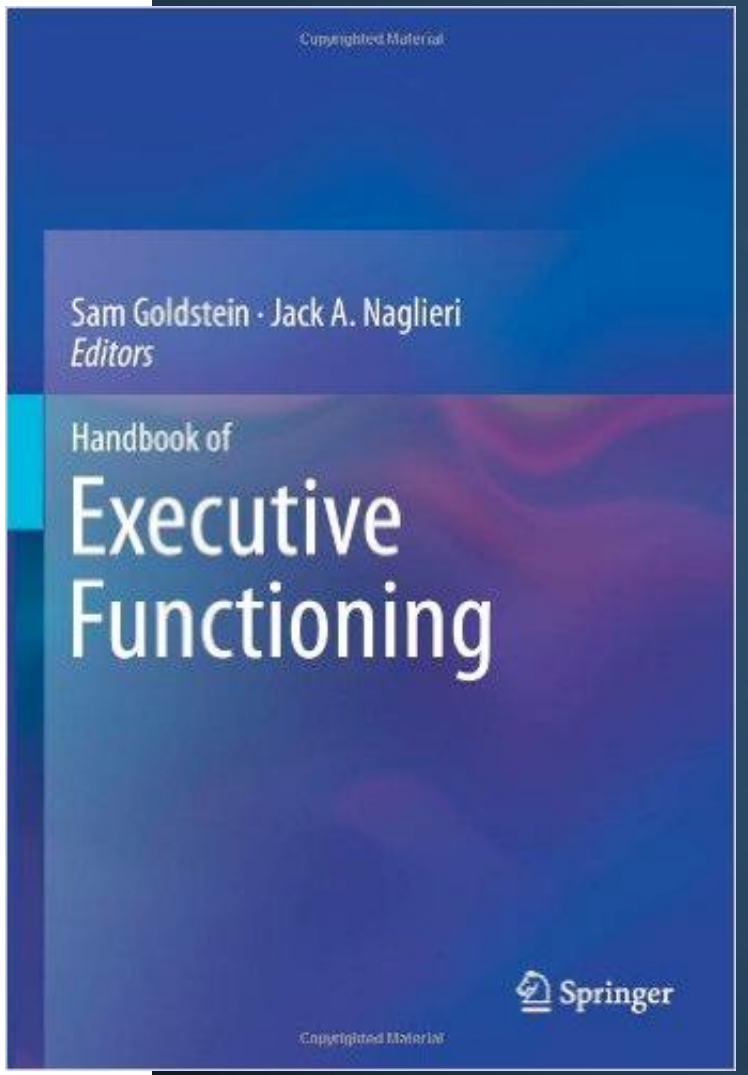






What is Executive Function(s)

- Goldstein, Naglieri, Princiotta, & Otero (2013) found more than 30 definitions of EF !
  - EF is a **unitary** construct
  - EF is a **unitary** construct with **many parts**
  - EF has **three components**: inhibitory control, set shifting (flexibility), and working memory
  - EF is a multidimensional model with many independent abilities
- **Critical Question: Is EF a unitary or multidimensional concept when measured by observable behaviors?**
- **We tested this hypothesis with CEFI and CEFI-Adult**



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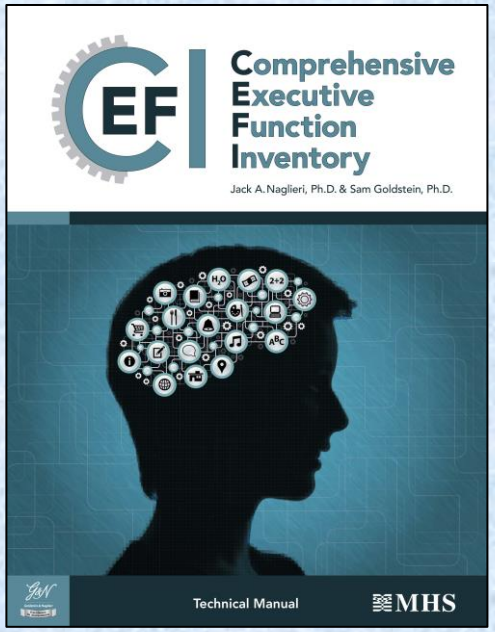


CEFI Factor Analysis

Item Level Analysis

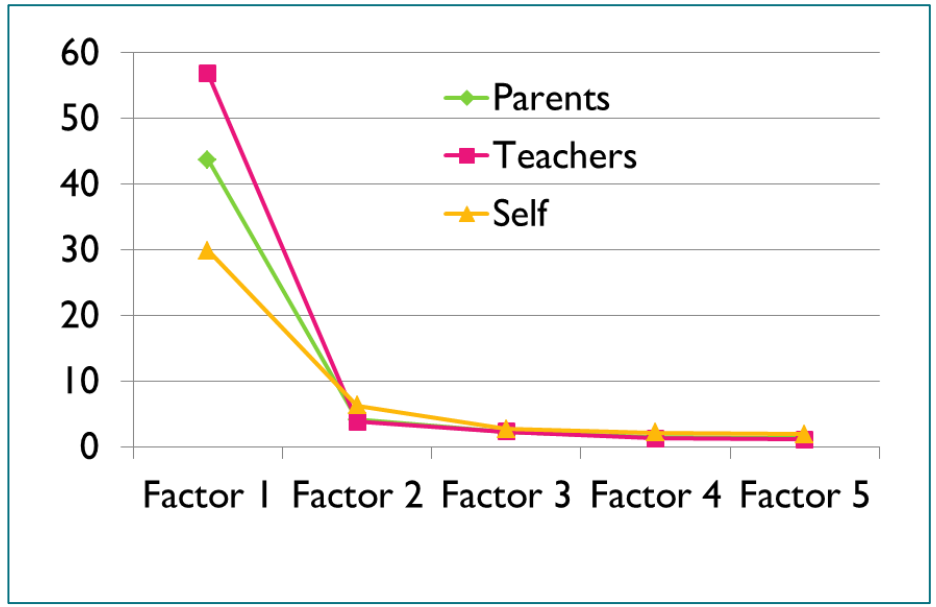
- For the ***first half*** of the normative sample (Parent, Teacher and Self ratings') **item scores** (90 items) used in factor analysis

Scale Level Analysis

- Using the ***second half*** of the normative sample EFA was conducted using raw scores for the following scales:
  - Attention
  - Emotion Regulation
  - Flexibility
  - Inhibitory Control
  - Initiation
  - Organization
  - Planning
  - Self-Monitoring
  - Working Memory

CEFI Factor Analysis Parent (N=1,400), Teacher (N=1,400) and Self (N=700)

Item Factor Analyses

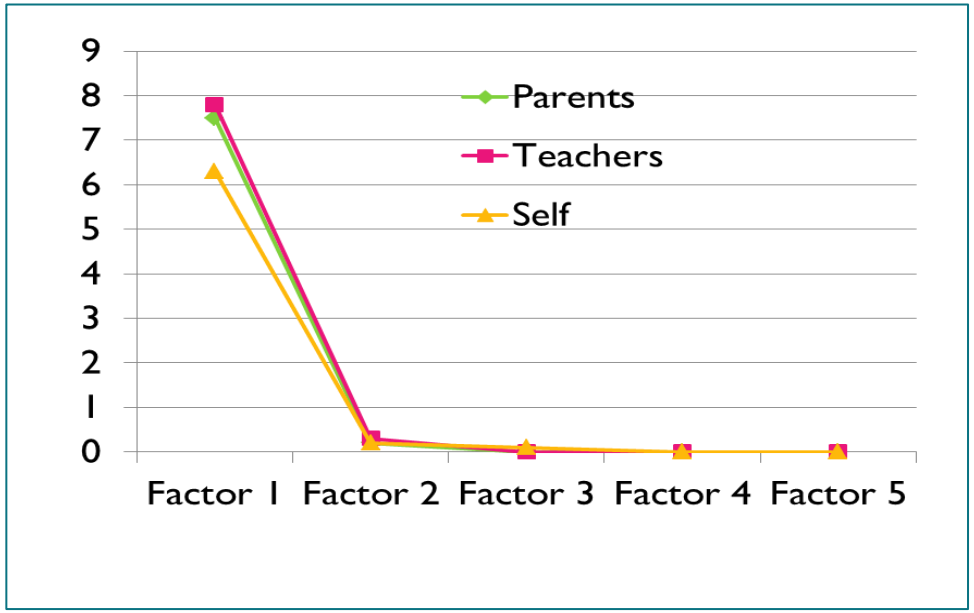


Eigenvalues from the Inter-Item Correlations

Form	Factor						
	1	2	3	4	5	6	7
Parent	43.7	4.1	2.3	1.5	1.3	1.3	1.0
Teacher	56.8	3.8	2.3	1.3	1.1	1.1	0.8
Self-Report	29.9	6.3	2.7	2.1	1.9	1.8	1.5

Note. Extraction method: Principal Axis Factoring. Only the first 10 eigenvalues are presented.

Scale Factor Analyses



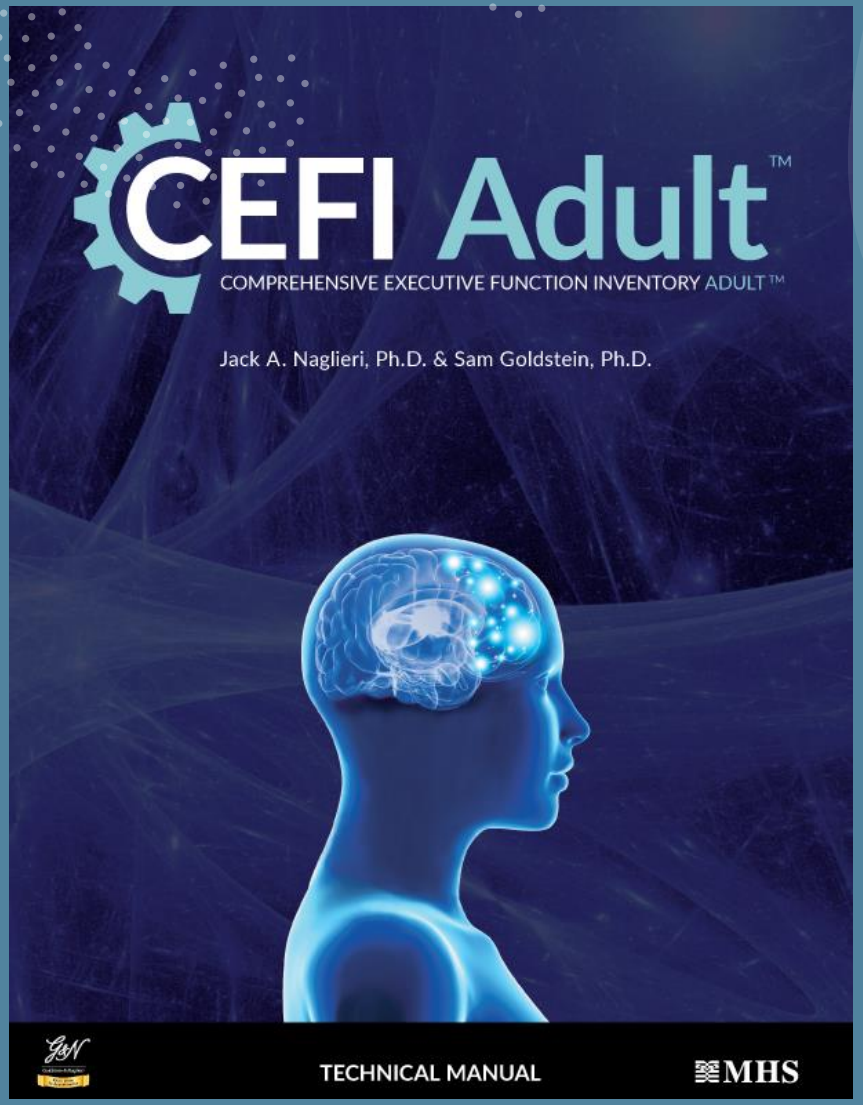
Eigenvalues of the CEFI Scales Correlations

Form	Factor						
	1	2	3	4	5	6	7
Parent	7.5	0.2	0.0	0.0	0.0	0.0	0.0
Teacher	7.8	0.3	0.0	0.0	0.0	0.0	0.0
Self-Report	6.3	0.2	0.1	0.0	0.0	0.0	-0.1

Note. Extraction method: Principal Axis Factoring.

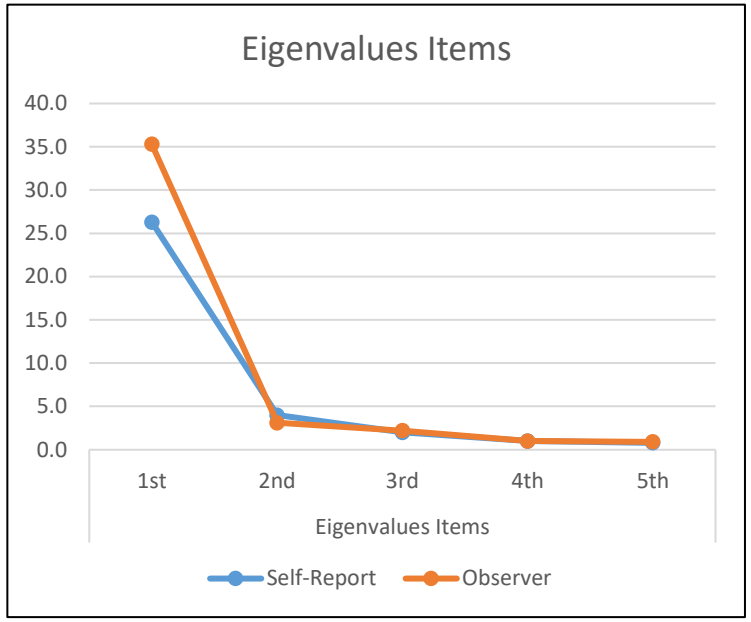
Factor Analysis of the CEFI Adult

- Same scale structure as CEFI
- Full Scale
  - Attention
  - Emotion Regulation
  - Flexibility
  - Inhibitory Control
  - Initiation
  - Organization
  - Planning
  - Self-Monitoring
  - Working Memory



CEFI Adult Self (N = 1,600) & Observer (N = 1,600)

Item Factor Analyses

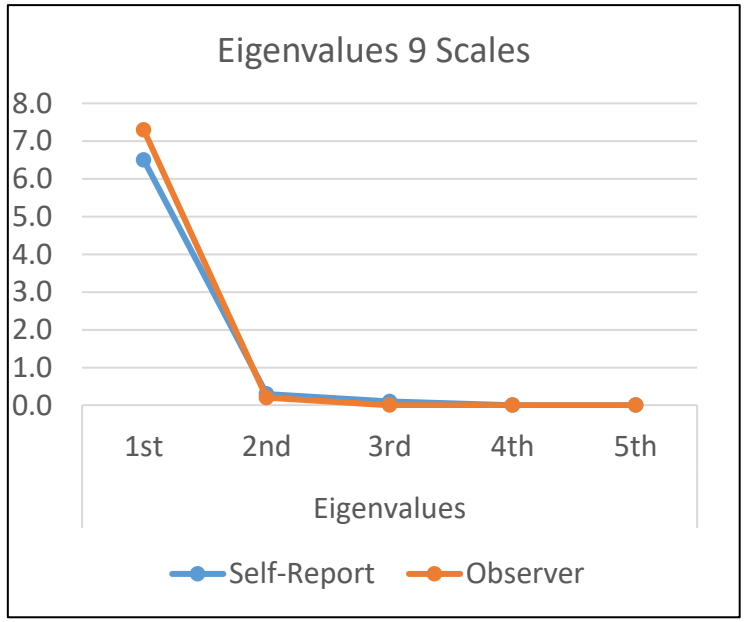


Eigenvalues from the Inter-Item Correlations

Form	1st:2nd	Factor								
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Self-Report	6.7	26.3	4.0	2.0	1.0	0.8	0.7	0.6	0.5	0.5
Observer	11.3	35.3	3.1	2.2	1.0	0.9	0.8	0.7	0.5	0.5

Note. Extraction method: Principal Axis Factoring. Only the first 9 eigenvalues are presented.

Scale Factor Analyses



Eigenvalues from the CEFI Adult Scales Correlations

Form	1st:2nd	Factor								
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Self-Report	21.7	6.5	0.3	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.1
Observer	32.7	7.3	0.2	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1

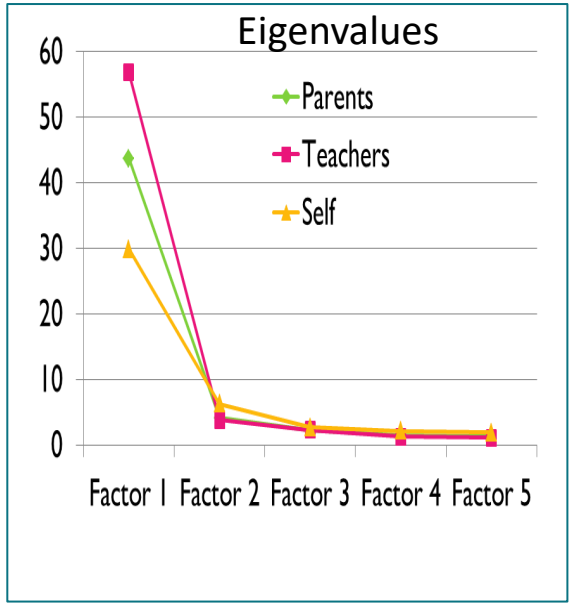
Note. Extraction method: Principal Axis Factoring.

CEFI Parent (N=1,400), Teacher (N=1,400) and Self (N=700)

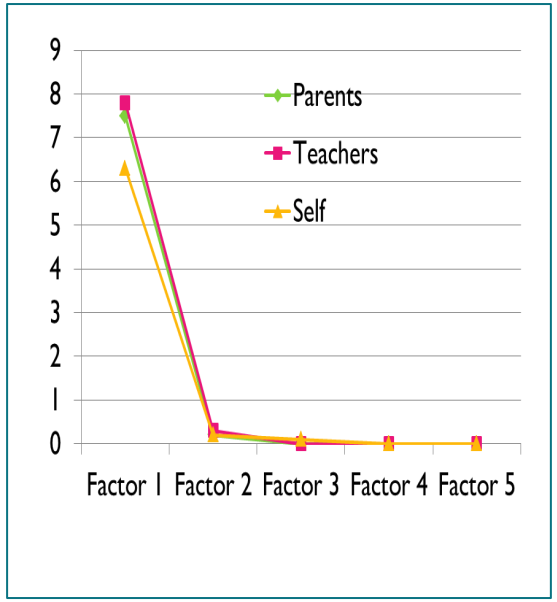
CEFI Adult Self (N = 1,600) & Observer (N = 1,600)

- Factor analytic studies using the CEFI and CEFI-Adult nationally representative standardization samples (N = 6,700)

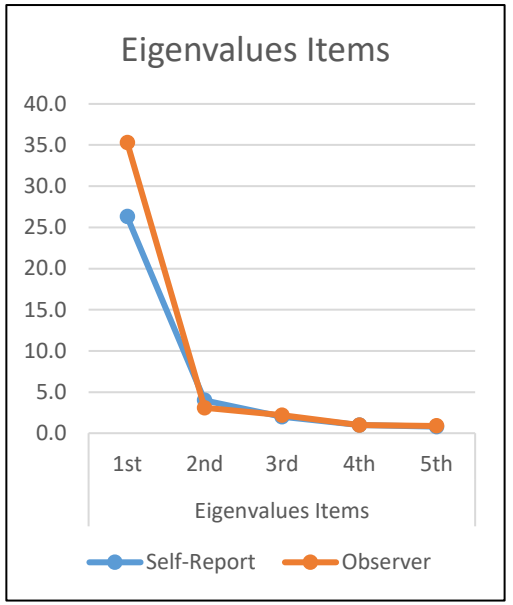
Item Factor Analyses



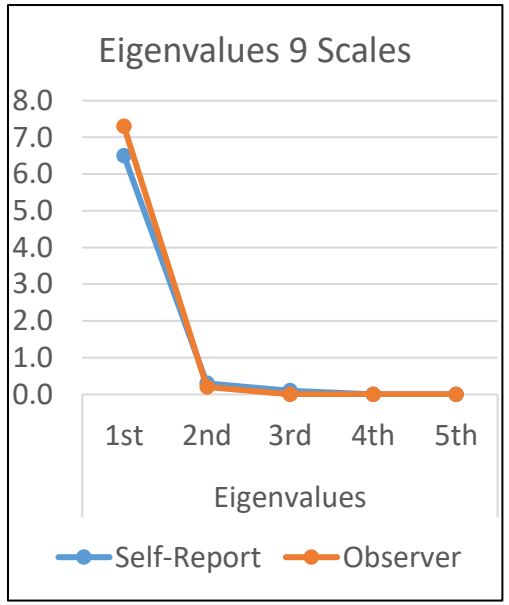
Scale Factor Analyses



Item Factor Analyses

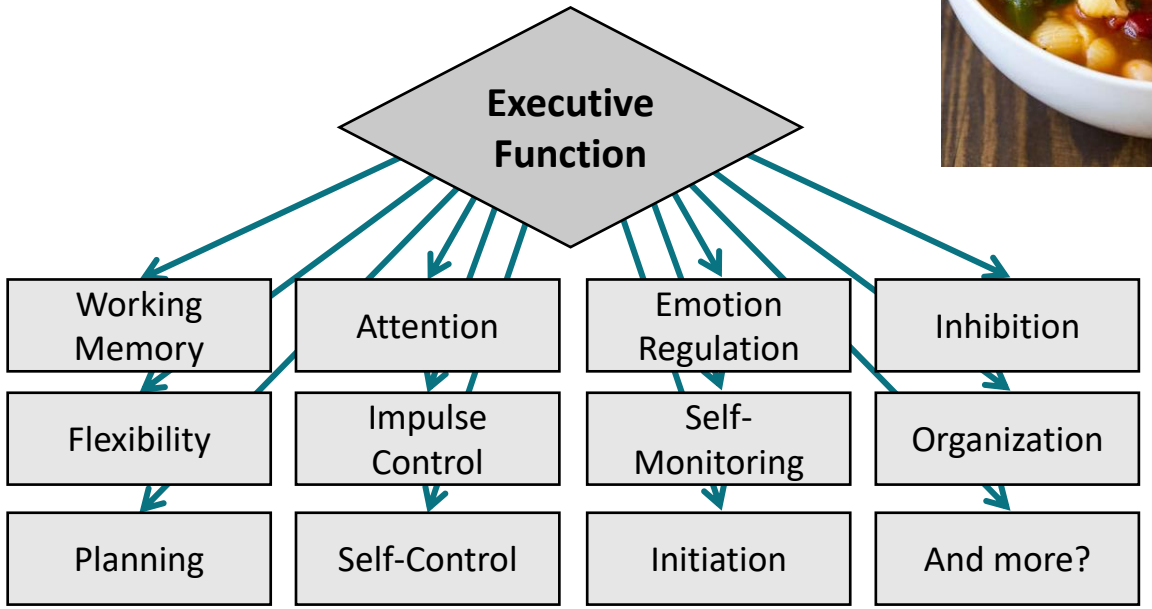


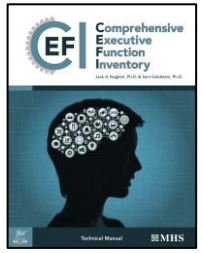
Scale Factor Analyses



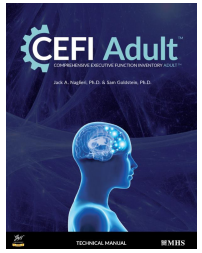
Executive Function or Functions

- Factor analyses also conducted **by gender, race, ethnicity, clinical vs nonclinical status** – same findings
- This means EF behaviors are best seen as **one construct**
- ***"How* you do what *you* decide to do"**





CEFI (Naglieri & Goldstein, 2012)



CEFI Adult (Naglieri & Goldstein, 2017)

Executive Function Involves

"How you do what *you* decide to do" demands…

- **Initiation** to achieve a goal, **planning** and **organizing** parts of a task, **attending** to details to notice success of the solution, keeping information in **memory**, having **flexibility** to modify the solution as information from **self-monitoring** is received and demonstrating **emotion regulation** (which also demands **inhibitory control**) to ensure clear thinking so that the task is completed successfully.

