From Science to System: Updating the FASD Forensic Assessment Protocol for Justice, Clarity, and Change

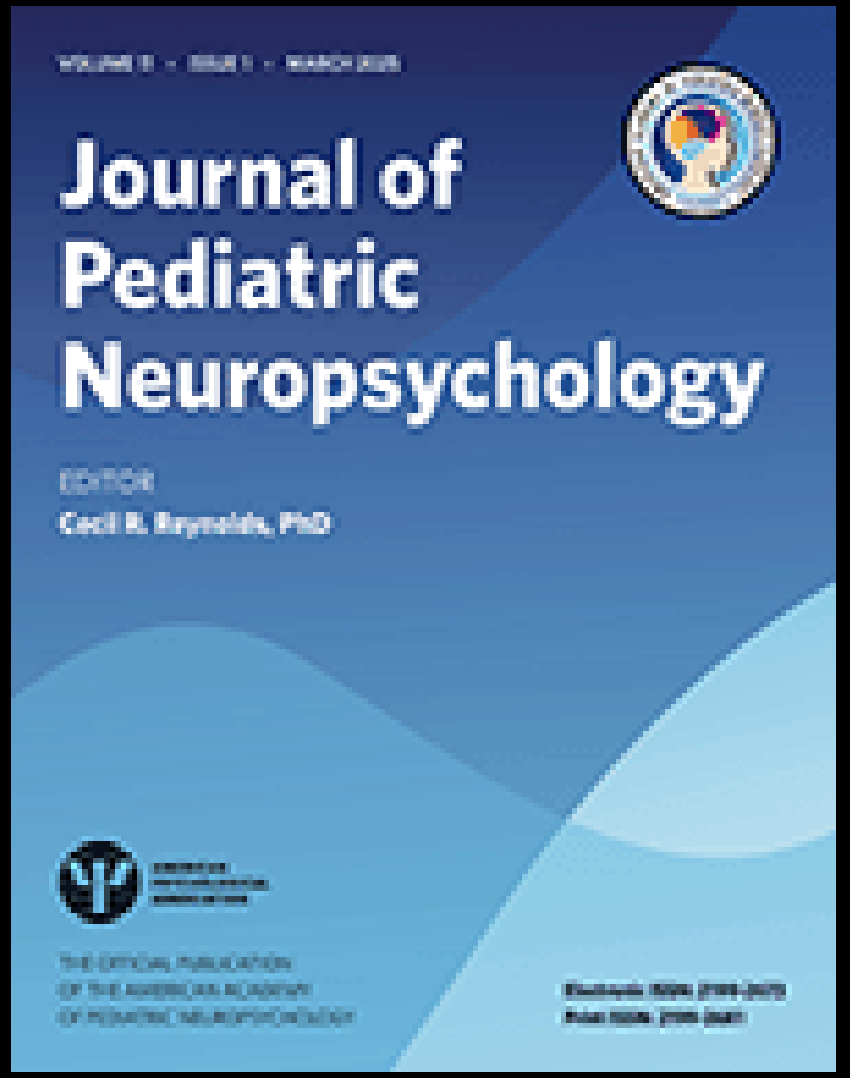
Karen Steele, Moderator
Natalie Novick Brown, PhD
Paul D. Connor, PhD
Richard S. Adler, MD

FASD United 10th International Conference
Seattle, WA
April 19, 2026

March 2026 Editor's Choice

An Updated FASD Assessment Protocol for the Forensic Context

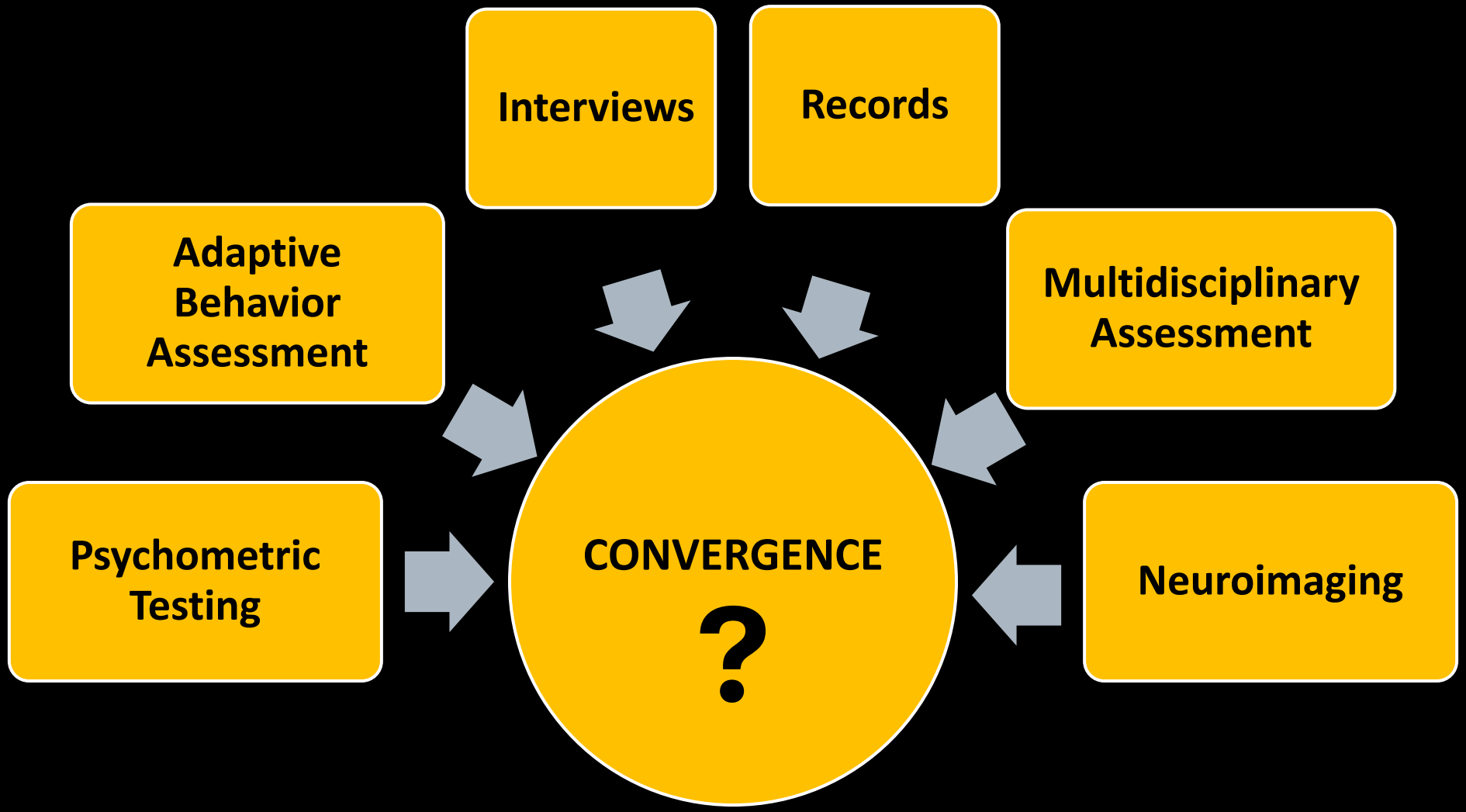
Natalie Novick Brown
Paul D. Connor
Richard S. Adler



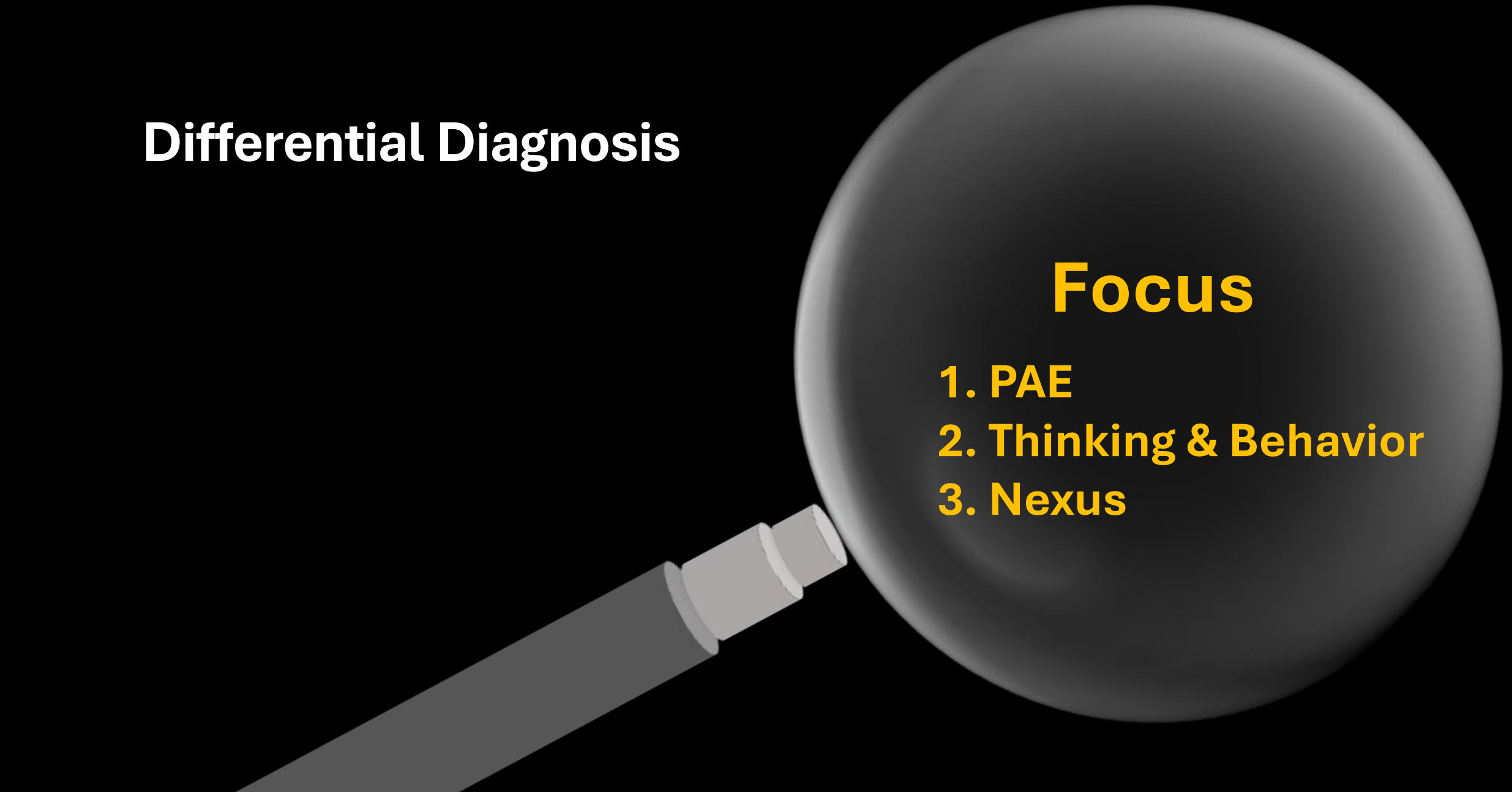
FORENSIC OBJECTIVITY
through:

- ✓ Multidisciplinary Team (MDT)
- ✓ Independence
- ✓ Convergence
- ✓ Differential Diagnosis (DD)
- ✓ Continuous Quality Improvement (CQI)

MDT: Independence and Convergence

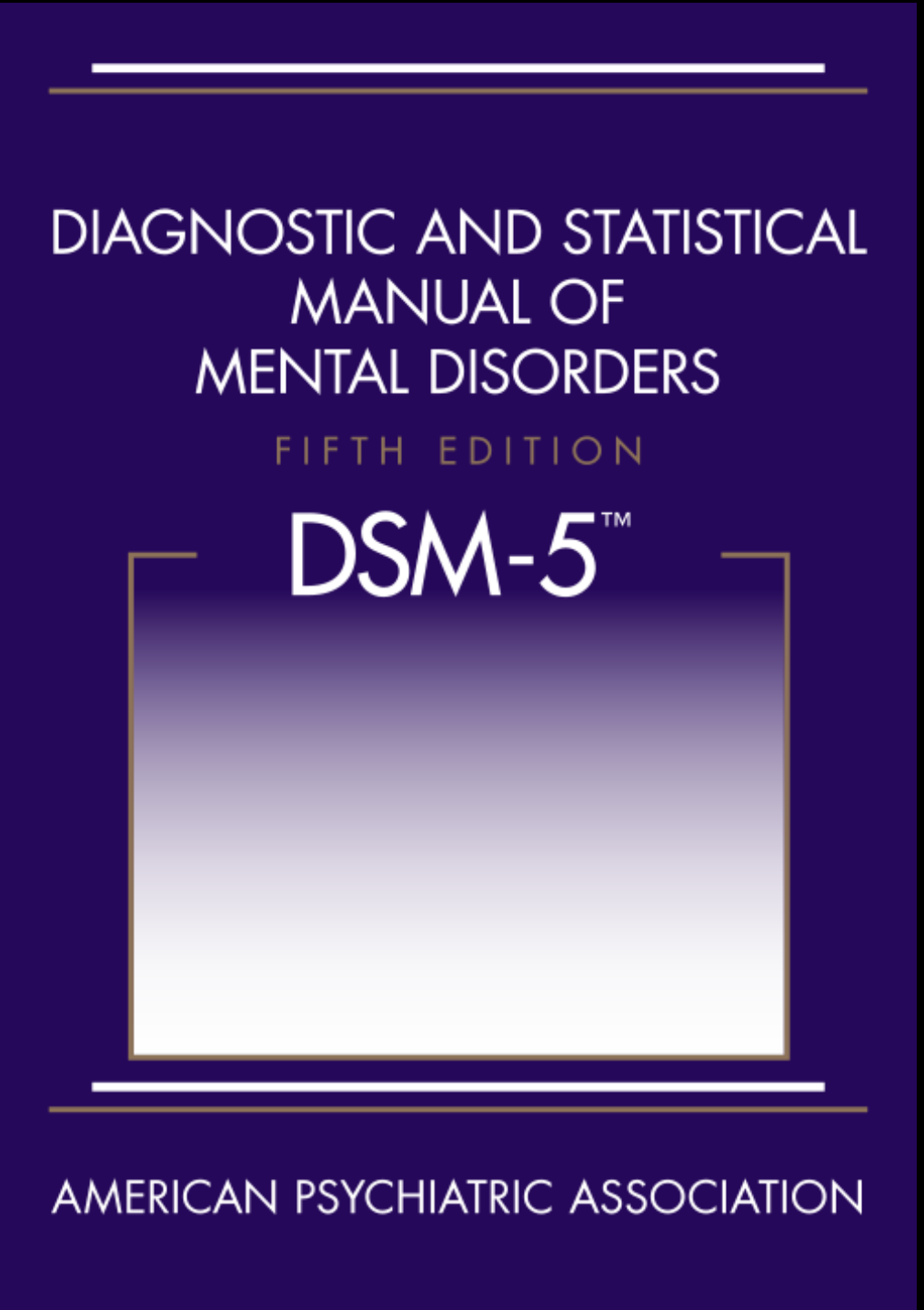


Differential Diagnosis



Continuous Quality Improvement (CQI) Grounded in the Evolving Science

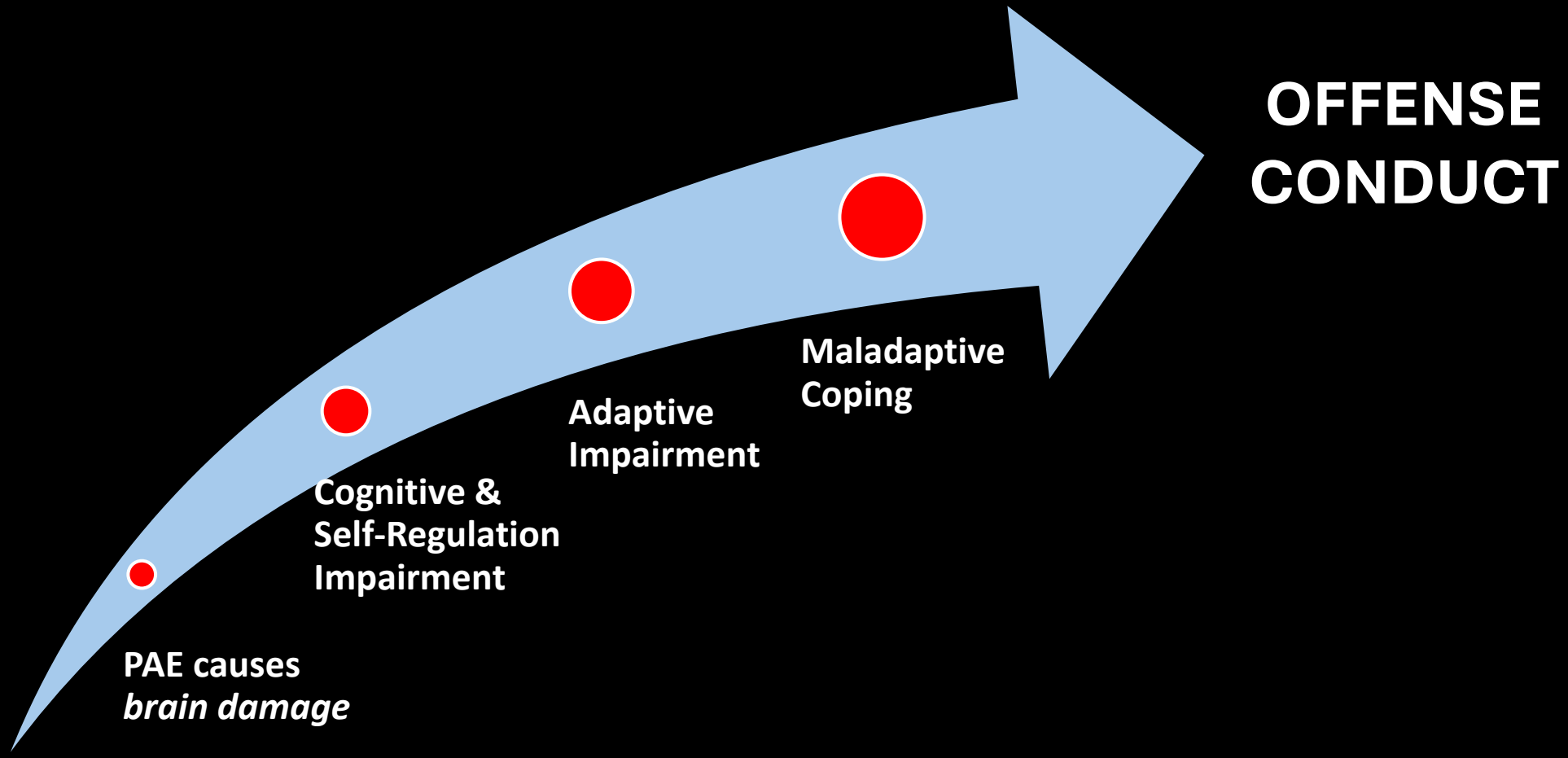
- ✓ Biopsychosocial Perspective
- ✓ Developmental Scope (‘whole cloth’)
- ✓ Relevant Empirical Research
- ✓ Neuroimaging
- ✓ Diagnostic Changes