CEFI and the CEFI Adult

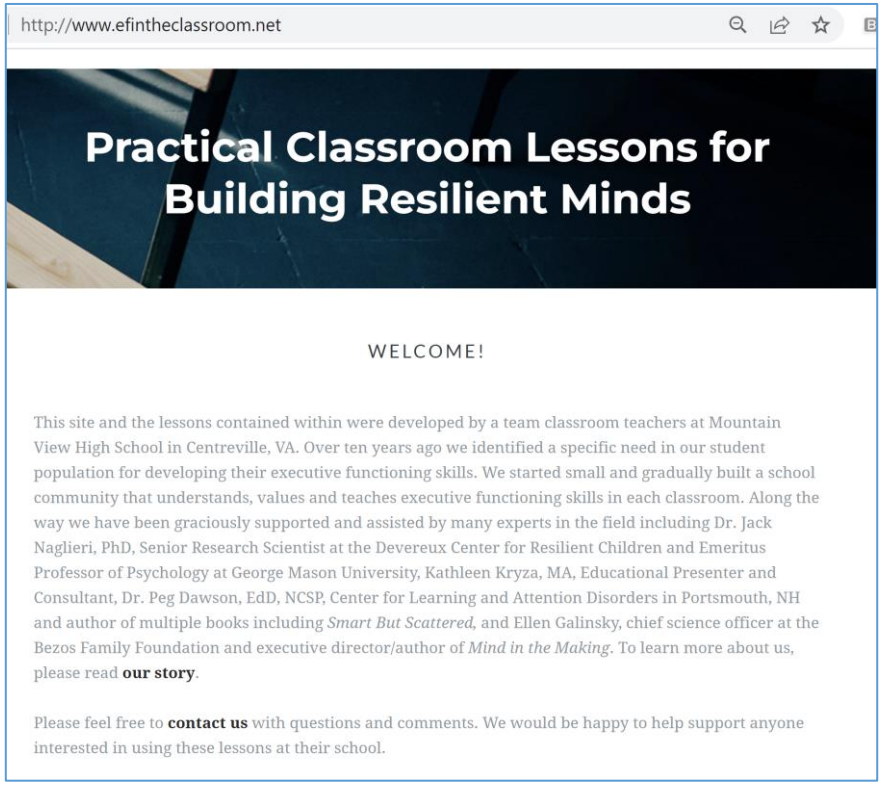
- **Strength based** EF measures
- Items are **positively** worded
- Higher scores = **good** behaviors related to EF
- Scores set at mean of **100**, SD of **15**
- CEFI: Ages 5-18 years rated by a parent, teacher, or the child/youth
- CEFI Adult: Ages 18+ years rated by the adult or an observer

EF is a unitary concept like ‘g’ general ability

Time for Questions and Answers

www.efintheclassroom.net
FREE Interventions for EF Behaviors

CEFI Scales	Efintheclassroom.net
Attention	Sustained Attention
Emotion Regulation	Emotional Control
Flexibility	Cognitive Flexibility
Inhibitory Control	Response Inhibition
Initiation	Task Initiation
Organization	Organization
Planning	Planning
Self-Monitoring	Response Inhibition
Working Memory	Working Memory



Antwerp train Station (2009)

Planning Lesson Student Responses

Q 1: What would you have to plan out?

- They had to learn the dance steps (knowledge)
- Someone had to start dancing (initiation)

Q2: What are the parts of a good plan?

- Think of possible problems (strategy generation)
- Organize the dance (organization)

Planning Lesson Student Responses

Q3: How do you know if a plan is any good?

- Put the plan in action and see if it works (self-monitoring)
- Give it a try (perhaps learn by failing)

Q4: What should you do if a plan isn't working?

1. Fix it. (self-correction)
2. Go home! (a bad plan)

Planning Lesson Student Responses

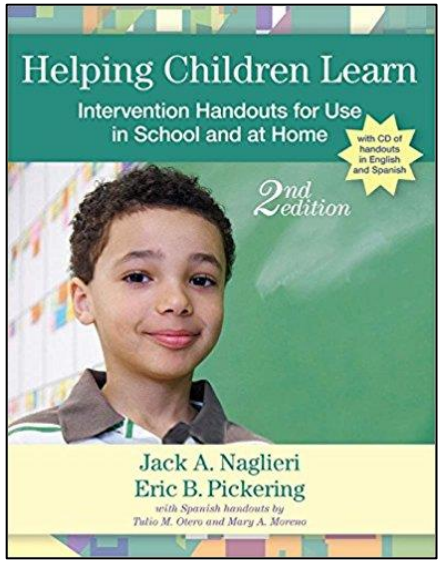
Q5: How do you use planning in this class?

1. We don't plan in this class
2. Mrs. X does all the planning in this class so you don't have to think about planning

To encourage EF we have to stress thinking about *how to do what **you** chose to do*

Encourage Planning

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



Step 1 – Talk with Students

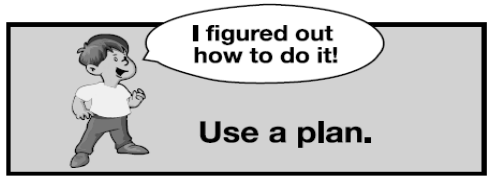
How Can You Be Smarter?

You can be smarter if you PLAN before doing things. Sometimes people say, "Look before you leap," "Plan your work and work your plan," or "Stop and think." These sayings are about using the ability to plan. When you stop and think about *how* to study, you are using your ability to plan.

You will be able to do more if you remember to use a plan. An easy way to remember to use a plan is to look at the picture "Think smart and use a plan!" (Figure 1). You should always use a plan for reading, vocabulary, spelling, writing, math problem solving, and science.

Do you have a favorite plan for learning spelling words? Do you use flashcards or go on the Internet to learn? Do you ask the teacher or another student for help? You can learn more by using a plan for studying that works best for you.

Think smart and use a plan!



It is smart to have a plan for doing all schoolwork. When you read, you should have a plan. One plan is to look at the questions you have to answer about the story first. Then read the story to find the answers. Another plan is to make a picture of what you read so that you can see all the parts of the story. When you write you should also have a plan. Students who are good at writing plan and organize their thoughts first. Then they think about what they are doing as they write. Using a plan is a good way to be smarter about your work!

Planning Facilitation for Math Calculation

Math calculation is a complex activity that involves recalling basic math facts, fol
dures, working carefully, and checking one's work. Math calculation requires a c
approach to follow all of the necessary steps. Children who are good at math ca
move on to more difficult math concepts and problem solving with greater ease
are having problems in this area. For children who have trouble with math calcul
that helps them approach the task planfully is likely to be useful. Planning facilita
technique.

Planning facilitation helps students develop useful strategies to carefully complet
through discussion and shared discovery. It encourages students to think about
problems, rather than just think about whether their answers are correct. This he
careful ways of doing math.

How to Teach Planning Facilitation

Planning facilitation is provided in three 10-minute time periods: 1) 10 minutes o
utes of discussion, and 3) 10 more minutes of math. These steps can be describ

Step 1: The teacher should provide math worksheets for the students to comple
10-minute session. This gives the children exposure to the problems and ways t
teacher gives each child a worksheet and says, "Here is a math worksheet for y
try to get as many of the problems correct as you can. You will have 10 minutes
on this instruction are okay, but do not give any additional information.

Hammill Institute on Disabilities

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

Jackie S. Iseman[1] and Jack A. Naglieri[1]

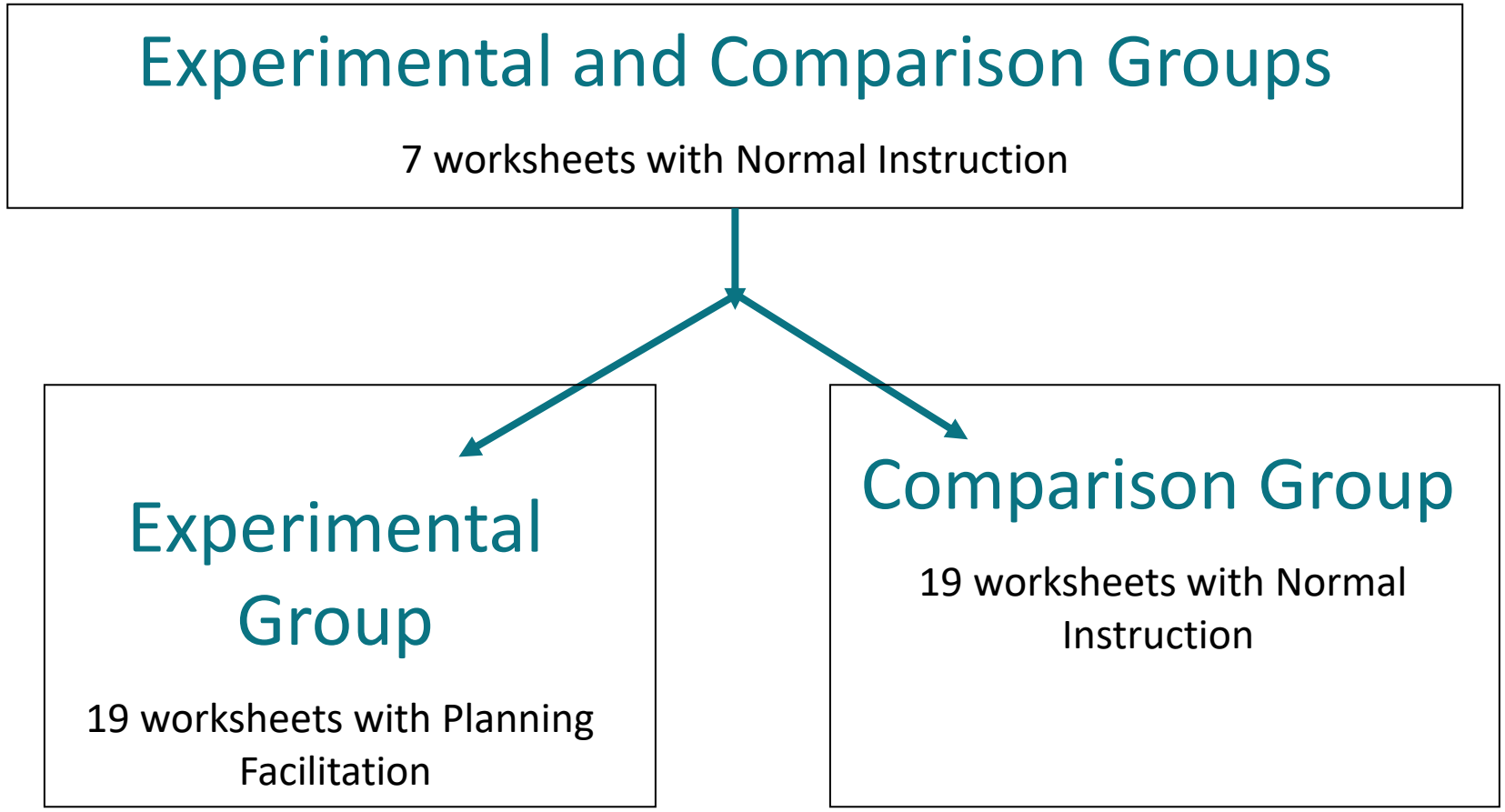
Abstract

The authors examined the effectiveness of cognitive strategy instruction based on PASS (Planning, Attention, Simultaneous, Successive) given by special education teachers to students with ADHD randomly assigned by classroom. Students in the experimental group were exposed to a brief cognitive strategy instruction for 10 [illegible] development and application of effective planning for mathematical computation, [illegible] standard math instruction. Standardized tests of cognitive processes and math [illegible] students completed math worksheets throughout the experimental phase. Stan[illegible] *Johnson Tests of Achievement, Third Edition*, Math Fluency and *Wechsler Individu*[illegible] Numerical Operations) were administered pre- and postintervention, and Math [illegible] follow-up. Large pre–post effect sizes were found for students in the experimental [illegible] math worksheets (0.85 and 0.26), Math Fluency (1.17 and 0.09), and Numerical O[illegible] At 1 year follow-up, the experimental group continued to outperform the compa[illegible] students with ADHD evidenced greater improvement in math worksheets, far[illegible] (which measured the skill of generalizing learned strategies to other similar tasks[illegible] when provided the PASS-based cognitive strategy instruction.

Ja[illegible]

Design of the Study

Iseman & Naglieri (2005)



Strategy Instruction

Iseman & Naglieri (2005)

- 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?

Iseman & Naglieri (2005)

Iseman and Naglieri

Table 3. Students' Comments During Planning Facilitation Sessions

Goals
- "My goal was to do all of the easy problems on every page first, then do the others."
- "To get as many correct as I can."
- "To get as many right as quickly as possible."
- "To take time and make sure I get them correct."

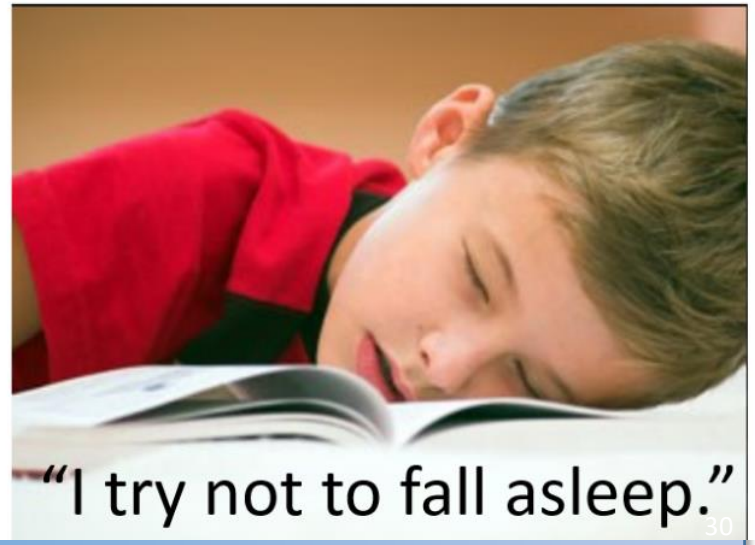
Starting place
- "I started on the first one."
- "I skipped around."
- "I do the easy ones first."
- "I look at the type of problem and the number of steps and decide which problems to do first."

Overall plan
- "I did all the easy problems on a page and went onto the next one."
- "I do all the addition first, then the easy minus, and then I move onto the harder ones."
- "I do the problems I know, then I check my work."

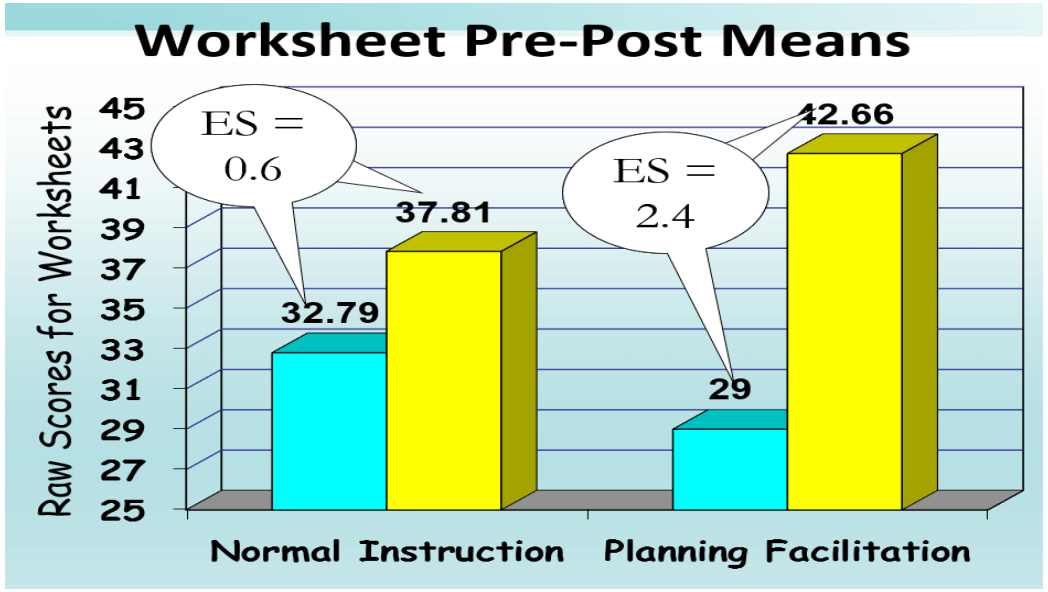
Specific strategies
- "I simplify fractions first."
- "Skip the longer multiplication questions."
- "The problems that have lots of steps take more time, so I skip them."
- "I do them [the algebra] by figuring out what I can put in for X to make the problem work."
- "I draw lines so I don't get my columns confused [on the multiplication]."
- "I stopped drawing lines because it slowed me down."
- "If a problem is taking a long time I skip it and come back to it if I have time."
- "I did the ones that take the least time."
- "Remember that anything times 0 is 0."

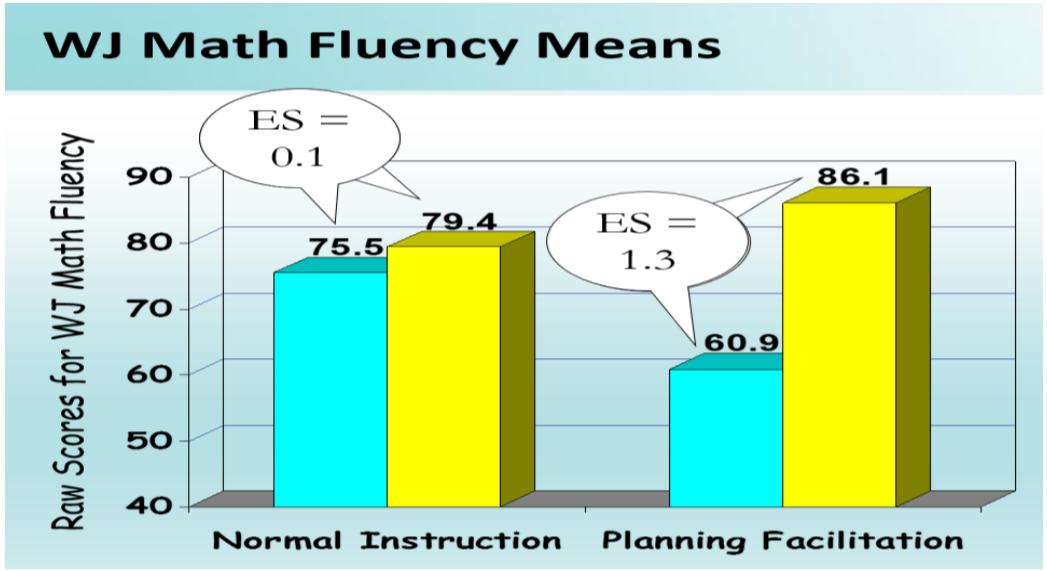
Noticing patterns in the worksheets
- "I did all the problems in the brain-dead zone first."
- "I started in the middle of the page, the problems on top take longer."
- "Next time I'll skip the hard multiplication at the top of the first page."

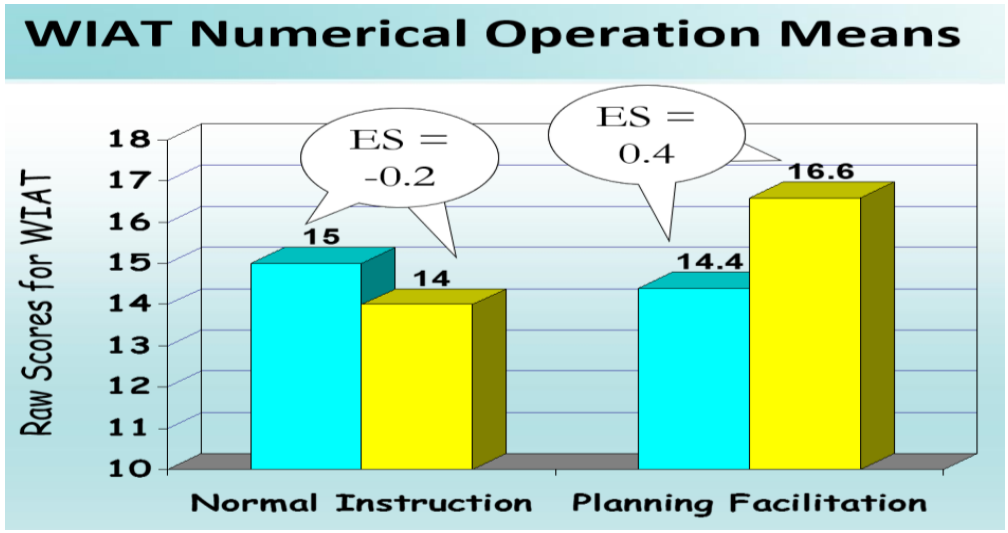
- "My goal was to do all of the easy problems on every page first, then do the others."
- "I do the problems I know, then I check my work."
- "I did all the problems in the brain-dead zone first."



Iseman & Naglieri (2005)







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

Effectiveness of a Cognitive Strategy Intervention in Improving Arithmetic Computation Based on the PASS Theory

Jack A. Naglieri and Deanne Johnson

Abstract

The purpose of this study was to determine if an instruction designed to facilitate planning, given by teachers to their class as a group, would have differential effects depending on the specific Planning, Attention, Simultaneous, Successive (PASS) cognitive characteristics of each child. A cognitive strategy instruction that encouraged planning was provided to the group of 19 students with learning disabilities and mild mental impairments. All students completed math worksheets during 7 baseline and 14 intervention sessions. During the intervention phase, students engaged in self-reflection and verbalization of strategies about how the arithmetic computation worksheets should be completed. The sample was sorted into one experimental and four contrast groups after the experiment
were four groups with a cognitive weakness in each PASS scale from the Cognitive Assessment System and one g
weakness
contrast t
size of -0.2
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Reading Psychology, 31:428–453, 2010
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REMEDIATING READING COMPREHENSION DIFFICULTIES: A COGNITIVE PROCESSING APPROACH

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The efficacy of a cognitive-based remediation program was investigated with 14 English-as-a-second-language (ESL) poor readers in Grade 4 who had significant difficulty in comprehension and 14 normal ESL readers in Grade 4 who received no remediation. Both groups were selected from 2 English-medium schools

J. P. Das, Denyse V. Hayward, George K. Georgiou
University of Alberta

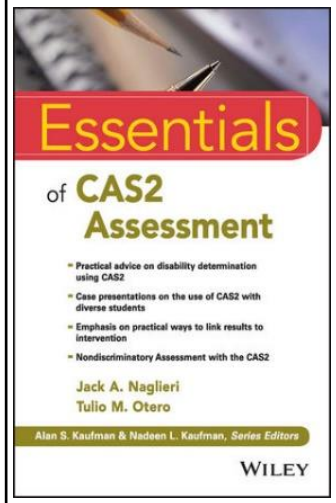
Troy Janzen
Taylor University College

Neelam Boora
Nipisihkopahk Middle School

Comparing the Effectiveness of Two Reading Intervention Programs for Children With Reading Disabilities

Abstract

The effectiveness of two reading intervention programs (phonics-based and inductive learning) was investigated with 63 First Nations children identified as poor readers in Grades 3 and 4 in Study 1, whereas in Study 2, the efficacy of booster sessions for inductive learning or PREP (PASS Reading Enhancement Program) was examined. The major dependent variables in Study 1 were pretest to posttest changes following intervention on reading tests for word reading and word decoding. Other
nt variables comprised tests of phonological awareness, rapid



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

Jackie S. Iseman[1] and Jack A. Naglieri[1]

Abstract

The authors examined the effectiveness of cognitive strategy instruction based on PASS (Pla
Successive) given by special education teachers to students with ADHD randomly assigned
experimental group were exposed to a brief cognitive strategy instruction for 10 days, wh
development and application of effective planning for mathematical computation, whereas t
standard math instruction. Standardized tests of cognitive processes and math achievem
students completed math worksheets throughout the experimental phase. Standardized
Johnson Tests of Achievement, Third Edition, Math Fluency and *Wechsler Individualized Achievement Test, Second Edition*,
Numerical Operations) were administered pre- and postintervention, and Math Fluency was also administered at 1 year follow-up. Large pre–post effect sizes were found for students in the experimental group but not the comparison group on math worksheets (0.85 and 0.26), Math Fluency (1.17 and 0.09), and Numerical Operations (0.40 and –0.14, respectively). At 1 year follow-up, the experimental group continued to outperform the comparison group. These findings suggest that students with ADHD evidenced greater improvement in math worksheets, far transfer to standardized tests of math (which measured the skill of generalizing learned strategies to other similar tasks), and continued advantage 1 year later when provided the PASS-based cognitive strategy instruction.

Mathematics Instruction and PASS Cognitive Processes: An Intervention Study

Jack A. Naglieri and Suzanne H. Gottling

Abstract

The purpose of this study was to determine if an instruction designed to facilitate planning, given by t
group, would have differential effects depending on the specific cognitive characteristics of the individ
instruction that facilitated planning was provided to a group of 12 students with learning disabilities. All
work sheets during 7 sessions of baseline and 21 sessions of intervention (when the instruction designed
provided). During the intervention phase, students engaged in self-reflection and verbalization of strategie
problems were completed. The class was sorted according to planning scores, obtained using the Cogn
which is based on Planning, Attention, Simultaneous, Successive (PASS) theory; and low- and high-plann
identified. The results, consistent with previous research, showed that teaching control and regulation
beneficial effects for all students but was especially helpful for those who were poor in planning, as de
Implications of these findings are provided.

Journal of Psychoeducational Assessment
2003, *21*, 282-289

PLANNING FACILITATION AND READING COMPREHENSION: INSTRUCTIONAL RELEVANCE OF THE PASS THEORY

Frederick A. Haddad
Kyrene School District, Tempe, Arizona

Y. Evie Garcia
Northern Arizona University

Jack A. Naglieri
George Mason University

Michelle Grimditch, Ashley McAndrews, Jane Eubanks
Kyrene School District, Tempe, Arizona

The purpose of this study was to evaluate whether instruction designed to facilitate planning would have differential benefit on reading comprehension depending on the specific Planning, Attention, Simultaneous, and Successive (PASS) cognitive characteristics of each child. A sample of 45 fourth-grade general education children was sorted into three groups based on each PASS scale profile from the Cognitive Assessment System (CAS). The groups did not differ by CAS Full Scale standard score, chronological age, gender, or pretest reading comprehension scores. After each child's pretest reading comprehension instructional level was determined, a cognitive strategy instruction intervention was conducted. The children completed a reading comprehension posttest at their respective instructional levels after the intervention. Results showed that children with a Planning weakness ($n = 13$) benefited substantially (effect size of 1.52) from the instruction designed to facilitate planning. Children with no weakness ($n = 21$; effect size = .52) or a Successive weakness ($n = 11$; effect size of .06) did not benefit as much. These results support previous research suggesting that PASS profiles are relevant to instruction.

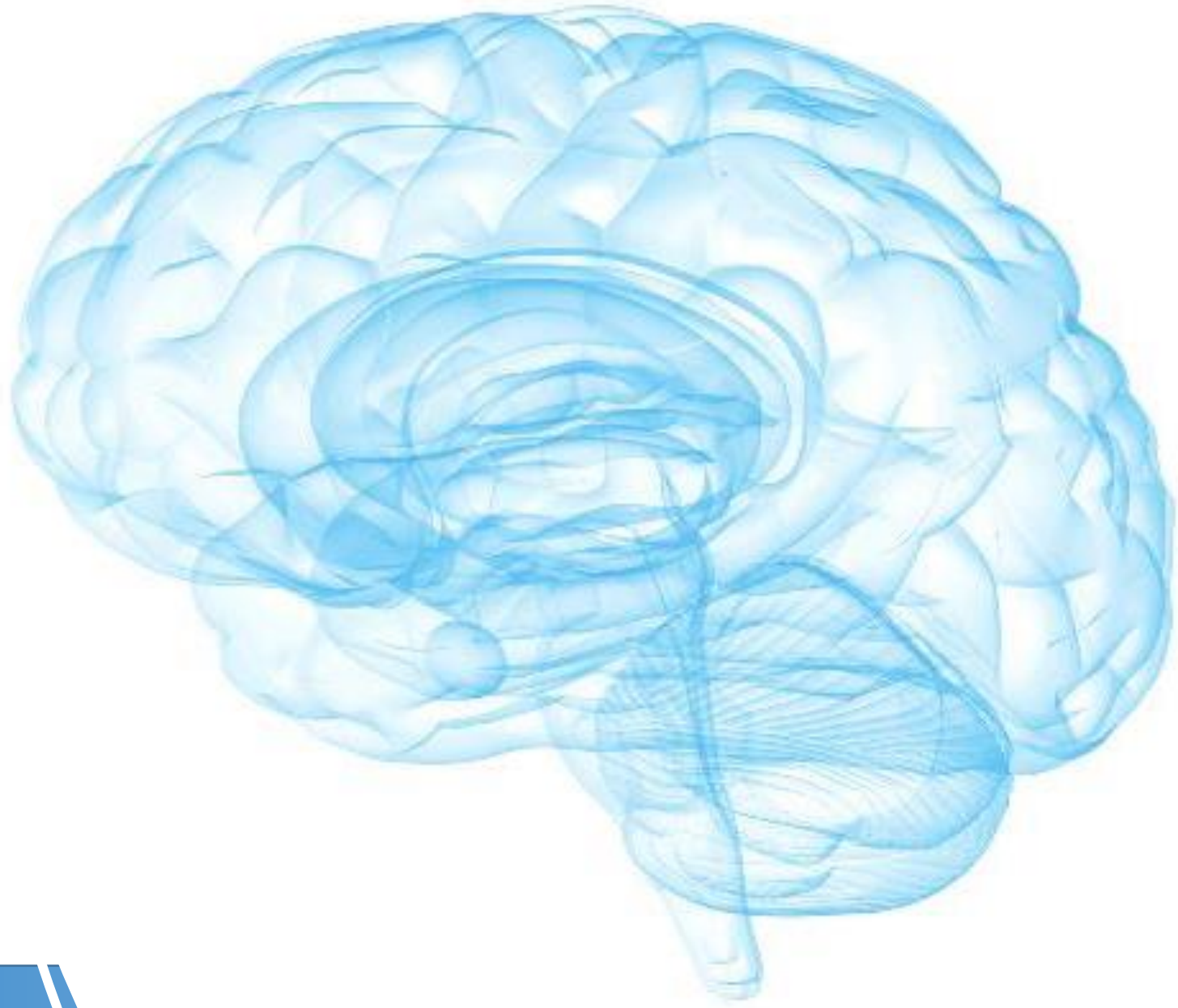
Don’t Be the Child’s Pre-Frontal Cortex!

QUESTIONS about the Interventions?

Presentation Outline

- Introduction to Executive Function (EF)
- EF Behaviors
- EF and Cognition (intelligence)
- EF and Social Emotional Skills
- EF and Academic/Job Performance
- Research about EF as ability, behavior, and SE
- Conclusions

EF is a Brain-Based Ability (AKA intelligence)



If we define intelligence from a neurocognitive perspective

EF is an ability (type of intelligence) by virtue of its relationship to the brain

But EF is not measured by traditional IQ tests

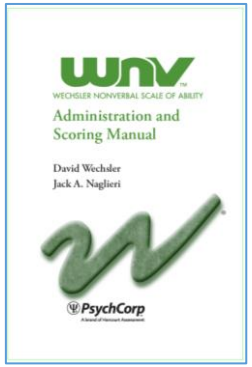
Traditional IQ and Achievement Tests

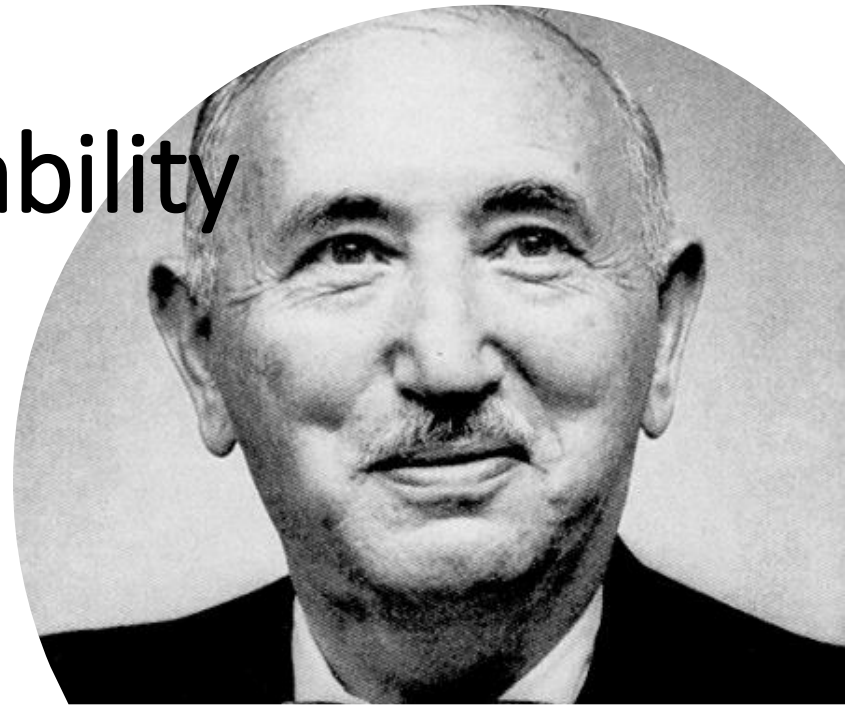
- When I started working as a school psychologist in 1975…I had concerns
  - Why did the WISC have Verbal and Performance (?) subtests?
  - What exactly did the scores mean?
  - Was the Stanford-Binet really different from the WISC?
  - Was there **a theory** behind the WISC and Binet that could guide my interpretation of the scores?

1975 Charles Champagne Elementary, Bethpage, NY

Wechsler's View of General ability

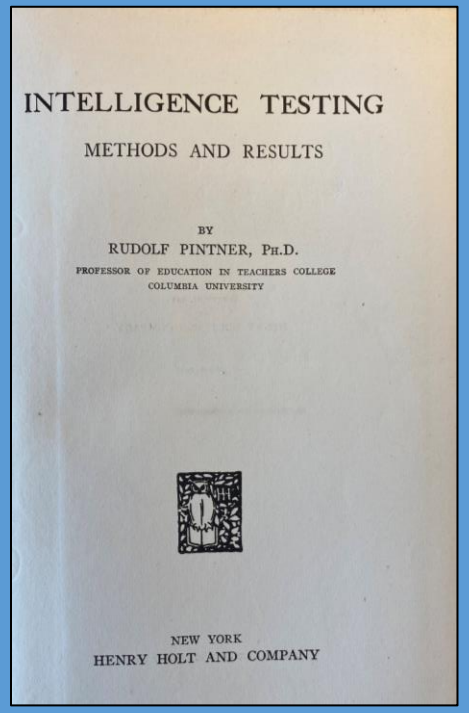
- Wechsler "believed that his Verbal and Performance Scales represented different ways to access *g* (general ability)", but he never believed [in verbal and] nonverbal intelligence as being separate from g. Rather he saw the Performance Scale as the most sensible way to measure the general intelligence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

General Ability Defined by Pintner (1923)


INTELLIGENCE TESTING

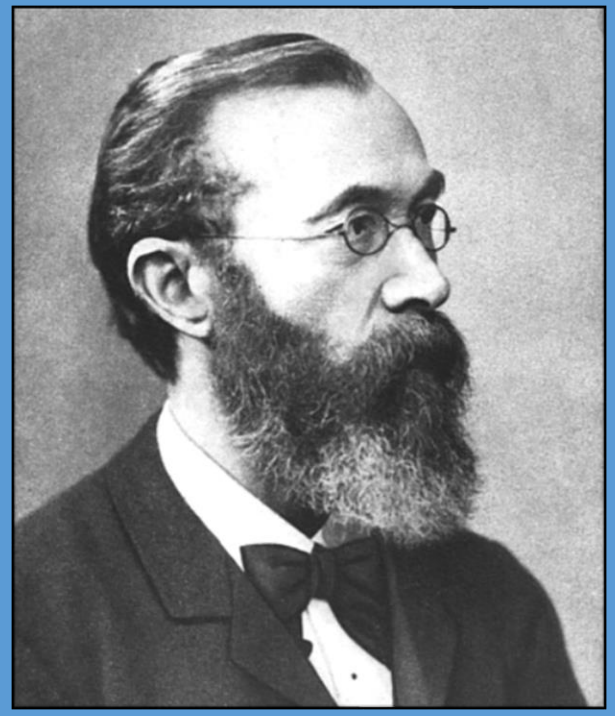
METHODS AND RESULTS

BY

RUDOLF PINTNER, PH.D.

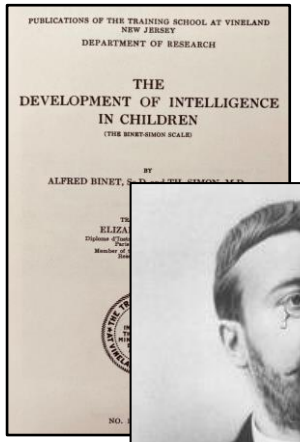
PROFESSOR OF EDUCATION IN TEACHERS COLLEGE
COLUMBIA UNIVERSITY

NEW YORK
HENRY HOLT AND COMPANY



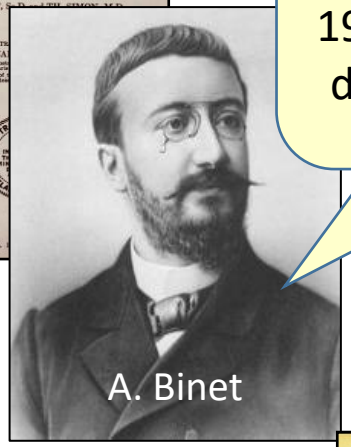
"we did not start with a clear definition of general intelligence… [but] borrowed from every-day life a vague term implying all-round ability and… we [are] still attempting to define it more sharply and endow it with a stricter scientific connotation" (p. 53, Pintner, 1923)".

Stanford-Binet → Army Mental Tests → Today

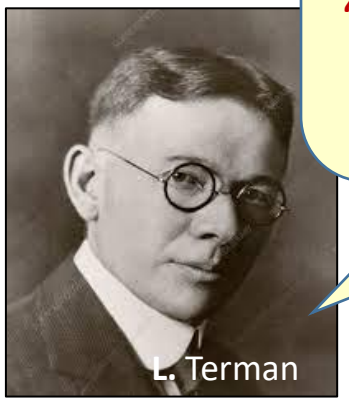

PUBLICATIONS OF THE TRAINING SCHOOL AT VINELAND
NEW JERSEY
DEPARTMENT OF RESEARCH

THE
DEVELOPMENT OF INTELLIGENCE
IN CHILDREN
(THE BINET-SIMON SCALE)

BY

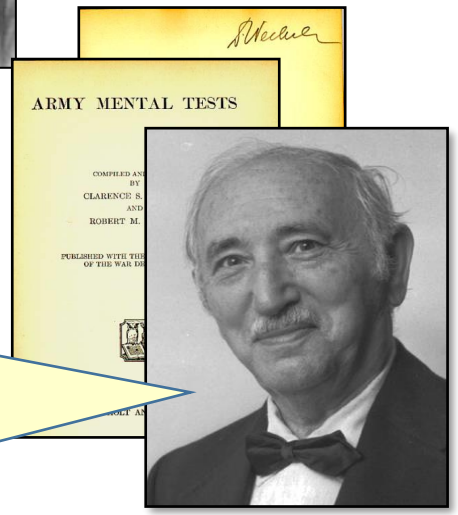


When working on the 1911 scale, Binet removed items from 1908 scale because 'they depended too much on school learning'



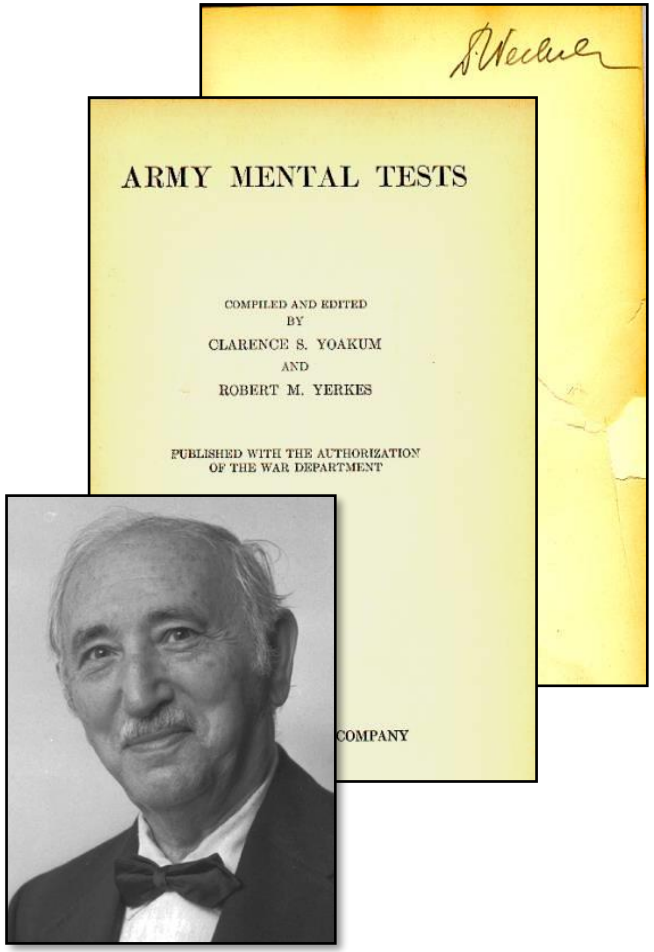
Terman added items dependent upon school learning into the 1916 Stanford-Binet because he believed 'intelligence at the verbal and abstract levels is the highest form of mental ability'.

Arthur Otis (Terman's student) was instrumental in the development of the U.S. Army Alpha (Verbal & Quantitative) and Beta (Nonverbal), the Otis-Lennon Ability Test and known for the multiple-choice format



Wechsler based his intelligence test on the U.S. Army Mental Tests (Verbal, Quantitative & Nonverbal)

Alpha & Beta → Wechsler



- **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

Verbal & Quantitative IQ (Knowledge)

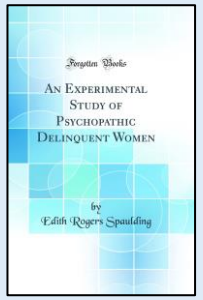
Nonverbal IQ (Thinking)

WISC, WJ CogAT & Otis-Lennon

IQ Tests Defined Intelligence

Edwin Boring: The Stanford-Binet became the **operational definition of intelligence**

Edith Spaulding & William Healy



The claim that we have measured hereditary intelligence has **no scientific foundation**

INHERITANCE AS A FACTOR IN CRIMINALITY.

A STUDY OF A THOUSAND CASES OF YOUNG REPEATED OFFENDERS.[1]

EDITH R. SPAULDING[2] AND WILLIAM HEALY.[3]

Inheritance as a factor in criminality may be considered under two heads: (*a*) the direct inheritance of criminalistic traits in otherwise normal individuals; (*b*) the indirect inheritance of criminalistic tendencies through such heritable factors as epilepsy, insanity, feeble-mindedness, etc. The first should include only those cases in which the traits themselves are primarily criminalistic, while the second comprises those in which certain inherited qualities of body or mind, not anti-social in themselves, produce criminals when ill proportioned to other characteristics in the same individual, or ill adjusted to environment. Thus a feeble-minded individual may show no delinquent tendencies if sufficiently protected, but placed on his own resources in society, he soon finds his way to the police court.

In the thousand cases which have been reviewed, we have carefully sought for evidence of direct inheritance of criminalistic traits, as such. However, in no one case of the thousand have we been able to discover evidence of anti-social tendencies in succeeding generations without also finding underlying trouble of a physical or mental nature, or such striking environmental faults or mal-adjustments as often develop delinquency in the absence of defective inheritance. In order to prove the existence of the first class, we feel it absolutely essential to rule out other well-known causative factors in each case.[4]

Family charts alone, without detailed environmental and developmental history, are not sufficient proof of inherited criminalism, no matter how many criminal histories they may contain. Studying the history of criminalistic tendencies, which themselves may arise through any of a large number of possible biologic, mental or social factors, is

[1]Read before the American Academy of Medicine at its thirty-eighth annual meeting, Minneapolis, June 14, 1913. Published here and in the *Bulletin of the American Academy of Medicine* simultaneously, by courtesy of the *Bulletin*.