Context: Paradigm Shift

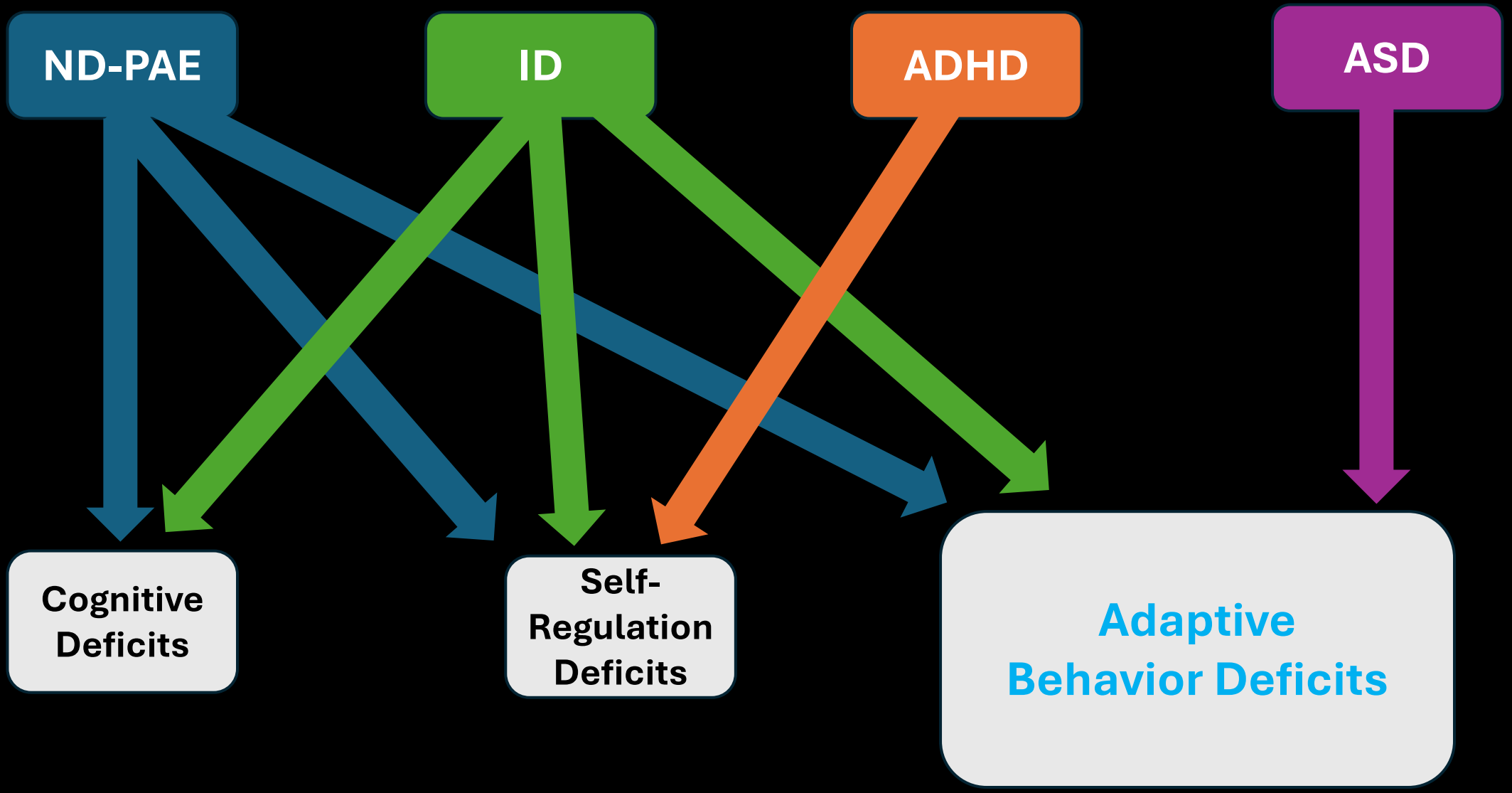
- ✓ DSM-5 Diagnosis: ND-PAE & ID
- ✓ EF Emphasis
- ✓ ID-Equivalence
- ✓ Severity Determination
- ✓ Arrested Development
- ✓ ‘General Acceptance’

Whole-Cloth Perspective



ND-PAE (FASD) = a direct cause-and-effect disorder.

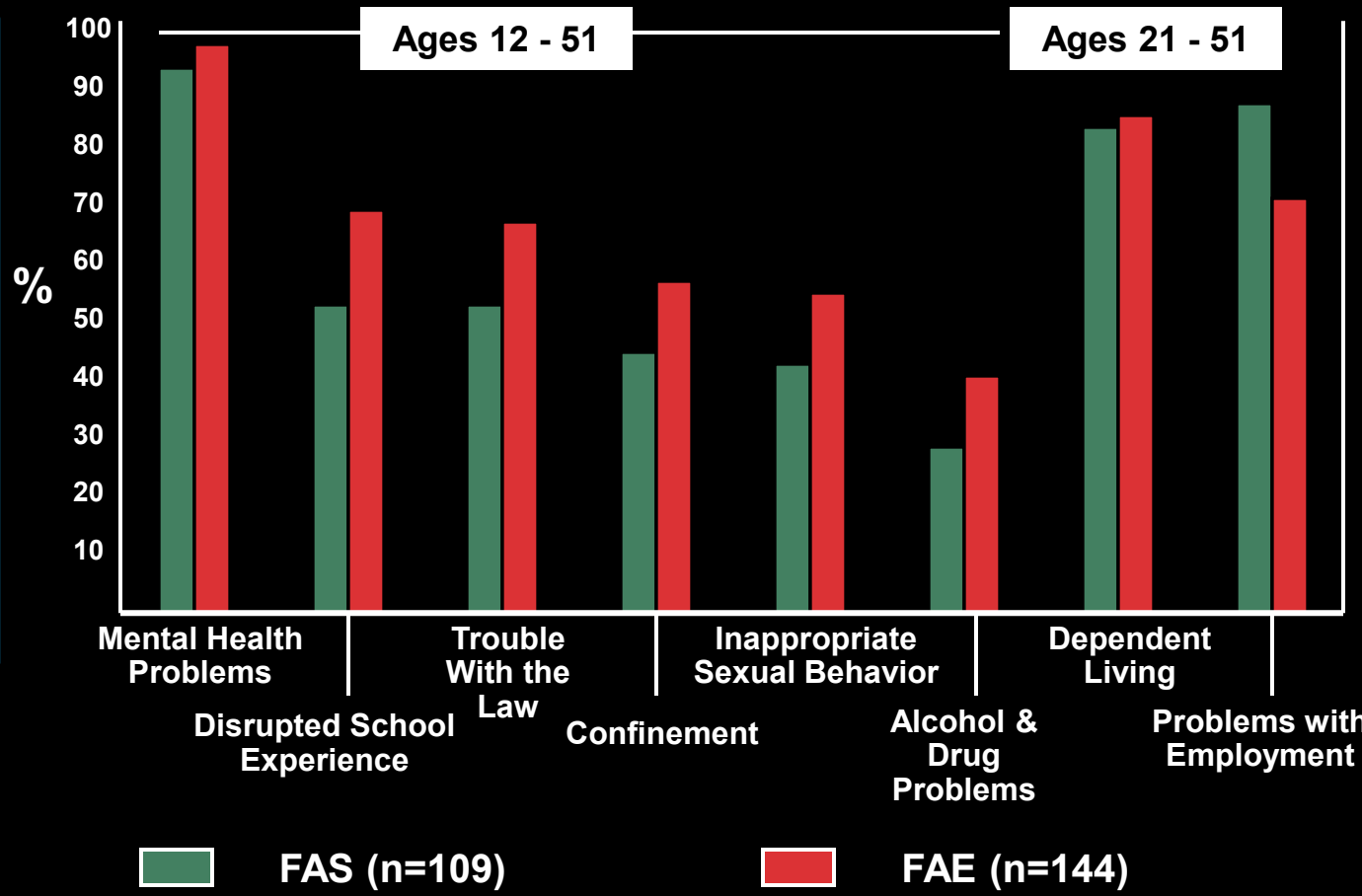
Severity


ND-PAE
ID
ADHD
ASD
Cognitive Deficits
Self-Regulation Deficits
Adaptive Behavior Deficits

FASD Developmental Trajectory: Severity

[1996 Secondary Disabilities Study]

Brain Damage
+
ACEs
=
"Secondary Disabilities" (developmental outcomes)



*** Note that FAE (now, ARND) has worse outcomes than FAS in all but one area**

"FAE" (Fetal Alcohol Effects) = ARND*

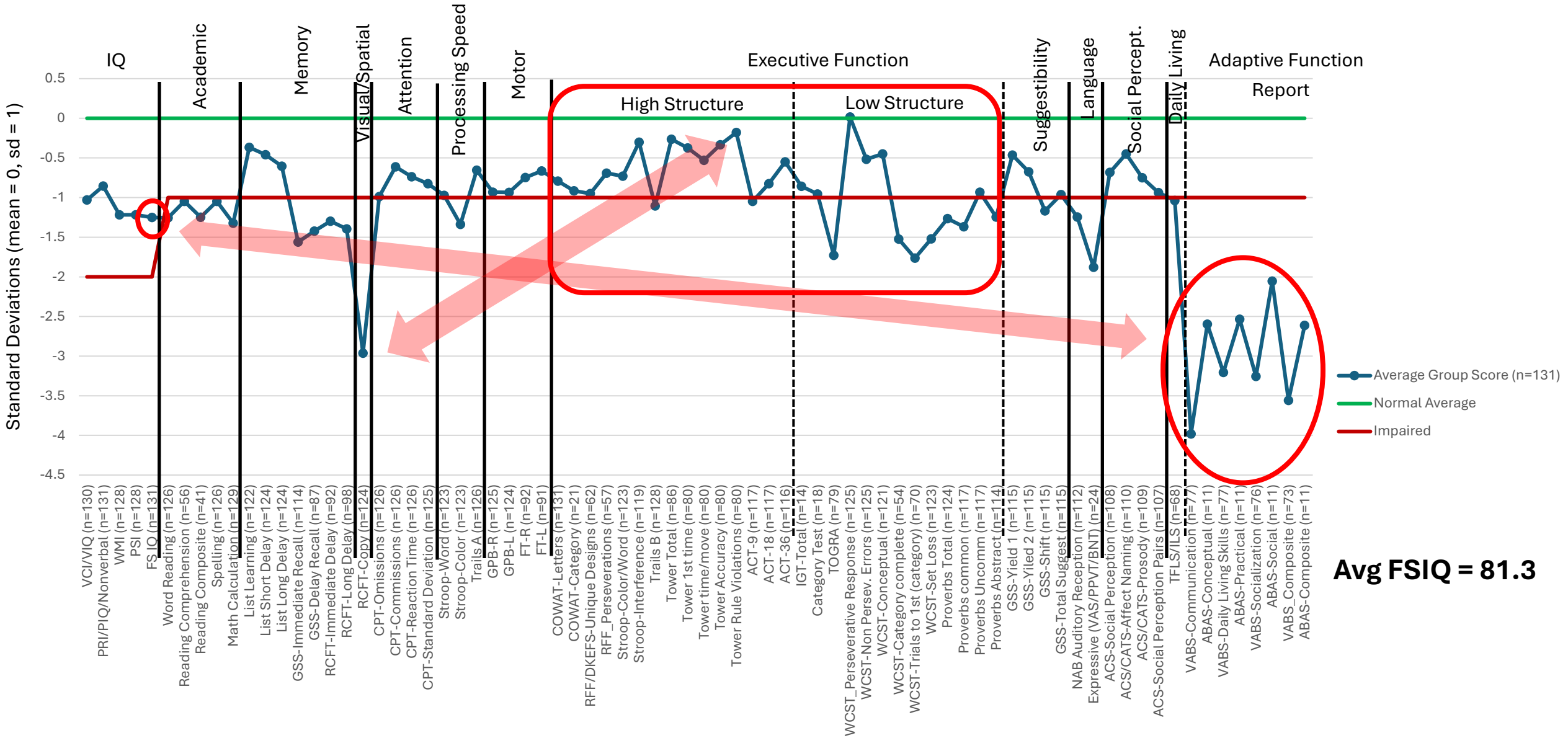
Protective factors:

- Diagnosis before age 6
- FASD-informed services and supports
- Stable, nurturing home environment
- No violence exposure.

Expected Cognitive Profiles

- Variable performance
- Context-dependent functioning
- Arrested development

Average Neuropsychological Profile of 131 Defendants Diagnosed with an FASD



Avg FSIQ = 81.3

The Developmental Paradox

Brain injury in utero is static, but the functional manifestation changes across the lifespan due to *minimal brain maturation as contextual demands increase*.

Arrested Development in Children

Study	Age	Sample	Vineland Results
Thomas et al., 1998	5-12y	FAS vs VIQ-matched vs normal controls	FAS lowest on all social skills (NC > VIQ > FAS); most impaired in interpersonal relationships; **arrested development in FAS**
Whaley et al., 2001	6-17y	PAE vs clinic controls	PAE showed **greater age-related decline in socialization scores**
Coles et al., 2009	6-17y	Heavy PAE vs ADHD vs controls	Mean composite at age 17 = 7y (**Socialization = 6y**)
Rasmussen et al., 2012	8-20y	FASD vs IQ-matched SLD vs controls	FASD = significantly lower in all adaptive domains vs both groups; **arrested development in Socialization**
Whaley et al., 2006	Preschool	PAE children	Early adaptive deficits across all domains; **Socialization deterioration pattern emerged in early childhood**
Popova et al., 2023	Children	FASD vs controls	FASD = significantly lower VABS scores vs controls

Arrested Development in Adults

Study	Age	Sample	Vineland Results
Streissguth et al., 1991	Adolescents & Adults	FASD clinical cohort	Mean composite score = 7y (**Socialization = 6y**)
Streissguth et al., 1996	Adolescents & adults	FASD cohort (N=415)	Mean composite score = 7y, **arrested development in Socialization & Communication**
Spohr et al., 2007	Young Adults	FAS cohort followed from childhood	**Persistent deficits into adulthood, especially in socialization & communication**
Day et al., 2015	Young Adults	Prospective PAE cohort vs controls	Mean adaptive composite lower in PAE

DSM-5-TR: Arrested Development in ND-PAE

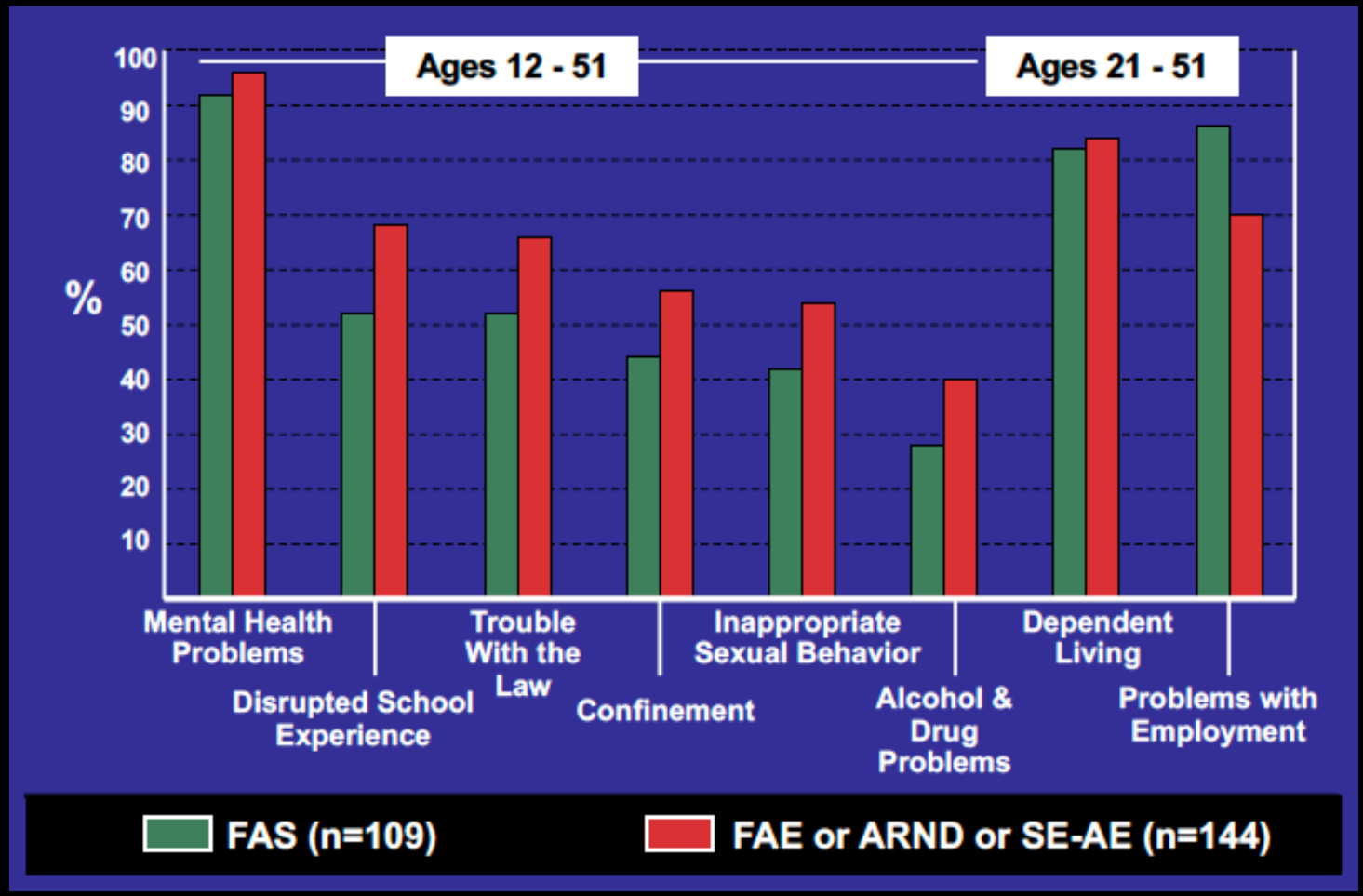
Development and Course

Among individuals with prenatal alcohol exposure, evidence of CNS dysfunction varies according to developmental stage. Although about one-half of young children prenatally exposed to alcohol show marked developmental delay in the first 3 years of life, other children affected by prenatal alcohol exposure may not exhibit signs of CNS dysfunction until they are preschool- or school-age. Additionally, impairments in higher order cognitive processes (i.e., executive functioning), which are often associated with prenatal alcohol exposure, may be more easily assessed in older children. When children reach school age, learning difficulties, impairment in executive function, and problems with integrative language functions usually emerge more clearly, and both social skills deficits and challenging behavior may become more evident. In particular, as school and other requirements become more complex, greater deficits are noted. Because of this, the school years represent the ages at which a diagnosis of ND-PAE would be most likely.

DSM-5-TR: Page 918

Functional Consequences

(assessing severity via the ‘whole cloth’ approach)

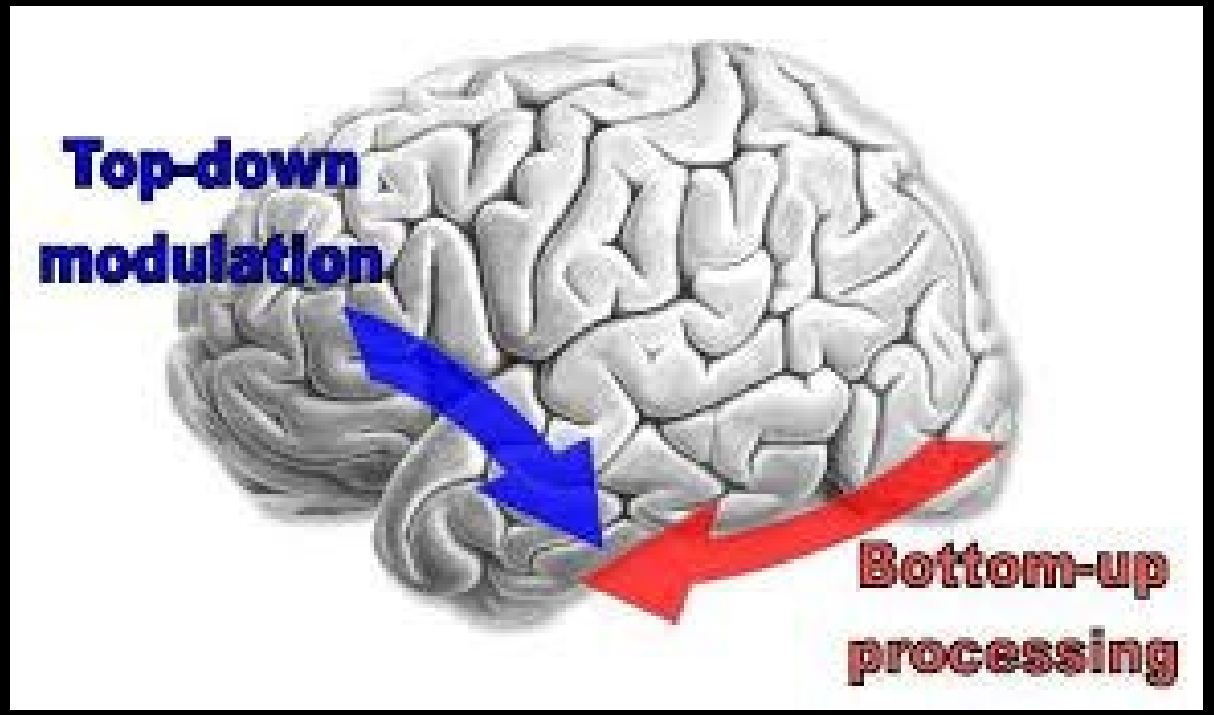


1996 CDC Secondary Disabilities Study

Diagnostic Analysis of Leroy Johnson: ND-PAE

ND-PAE DIAGNOSTIC CRITERIA	LEROY JOHNSON	
Neurocognition (at least 1 impaired domain)	Age 14 (Dr. Ohanesian): **Academic Achievement** **Verbal Learning/Memory** **Auditory Processing**	Age 48 (Dr. Watson): **Intellectual (IQ index discrepancies)** **Academic Achievement** **Verbal Learning/Memory** **Visuospatial Construction**
Self-Regulation (at least 1 impaired domain)	Age 14 and Age 48 (Dr. Ohanesian & Dr. Watson): **Executive Dysfunction: attention, mood, impulse control**	
Adaptive Functioning (at least 2 impaired domains)	**Communication** **Daily Living Skills** **Socialization**	
Childhood Onset	**Evidence: contemporaneous school records, witness statements**	
Causes clinically significant distress in multiple contexts	**All 8 Secondary Disabilities**	
Differential Diagnosis	**ND-PAE is the only condition that explains ALL lifelong functioning**	

ND-PAE: A cause-and-effect mental defect.



CAUSE:

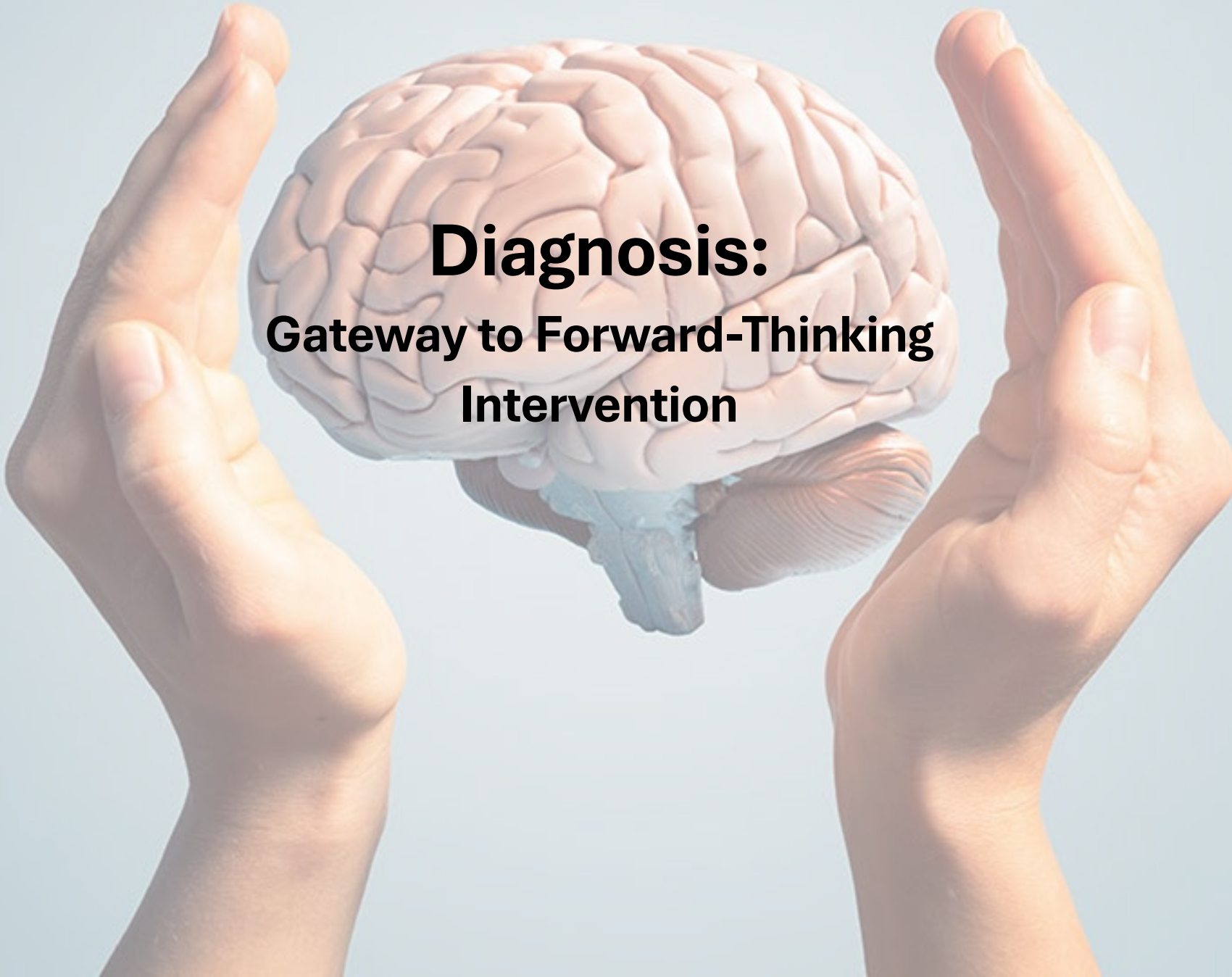
Prenatal alcohol exposure directly causes brain damage that impairs executive (top-down) control over behavior.

EFFECT:

Brain damage in FASD explains lifelong adaptive impairment *in unstructured environments*.

Mr. Johnson's brain damage occurred through no fault of his own.

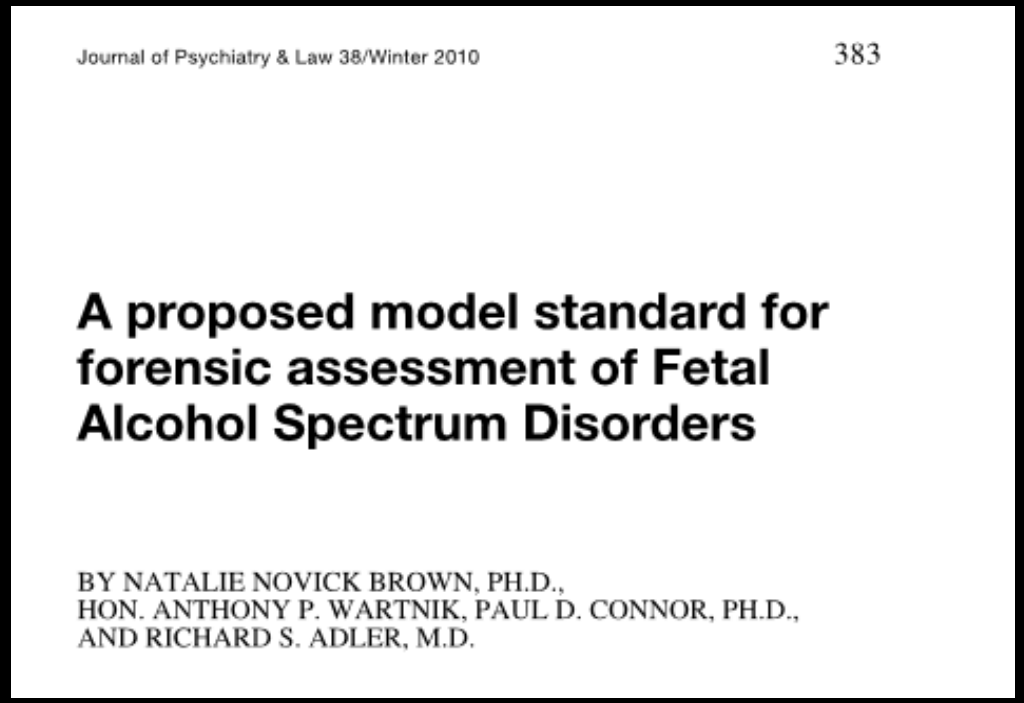
ND-PAE doesn't excuse his behavior, but it helps explain it.



Diagnosis:

Gateway to Forward-Thinking Intervention

The Neuropsychological Assessment Battery



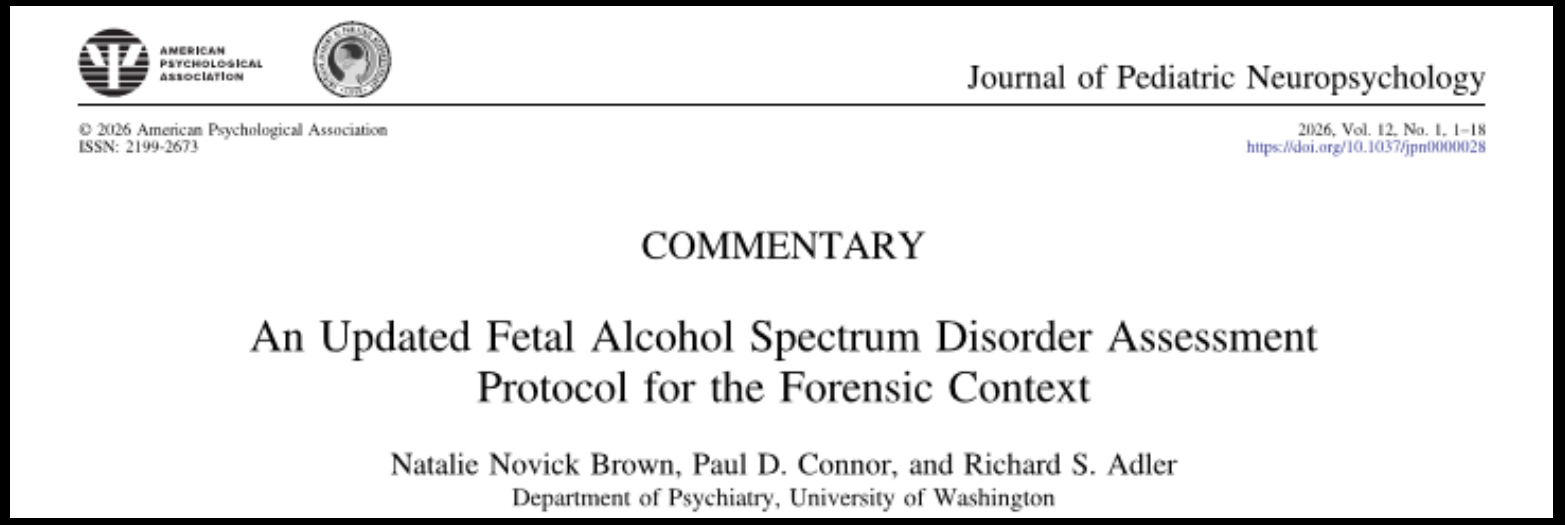
Journal of Psychiatry & Law 38/Winter 2010

A proposed model standard for forensic assessment of Fetal Alcohol Spectrum Disorders

BY NATALIE NOVICK BROWN, PH.D.,
HON. ANTHONY P. WARTNIK, PAUL D. CONNOR, PH.D.,
AND RICHARD S. ADLER, M.D.

7 Domains of Neuropsychological Functioning

1. IQ (WAIS-IV)
2. Achievement (WRAT-4)
3. Learning and Memory (CVLT, RCFT)
4. Attention (CPT)
5. Motor Coordination (Grooved Pegs, Finger Tap)
6. Executive Functions (WCST, DKEFS, COWAT, RFF, Stroop, ACT, Trails)
7. Adaptive Functioning (VABS)



AMERICAN PSYCHOLOGICAL ASSOCIATION

Journal of Pediatric Neuropsychology

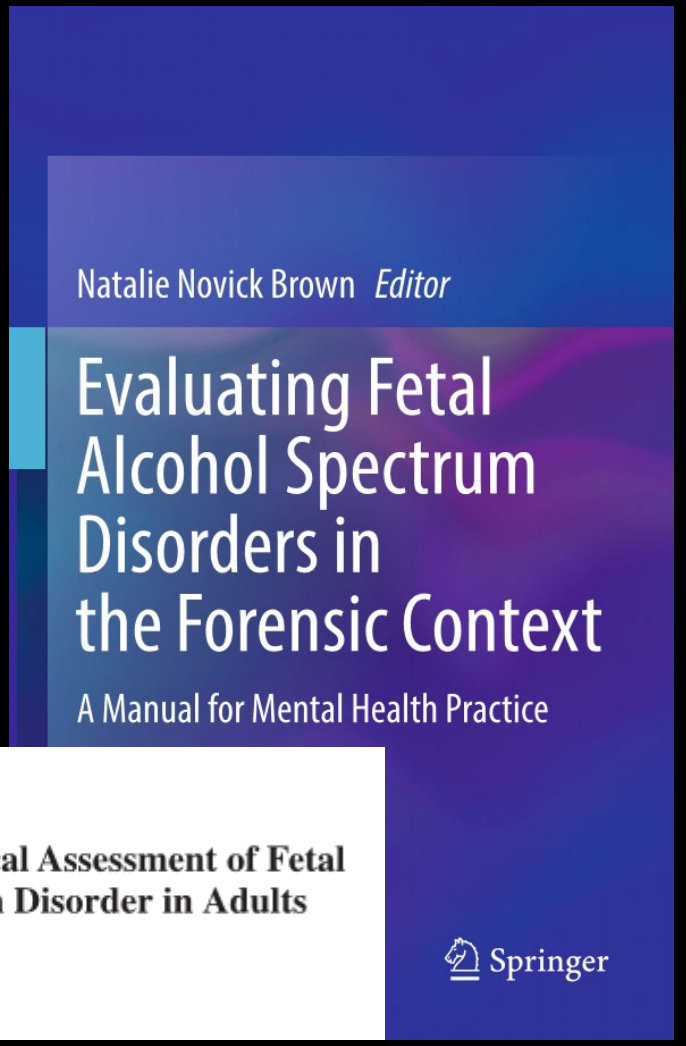
© 2026 American Psychological Association
ISSN: 2199-2673

2026, Vol. 12, No. 1, 1–18
https://doi.org/10.1037/jpn0000028

COMMENTARY

An Updated Fetal Alcohol Spectrum Disorder Assessment Protocol for the Forensic Context

Natalie Novick Brown, Paul D. Connor, and Richard S. Adler
Department of Psychiatry, University of Washington



Chapter 5
Neuropsychological Assessment of Fetal Alcohol Spectrum Disorder in Adults

Paul D. Connor

Springer

The 2026 Updated Protocol

Continues to Utilize the Nomenclature of IOM in Combination with the Structural Guidelines of the CDC