We cannot measure intelligence *when we have never defined it.*

Support for ‘g’

Journal Information
Journal TOC

PsycARTICLES: Journal Article

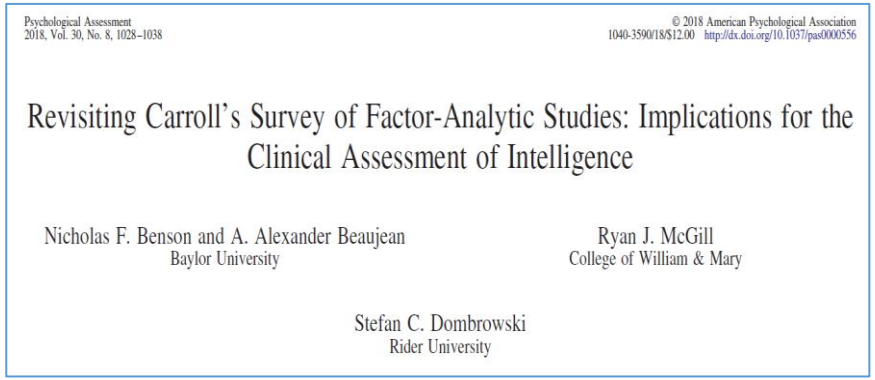
Structural validity of the Wechsler Intelligence Scale for Children–Fifth Edition: Confirmatory factor analyses with the 16 primary and secondary subtests.

© Request Permissions

Canivez, Gary L.,Watkins, Marley W.,Dombrowski, Stefan C.

Canivez, G. L., Watkins, M. W., & Dombrowski, S. C. (2017). Structural validity of the Wechsler Intelligence Scale for Children–Fifth Edition: Confirmatory factor analyses with the 16 primary and secondary subtests. *Psychological Assessment, 29*(4), 458–472. https://doi.org/10.1037/pas0000358

- …The small portions of variance uniquely captured by [WISC-V subtests]… render the group factors [scales]of questionable interpretive value independent of g (FSIQ general intelligence)
- Present CFA results confirm the EFA results (Canivez, Watkins, & Dombrowski, 2015); Dombrowski, Canivez, Watkins, & Beaujean (2015); and Canivez, Dombrowski, & Watkins (2015).



Psychological Assessment
2018, Vol. 30, No. 8, 1028–1038

© 2018 American Psychological Association
1040-3590/18/$12.00 http://dx.doi.org/10.1037/pas0000556

Revisiting Carroll’s Survey of Factor-Analytic Studies: Implications for the Clinical Assessment of Intelligence

Nicholas F. Benson and A. Alexander Beaujean
Baylor University

Ryan J. McGill
College of William & Mary

Stefan C. Dombrowski
Rider University

- **The results of this study indicate that most cognitive abilities specified in** John Carroll’s **three-stratum theory have little-to-no interpretive relevance above and beyond that of general intelligence.**

Factor Analytic Models of Intelligence

- CHC is a statistical model that is not consistent with brain functioning *(i.e.* ***modularity vs. gradiental)***
- It fails to account for the frontal lobes *(i.e. executive functions)*,
- Assumes 69 specific narrow abilities!
- Can lead to "over-testing" of students.
- Does not always intuitively correlate with academic performance and therefore can be problematic in generating interventions

  (i.e. The cluster score for reading on WJIV includes number-pattern matching?)

Cattell-Horn-Carroll's three stratum

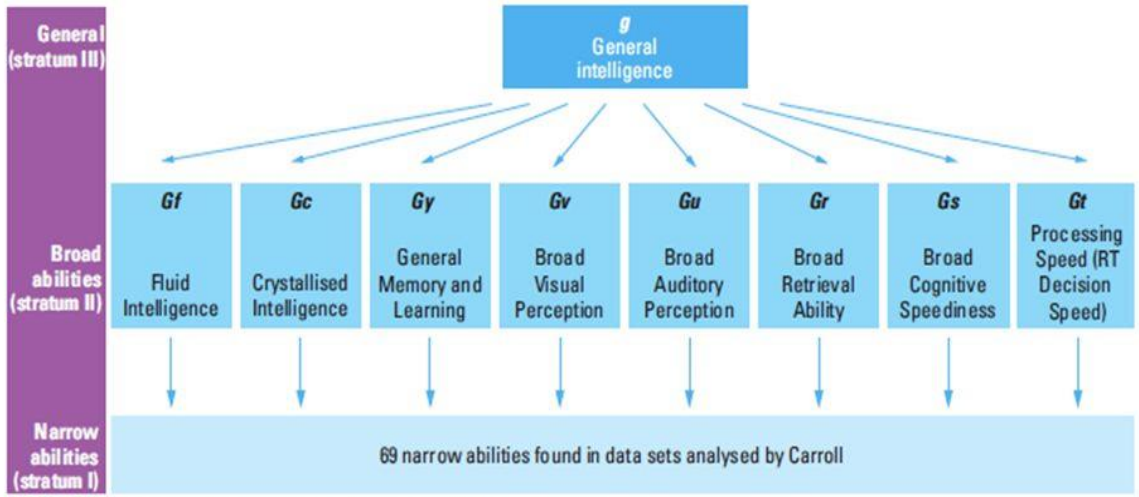


Figure 11.14 Carroll's three-stratum theory of cognitive abilities

Research Supports ‘g’ but little More

Watkins, M. W., & Canivez, G. L. (2021). Assessing the psychometric utility of IQ scores: A tutorial using the Wechsler intelligence scale for children–fifth edition. School Psychology Review, 1-15.

Benson, N. F., Beaujean, A. A., McGill, R. J, & Dombrowski, S. C. (2018). Revisiting **Carroll’s Survey of Factor-Analytic Studies**: Implications for the Clinical Assessment of Intelligence. *Psychological Assessment,* 30, 8, 1028–1038.

Canivez, G. L., Watkins, M. W., & Dombrowski, S. C. (2017). Structural validity of the **Wechsler Intelligence Scale for Children–Fifth Edition:** Confirmatory factor analyses with the 16 primary and secondary subtests. *Psychological Assessment, 29,* 458-472.

Canivez, G. L., & McGill, R. J. (2016). Factor structure of the **Differential Ability Scales–Second Edition**: Exploratory and hierarchical factor analyses with the core subtests. *Psychological Assessment, 28,* 1475-1488. http://dx.doi.org/10.1037/pas0000279

Canivez, G. L., & McGill, R. J. (2016). Factor structure of the **Differential Ability Scales-Second Edition**: Exploratory and hierarchical factor analyses with the core subtests. Psychological Assessment, 28, 1475–1488. https://doi.org/10.1037/pas0000279

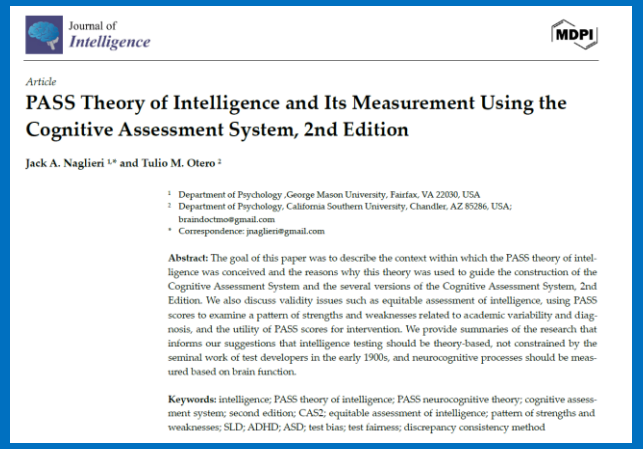
Canivez, G. L. (2008). Orthogonal higher order factor structure of the **Stanford-Binet Intelligence Scales-Fifth Edition** for children and adolescents. School Psychology Quarterly, 23, 533–541.

Dombrowski, S. C., **Canivez, G. L.,** & Watkins, M. W. (2017, May). Factor structure of the 10 **WISC–V** primary subtests across four standardization age groups. *Contemporary School Psychology.* Advance online publication.

Dombrowski, S. C., McGill, R. J., & Canivez, G. L. (2017). Exploratory and hierarchical factor analysis of the **WJ IV Cognitive** at school age. *Psychological Assessment, 29,* 394-407.

McGill, R. J., & **Canivez, G. L.** (2017, October). Confirmatory factor analyses of the **WISC–IV Spanish** core and supplemental Subtests: Validation evidence of the Wechsler and CHC models. *International Journal of School and Educational Psychology*. Advance online publication.

Watkins, M. W., Dombrowski, S. C., & **Canivez, G. L.** (2017, October). Reliability and factorial validity of the **Canadian Wechsler Intelligence Scale for Children–Fifth Edition**. *International Journal of School and Educational Psychology*.



Journal of *Intelligence*

MDPI

Article

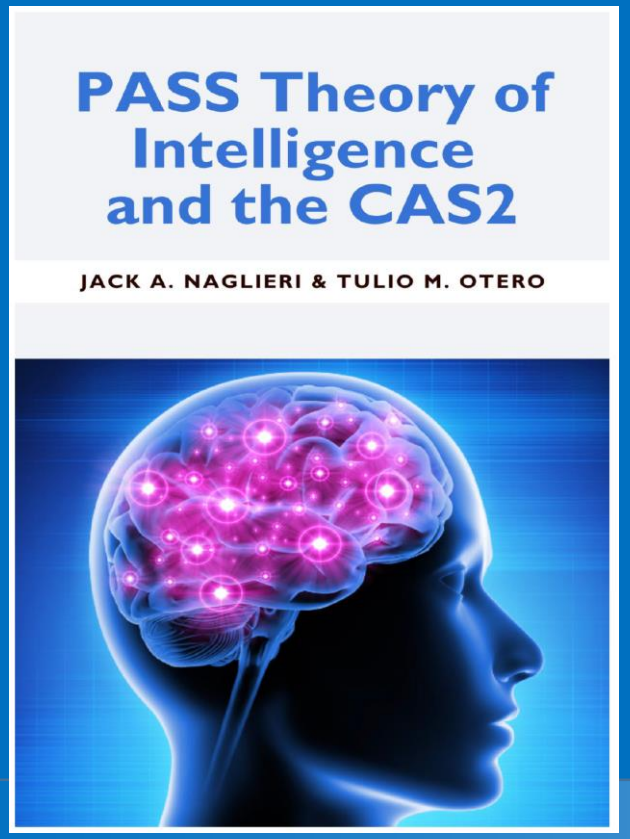
PASS Theory of Intelligence and Its Measurement Using the Cognitive Assessment System, 2nd Edition

Jack A. Naglieri [1,*] and Tulio M. Otero [2]

[1] Department of Psychology ,George Mason University, Fairfax, VA 22030, USA
[2] Department of Psychology, California Southern University, Chandler, AZ 85286, USA; braindoctmo@gmail.com
* Correspondence: jnaglieri@gmail.com

Abstract: The goal of this paper was to describe the context within which the PASS theory of intelligence was conceived and the reasons why this theory was used to guide the construction of the Cognitive Assessment System and the several versions of the Cognitive Assessment System, 2nd Edition. We also discuss validity issues such as equitable assessment of intelligence, using PASS scores to examine a pattern of strengths and weaknesses related to academic variability and diagnosis, and the utility of PASS scores for intervention. We provide summaries of the research that informs our suggestions that intelligence testing should be theory-based, not constrained by the seminal work of test developers in the early 1900s, and neurocognitive processes should be measured based on brain function.

Keywords: intelligence; PASS theory of intelligence; PASS neurocognitive theory; cognitive assessment system; second edition; CAS2; equitable assessment of intelligence; pattern of strengths and weaknesses; SLD; ADHD; ASD; test bias; test fairness; discrepancy consistency method



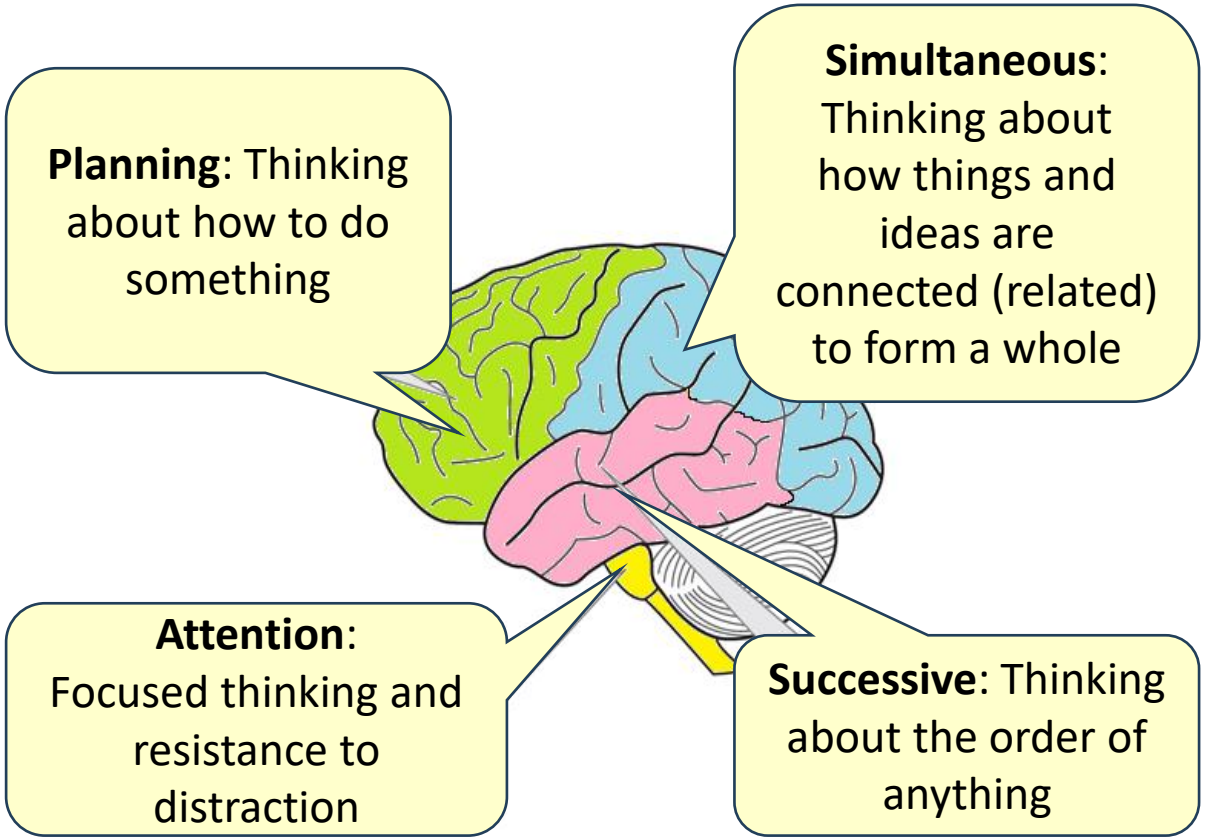
How can we measure EF using tests of General Ability (g) ability? We can't!

Introduction to the PASS Theory of Intelligence

46

A New Way to Understand EF as Intelligence

- We often talk about Executive Function as a reflection of the frontal lobes of the brain
- Doesn't it make sense to think of EF as a part of intelligence?
- What theory of intelligence includes EF?

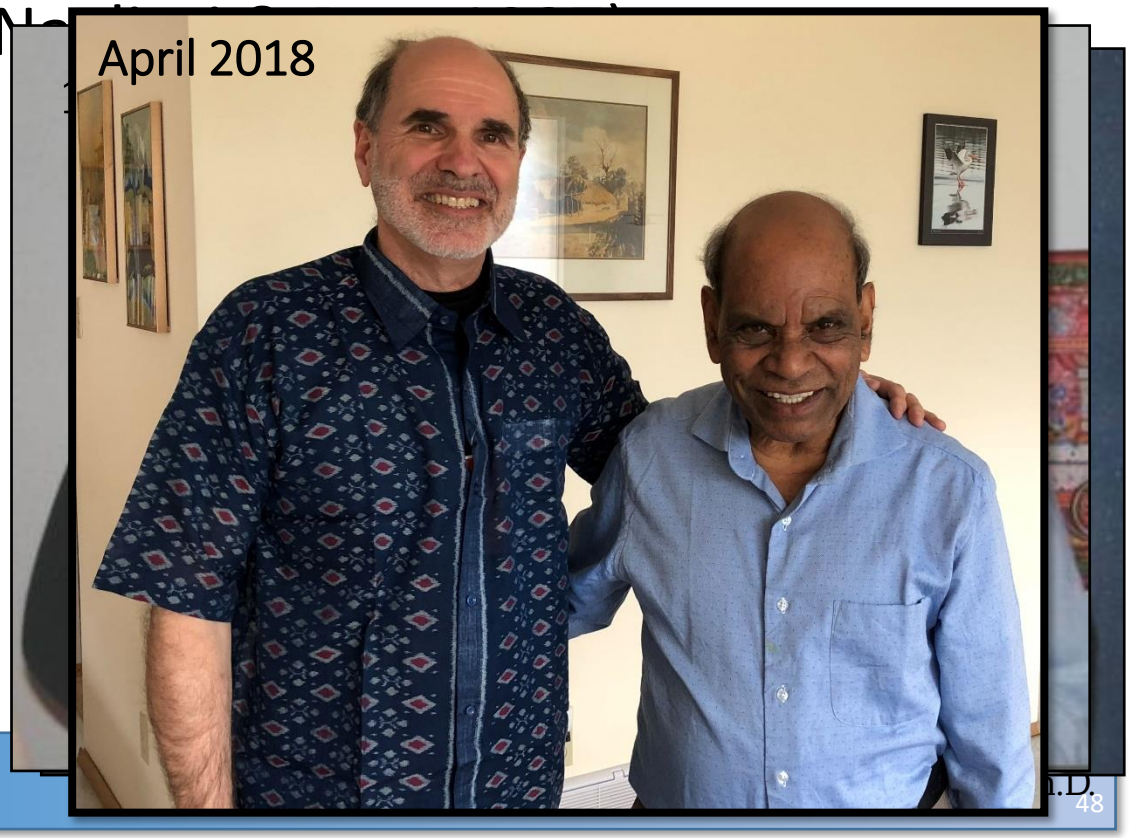


From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017 Figure 1.2 Functional Units from A. R. Luria

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 (N

➢ We conceptualized intelligence as Planning, Attention, Simultaneous, and Successive (PASS) neurocognitive processes based on Luria's concepts of brain function.



PASS Theory Based on Luria's Concept of Functional Units

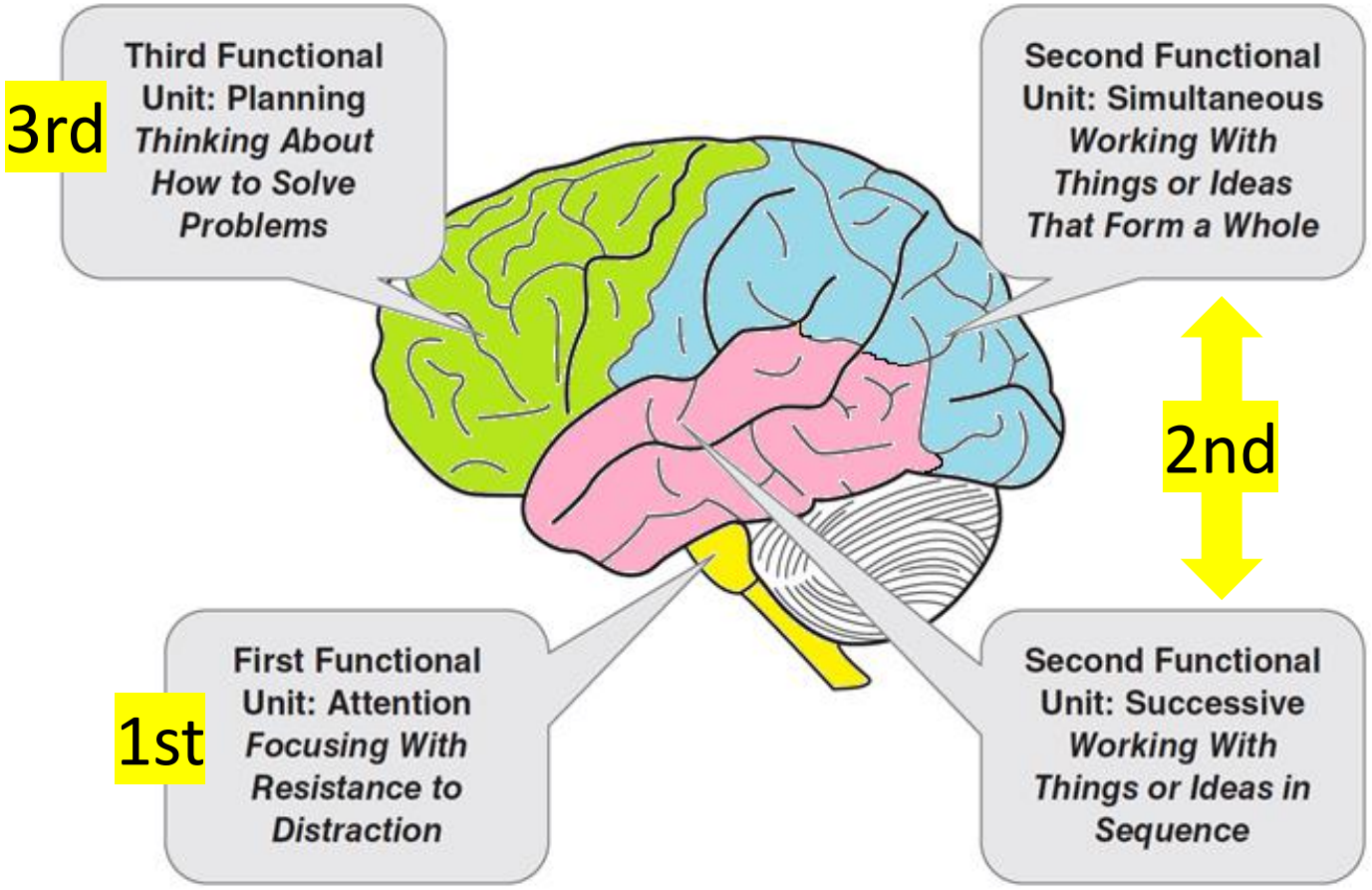
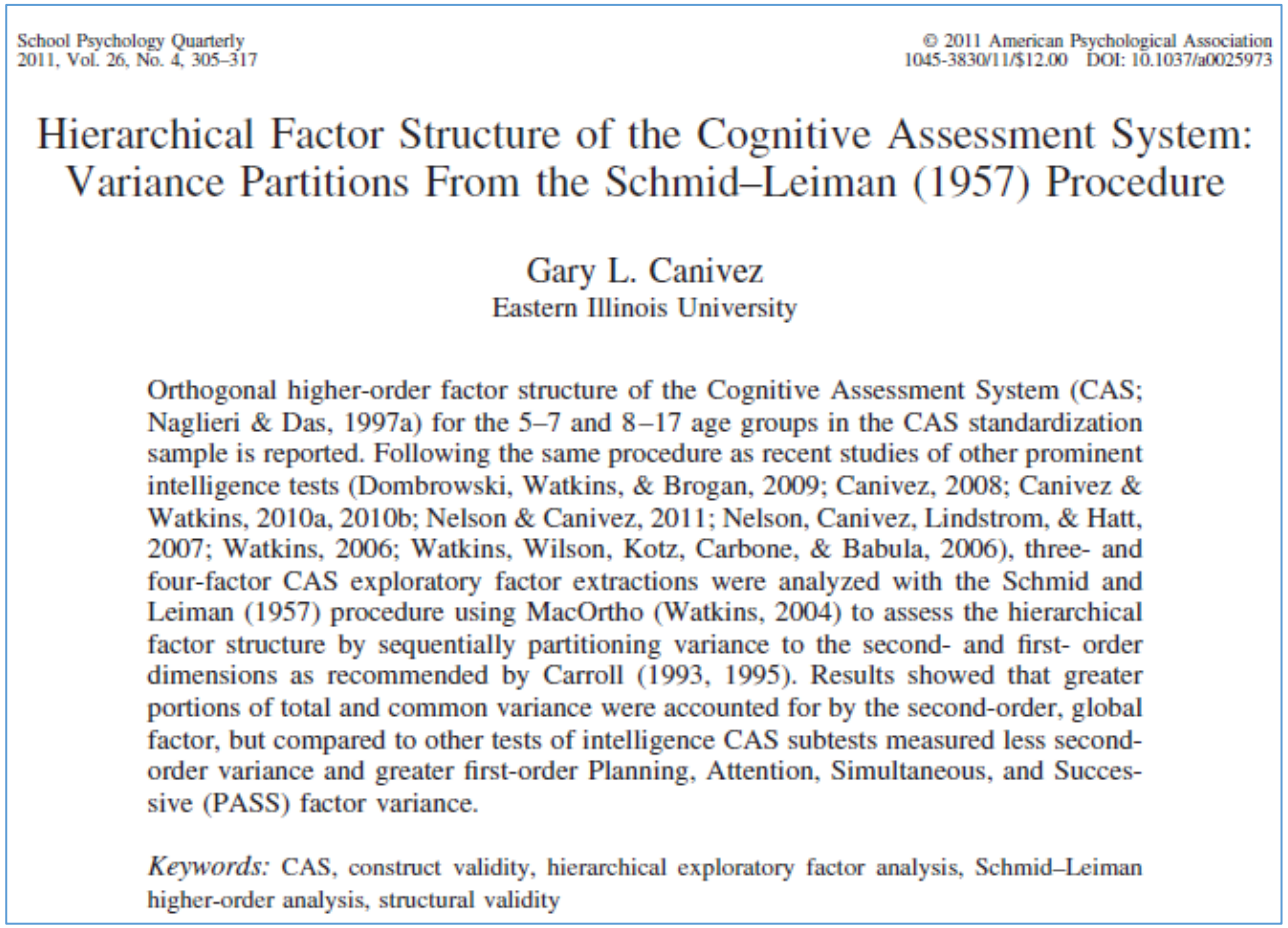


Figure 1.2 Three Functional Units and Associated Brain Structures

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



School Psychology Quarterly
2011, Vol. 26, No. 4, 305–317

© 2011 American Psychological Association
1045-3830/11/$12.00 DOI: 10.1037/a0025973

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

Gary L. Canivez
Eastern Illinois University

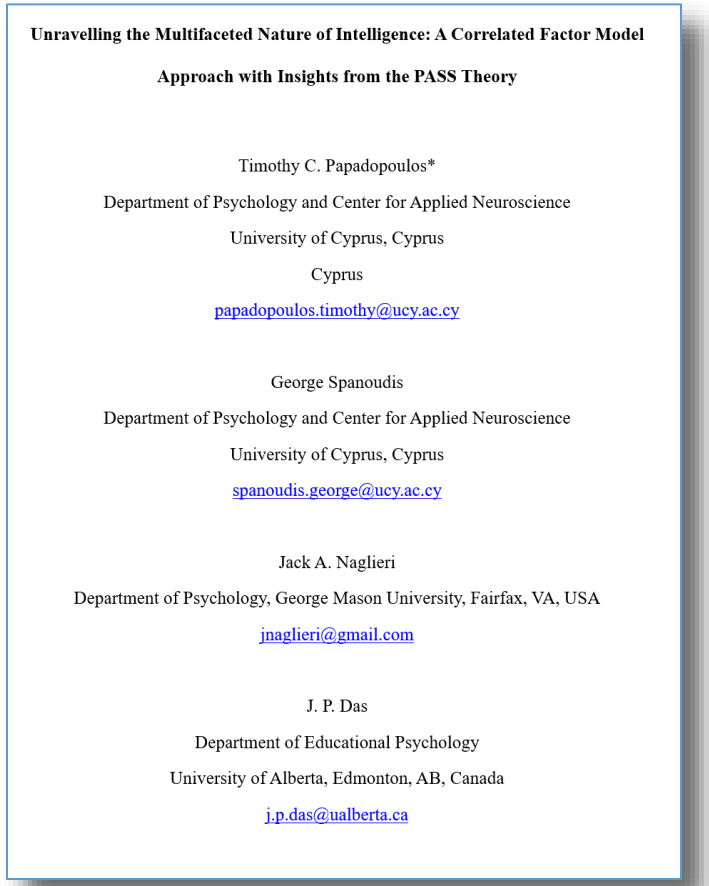
Orthogonal higher-order factor structure of the Cognitive Assessment System (CAS; Naglieri & Das, 1997a) for the 5–7 and 8–17 age groups in the CAS standardization sample is reported. Following the same procedure as recent studies of other prominent intelligence tests (Dombrowski, Watkins, & Brogan, 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 MacOrtho (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 INTERPRETATION OF THE FOUR PASS Scales

- "…compared to the WISC–IV, WAIS–IV, SB–5, RIAS, WASI, and WRIT, 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)

Papadopoulos, et al., 2023



Unravelling the Multifaceted Nature of Intelligence: A Correlated Factor Model Approach with Insights from the PASS Theory

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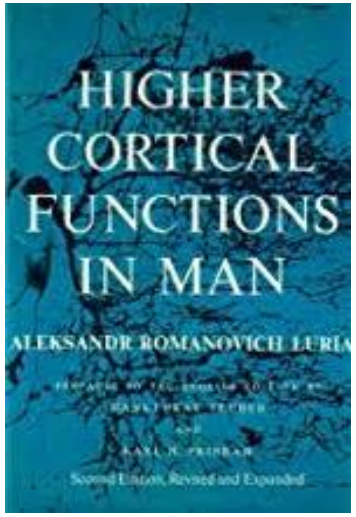
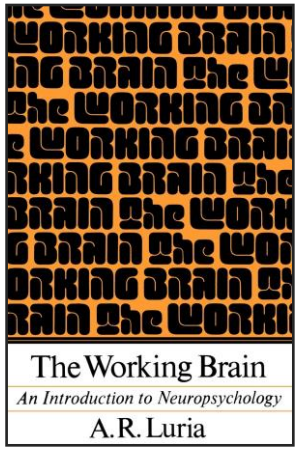
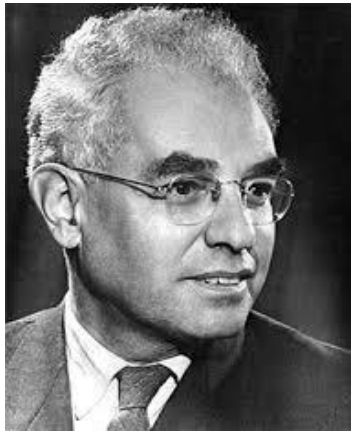
j.p.das@ualberta.ca

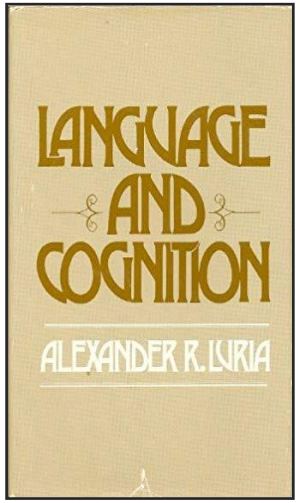
- Our results unambiguously support the notion that intelligence is not a unidimensional entity but a composite of distinct cognitive processes…which posits separate cognitive domains for Planning, Attention, Simultaneous and Successive processing… [these] emerged as the most fitting representation of intelligence [and] the best fit to the data.
- This outcome reinforces the notion that intelligence is a multifaceted construct, with various cognitive abilities working in concert, corroborating previous findings (e.g., Das & Kirby, 2022; Naglieri, 2015; Papadopoulos et al., 2018).

PASS Neurocognitive Theory









- **P**lanning = THINKING ABOUT HOW YOU DO WHAT YOU DECIDE TO DO
- **A**ttention = BEING ALERT AND RESISTING DISTRACTIONS
- **S**imultaneous = THINKING USED TO SEE HOW THINGS ARE RELATED (THE BIG PICTURE)
- **S**uccessive = THINKING THAT IS USED TO MANAGE A SEQUENCE

PASS = 'basic psychological processes'

NOTE: Easy to understand concepts!

We Operationalized the CAS2 To Measure Thinking (PASS) not Knowing

What does the examinee have to **know** to complete a task?

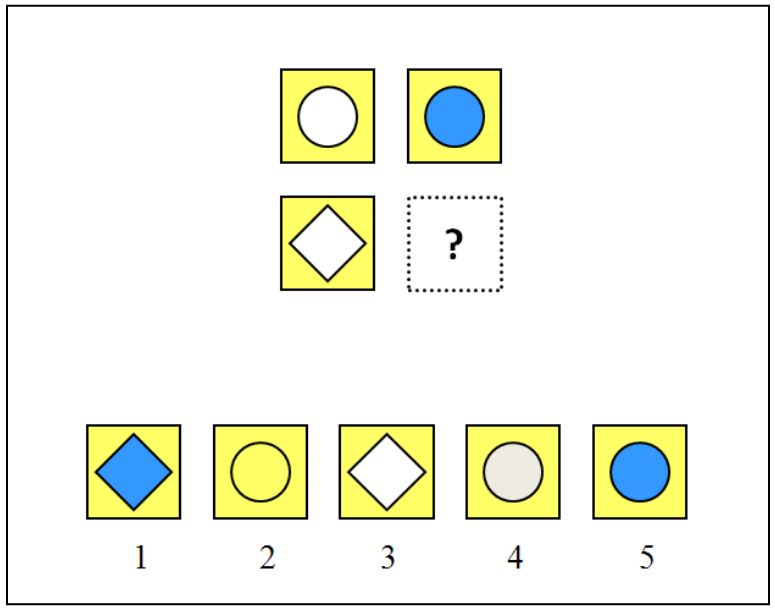
- This is dependent on *instruction*

How does the examinee have to **think** to complete a task?

- This is dependent on the *brain – 'basic psychological processes'*
- Some thinking involves executive function and some does not

Thinking vs Knowing

Solving these analogies demands the same kind of thinking



Girl is woman as boy is to ____?

3 is to 6 as 4 is to _____?

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

PASS Theory Based on Brain Function – 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 helps us make decisions about how to solve any kind of a problem from academics to social situations and life in general
- Math calculation, written expression.

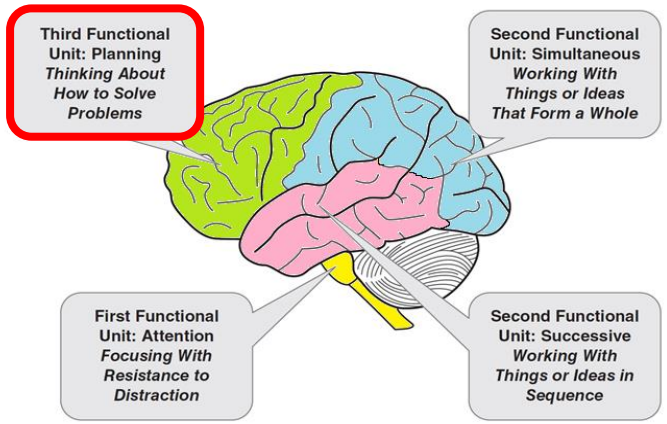
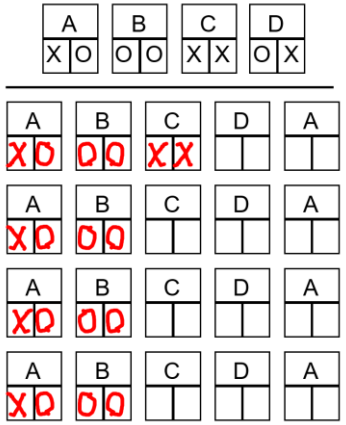


Figure 1.2 Three Functional Units and Associated Brain Structures

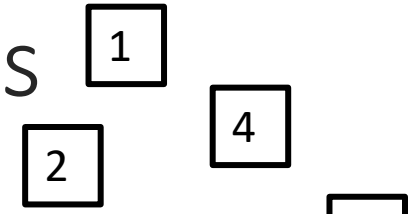
From: *Essentials of CAS2 Assessment*. Naglieri & Otero, 2017

Planning Subtests

Planned Codes



Planned Connections



Planned Number Matching

5176	5761	5167	1576	5176	1567

CAS2 Cognitive Assessment System Second Edition

Examiner Record Form

Jack A. Naglieri J. P. Das Sam Goldstein

Section 2. Subtest and Composite Scores

Subtest	Raw Score	Scaled Score PLAN	SIM	ATT	SUC
Planned Codes (PCd)					
Planned Connections (PCn)					
Planned Number Matching (PNM)					
Matrices (MAT)					
Verbal-Spatial Relations (VSR)					
Figure Memory (FM)					
Expressive Attention (EA)					
Number Detection (ND)					
Receptive Attention (RA)					
Word Series (WS)					
Sentence Repetition/ Questions (SR/SQ)					
Visual Digit Span (VDS)					

	PLAN	SIM	ATT	SUC	FS
Sum of Subtest Scaled Scores		+	+	+	=
PASS Composite Index Scores					
Percentile Rank					
____% Confidence Interval Upper					
____% Confidence Interval Lower					

PASS Theory Based on Brain Function – Attention

Attention is a basic psychological process we use to

- selectively attend to some stimuli and ignores others
- Focus our cognitive activity
- Selective attention
- Resistance to distraction
- Listening, as opposed to hearing
- Academics
  - Multiple choice tests
  - Noticing details
  - Intricate work

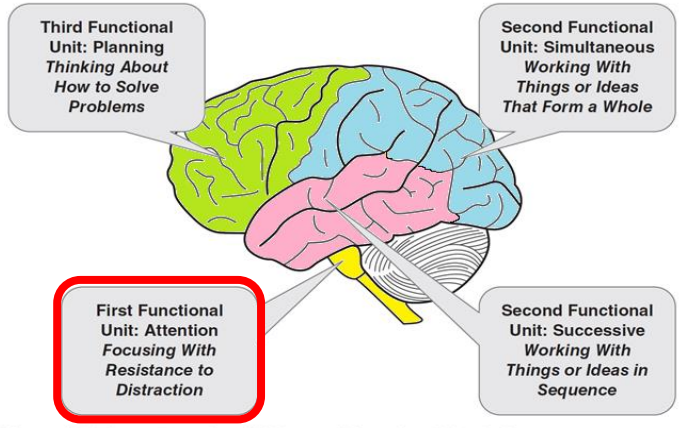


Figure 1.2 Three Functional Units and Associated Brain Structures

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

Attention Subtests

Expressive Attention

RED	RED	BLUE
YELLOW	YELLOW	RED
BLUE	RED	YELLOW
BLUE	BLUE	BLUE
YELLOW	BLUE	YELLOW

Number Detection

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

Receptive Attention

N n	T r	b t
TR	n b	A a

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Visual Digit Span (VDS)					

	PLAN	SIM	ATT	SUC	FS
Sum of Subtest Scaled Scores		+	+	+	=
PASS Composite Index Scores					
Percentile Rank					
____% Confidence Interval Upper					
____% Confidence Interval Lower					

PASS Theory Based on Brain Function - Simultaneous Processing

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

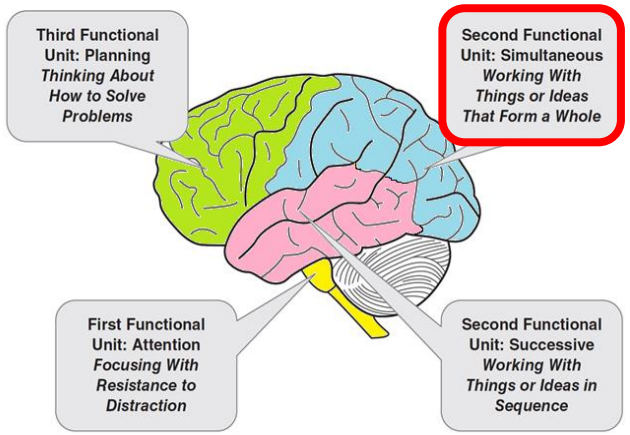
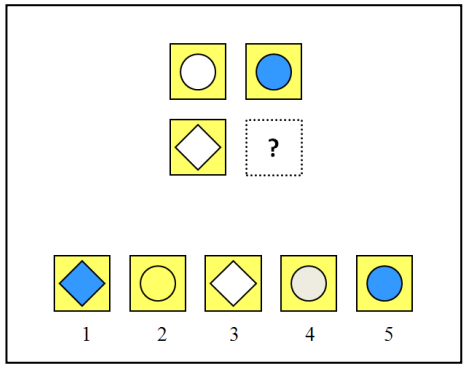


Figure 1.2 Three Functional Units and Associated Brain Structures

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

Simultaneous Subtests

Matrices



Verbal Spatial Relations

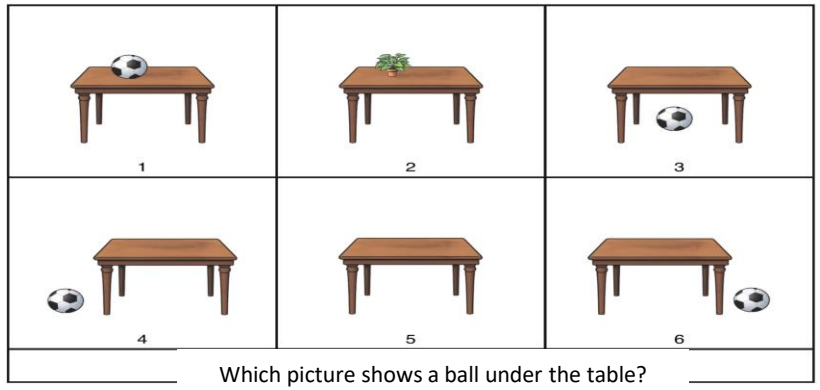
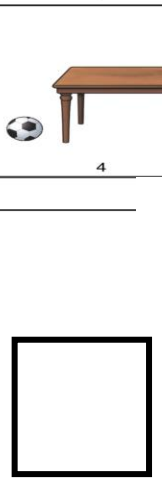
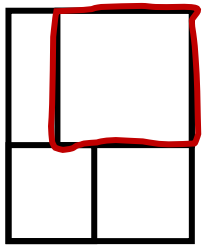


Figure Memory





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Sentence Repetition/ Questions (SR/SQ)					
Visual Digit Span (VDS)					

	PLAN	SIM	ATT	SUC	FS
Sum of Subtest Scaled Scores		+	+	+	=
PASS Composite Index Scores					
Percentile Rank					
____% Confidence Interval Upper					
____% Confidence Interval Lower					

PASS Theory Based on Brain Function – Successive Processing

- **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
  - Academics
    - Phonological tasks
    - Letter-sound correspondence
    - Decoding words
    - Understanding the syntax of sentences
    - Comprehension of written instructions

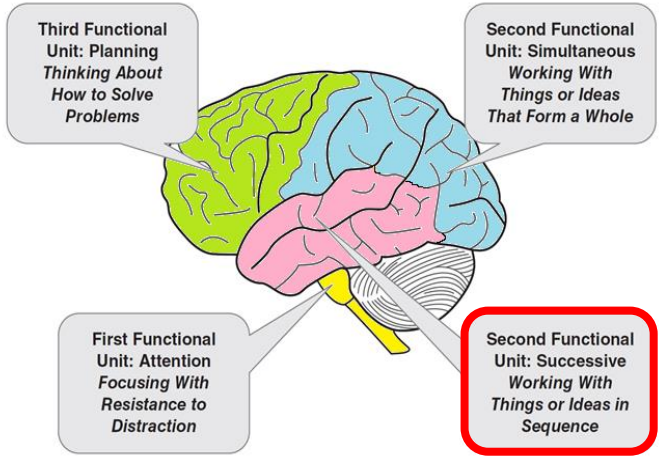


Figure 1.2 Three Functional Units and Associated Brain Structures

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

Successive Subtests

Word Series

Repeat: Man Book Car

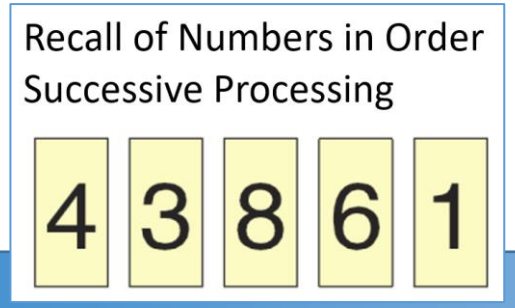
Sentence Repetition

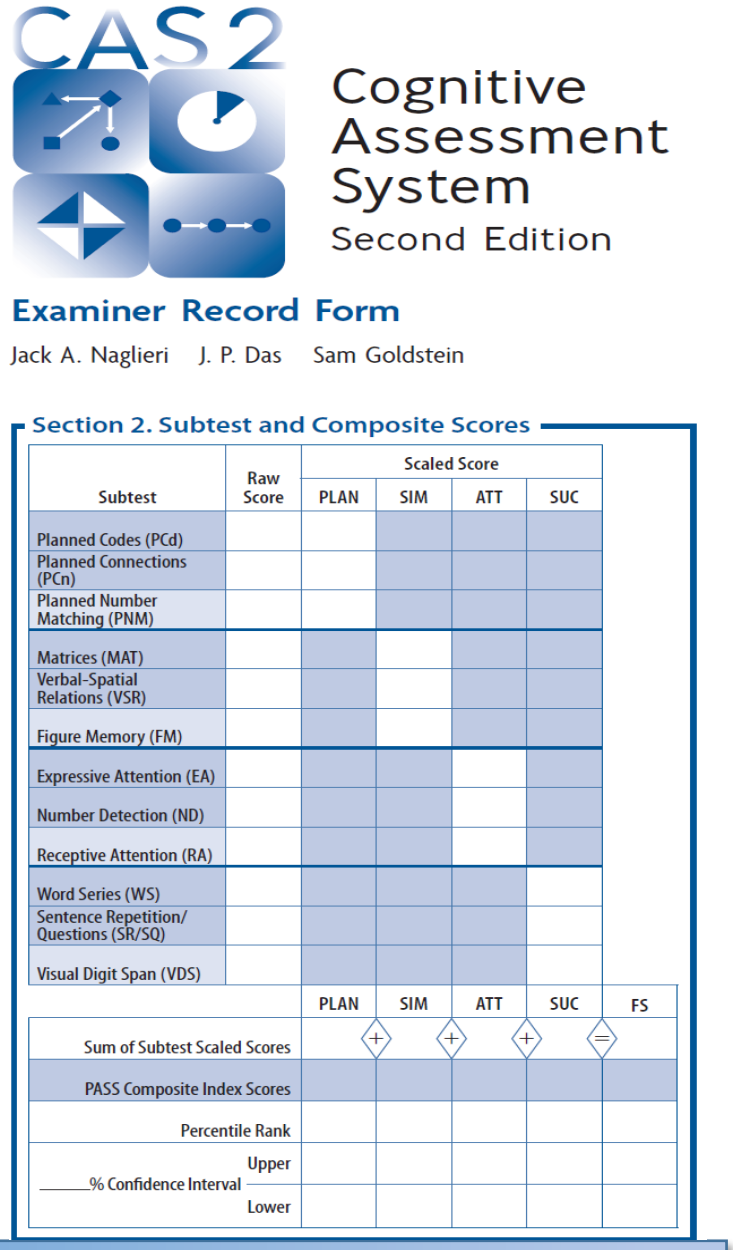
The Blue Grayed the Green

or Sentence Questions

What did the Blue do?