The Updated Protocol Utilizes 11 Domains

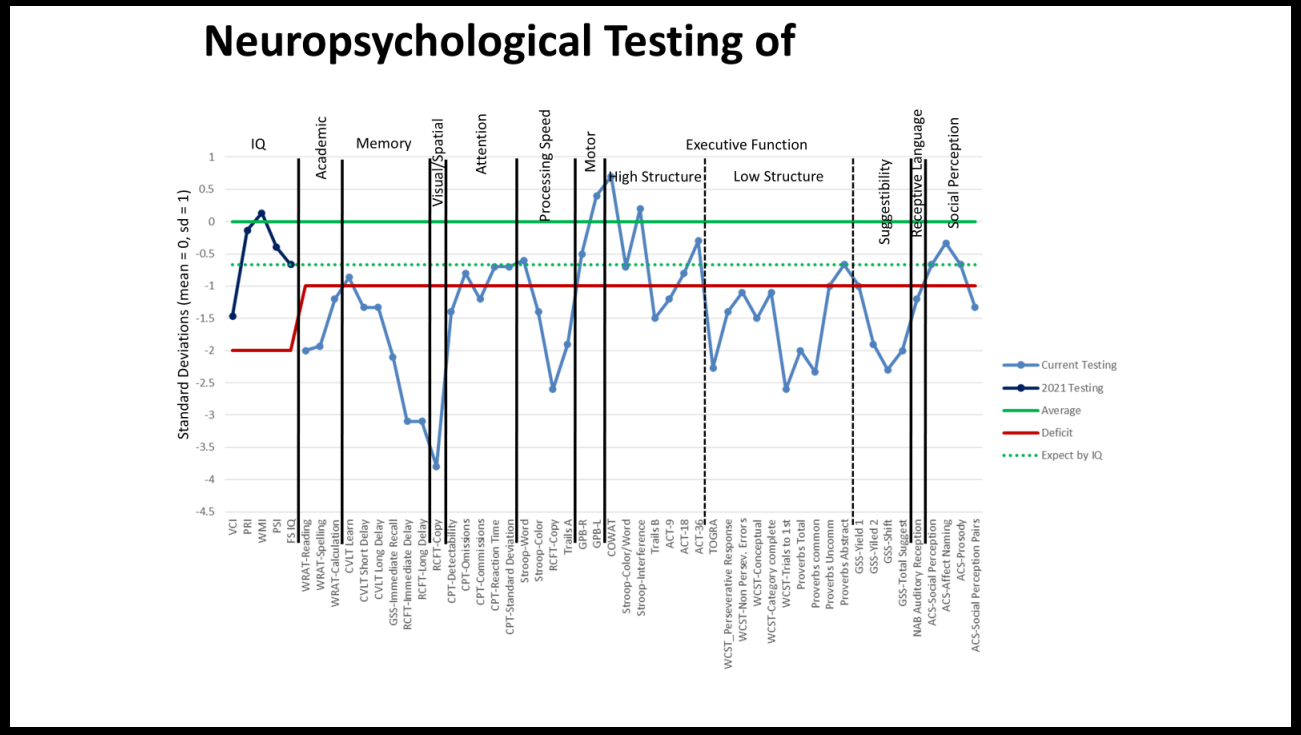
1. IQ (WAIS-IV)
2. Achievement (WRAT-4)
3. Visual Spatial Construction (e.g. RCFT)
4. Learning and Memory (CVLT, GSS2 Memory, RCFT)
5. Attention (CPT)
6. Motor Coordination (Grooved Pegs, Finger Tap)
7. Processing Speed (PSI, Trails A, Stroop)
8. Executive Functions (WCST, DKEFS, COWAT, RFF, Stroop, ACT, Trails) and Suggestibility (e.g. GSS2)
9. Communication
    1. Ability: NAB: AC
    2. Other Report: VABS Communication
10. Daily Living
    1. Ability: TFLS
    2. Other Report: VABS Daily Living
11. Socialization
    1. Ability: ACS: SC
    2. Other Report: VABS Socialization

Additional Analyses with the Updated Protocol

- Percentage of Scores within the Impaired Range
- Analysis of the “Functional Footprint”
- Comparison to Neuroimaging results
- Comparison with Other Justice Involved Individuals with FASD

Percentage of Scores within the Impaired Range

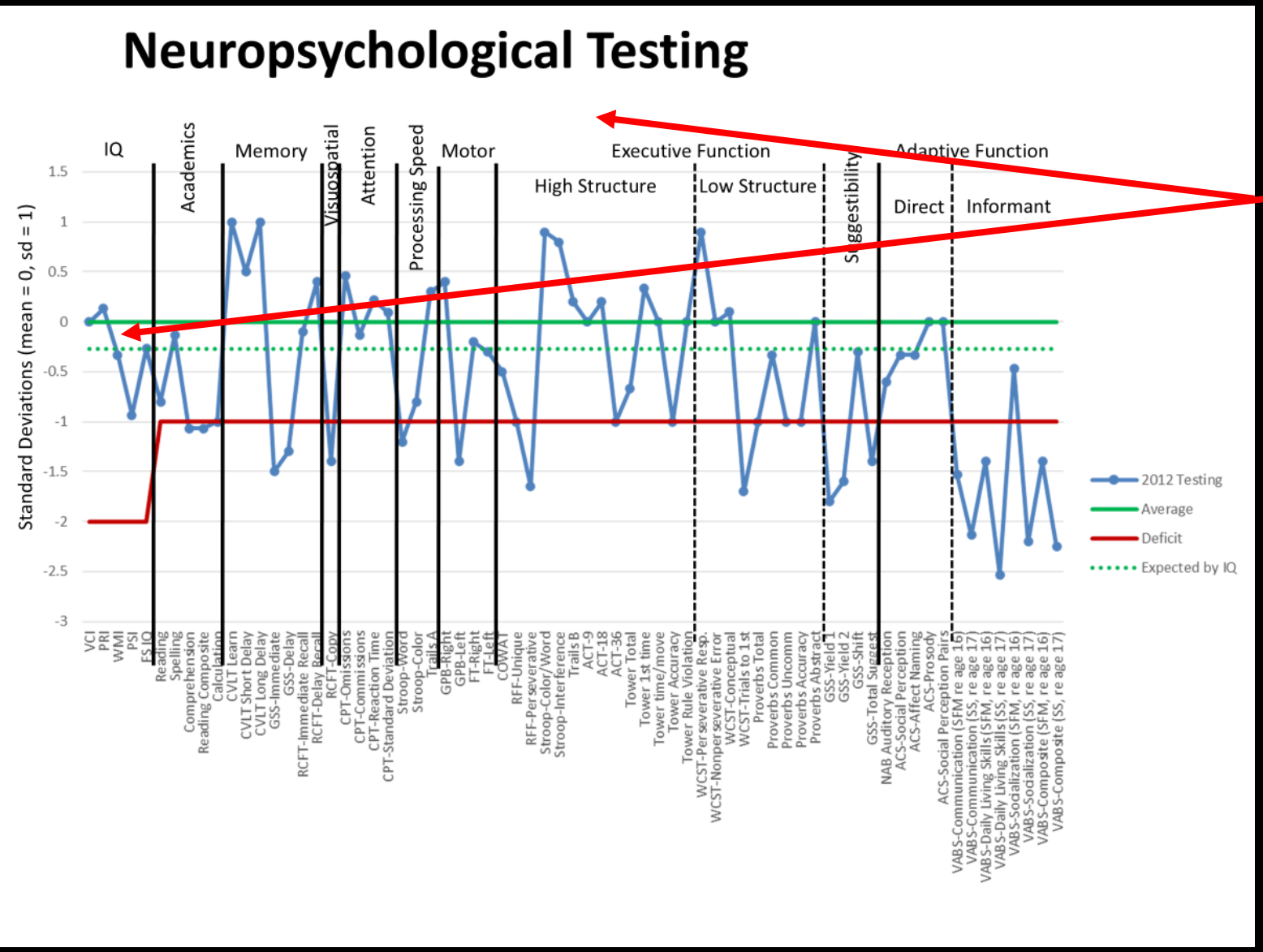
- Typically developing individuals can have ~10-15% of scores within the impaired range on a large battery of tests
- In FASD will expect larger percentage non-IQ scores to be within the impaired range:



Overall, 61.75% of non-IQ scores were within impaired range

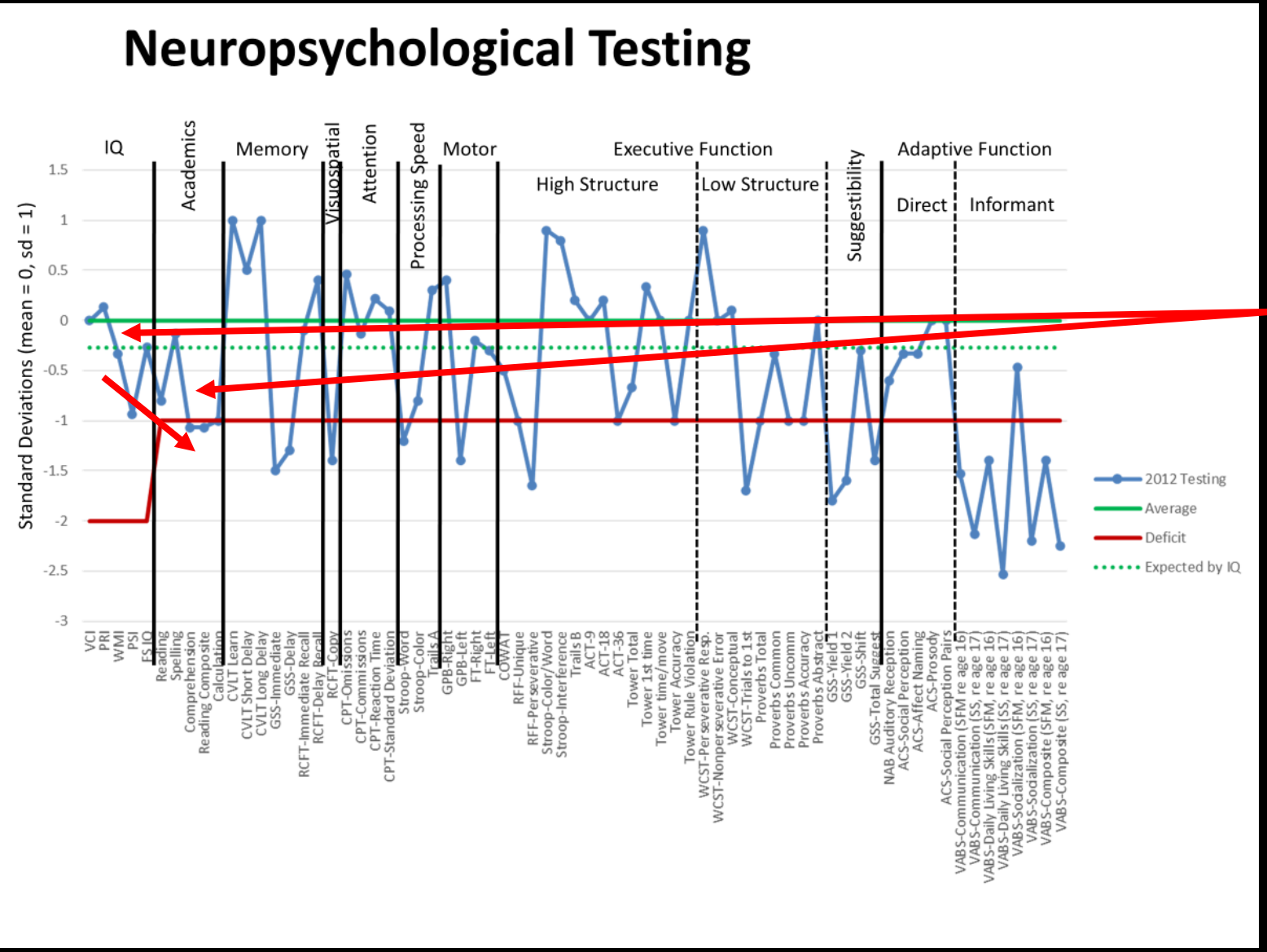
- 36% mildly or mildly to moderately impaired range
- 19% moderately or moderately to severely impaired range
- 6.75% severely impaired range

The “Functional Footprint”



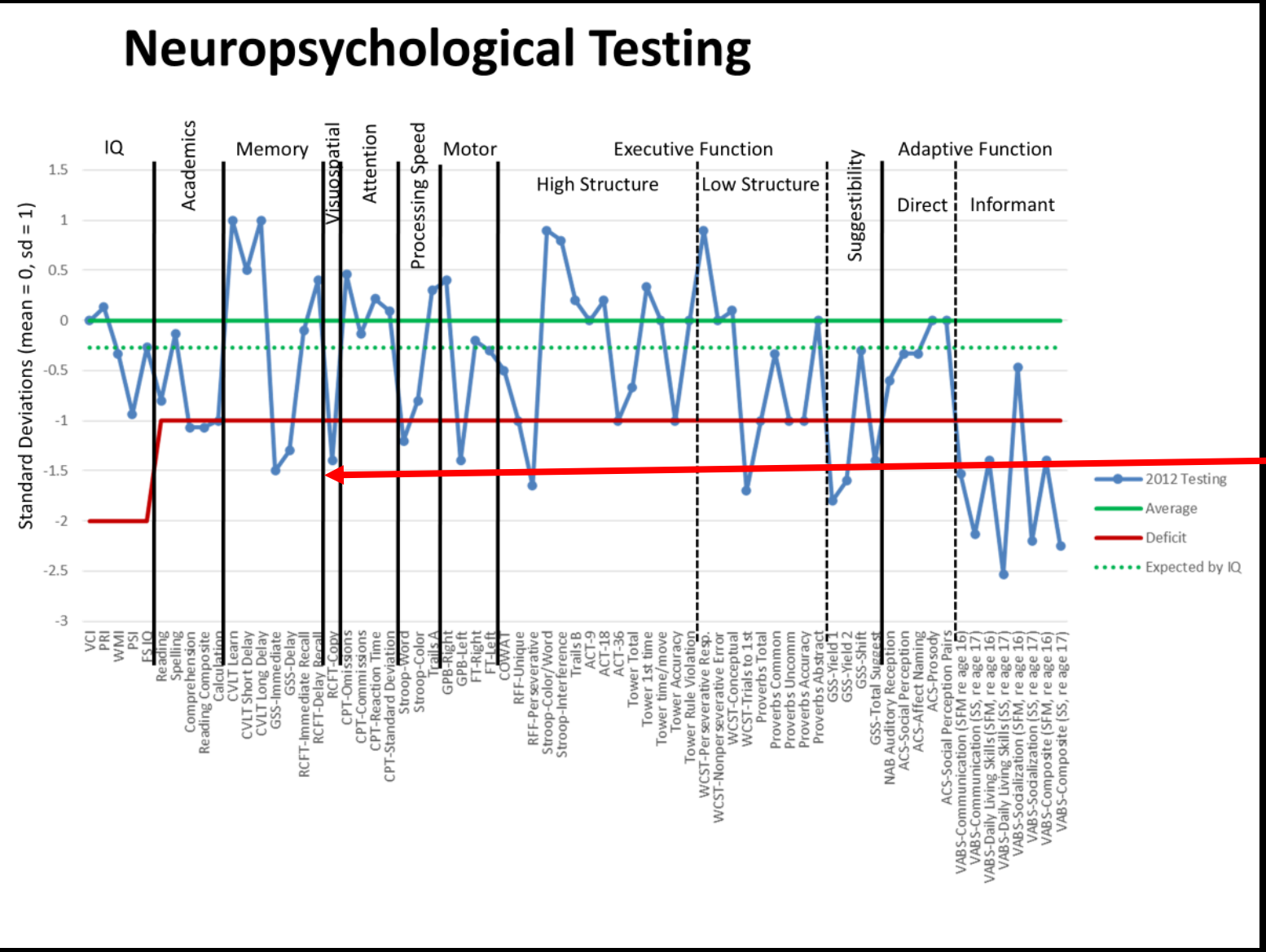
- Variability of scores across the battery (and across domains of IQ)
- Academic impairment indicating Learning Disorders
- Impaired visuospatial perception or construction (RCFT Copy often the lowest score on neuropsychological testing)
- Disconnection between IQ and Adaptive Functioning
- Context-based performance (does more poorly on less structured and abstract tasks

The “Functional Footprint”



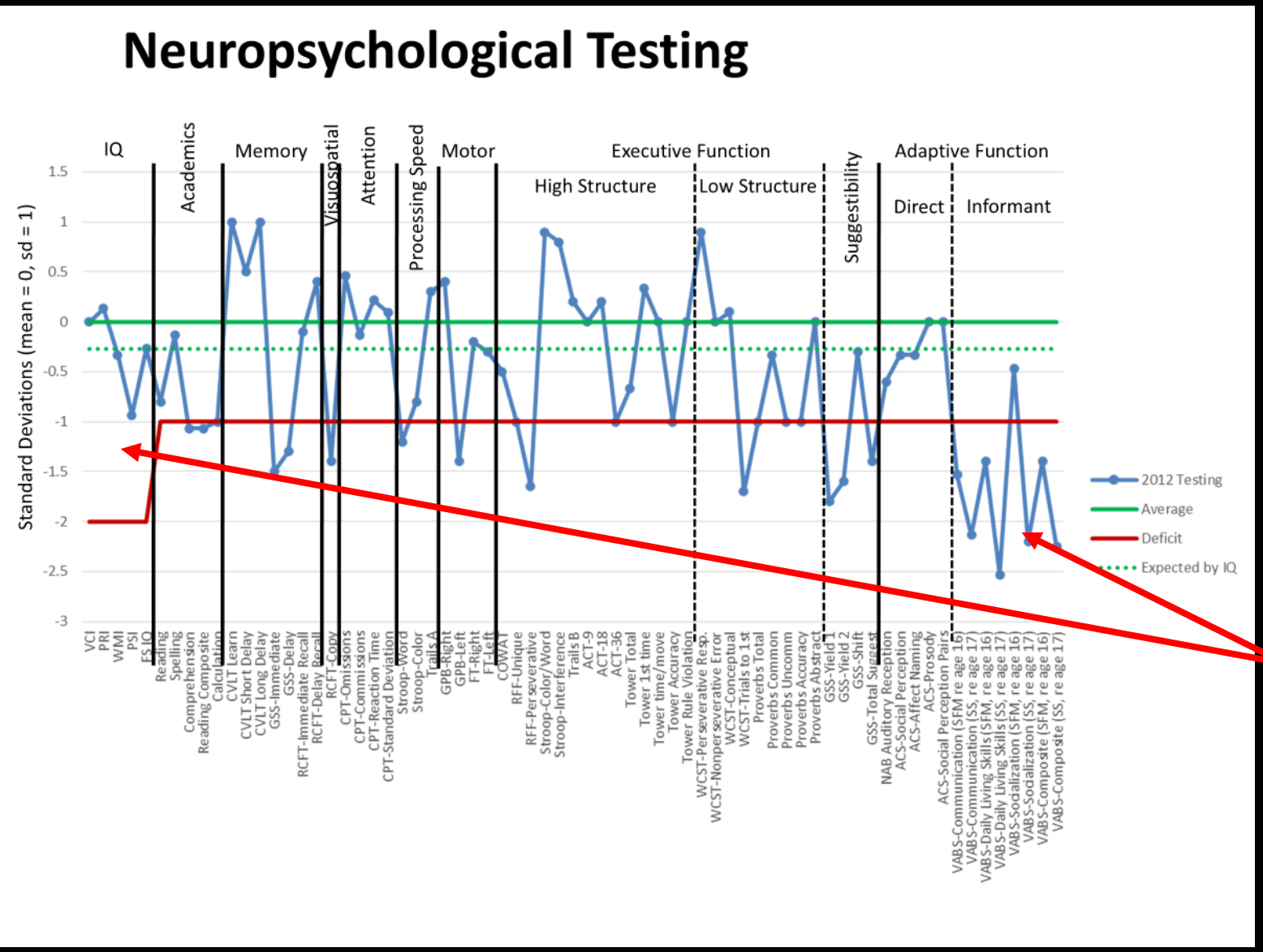
- Variability of scores across the battery (and across domains of IQ)
- Academic impairment indicating Learning Disorders
- Impaired visuospatial perception or construction (RCFT Copy often the lowest score on neuropsychological testing)
- Disconnection between IQ and Adaptive Functioning
- Context-based performance (does more poorly on less structured and abstract tasks

The “Functional Footprint”



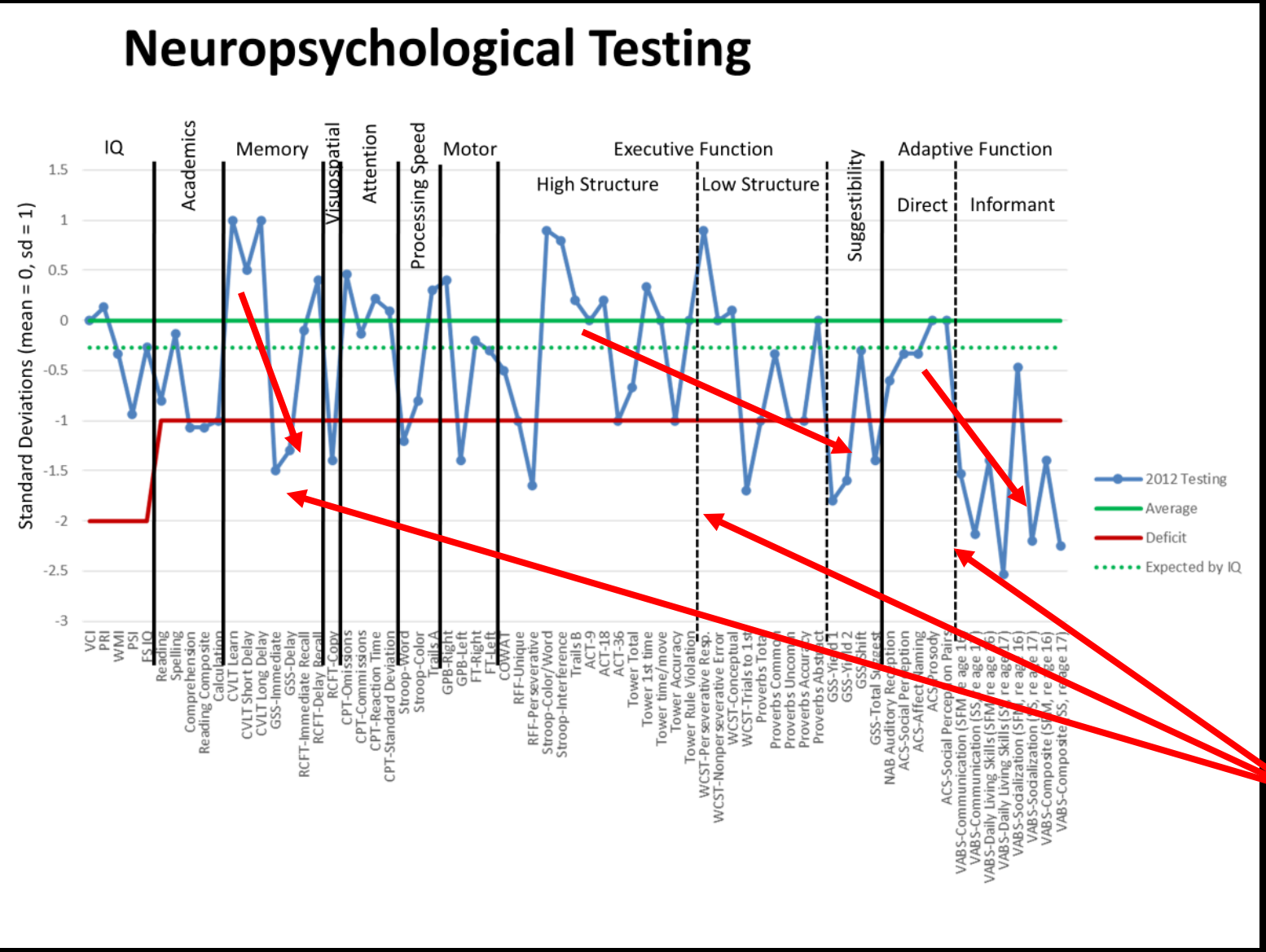
- Variability of scores across the battery (and across domains of IQ)
- Academic impairment indicating Learning Disorders
- Impaired visuospatial perception or construction (RCFT Copy often the lowest score on neuropsychological testing)
- Disconnection between IQ and Adaptive Functioning
- Context-based performance (does more poorly on less structured and abstract tasks

The “Functional Footprint”



- Variability of scores across the battery (and across domains of IQ)
- Academic impairment indicating Learning Disorders
- Impaired visuospatial perception or construction (RCFT Copy often the lowest score on neuropsychological testing)
- Disconnection between IQ and Adaptive Functioning
- Context-based performance (does more poorly on less structured and abstract tasks

The “Functional Footprint”



- Variability of scores across the battery (and across domains of IQ)
- Academic impairment indicating Learning Disorders
- Impaired visuospatial perception or construction (RCFT Copy often the lowest score on neuropsychological testing)
- Disconnection between IQ and Adaptive Functioning
- Context-based performance (does more poorly on less structured and abstract tasks

Comparison of Neuropsychological Findings with Neuroimaging

Damaged Brain Regions per QEEG	Mr. X's Testing (z-scores)
Frontal Lobes, especially the left (impulse control, executive functioning, abstract thinking, mood and social skills)	Finger Tapping (R) = **-1.1** Finger Tapping (L) = -0.9 Grooved Pegs (R) = **-2.4** Grooved Pegs (L) = **-1.9** BNT = -0.4 WRAT Word Reading = **-1.4** COWAT = **-2.3** RFF Unique Designs = **-1.1** RFF Perseverations = -0.1 Stroop Interference = **-2.3** Trails B = **-1.1** ACT working memory = -0.5 to -0.9 TOGRA = -0.6 WCST Trials to First Category = **-1.4** Set Loss = **-2.6** DKEFS Proverbs Accuracy = -0.3 GSS Total Suggestibility = -0.1 ACS Social Perception = **-1.0** Affect Naming = **-1.0** Prosody = -0.7

Comparison of Neuropsychological Findings with Neuroimaging

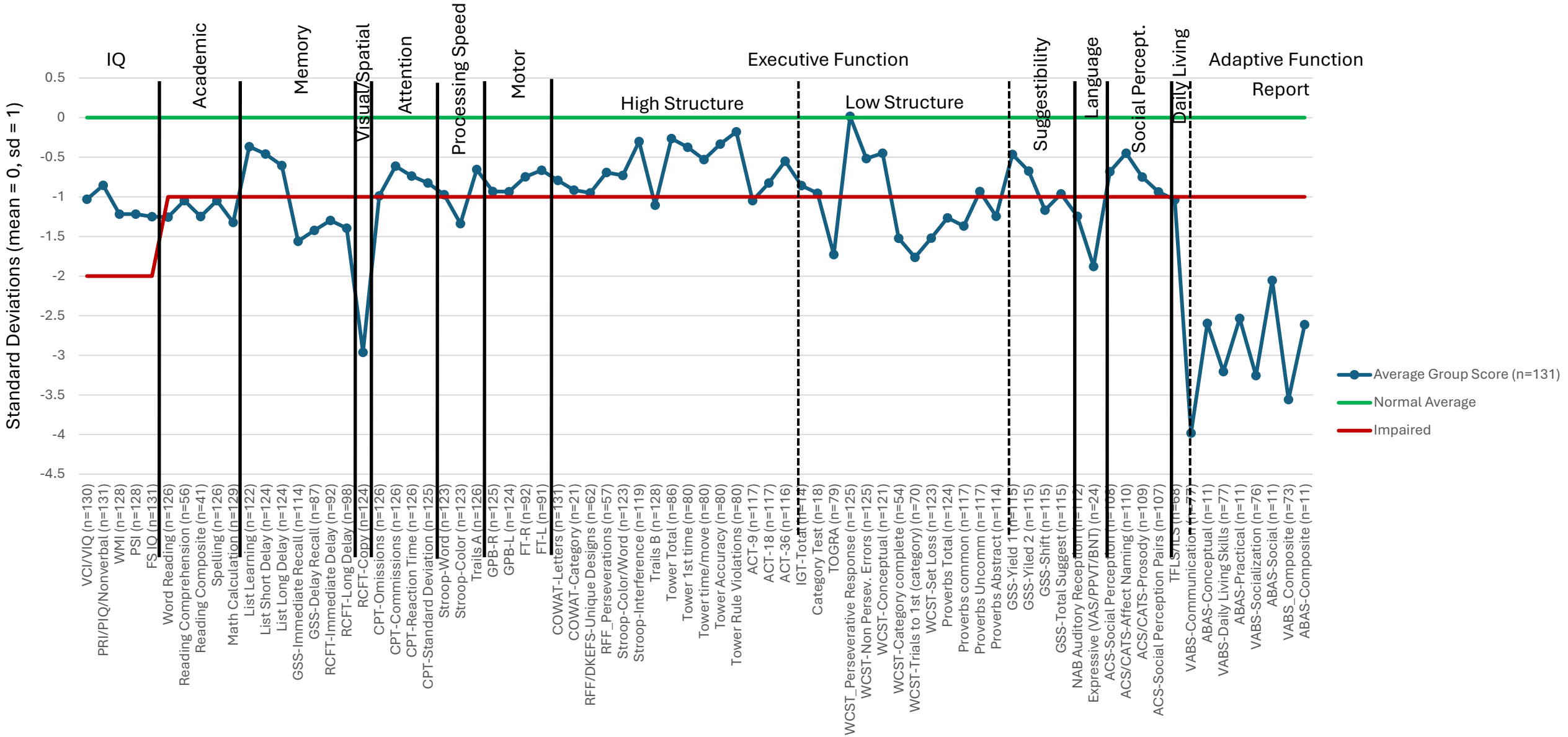
Damaged Brain Regions per QEEG	Mr. X's Testing (z-scores)
Left Temporal Lobes (auditory processing, short-term memory, receptive language, creation of new memories, retrieval of short-term memory, attention control)	CVLT List Learning Initial Learning = -0.3 Short Delay Memory = **-1.5** Long Delay Memory= **-1.5** WMS Story Immediate = -0.7 Delayed Memory = -0.7 GSS Story Learn = **-1.3** Story Retention = **-1.3** NAB Aud. Comprehension = 0.5
Occipital Lobes, especially the left (visual perception and spatial processing)	Trails A = -0.3 Stroop Color Naming = **-1.3** Word Naming = **-1.7** RFF Unique Designs = **-1.1** BNT = -0.4 RCFT Figure Copy = **-2.3** WAIS PSI = **-1.3** WAIS PRI = -0.8

Comparison of Neuropsychological Findings with Neuroimaging

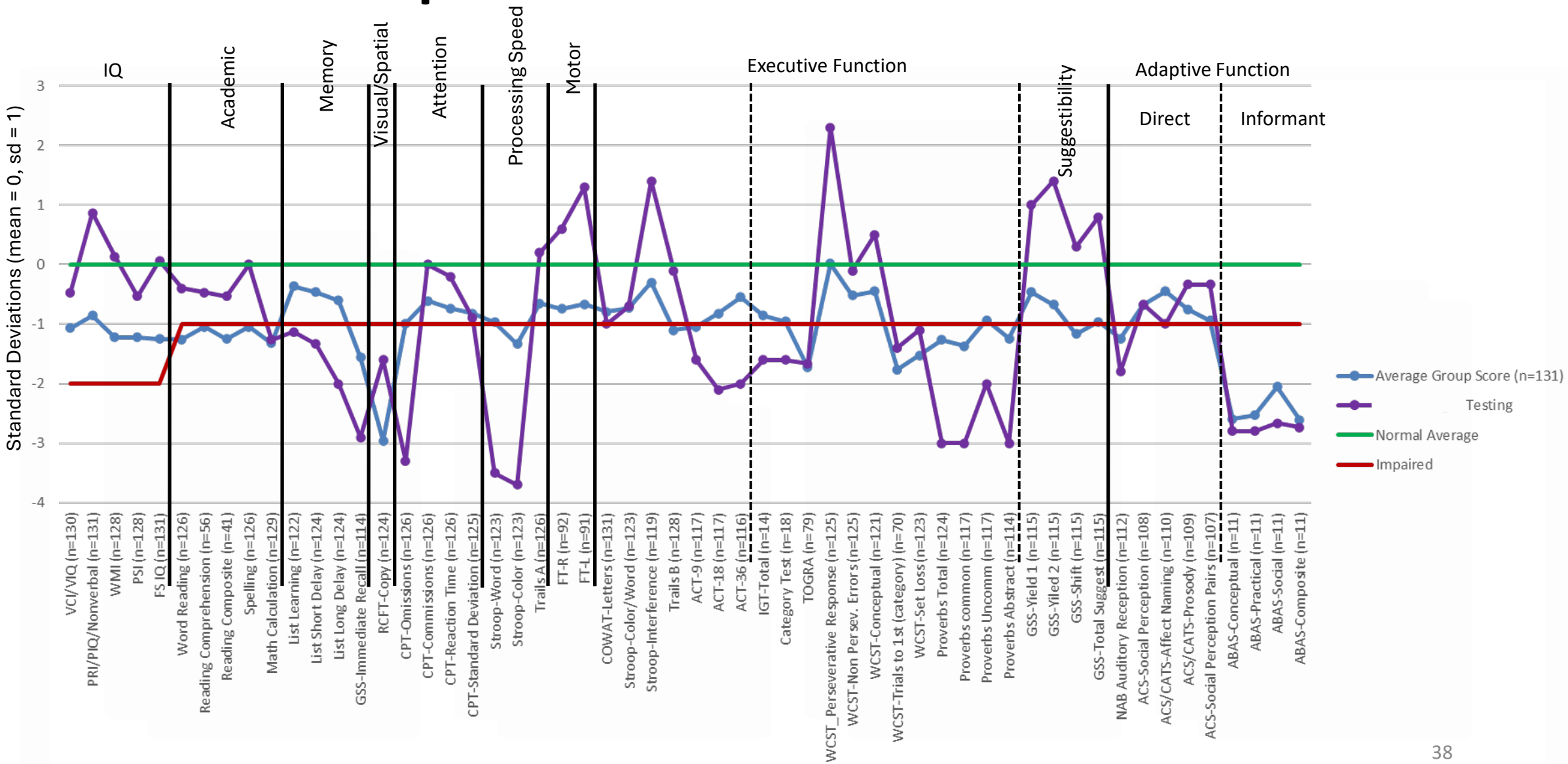
Damaged Brain Regions per QEEG	Mr. X's Testing (z-scores)
Parietal Lobes, especially the left (visual-spatial processing, short-term memory, executive attention, receptive language, awareness of emotional expression in others)	RCFT Figure Copy = **-2.3** Trails A = -0.3 Trails B = **-1.1** CVLT List Learning Initial Learning = -0.3 Short Delay Memory = **-1.5** Long Delay Memory= **-1.5** WMS Story Immediate = -0.7 Delayed Memory = -0.7 GSS Story Learn = **-1.3** Story Retention = **-1.3** NAB Aud. Comprehension = 0.5 WAIS WMI = **-1.1** PRI = **-1.3** WRAT Math Computation = **-1.0** WJ Reading Comprehension = 0.3 CPT Reaction Time = **-1.7** Standard Deviation = **-1.7** ACS Social Perception = **-1.0** Affect Naming = **-1.0** Prosody = -0.7

Comparison with Other Justice Involved Individuals with FASD

Average Neuropsychological Profile of 131 Defendants Diagnosed with an FASD



Current and Prior Neuropsychological Testing Compared to Others with FASD n=131



MEDICAL ASSESSMENT

RICHARD S. ADLER, M.D.