Visual Digit Span





PASS Comprehensive System

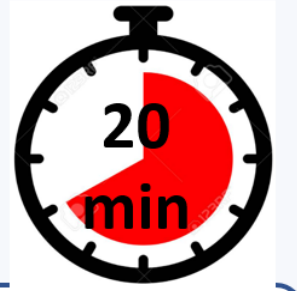
(Naglieri, Das, & Goldstein, 2014)

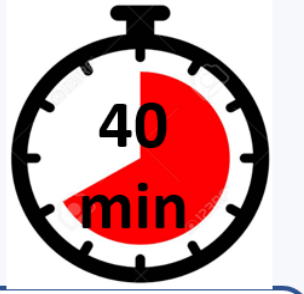
Ways to Measure PASS

CAS2 Core & Extended English & Spanish for comprehensive Assessment

CAS2 Brief for re-evaluations, instructional planning, gifted screening

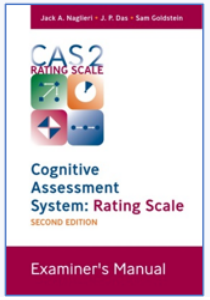
CAS2 Rating Scale for teacher ratings





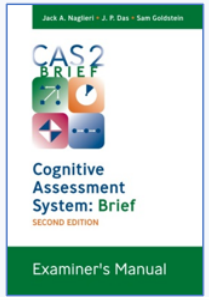
CAS2 Rating Scale
(4 subtests)

Total Score
Planning
Simultaneous
Attention
Successive



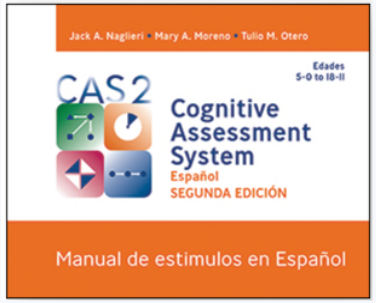
CAS2 Brief
(4 subtests
20 minutes)

Total Score
Planning
Simultaneous
Attention
Successive



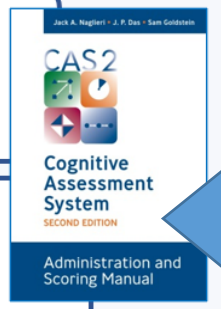
CAS2 Core
(8 subtests
40 minutes)

Full Scale
Planning
Simultaneous
Attention
Successive



CAS2 Extended
(12 subtests
60 minutes)

Full Scale
Planning
Simultaneous
Attention
Successive
Supplemental Scales
Executive Function
Working Memory
Verbal / Nonverbal
Visual / Auditory
Speed / Fluency



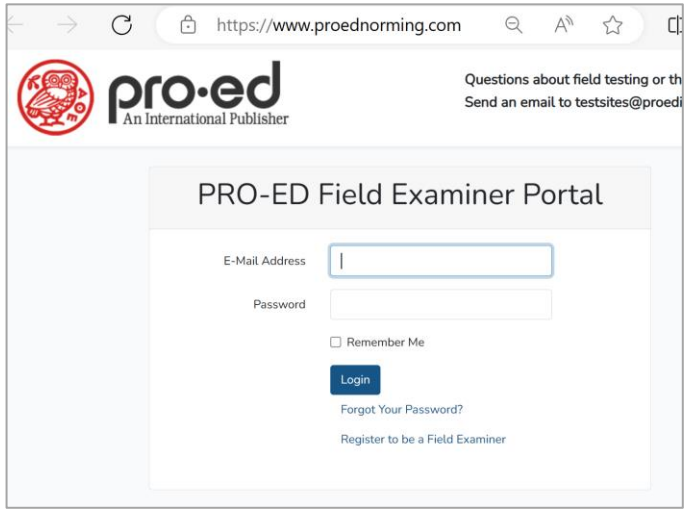
CAS2 Digital (English & Spanish) coming in 2022

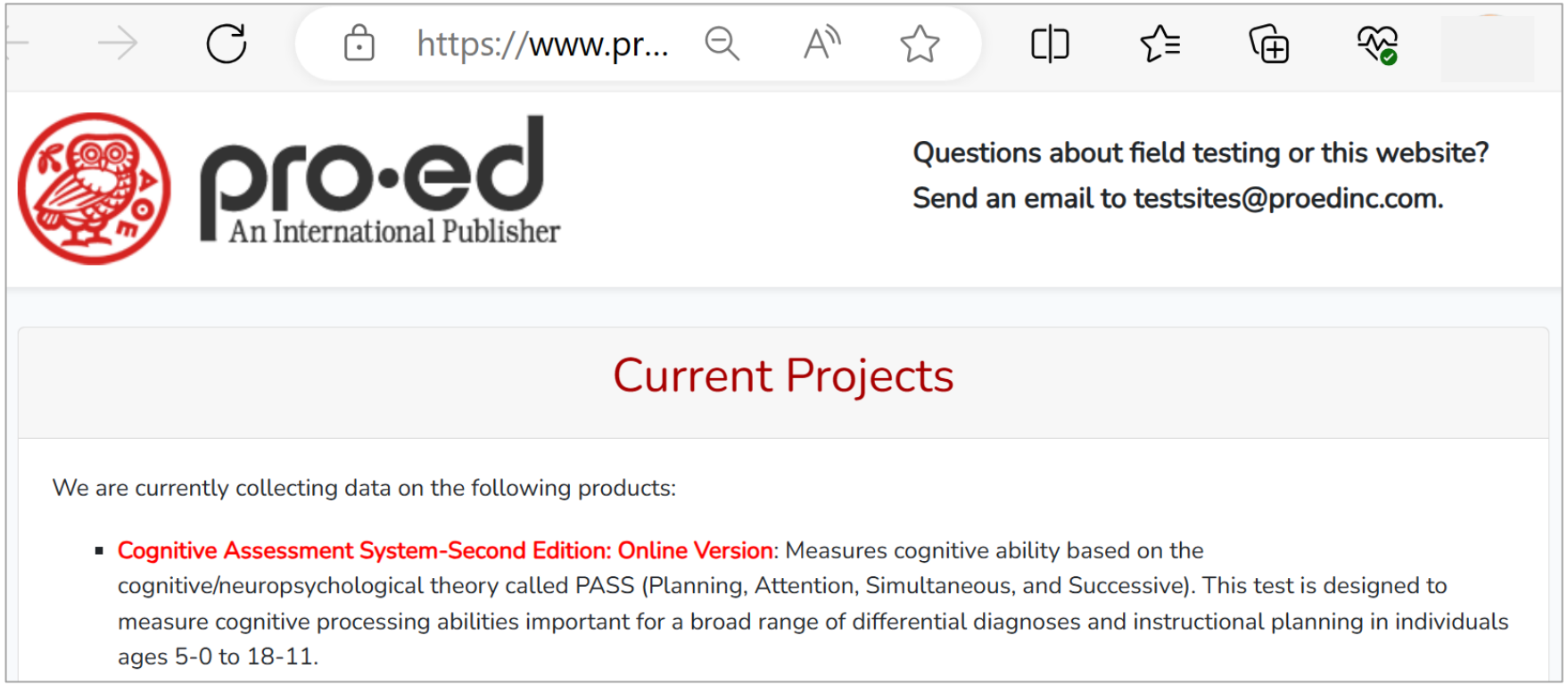
Planning & Executive Function Scores

CAS2 Online Norming Study

www.proednorming.com

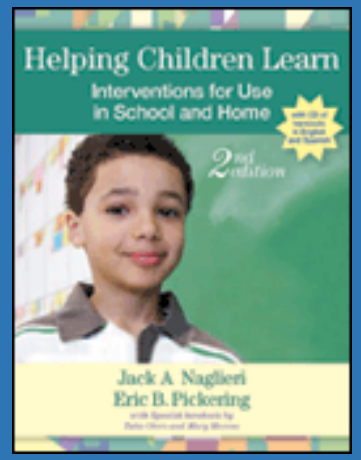
[Field Examiner Portal (proednorming.com)](http://www.proednorming.com)





Time for Questions and Answers

Using good EF to overcome a neurocognitive processing disorder (Dyslexia)

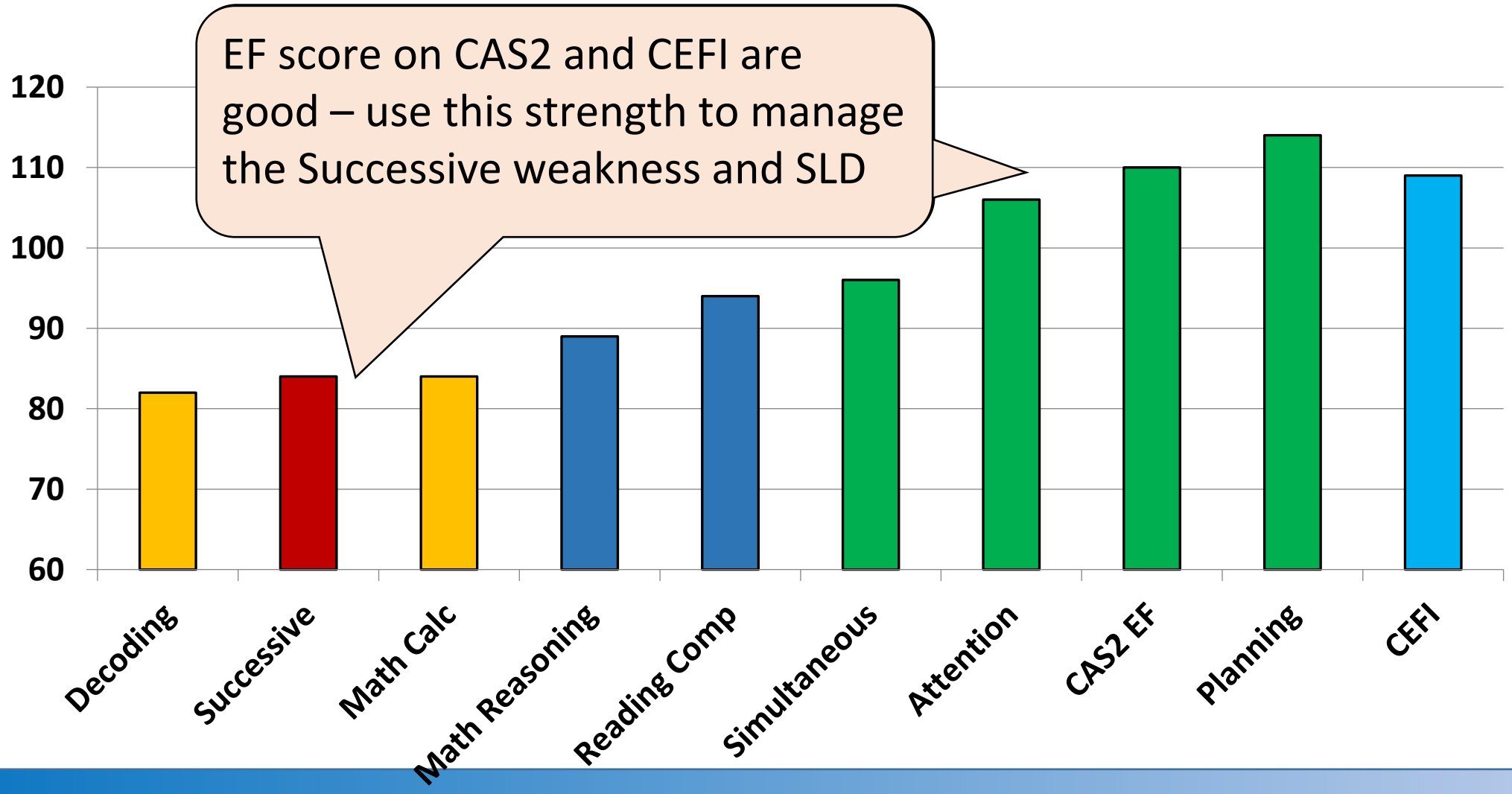


Ben's Problem with Successive Processing

Ben was an energetic but frustrated third-grade student who liked his teachers, was popular with his peers, and fit in well socially at school. However, Ben said he did not like school at all, particularly schoolwork. Ben was good at turning in all of his work on time, and he worked hard, but he earned poor grades. He appeared to be getting more and more frustrated at school.

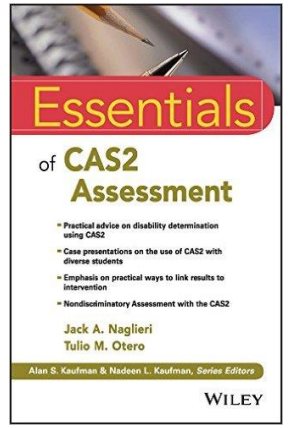
In general, Ben struggled to perform well because he had a lot of trouble following directions that were not written down, his writing often did not make sense, and he did not appear to comprehend what he read. Ben's teachers noticed that when directions for assignments and projects were given orally in class, he often only finished part of the task. Ben's teacher described an assignment in which students had to collect insects, label them, organize them into a collection, and then give a brief presentation about each insect. Unlike any other student, Ben chose to make the labels for the insects first and then go look for the insects. He found only a few of the insects he had made labels for, and when he put them in the collection, they were not in the order that had been specified. He also had trouble with the spelling of the scientific names of the insects and made many errors in the sequence of letters in the words.

Ben's Strength in EF & Problem with Successive processing



Ben's SLD: Discrepancy Consistency Method

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



Significant Discrepancy

HIGH SCORES
Simultaneous
Planning
Attention

Significant Discrepancy

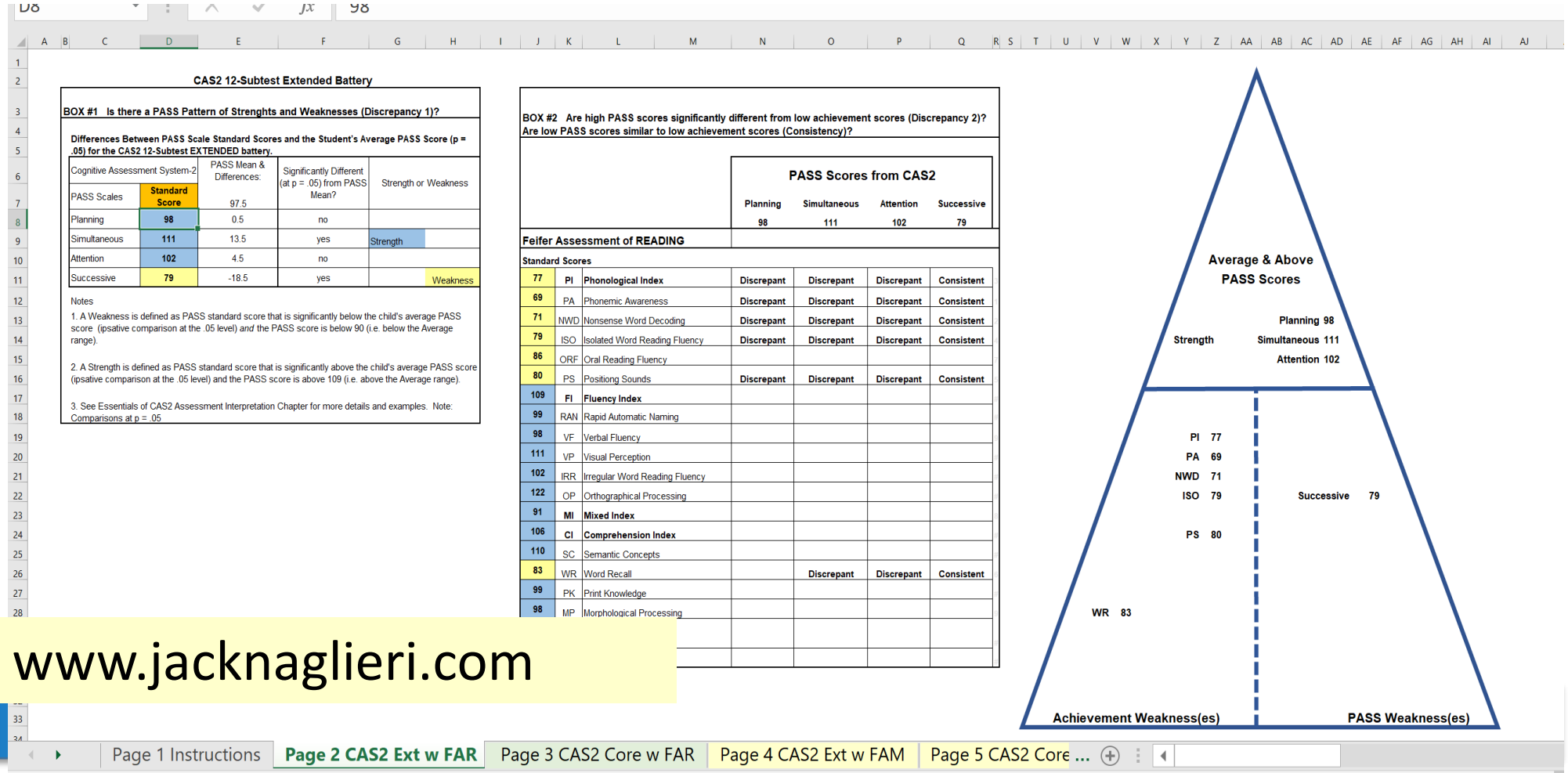
LOW SCORES
Math Calculation, Math Reasoning & Reading Decoding

LOW SCORES
CAS2: Successive

Consistent Scores

CAS2 & FAR PSW Analyzer

- CAS2 and Achievement Analyzer



CAS2 12-Subtest Extended Battery

BOX #1 Is there a PASS Pattern of Strenghts and Weaknesses (Discrepancy 1)?

Differences Between PASS Scale Standard Scores and the Student's Average PASS Score (p = .05) for the CAS2 12-Subtest EXTENDED battery.

Cognitive Assessment System-2		PASS Mean & Differences:	Significantly Different (at p = .05) from PASS Mean?	Strength or Weakness
PASS Scales	Standard Score	97.5		
Planning	98	0.5	no	
Simultaneous	111	13.5	yes	Strength
Attention	102	4.5	no	
Successive	79	-18.5	yes	Weakness

Notes

1. A Weakness is defined as PASS standard score that is significantly below the child's average PASS score (ipsative comparison at the .05 level) *and* the PASS score is below 90 (i.e. below the Average range).

2. A Strength is defined as PASS standard score that is significantly above the child's average PASS score (ipsative comparison at the .05 level) and the PASS score is above 109 (i.e. above the Average range).

3. See Essentials of CAS2 Assessment Interpretation Chapter for more details and examples. Note: Comparisons at p = .05

BOX #2 Are high PASS scores significantly different from low achievement scores (Discrepancy 2)? Are low PASS scores similar to low achievement scores (Consistency)?

			PASS Scores from CAS2			
			Planning	Simultaneous	Attention	Successive
			98	111	102	79
Feifer Assessment of READING						
Standard Scores						
77	PI	**Phonological Index**	Discrepant	Discrepant	Discrepant	Consistent
69	PA	Phonemic Awareness	Discrepant	Discrepant	Discrepant	Consistent
71	NWD	Nonsense Word Decoding	Discrepant	Discrepant	Discrepant	Consistent
79	ISO	Isolated Word Reading Fluency	Discrepant	Discrepant	Discrepant	Consistent
86	ORF	Oral Reading Fluency				
80	PS	Positiong Sounds	Discrepant	Discrepant	Discrepant	Consistent
109	FI	**Fluency Index**				
99	RAN	Rapid Automatic Naming				
98	VF	Verbal Fluency				
111	VP	Visual Perception				
102	IRR	Irregular Word Reading Fluency				
122	OP	Orthographical Processing				
91	MI	**Mixed Index**				
106	CI	**Comprehension Index**				
110	SC	Semantic Concepts				
83	WR	Word Recall		Discrepant	Discrepant	Consistent
99	PK	Print Knowledge				
98	MP	Morphological Processing				

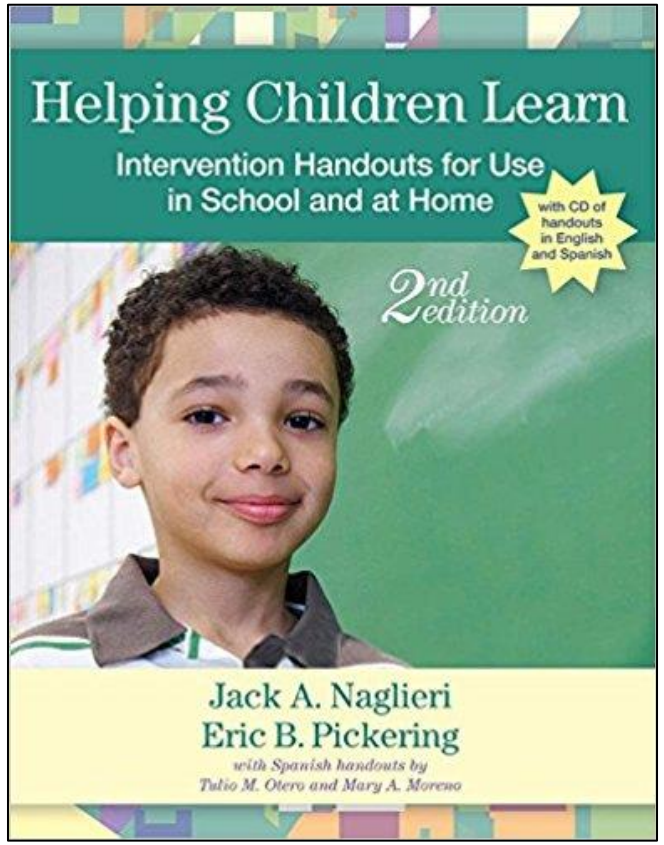
FREE – on www.jacknaglieri.com

Ben's Problem with Successive Processing

- Ben has difficulty whenever ANY task requires sequencing
  - Academic or ability tests
  - Visual or auditory tests
  - Math or spelling or reading
  - Tasks that require memory of seque
- How do we help him learn better?