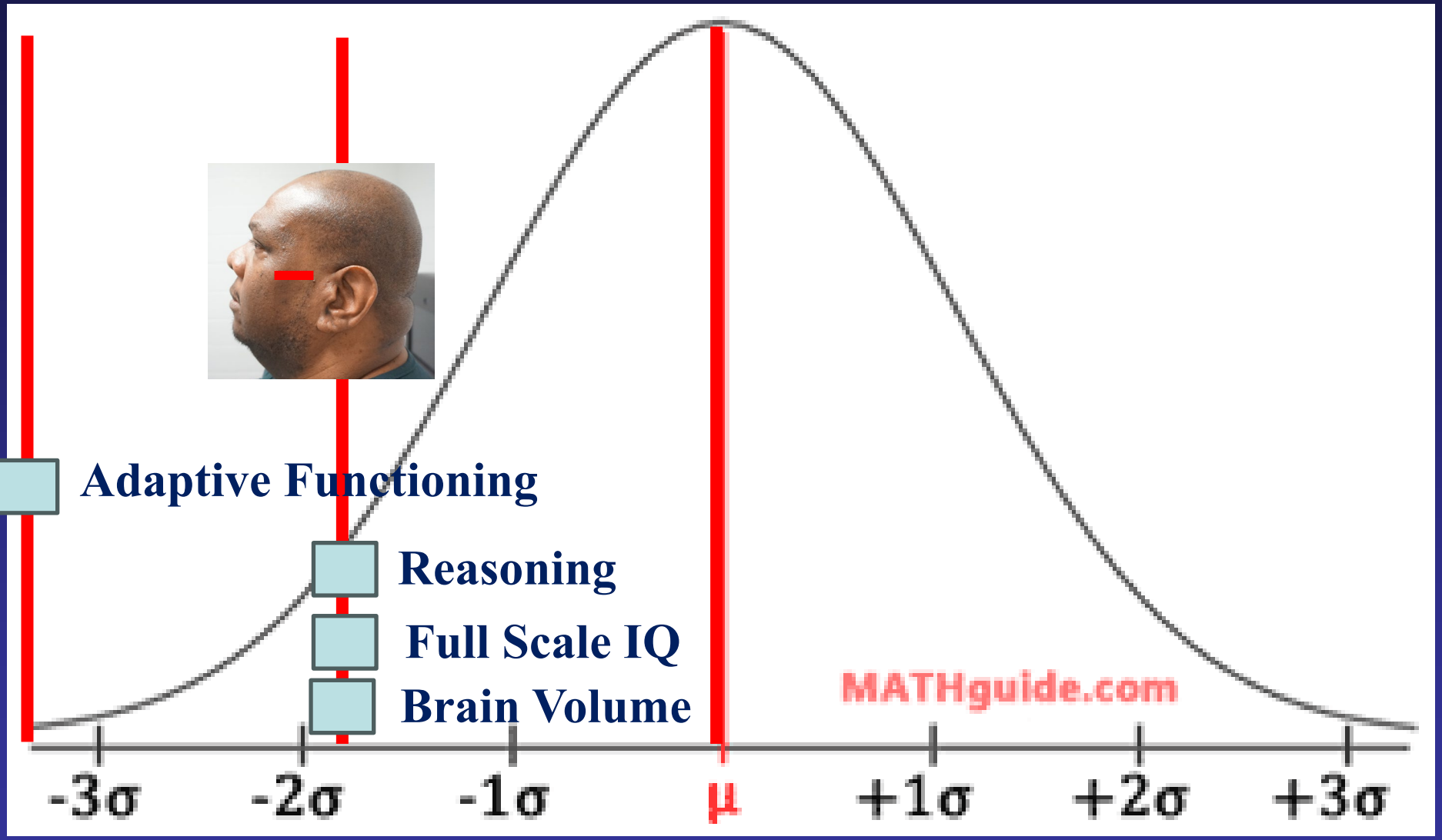
FORENSIC & CLINICAL PSYCHIATRY
THE PTSD INSTITUTE
SEATTLE, WA

CLINICAL FACULTY
UNIVERSITY OF WASHINGTON SCHOOL OF MEDICINE


CONVERGENT VALIDITY
Record Review
Life History/Prenatal Exposure
(Neuro)psychological Testing
Clinical Interview
Physical Examination
Measurement of Facial Features of FASD
Functional/ Adaptive Life History
Quantitative EEG (QEEG)
Brain MRI
Brain MRI Volumetric Quantification
DTI
PET

OPINIONS

- PFAS/ND-PAE = Brain damage at birth
- Traumatic Brain Injury
- FSIQ = 75
- Borderline Intellectual Functioning
- No exaggeration, no manipulation
- No Malingering, No Psychopathy
- Psychiatric illnesses pertinent to crime


Adaptive Functioning
Reasoning
Full Scale IQ
Brain Volume
MATHguide.com
-3σ
-2σ
-1σ
μ
+1σ
+2σ
+3σ

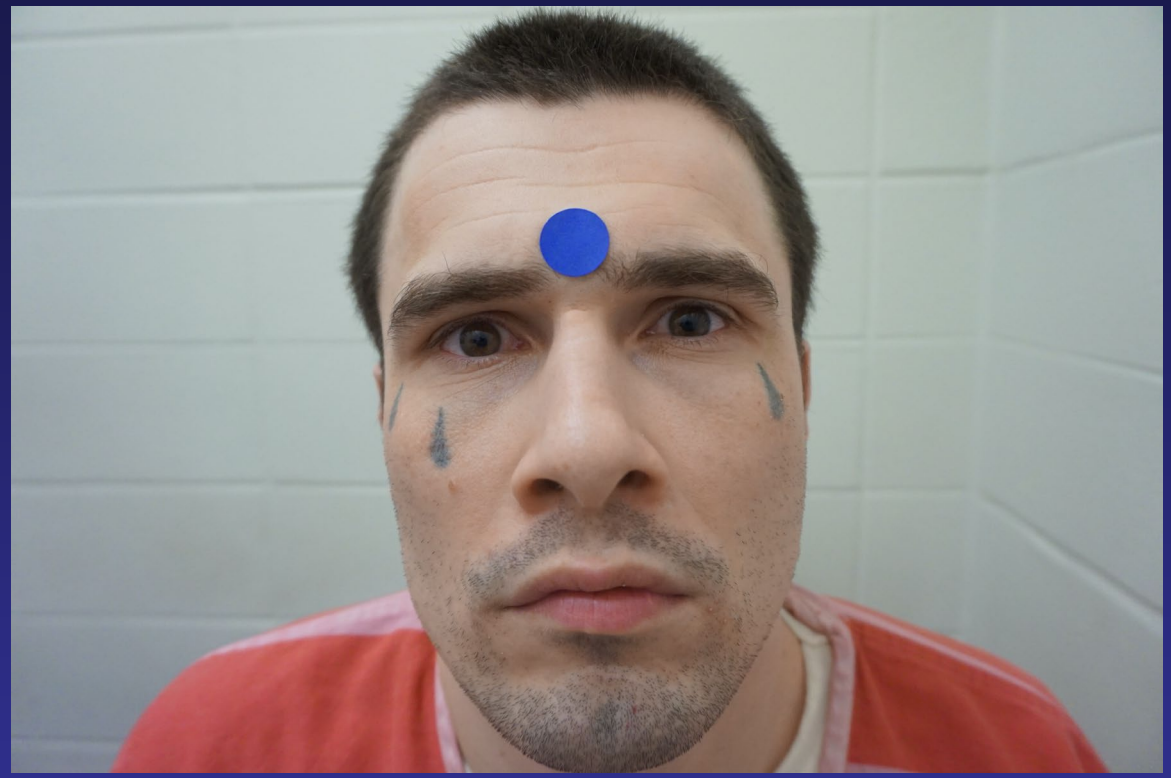
DIAGNOSING
ND-PAE DOES NOT NEED
AN M.D. INVOLVED

DIFFERENTIAL DIAGNOSIS GENETIC TESTING

INTEGRATION WITH NEUROPSYCHOLOGICAL TESTING AND NEUROIMAGING/ NEUROEVALUATIVE TESTING

PHYSICAL EXAMINATION

FACIAL FEATURES
FAS FACIAL
PHOTOGRAPHIC ANALYSIS



FRONTAL VIEW
FAS FACIAL PHOTOGRAPHIC ANALYSIS

FAS Facial Photographic Analysis Report

IDENTIFICATION

Name: Steven (First) | (Middle) | Mulkey (Last)
Subject I.D.: None
Source of Photo: RSA Psychiatric Examination
Gender: Male
Race: Caucasian/Caucasian
Birth Date: 10/6/1990

PHOTO ASSESSMENT

Normal PFL Chart: Caucasian (Hall '89)
Normal ICD Chart: Caucasian (Hall '89)
Lip-Philtrum Guide: Caucasian

	Frontal	¾ View	Lateral
File Name	Mulkey Frontal2		
Date of Photo	3/29/2023		
Age (yrs) in photo	32.48		
Date of Photo Assessment	4/3/2023		
Photo Assessor	RSA		

Length of Real Internal Measure of Scale(sticker) placed on forehead (mm): 19.05
Length of Internal Measure of Scale in Frontal Photo (pixels): 356.0

Left Palpebral Fissure Length:	In photo (pixels) 488.2	True Length (mm) 28.7	Z-score -1.65
Right Palpebral Fissure Length:	In photo (pixels) 496.1	True Length (mm) 29.2	Z-score -1.24
Mean Palpebral Fissure Length:	In photo (pixels) 492.2	True Length (mm) 29.0	Z-score -1.45
Inner Canthal Distance (ICD):	In photo (pixels) 553.4	True Distance (mm) 29.6	Z-score -0.69

Flat Philtrum (5-point rank): In Frontal Photo 4 | In ¾ Photo 4
Thin Upper Lip: Circularity (perimeter²/area) 55.5 | 5-Point rank (Circ) 2 | 5-Point rank (Scale) 2

clown eyebrows ☐ ptosis ☐ strabismus ☐ epicanthal folds ☐
flat midface ■ protruding ears ☐ flat nasal bridge ☐ hypertelorism ☐

Other anomalies present: None reported

Comments:
Other syndromes present: None reported

PHOTO QUALITY

	Frontal	¾ View	Lateral
Side showing			
Head rotation (5-point rank/degrees) to subject's Right (+) or Left (-)			
Head tilt (5-point rank) toward subject's Right (+) or Left (-) shoulder			
Head tip (degrees) Up (+) or Down (-) from Frankfort Horizontal Plane			
Exposure (3-point rank)			
Focus (3-point rank)			
Facial Expression (3-point rank)			
Reliability of ABC-Score for palpebral fissure length (5-point rank)			
Reliability of ABC-Score for philtrum (5-point rank)			
Reliability of ABC-Score for upper lip (5-point rank)			

No Picture Available
No Picture Available

Mulkey Frontal2

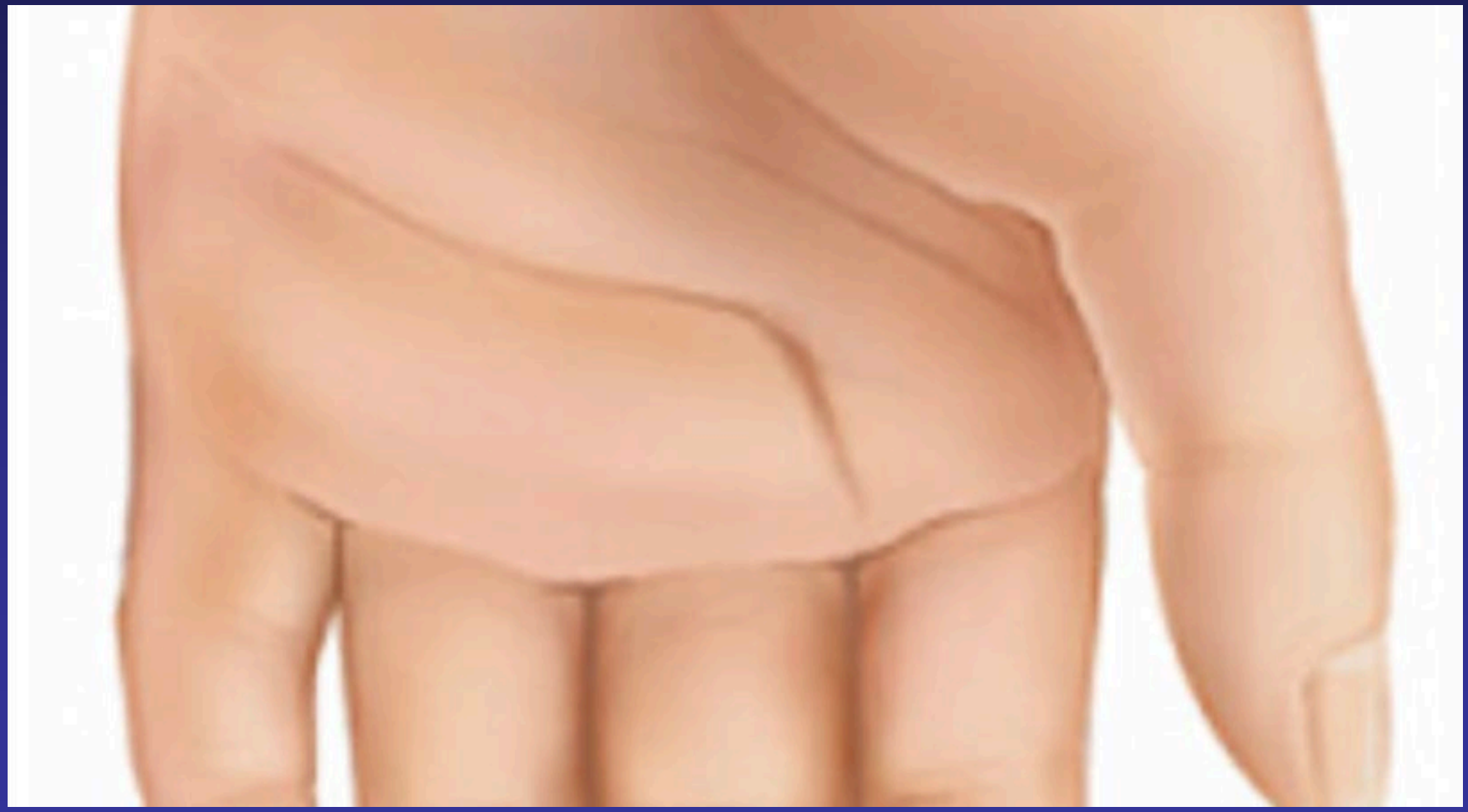
OUTCOME

	B (PFL)	C (Philtrum)	A (Lip)
ABC-Score			
Data Used	mean	3/4 View	circularity

4-Digit Diagnostic Code for Face: 2: FAS features mild

Clinodactyly in Mr. Timothy Hurst

Hockey Stick Crease and Clinodactyly



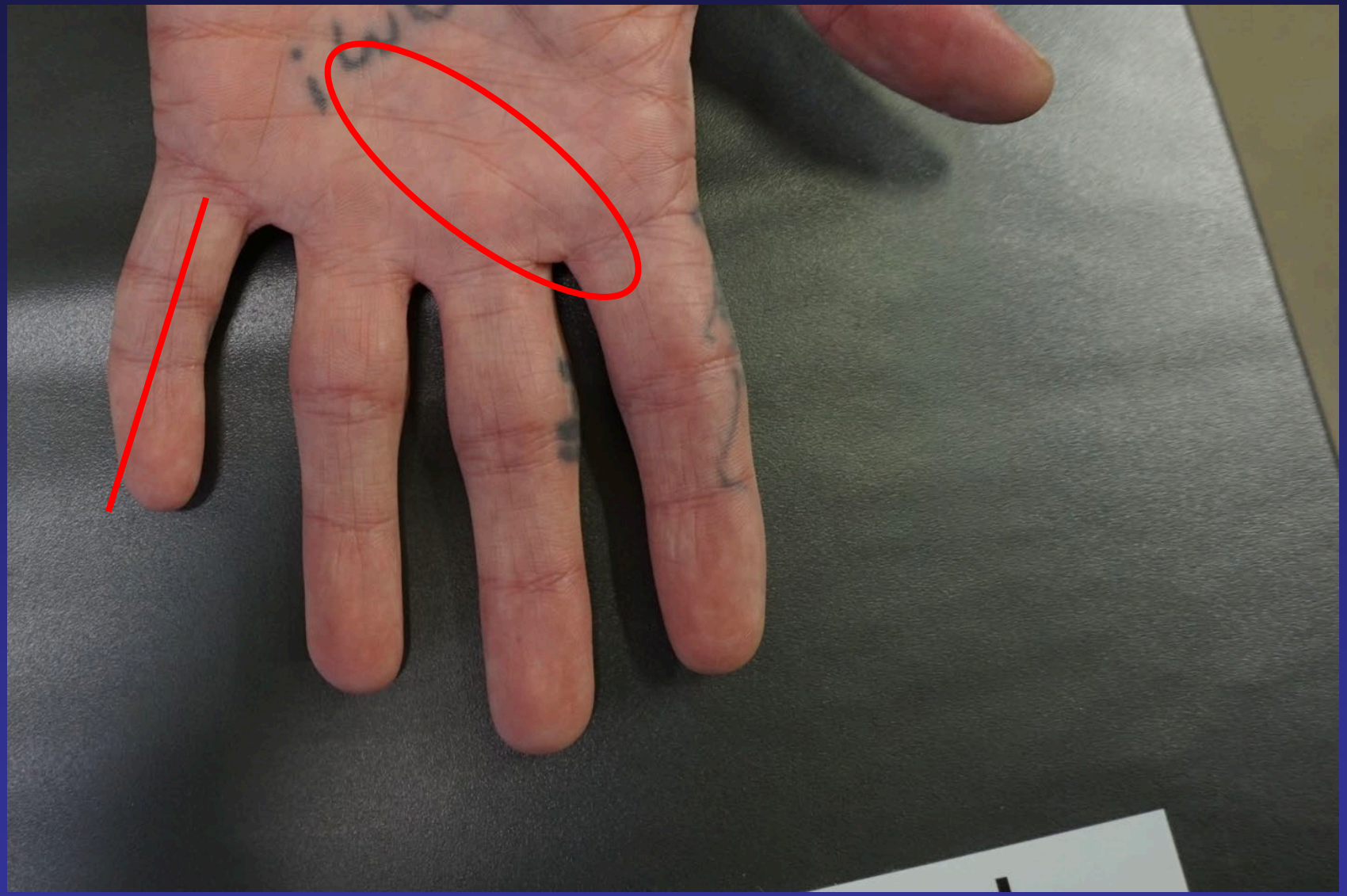


Figure 6. Palmar side of the left hand
Curving of the 5th digit and a Hockey Stick Crease are present
Pg.15 of Dr. Adler's Report