Teach Children about their Abilities

- Helping Children Learn Intervention Handouts for Use in School and at Home, *Second Edition (*Naglieri, & Pickering, 2011)
- Spanish handouts by Tulio Otero & Mary Moreno



Ben's Problem with Successive Ability

Teach him to use his strength in EF (Planning)

How Can You Be Smarter?

You can be smarter if you PLAN before doing things. Sometimes people say, "Look before you leap," "Plan your work and work your plan," or "Stop and think." These sayings are about using the ability to plan. When you stop and think about *how* to study, you are using your ability to plan.

You will be able to do more if you remember to use a plan. An easy way to remember to use a plan is to look at the picture "Think smart and use a plan!" (Figure 1). You should always use a plan for reading, vocabulary, spelling, writing, math problem solving, and science.

Do you have a favorite plan for learning spelling words? Do you use flashcards or go on the Internet to learn? Do you ask the teacher or another student for help? You can learn more by using a plan for studying that works best for you.

Think smart and use a plan!

It is smart to have a plan for doing all schoolwork. When you read, you should have a plan. One plan is to look at the questions you have to answer about the story first. Then read the story to find the answers. Another plan is to make a picture of what you read so that you can see all the parts of the story. When you write you should also have a plan. Students who are good at writing plan and organize their thoughts first. Then they think about what they are doing as they write. Using a plan is a good way to be smarter about your work!

How to Be Smart: Planning

When we say people are smart, we usually mean that they know a lot of information. But being smart also means that someone has a lot of ability to learn new things. Being smart at learning new things includes knowing and using your *thinking abilities*. There are ways you can use your abilities *better* when you are learning.

What Does Being Smart Mean?

One ability that is very important is called *Planning*. The ability to *plan* helps you figure out *how to do things*. When you don't know how to solve a problem, using Planning ability will help you figure out how to do it. This ability also helps you control what you think and do. It helps you to stop before doing something you shouldn't do. Planning ability is what helps you wait until the time is right to act. It also helps you make good decisions about what to say and what to do.

Ben's Problem with Successive Ability

Teach him to recognize sequences

How to Teach Successive Processing Ability

The first step in teaching children about their own abilities is to explain what Successive processing ability is. In Figure 1 (which is included in the PASS poster on the CD), we provide a fast and

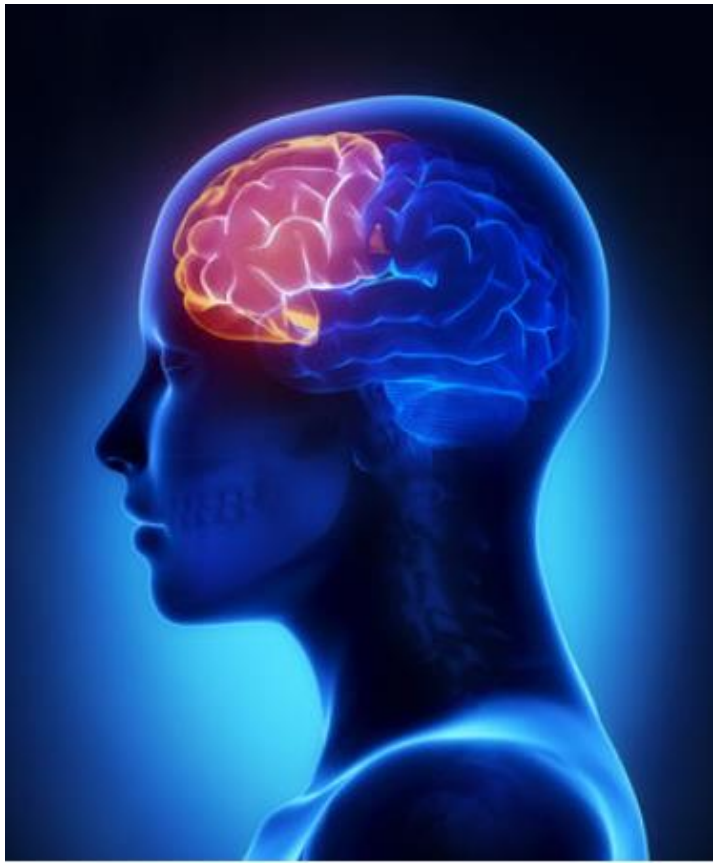
1. Teach children that most information is presented in a specific sequence so that it makes sense.
2. Encourage children by asking, "Can you see the sequence of events here?" or "Did you see how all of this is organized into a sequence that must be followed?"
3. Remind the students to think of how information is sequenced in different content areas, such as reading, spelling, and arithmetic, as well as in sports, playing an instrument, driving a car, and so forth.
4. Teach children that the sequence of information is critical for success.
5. Remind students that seeing the sequence requires careful examination of the serial relationships among the parts.

If Executive Function Requires Thinking, should we describe it as a Skill ?

EF= Thinking About How to do What You Decide to do?

Executive Function and Skills

- What does the term SKILLS refer to?
  - A well practiced activity that can be executed automatically and with ease
    - This means there is fluency and little thinking involved
- What does the term Executive Function refer to?
  - Thinking About How You Do What You Decide To Do
    - Therefore EF can NOT be described as a skill



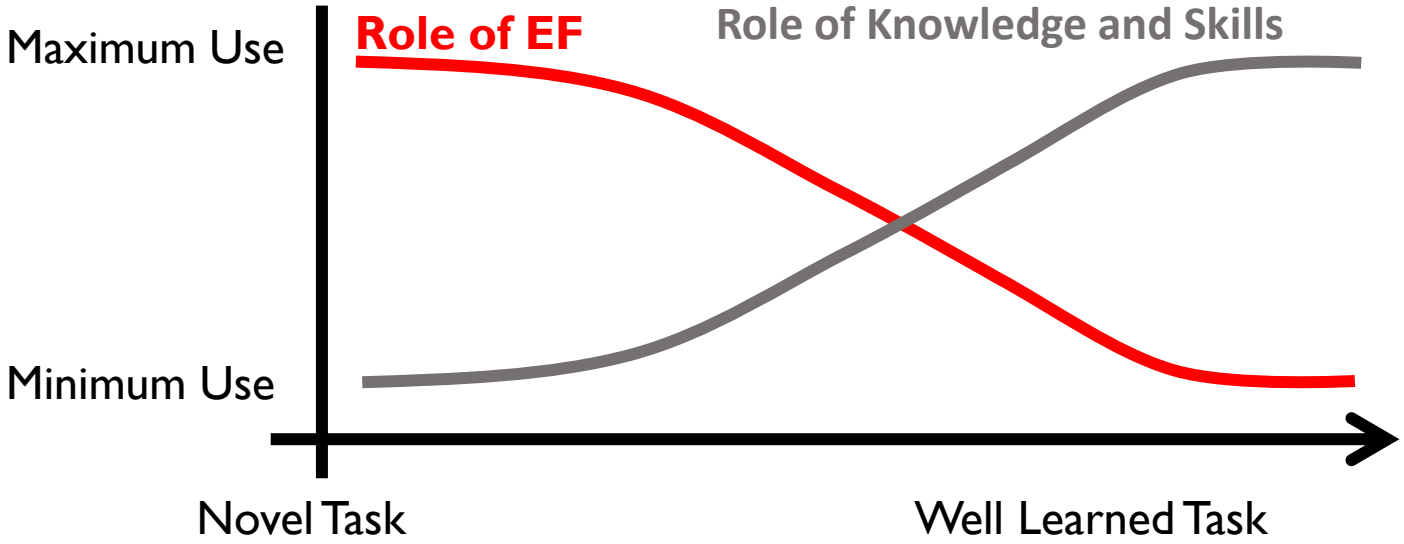
EF's Learning Curves

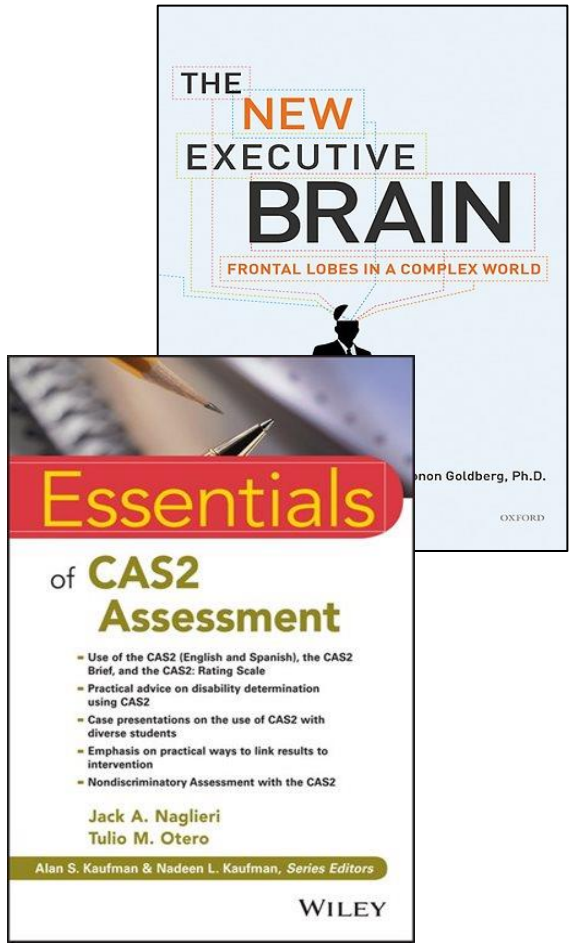
(Goldberg, 2009; Naglieri & Otero, 2017)

- Because MAKING DECISIONS about how to do what you decide to do is particularly demanded in novel situations, we need to fully engage our frontal lobes (EF) to be successful in our world today.

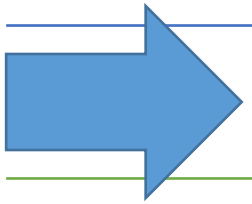
EF's Learning Curves (Naglieri & Otero, 2017)

- Learning depends upon instruction and EF
- At first, EF plays a major role in learning (see Goldberg, 2009, p. 90)
- When a new task is learned and practiced it becomes a skill and execution requires less EF (see Naglieri & Otero, 2017, p. 117)





Presentation Outline

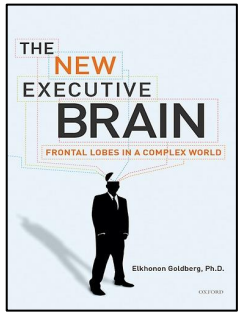


- Introduction to Executive Function (EF)
- EF Behaviors
- EF and Cognition (intelligence)
- EF and Social Emotional Skills
- EF and Academic/Job Performance
- Research about EF as ability, behavior, and SE
- Conclusions

Phineas had Social Emotional Deficit

- Phineas had profound social emotional problems after his injury to the frontal lobes
- Phineas was
    - Insulting
    - impulsively says things
    - uses vulgar language
    - can't manage his emotions
    - inconsistent in social situations
    - doesn't recognize he is offensive
    - looses control in interactions with others

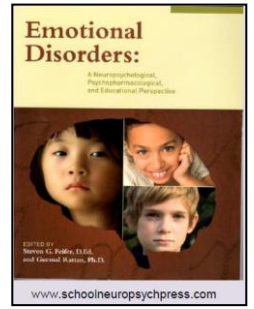
Frontal Lobes and Emotion

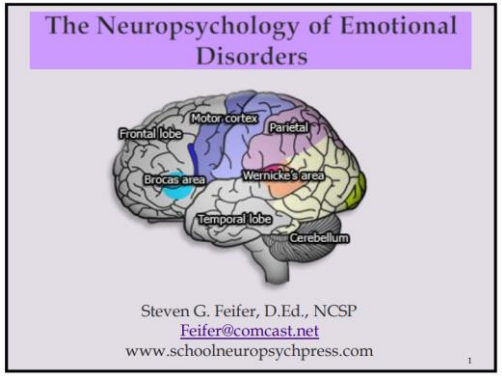


Goldberg (2011, p 116-117)

- the "emphasis in the classic studies of frontal lobe syndromes was on cognition [intelligence] rather than on affect [social emotional]"
- 'very few researchers have attempted to merge cognitive and emotional aspects of frontal lobe dysfunction'

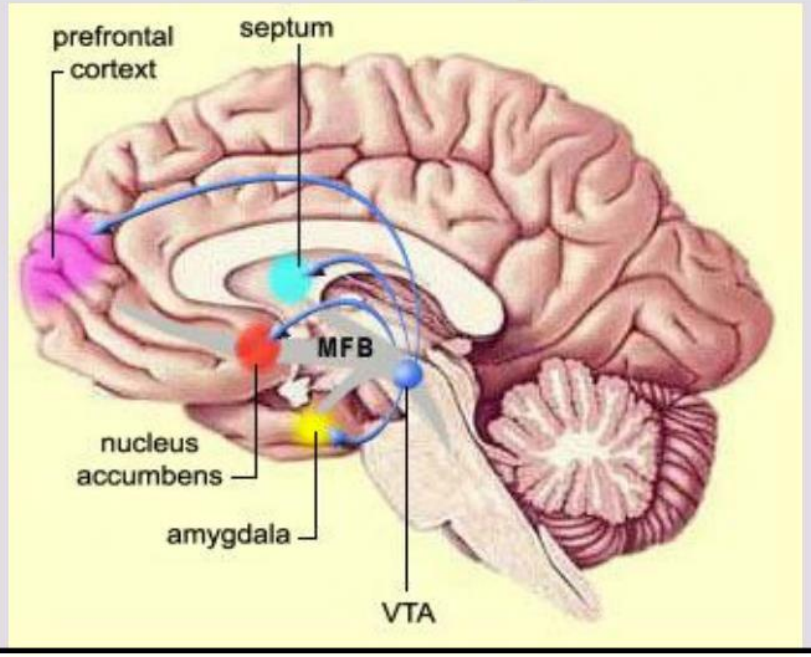
- Feifer's Emotional Disorders book contains a collection of papers on the relationship between EF and Emotional Disorders





- And see Feifer@comcast.net

The Cerebral Orchestra of Emotions: Subcortical Regions



22

The Cerebral Orchestra of Emotions: Cortical Regions

(1) Orbitofrontal cortex - region of the brain responsible for ascribing an emotional valence or value judgment to another's feelings. Often triggers an automatic social skills response (Rolls, 2004).

* Has rich interconnections with the limbic system.
* Responsible for ***emotional executive functioning***.
* Self-regulation of behavior as highest levels of emotional decision making dictated by this brain region.

23

Emotions and the Frontal Lobe

Emotional Executive Functioning

Presentation Outline

Introduction to Executive Function (EF)

EF Behaviors

EF and Cognition (intelligence)

EF and Social Emotional Skills

EF and Academic/Job Performance

Research about EF as ability, behavior, and SE

Conclusions

EF in the Classroom

- Consider any task that requires the student to figure out HOW to complete a task such as:
  - Writing a story
  - Coming up with several ways of solving a math problem
  - Organizing a complex set of items, thoughts, tasks
  - Reading comprehension and inferential test questions
  - When strategies are needed for any academic task
  - How to study
  - How to prepare for a test
  - All these involve PLANNING and ATTENTION

- See www.jacknaglieri.com for papers on CAS2, Feifer Assessments of Reading, Math, and Writing

Correspondence of FAR and PASS	Planning	Attention
Phonemic Awareness - measures rhyming, blending, segmenting, and manipulating sounds.		
Positioning Sounds - a phonemic localization task determining sound positions.		
Nonsense Word Decoding - the student decodes a series of nonsense words.		
Isolated Word Reading Fluency - the student reads a list of words in 60 seconds.		
Oral Reading Fluency - the student reads a passage composed of the same words as the Isolated Word Reading Fluency task.		
Rapid Automatic Naming - the student names either objects, letters, or stencils.		
Visual Perception - the student identifies letters or words printed backwards from an array.		X
Verbal Fluency - the student retrieves words from a category, or items that start with a letter.	X	X
Orthographic Processing - the student recalls a letter, or group of letters, from a target word.		X
Irregular Word Reading Fluency - the student reads a list of phonologically irregular words.		
Semantic Concepts - the student identifies the correct antonym or synonym of a target word.	X	
Word Recall - the student repeats back a list of words over two trials.	X	X
Morphological Processing - the student selects the correct prefix, suffix, or stem that completes a target word.		
Silent Reading Fluency - the student answers questions after reading a passage silently.	X	X

Correspondence of FAM and PASS	Planning	Attention
Phonemic Awareness - measures rhyming, blending, segmenting, and manipulating sounds.		
Positioning Sounds - a phonemic localization task determining sound positions.		
Nonsense Word Decoding - the student decodes a series of nonsense words.		
Isolated Word Reading Fluency - the student reads a list of words in 60 seconds.		
Oral Reading Fluency - the student reads a passage composed of the same words as the Isolated Word Reading Fluency task.		
Rapid Automatic Naming - the student names either objects, letters, or stencils.		
Visual Perception - the student identifies letters or words printed backwards from an array.		X
Verbal Fluency - the student retrieves words from a category, or items that start with a letter.	X	X
Orthographic Processing - the student recalls a letter, or group of letters, from a target word.		X
Irregular Word Reading Fluency - the student reads a list of phonologically irregular words.		
Semantic Concepts - the student identifies the correct antonym or synonym of a target word.	X	
Word Recall - the student repeats back a list of words over two trials.	X	X
Morphological Processing - the student selects the correct prefix, suffix, or stem that completes a target word.		
Silent Reading Fluency - the student answers questions after reading a passage silently.	X	X

Note: The correspondence of PASS with FAR and FAM needs to be carefully examined for each stud

Presentation Outline

- Introduction to Executive Function (EF)
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- EF and Cognition (intelligence)
- EF and Social Emotional Skills
- EF and Academic/Job Performance
- Research about EF as ability, behavior, and SE
- Conclusions

Does EF Correlate with Achievement ?

EF and Achievement (Naglieri & Rojahn, 2004)

- Correlation between Executive Function (Planning + Attention) with achievement = **.51** (N = 1,559) is stable across 5–17-year range
- EF scores added significantly to the prediction of achievement after Simultaneous and Successive scores

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Relations between executive function and academic achievement from ages 5 to 17 in a large, representative national sample

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ABSTRACT

This study examined age-related changes in complex executive function (EF) in a large, representative sample ($N = 2036$) aged 5 to 17 using the Cognitive Assessment System (CAS; Naglieri & Das, 1997a). Relations between complex EF and academic achievement were examined on a sub-sample ($N = 1395$) given the Woodcock–Johnson Tests of Achievement–Revised (Woodcock & Johnson, 1989). Performance on the three complex EF tasks improved until at least age 15, although improvement slowed with increasing age and varied some across tasks. Moreover, the different developmental patterns in the correlations between completion time and accuracy provide clues to developmental processes. Examination of individual achievement subtests clarified the specific aspects of academic performance most related to complex EF. Finally, the correlation between complex EF and academic achievement varied across ages, but the developmental pattern of the strength of these correlations was remarkably similar for overall math and reading achievement, suggesting a domain-general relation between complex EF and academic achievement.
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Construct Validity of the PASS Theory and CAS: Correlations With Achievement

Jack A. Naglieri and Johannes Rojahn
George Mason University

The relationship among Planning, Attention, Simultaneous, and Successive (PASS) processing scores of the Cognitive Assessment System (CAS) and the Woodcock–Johnson Revised Tests of Achievement (WJ-R) were examined with a sample of 1,559 students aged 5–17 years. Participants were part of the CAS standardization sample and closely represented the U.S. population on a number of important demographic variables. Pearson product–moment correlation between CAS Full Scale and the WJ-R Skills cluster was .71 for the Standard and .70 for the Basic CAS Battery scores, providing evidence for the construct validity of the CAS. The CAS correlated with achievement as well if not better than tests of general intelligence. The amount of variance in the WJ-R scores the CAS accounted for increased with age between 5- to 13-year-olds. The 4 PASS scale scores cumulatively accounted for slightly more of the WJ-R variance than the CAS Full Scale score.

There are many ways in which the validity of a theory of cognitive ability may be evaluated. Psychologists often attempt to relate information about a child's cognitive characteristics to that achievement. For instance, subtests like General Information are also included on individual achievement tests (e.g., the Peabody Individual Achievement Test—Revised; Markwardt, 1997). Sim-

EF, WISC-IV, CAS, Achievement

- Data from Sam Goldstein's evaluation center in Salt Lake City, UT
- Children given the WISC-IV (N = 43), CAS (N = 62), and the WJIII achievement (N = 58) as part of the typical test battery

Demographic Characteristics of the CAS, WISC-IV, and WJ III ACH Validity Samples

Demographic		CAS		WISC-IV		WJ III ACH	
		N	%	*N*	%	*N*	%
Gender	Male	38	61.3	29	67.4	36	62.1
	Female	24	38.7	14	32.6	22	37.9
Race/ Ethnic Group	Hispanic	1	1.6	1	2.3	1	1.7
	Asian	2	3.2	2	4.7	2	3.4
	White	55	88.7	38	88.4	52	89.7
	Other	4	6.5	2	4.7	3	5.2
Parental Education Level	High school diploma or less	1	1.6	0	0.0	1	1.7
	Some college or associate's degree	21	33.9	12	27.9	18	31.0
	Bachelor's degree or higher	36	58.1	26	60.5	34	58.7
	Missing information	4	6.5	5	11.6	5	8.6
Diagnostic or Educational Group	ADHD	24	38.7	15	34.9	20	34.5
	Anxiety	15	24.2	9	20.9	14	24.1
	ASD	7	11.3	5	11.6	7	12.1
	LD	3	4.8	3	7.0	3	5.2
	Mood	4	6.5	3	7.0	5	8.6
	Other	9	4.8	8	4.6	9	5.1
Total		**62**	**100.0**	**43**	**100.0**	**58**	**100.0**
Age *M* (*SD*)		**10.4 (2.9)**		**10.2 (2.6)**		**10.5 (2.7)**	

Note. ADHD = Attention-Deficit/Hyperactivity Disorder; Anxiety = Anxiety Disorder; ASD = Autism Spectrum Disorder; LD = Learning Disorder; Mood = Mood Disorder.