Standard Height of Ears

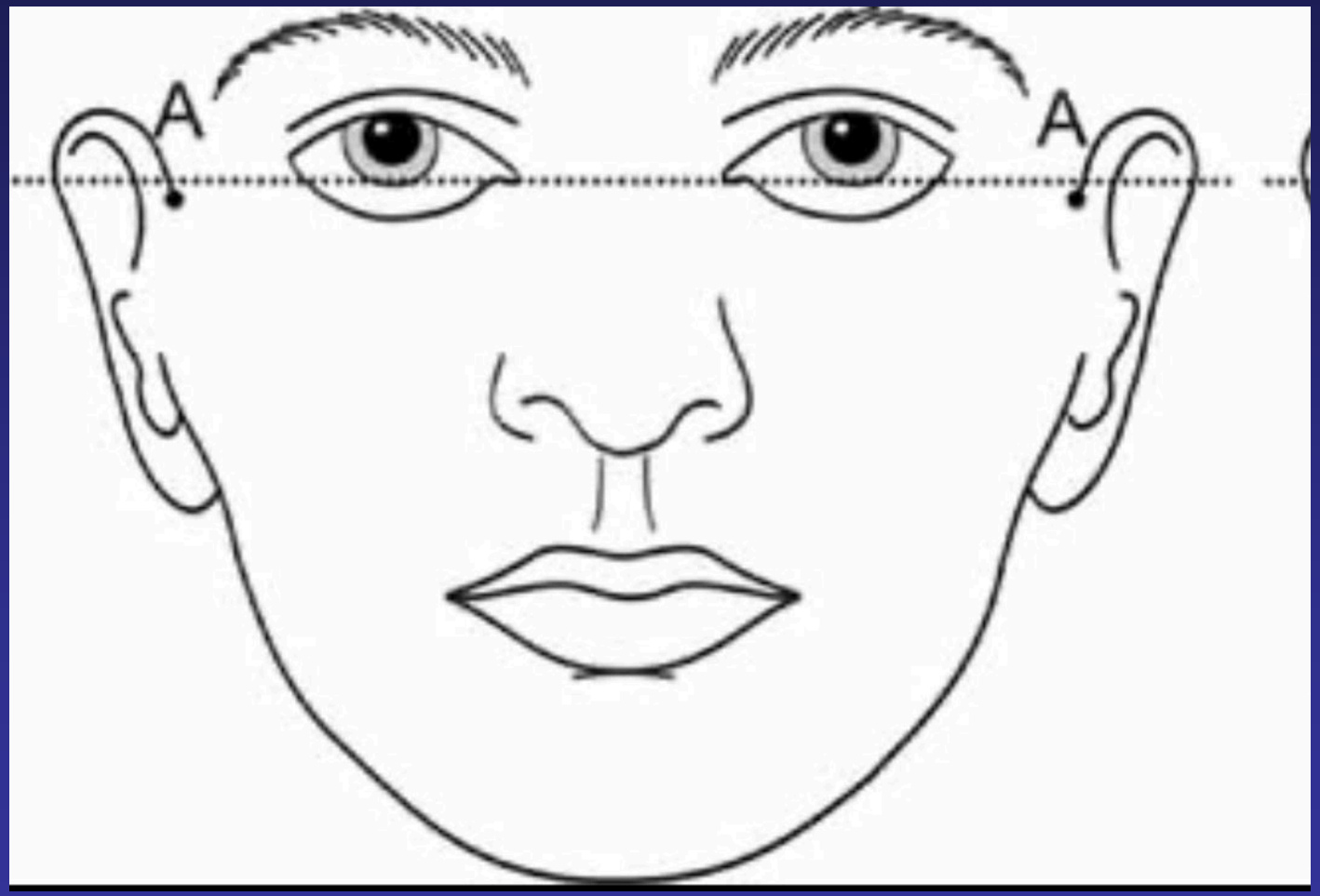


Figure 2. Right facial profile
Upper red line shows the expected level of the external ear in line with the lateral margin of the eye. Lower line shows the level of Mr. Meade's right ear
Pg. 10 of Dr. Adler's Report

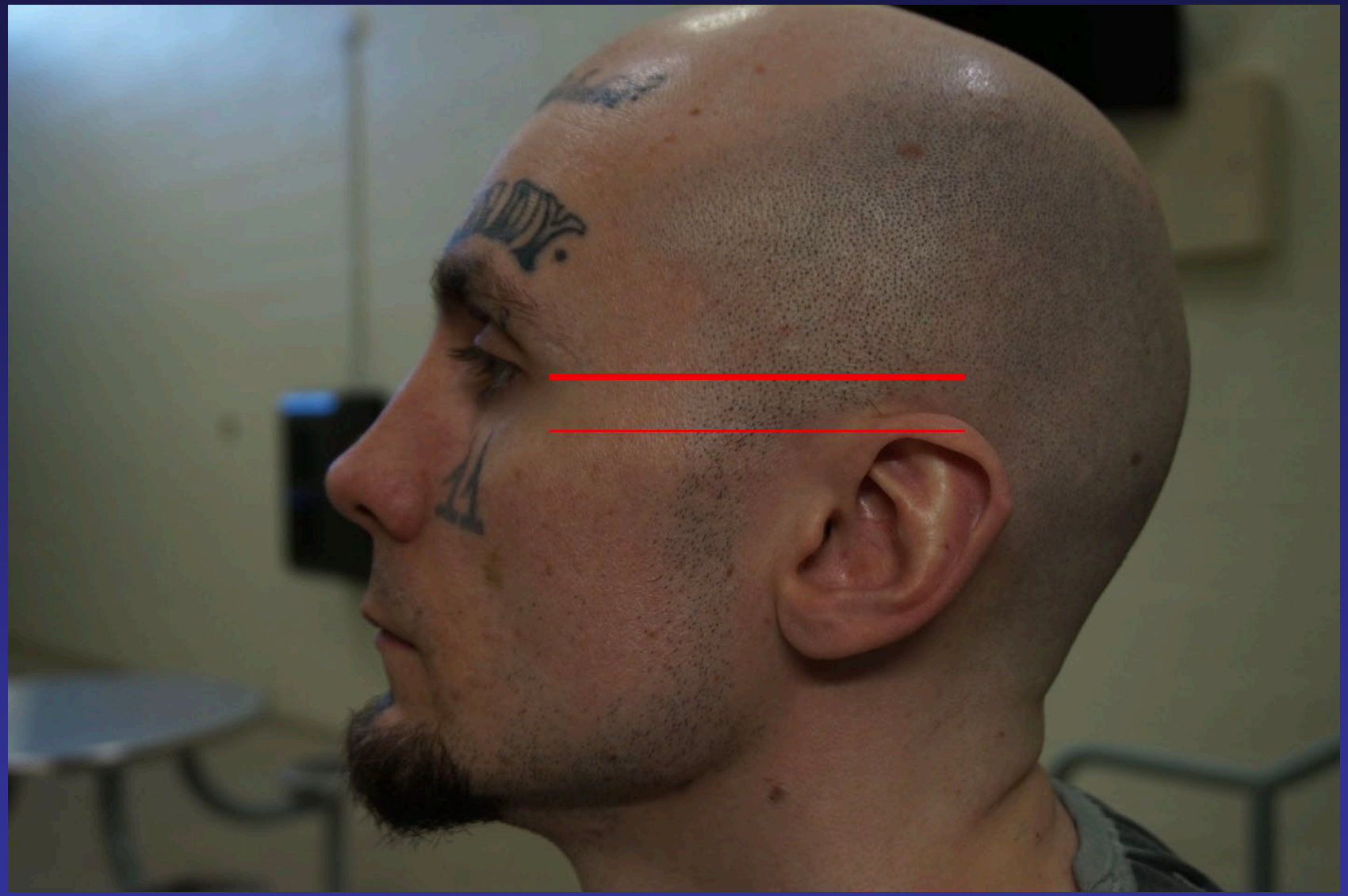
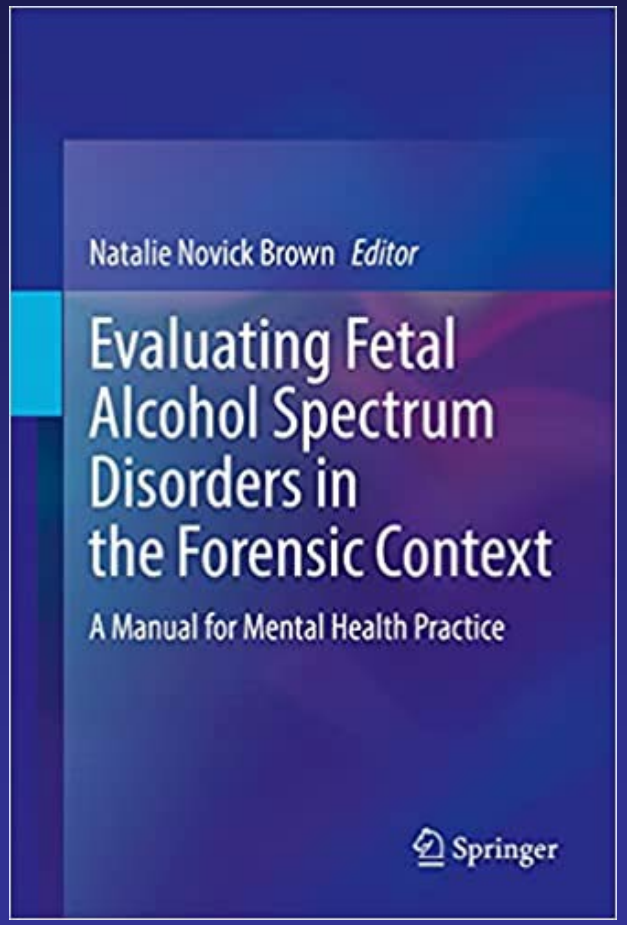


Figure 3. Left facial profile
Upper red line shows the expected level of the external ear in line with the lateral margin of the eye. Lower line shows the level of Mr. Meade's left ear
Pg. 11 of Dr. Adler's Report



CHAPTERS

1. Diagnostic History
2. Forensic Relevance (case law review)
3. Prevalence & Screening
4. Interviewing for PAE
5. Neuropsychological Assessment
6. Medical Assessment & Differential Diagnosis
7. **NEUROIMAGING**
8. Functional/Adaptive Assessment
9. Comorbidity
10. Assessing Severity
11. Assessing Juveniles
12. Alternative Sentencing for Juveniles
13. Violence Risk Assessment in Prenatal Drug Exposure Cases
14. Sexually Violent Predator Civil Commitment Assessment
15. Competency Assessment
16. Pharmacotherapy
17. Prosecutorial Perspective (USA, Canada)
18. Views from the Bench (USA, Canada, New Zealand)

NEUROIMAGING:

BRAIN MRI
QUANTITATIVE BRAIN MRI
DTI
QUANTITATIVE DTI
QEEG
PET

NEUROIMAGING
IS THE CHERRY ON TOP
NOT THE SUNDAE

NEUROIMAGING:

ILLUSTRATIVE EXHIBIT, NOT NEEDED TO MAKE THE DIAGNOSIS

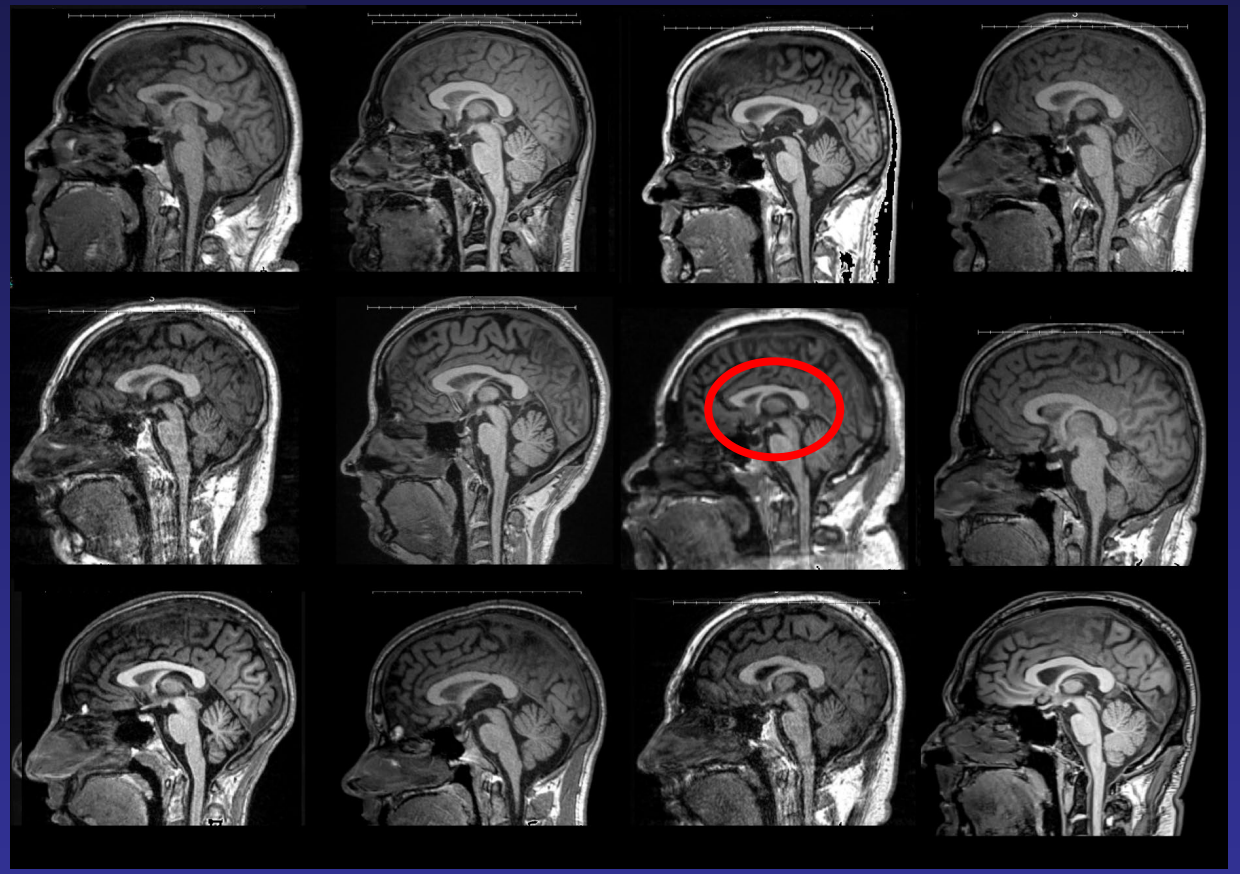
EVIDENTIARY ADMISSIBILITY

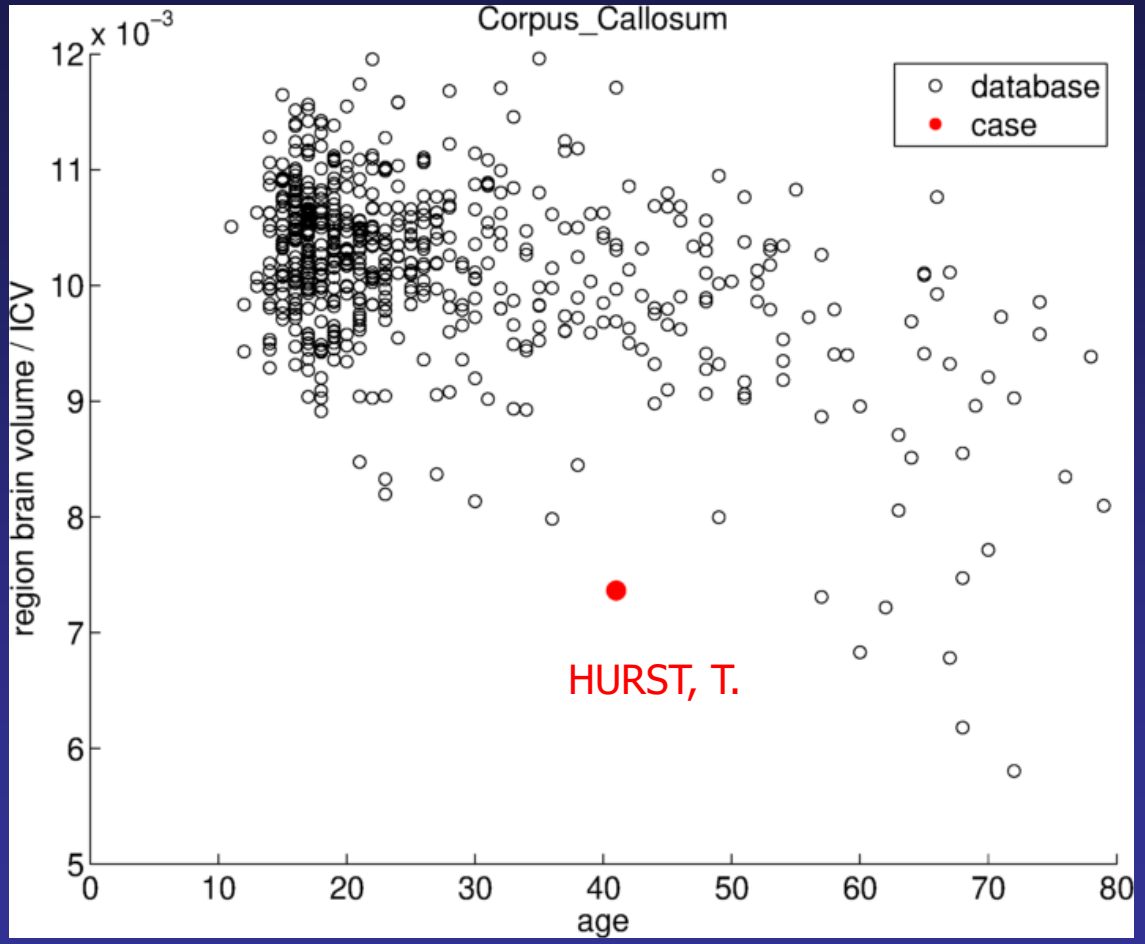
CRUZ & WALTON

Table 10.3 Use and abuse of neuroimaging in the courtroom

1. Experts should present all relevant facts available in their testimony, ensure truthfulness and balance, and consider opposing points of view.
2. Experts should specify known deviations from standard practice.
3. Experts should have substantive knowledge and experience in the area in which they are testifying.
4. Experts should use standard terminology and describe standardization methods and the cohort characteristic from which claims are determined, when applicable.
5. Nonvalidated findings that are used to inform clinical pathology should be approached with great caution.
6. Recognized appropriateness guidelines should be used to assess whether the imaging technique used is appropriate for the particular question.
7. Experts should avoid drawing conclusions about specific behaviors based on the imaging data alone.
8. Experts should be willing to submit their testimony for peer review.
9. Experts should be prepared to provide a description of the nature of the neuroimages (e.g., representational/statistical maps when derived from computational postprocessing of several images) and how they were acquired.
10. Raw images and raw data should be made available for replication if requested.
11. Experts should be able to explain the reasoning behind their conclusions.
12. False positive rates should be known and considered if the expert's testimony includes quantitative imaging.
13. Experts should be prepared to discuss limitations of the technology and provide both confirming research and disconfirming studies.