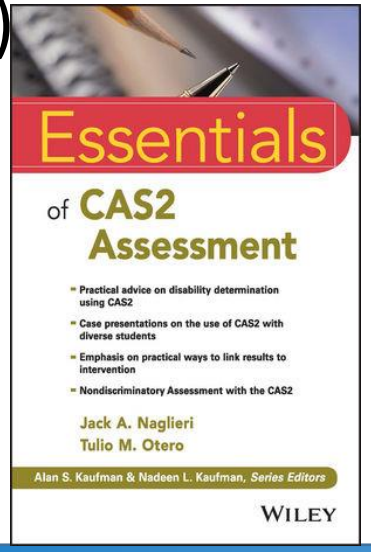
	CAS				
	FS	Plan	Sim	Att	Suc
CEFI					
Full Scale	.45	.49	.43	.37	.32

	WISC-IV				
	FS	VC	PR	WM	PS
CEFI					
Full Scale	.39	.44	.27	.30	.34

	WJ-III Achievement Tests				
CEFI Scales	Total	Broad Reading	Broad Math	Broad Written Language	Median
Full Scale	.51	.48	.49	.47	.49

Correlations: We can do better!

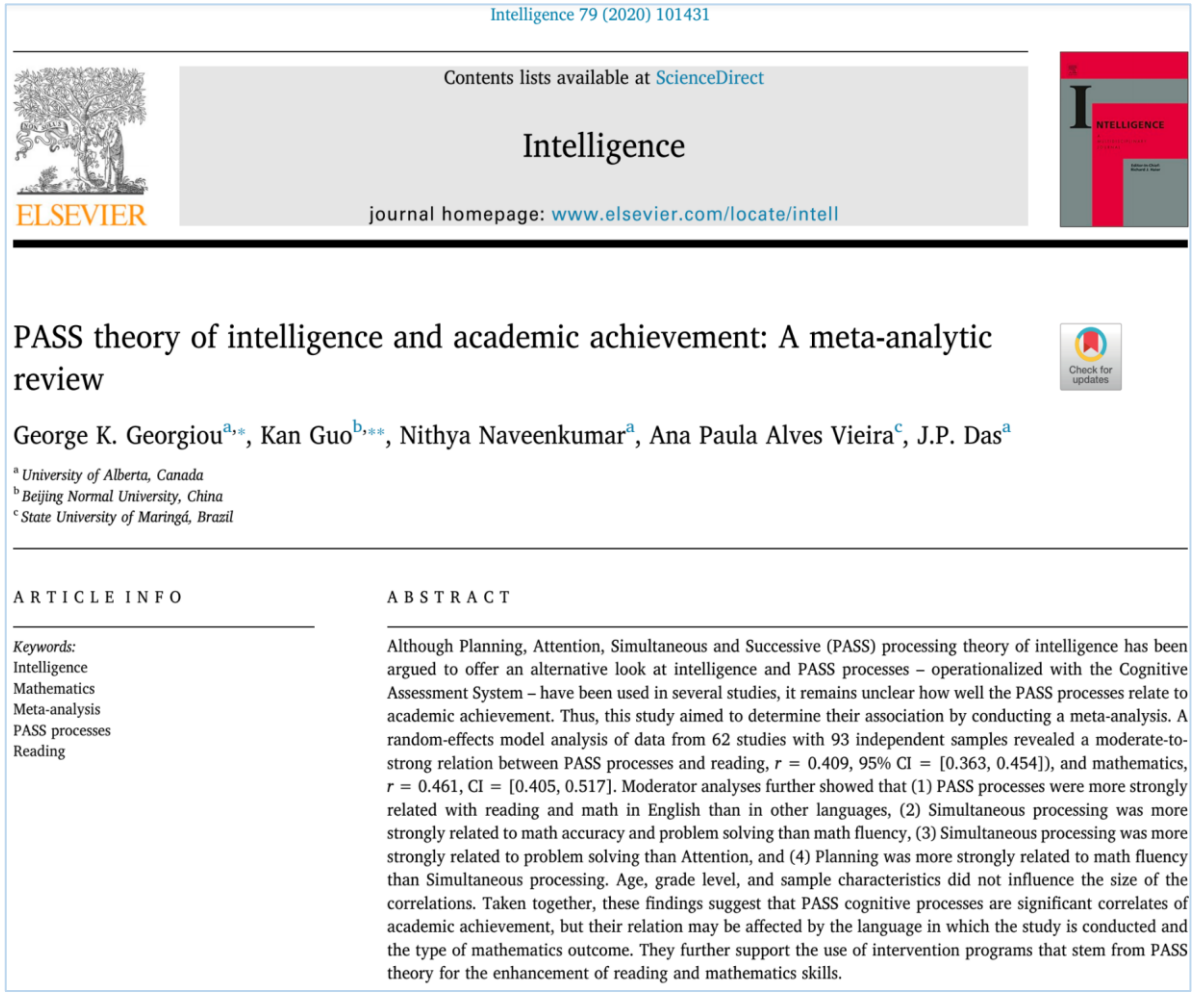
Average correlations between IQ Scales with total achievement scores from *Essentials of CAS2 Assessment* Naglieri & Otero (2017)



Correlations Between Ability and Achievement Test Scores			Average Correlation: All Scales	Average Correlation: Scales without achievement
WISC-V	Verbal Comprehension	.74		
WIAT-III	Visual Spatial	.46		
N = 201	Fluid Reasoning	.40		
	Working Memory	.63		
	Processing Speed	.34	.53	.47
WJ-IV COG	Comprehension Knowledge	.50		
WJ-IV ACH	Fluid Reasoning	.71		
N = 825	Auditory Processing	.52		
	Short Term Working Memory	.55		
	Cognitive Processing Speed	.55		
	Long-Term Retrieval	.43		
	Visual Processing	.45	.54	.50
KABC	Sequential/Gsm	.43		
WJ-III ACH	Simultaneous/Gv	.41		
N = 167	Learning/Glr	.50		
	Planning/Gf	.59		.48
	Knowledge/GC	.70	.53	
CAS	Planning	.57		
WJ-III ACH	Simultaneous	.67		
N=1,600	Attention	.50		
	Successive	.60	.59	

Note: WJ-IV Scales Comp-Know= Vocabulary and General Information; Fluid Reasoning = Number Series and Concept Formation; Auditory Processing = Phonological processing.

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



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PASS theory of intelligence and academic achievement: A meta-analytic review

George K. Georgiou[a,*], Kan Guo[b,**], Nithya Naveenkumar[a], Ana Paula Alves Vieira[c], J.P. Das[a]

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ABSTRACT

Although Planning, Attention, Simultaneous and Successive (PASS) processing theory of intelligence has been argued to offer an alternative look at intelligence and PASS processes – operationalized with the Cognitive Assessment System – have been used in several studies, it remains unclear how well the PASS processes relate to academic achievement. Thus, this study aimed to determine their association by conducting a meta-analysis. A random-effects model analysis of data from 62 studies with 93 independent samples revealed a moderate-to-strong relation between PASS processes and reading, $r = 0.409$, 95% CI = [0.363, 0.454]), and mathematics, $r = 0.461$, CI = [0.405, 0.517]. Moderator analyses further showed that (1) PASS processes were more strongly related with reading and math in English than in other languages, (2) Simultaneous processing was more strongly related to math accuracy and problem solving than math fluency, (3) Simultaneous processing was more strongly related to problem solving than Attention, and (4) Planning was more strongly related to math fluency than Simultaneous processing. Age, grade level, and sample characteristics did not influence the size of the correlations. Taken together, these findings suggest that PASS cognitive processes are significant correlates of academic achievement, but their relation may be affected by the language in which the study is conducted and the type of mathematics outcome. They further support the use of intervention programs that stem from PASS theory for the enhancement of reading and mathematics skills.

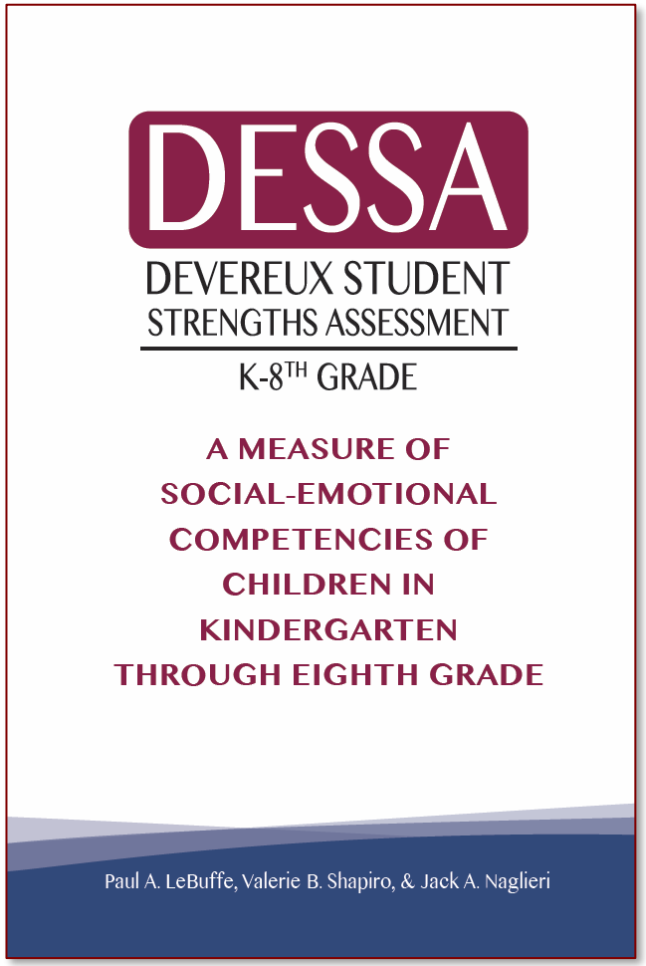
Georgiou, G., Guo, K., Naveenkumar, N., Vieira, A. P. A., & Das, J. P. (2019) PASS theory of intelligence and academic achievement: A meta-analytic review. *In press Intelligence.*

PASS Research

- "The results clearly show that when CAS Full Scale is used it correlates **.60 with reading** and **.61 with mathematics**."
- "**These correlations are significantly stronger … than the correlations reported in previous meta-analysis for other measures of intelligence** (e.g., Peng et al., 2019; Roth et al., 2015)…(e.g., WISC) that include tasks (e.g., Arithmetic, Vocabulary)..."
- "if we **conceptualize intelligence as … cognitive processes that are linked to the functional organization of the brain**" it leads to significantly higher relations with academic achievement."
  - "and these processes have direct implications for instruction and intervention…"

The Devereux Student Strengths Assessment (DESSA)

- Based on the concept of resilience & SEL principles described by CASEL
  - Identify social-emotional strengths and needs of elementary and middle school children (for K-8th grade)
  - 72 items and 8 scales
  - Completed by parents, teachers, and/or after-school / community program staff
  - Takes 15 minutes to complete
  - On-line administration, scoring and reporting available



CASEL and DESSA Scales

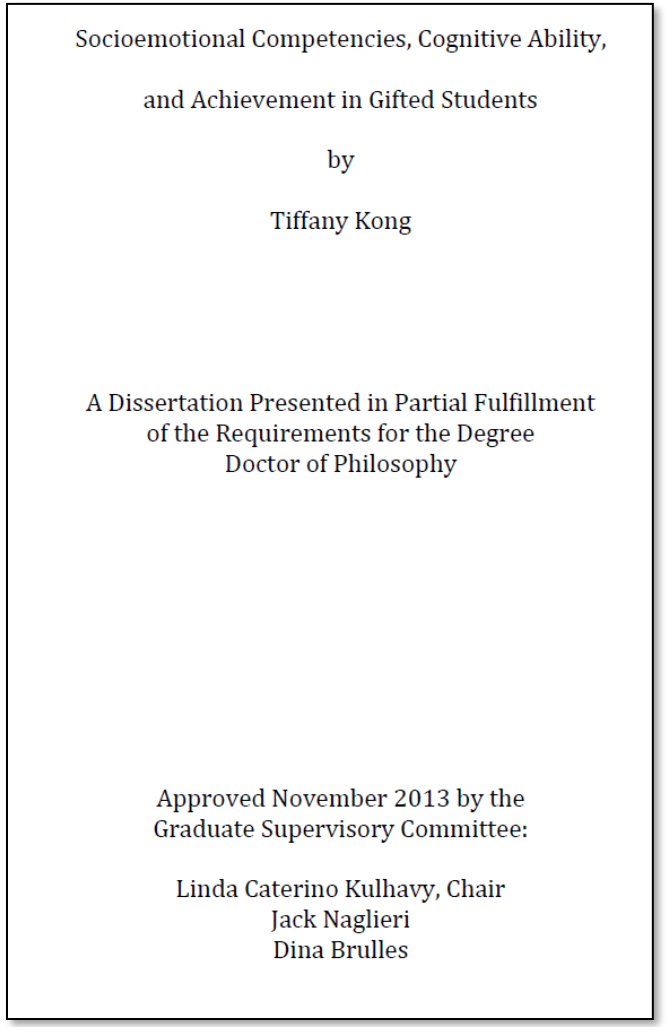
1. **Self-awareness**—being able to ac
and strengths; maintaining a well-
2. **Self-management**—being able to
control impulses, and persevere i
progress toward personal and ac
3. **Social awareness**—being able to
others; recognizing and appreciat
differences; recognizing and usin
4. **Relationship skills**—being able t
relationships based on cooperatio
preventing, managing, and resolv
needed
5. **Responsible decision-making**—h
consideration of reason, ethical
for self and others, and likely con
making skills to academic and so
one's school and community.[1]

Social Emotional Composite

- Self Awareness
- Self Management
- Social Awareness
- Relationship Skills
- Decision Making
- Goal Directed Behavior
- Personal Responsibility
- Optimistic Thinking

Kong (2013): IQ, SEL & Achievement

- Tiffany Kong studied CogAT, DESSA, and achievement scores for 276 elementary students grades K-8
- All gifted based on scores on verbal, quantitative, or nonverbal test scores at least 97th percentile



Socioemotional Competencies, Cognitive Ability,

and Achievement in Gifted Students

by

Tiffany Kong

A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved November 2013 by the
Graduate Supervisory Committee:

Linda Caterino Kulhavy, Chair
Jack Naglieri
Dina Brulles

Kong (2013): IQ, SEL & Achievement

- Mean IQ score = 129.6 nearly 2 SDs above the normative mean (achievement also high)

- Mean SEL score on DESSA was only ½ SD above the normative mean (T = 55.5)

Table 1

Means and Standard Deviations of Study Variables

Construct	Mean	*SD*
Age	10.96	1.81
DESSA Total	55.51	9.41
Verbal	125.69	13.74
Quantitative	124.41	10.34
Nonverbal	125.10	12.56
CogAT Composite	129.61	8.22
Reading	75.56	15.72
Language	69.46	19.60
Math	76.30	17.13
SAT10 Achievement Composite	73.77	12.66

Kong (2013) SEL Predicts Beyond IQ (p. 44)

DESSA predicted reading, language and math scores over IQ (CogAt) scores

Relations between Cognitive Ability, Socioemotional Competency, and Achievement Variables

Hierarchical regression analyses were conducted to determine which scales and subtests predicted the most variance in the dependent achievement variables. Composite CogAT scores were not found to significantly predict composite achievement, $R^2\Delta = .03$, $F(1, 121) = 3.27$, $p > .05$, reading, language, or math scores over-and-above the DESSA Total scores (Table 11). On the other hand, the DESSA Total scores significantly predicted composite achievement, $R^2\Delta = .05$, $F(1, 121) = 6.99$, $p < .05$; language scores, $R^2\Delta = .03$, $F(1, 121) = 4.26$, $p < .05$; and math scores, $R^2\Delta = .05$, $F(1, 121) = 6.09$, $p < .05$, over-and-above the composite CogAT scores.

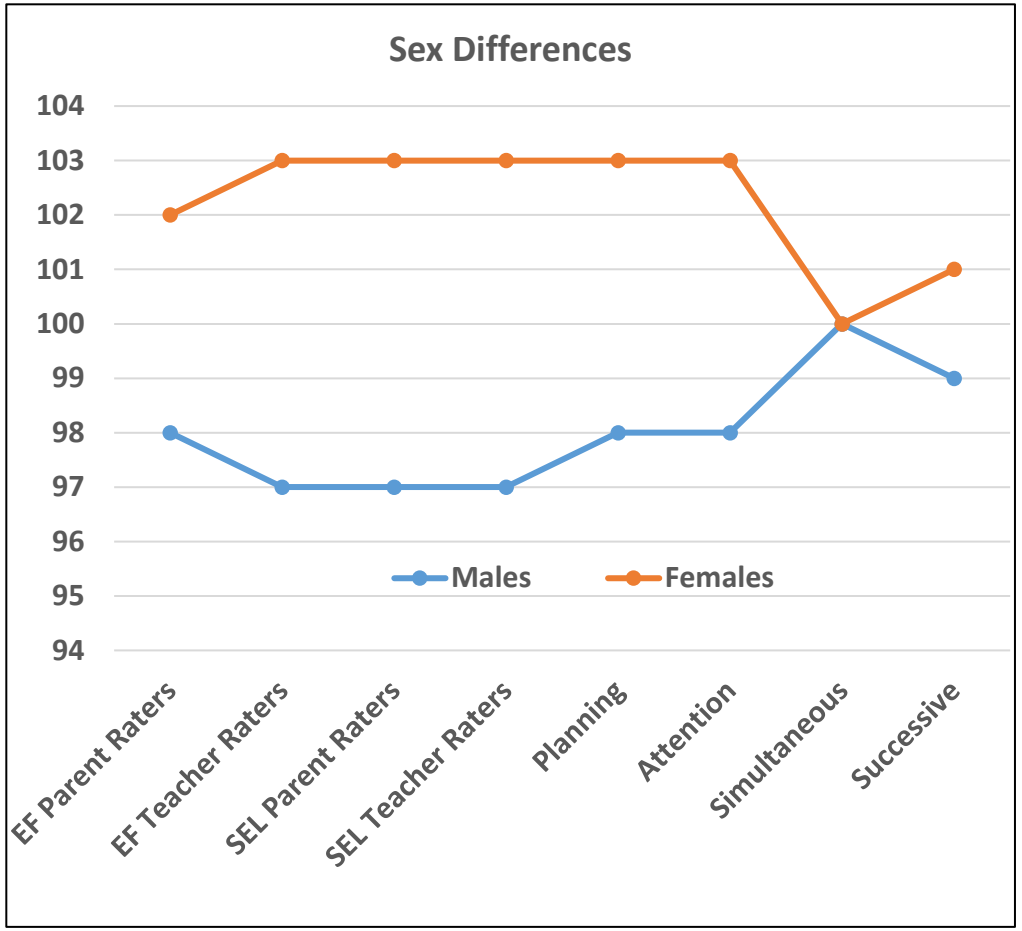
Take Away Messages

- Social Emotional behaviors reflect EF and therefore they correlate with achievement
- SEL behaviors are the result of EF and what the person has learned in all aspects of the environment
- Individuals CAN BE TAUGHT good, or bad, social emotional skills

- Your Comments? Questions?

Sex Differences in Executive Function

	CEFI	Males	Females	Difference
EF	EF Parent Raters	98	102	4
EF	EF Teacher Raters	97	103	6
	DESSA	Males	Females	Difference
SEL	SEL Parent Raters	97	103	6
SEL	SEL Teacher Raters	97	103	5
	PASS from CAS	Males	Females	Difference
EF	Planning	98	103	5
EF	Attention	98	103	5
	Simultaneous	100	100	0
	Successive	99	101	1



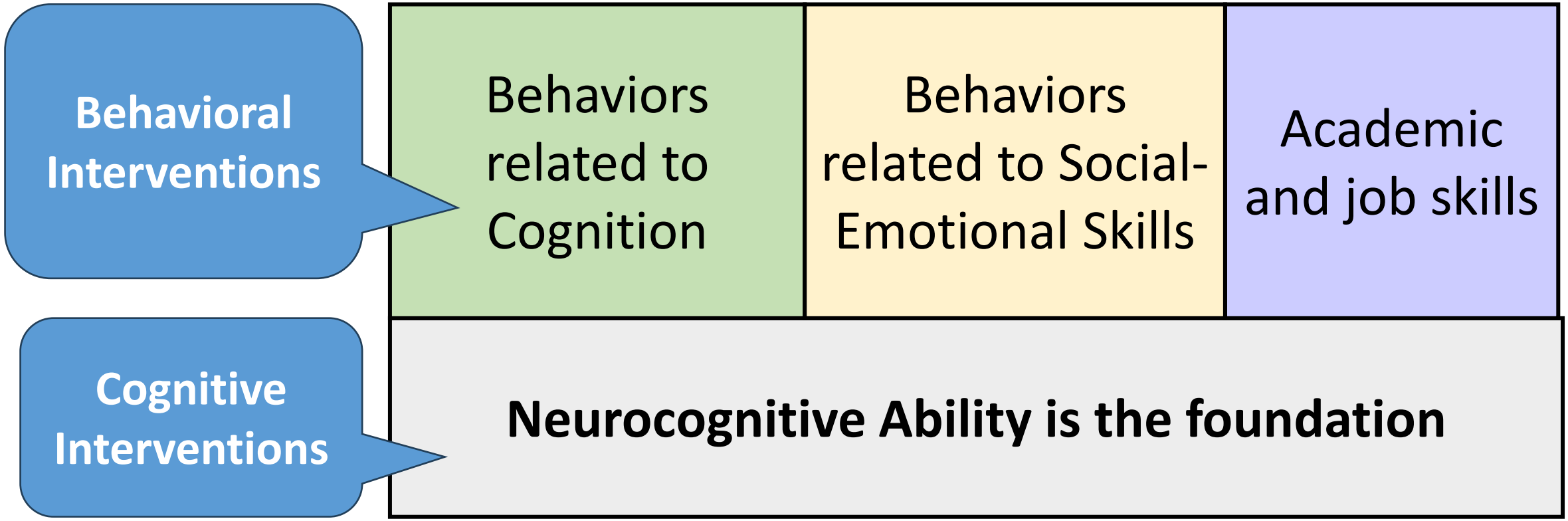
Note: CEFI Adult scores did not differ for adults.

Females have higher EF scores than Males

Presentation Outline

- Introduction to Executive Function (EF)
- EF Behaviors
- EF and Cognition (intelligence)
- EF and Social Emotional Skills
- EF and Academic/Job Performance
- Research about EF as ability, behavior, and SE
- Conclusions

Behavioral and/or Cognitive Explanation for EF Symptoms



Time for final Questions and Answers

My theme of advancing the field - CHANGE

Maybe It's Time to Let the Old Ways Die

NYASP 2022
Legends in School
Psychology Award
Interview

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