Proposed Standards for Neuroradiology Imaging Testimony (From Meltzer et al., 2014, pg. 635)




Corpus_Callosum
x 10^-3
region brain volume / ICV
age
database
case
HURST, T.
12
11
10
9
8
7
6
5
0
10
20
30
40
50
60
70
80

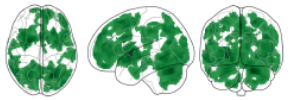
NEUROCLOUD VOL

PatientID: 1619312
Study: MR Brain wo contrast 20/05/22
Age: 32
Id: 1744

Disclaimer

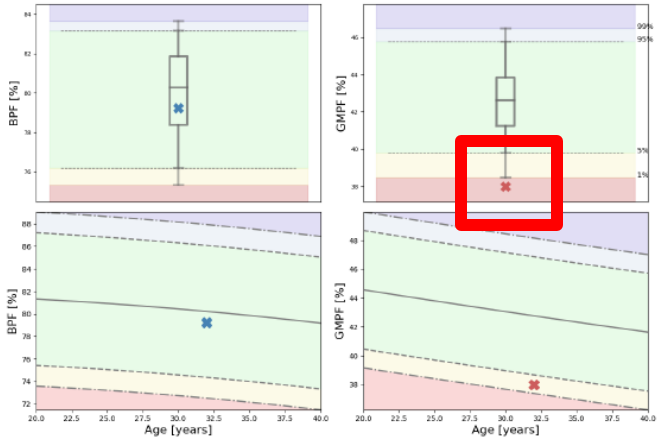
The results provided by Neurocloud VOL are not a diagnostic report but an image quantification tool. Qubiotech Health Intelligence S.L. accepts no responsibility for the use of Neurocloud VOL for uses other than those specified.

Glass brain



Standard deviation 2 DS 2.5 DS 3.0 DS

Parameter	Value
TIV (Total Intracranial Volume)	1,683.43 [cm3]
GM (Grey Matter)	639.63 [cm3]
WM (White matter)	694.57 [cm3]
CSF (Cerebrospinal fluid)	349.23 [cm3]
BPF (Brain Parenchymal Fraction)	79.25 (76.17 - 83.17) - [% (5 - 95)]
GMPF (Grey Matter Fraction)	38.00 (39.79 - 45.79) - [% (5 - 95)]



Qubiotech Health Inteligence S.L.
(+34) 981 976 470 - help@qubiotech.com - www.qubiotech.com

NEUROCLOUD VOL

PatientID: 1619312
Study: MR Brain wo contrast 20/05/22

ROIs analysis - Grey Matter

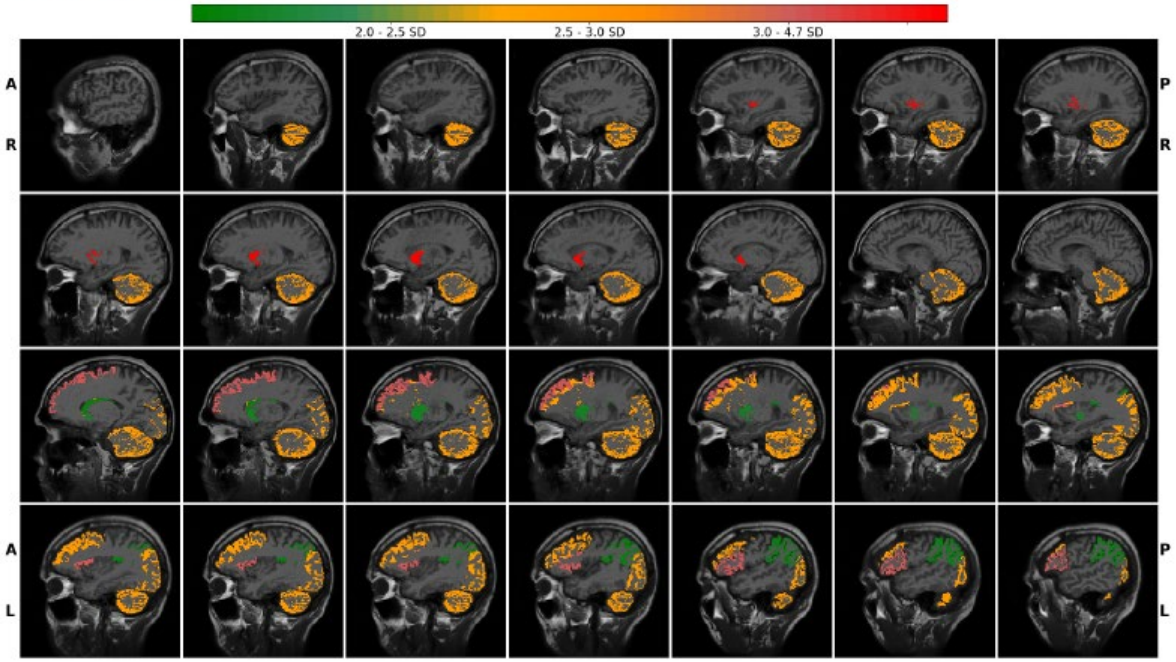
Standard deviation: 2 DS | 2.5 DS | 3.0 DS

ROI	Left hemisphere GM [%TIV]	Left hemisphere (5% - 95%)	Right hemisphere GM [%TIV]	Right hemisphere (5% - 95%)	Asymmetry [%]	Laterality
Frontal						
Precentral gyrus	0.93	0.85 - 1.07	0.95	0.82 - 1.05	-2.13	
Superior frontal gyrus	1.70	1.92 - 2.35	1.87	1.88 - 2.29	-9.52	Left
Middle frontal gyrus	1.19	1.28 - 1.65	1.30	1.26 - 1.6	-8.84	Left
Inferior frontal gyrus Broca's area	0.50	0.59 - 0.76	0.58	0.54 - 0.71	-14.81	Left
Cingulate gyrus, anterior part	0.31	0.27 - 0.37	0.29	0.23 - 0.38	6.67	
Anterior orbital gyrus	0.74	0.7 - 0.85	0.83	0.76 - 0.95	-11.46	
Straight gyrus	0.19	0.15 - 0.21	0.16	0.16 - 0.22	17.14	Right
Temporal						
Amygdala	0.10	0.1 - 0.13	0.12	0.11 - 0.14	-16.18	Left
Hippocampus	0.15	0.14 - 0.17	0.15	0.14 - 0.19	0.00	
Parahippocampal gyrus	0.21	0.18 - 0.25	0.21	0.19 - 0.25	0.00	
Anterior temporal lobe, medial part	0.31	0.3 - 0.4	0.34	0.3 - 0.38	-9.23	
Anterior temporal lobe, lateral part	0.38	0.37 - 0.48	0.37	0.34 - 0.43	2.67	
Temporal superior posterior part	0.42	0.42 - 0.56	0.48	0.44 - 0.58	-13.33	
Middle and inferior temporal gyrus	0.56	0.56 - 0.71	0.61	0.55 - 0.73	-8.55	
Posterior temporal lobe	1.61	1.46 - 1.82	1.55	1.46 - 1.79	3.80	
Fusiform gyrus	0.20	0.17 - 0.23	0.21	0.17 - 0.23	-4.88	
Occipital						
Lateral remainder of occipital lobe	1.16	1.27 - 1.58	1.27	1.29 - 1.59	-9.05	
Cuneus	0.30	0.3 - 0.42	0.28	0.29 - 0.41	6.90	
Lingual gyrus	0.39	0.41 - 0.62	0.40	0.4 - 0.59	-2.53	
Parietal						
Postcentral gyrus	0.78	0.74 - 0.93	0.77	0.68 - 0.91	1.29	
Inferiolateral remainder of parietal lobe	1.07	1.12 - 1.42	1.14	1.15 - 1.42	-6.33	
Precuneus	1.29	1.19 - 1.5	1.19	1.19 - 1.47	8.06	
Cingulate gyrus, posterior part	0.27	0.28 - 0.38	0.31	0.27 - 0.35	-13.79	Left
Internal structures						
Insula	0.55	0.5 - 0.62	0.46	0.48 - 0.63	17.82	Right
Caudate nucleus	0.19	0.2 - 0.28	0.22	0.2 - 0.27	-14.63	Left
Putamen	0.21	0.22 - 0.32	0.15	0.23 - 0.32	33.33	Bilateral
Thalamus	0.24	0.24 - 0.42	0.27	0.25 - 0.41	-11.76	
Cerebellum	2.29	2.54 - 3.21	2.17	2.44 - 3.14	5.38	Bilateral

NEUROCLOUD VOL

PatientID: 1619312
Study: MR Brain wo contrast 20/05/22

ROIs analysis - SAGITTAL



Qubiotech Health Inteligence S.L.
(+34) 981 976 470 - help@qubiotech.com - www.qubiotech.com

Powered by QUBIO tech

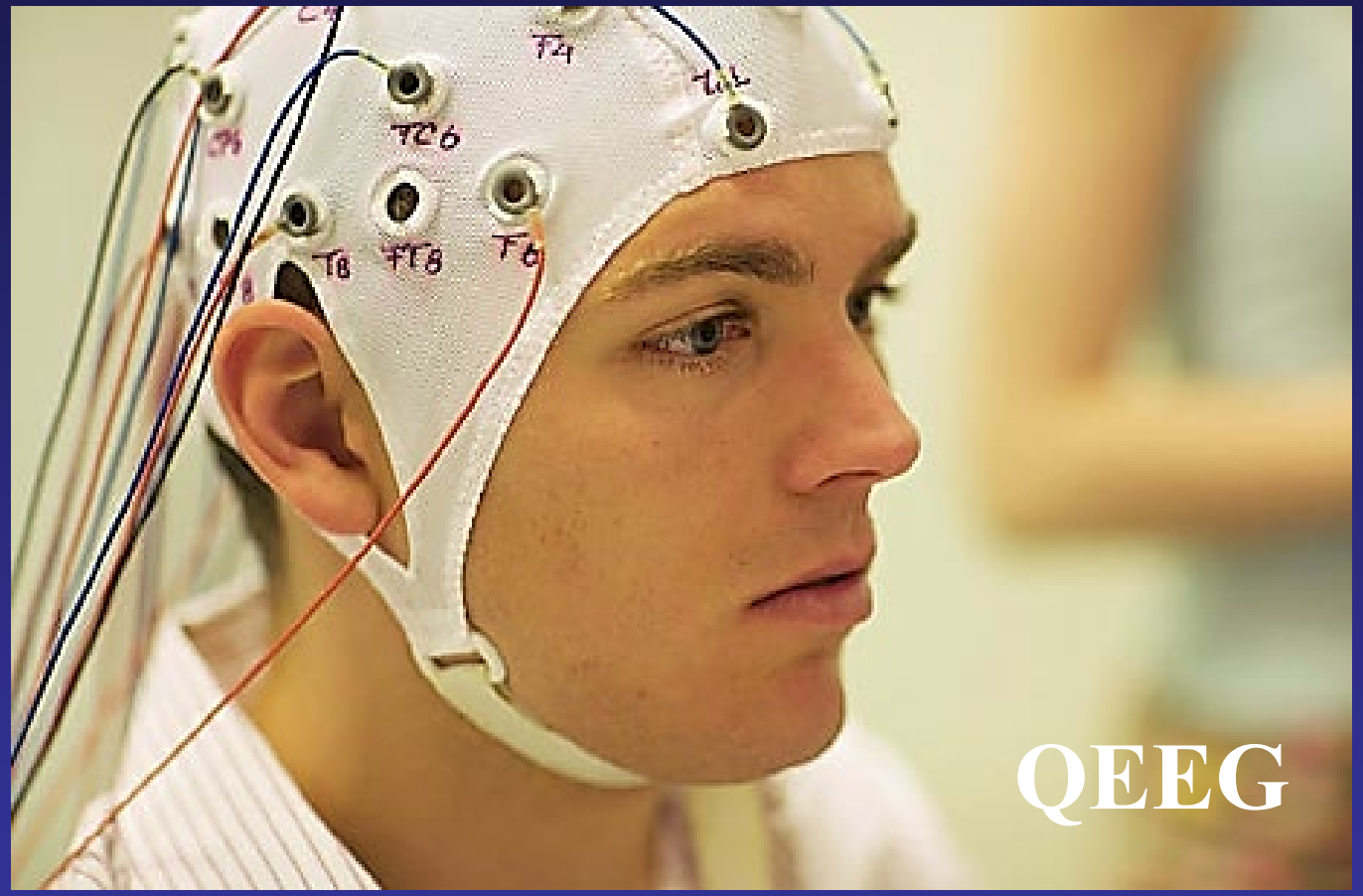
CNS Vital Signs Report		Test Date: 2019 March 25 09:53:19
Patient ID: 600000100		Administrator: administrator
Age: 40		Language: English (United States)
Total Test Time: 53:35 (min:secs)	CNSVS Duration: 50:18 (min:secs)	Version 4.0.88

Patient Profile:	Percentile Range				> 74	25 - 74	9 - 24	2 - 8	< 2
	Standard Score Range				> 109	90 - 109	80 - 89	70 - 79	< 70
Domain Scores	Patient Score	Standard Score	Percentile	VI**	Above	Average	Low Average	Low	Very Low
Neurocognition Index (NCI)		75	5	Yes				x	
Composite Memory	75	55	1	Yes					x
Verbal Memory	40	59	1	Yes					x
Visual Memory	35	67	1	Yes					x
Psychomotor Speed	175	102	55	Yes		x			
Reaction Time*	881	59	1	Yes					x
Complex Attention*	11	88	21	Yes			x		
Cognitive Flexibility	23	73	4	Yes				x	
Processing Speed	43	83	13	Yes			x		
Executive Function	26	76	5	Yes				x	
Social Acuity	12	124	95	Yes	x				
[illegible]	0	79	8	No				x	
Working Memory	9	99	47	Yes		x			
Sustained Attention	22	87	19	Yes			x		
Simple Attention	40	106	66	Yes		x			
Motor Speed	132	116	86	Yes	x				

Domain Dashboard: Above average domain scores indicate a standard score (SS) greater than 109 or a Percentile Rank (PR) greater than 74, indicating a high functioning test subject. Average is a SS 90-109 or PR 25-74, indicating normal function. Low Average is a SS 80-89 or PR 9-24 indicating a slight deficit or impairment. Below Average is a SS 70-79 or PR 2-8, indicating a moderate level of deficit or impairment. Very Low is a SS less than 70 or a PR less than 2, indicating a deficit and impairment. Reaction times are in milliseconds. An * denotes that "lower is better", otherwise higher scores are better. Subject Scores are raw scores calculations generated from data values of the individual subtests.

VI** - Validity Indicator: Denotes a guideline for representing the possibility of an invalid test or domain score. "No" means a clinician should evaluate whether or not the test subject understood the test, put forth their best effort, or has a clinical condition requiring further evaluation.

Verbal Memory Test (VBM)	Score	Standard	Percentile	
Correct Hits - Immediate	8	67	1	The VBM test measures how well a subject can recognize, remember, and retrieve words e.g. exploit or attend literal representations or attribute. Subjects have to remember 15 words and recognize them in a field of 15 distractors. There are two parts to this test, Immediate and Delayed. The delayed part is presented at the end of the battery. "Correct Hits" refers to the number of target words recognized. Low scores indicate verbal memory impairment.
Correct Passes - Immediate	13	81	10	
Correct Hits - Delay	5	62	1	
Correct Passes - Delay	14	96	40	


F4
TC6
T8
FT8
T6
QEEG

QUANTITATIVE EEG (QEEG)

- Measures the different brain waves (e.g. alpha, beta, theta, and delta) at different sites looking at several parameters such as coherence and asymmetry. It then compares the results against a database of persons with “normal brains.”

BENEFITS OF QUANTITATIVE EEG (QEEG)

1. Convergent Validity
2. Accusation(s) of malingering not applicable
3. Localization
4. Extent of abnormality
5. Distribution pattern
6. Networks involved
7. Brain Optimization Index scores
8. Correlation with performance testing/estimate of severity
9. Correlation with pathophysiology/etiology of diagnosed disorder
10. Remediable?
11. Efforts to mitigate?

Fig. 2- Example of Laplacian Absolute Power – eyes closed condition

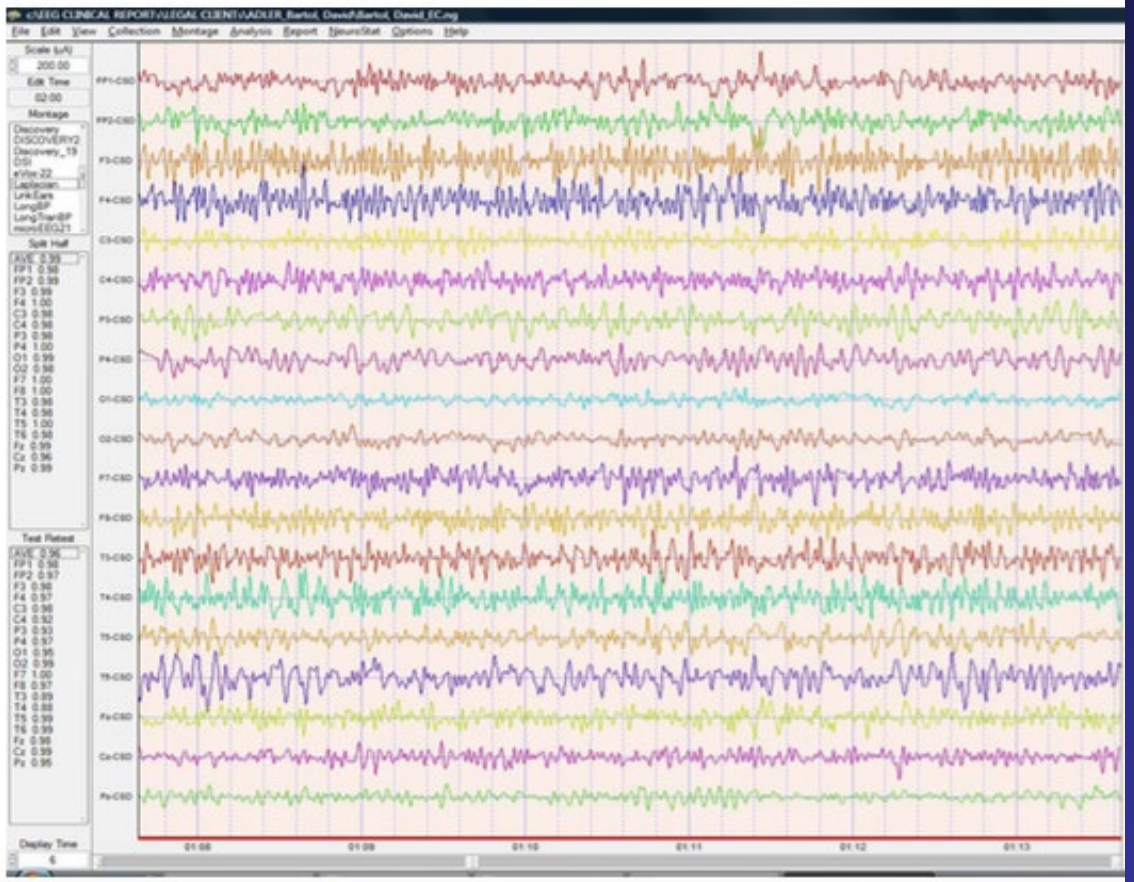
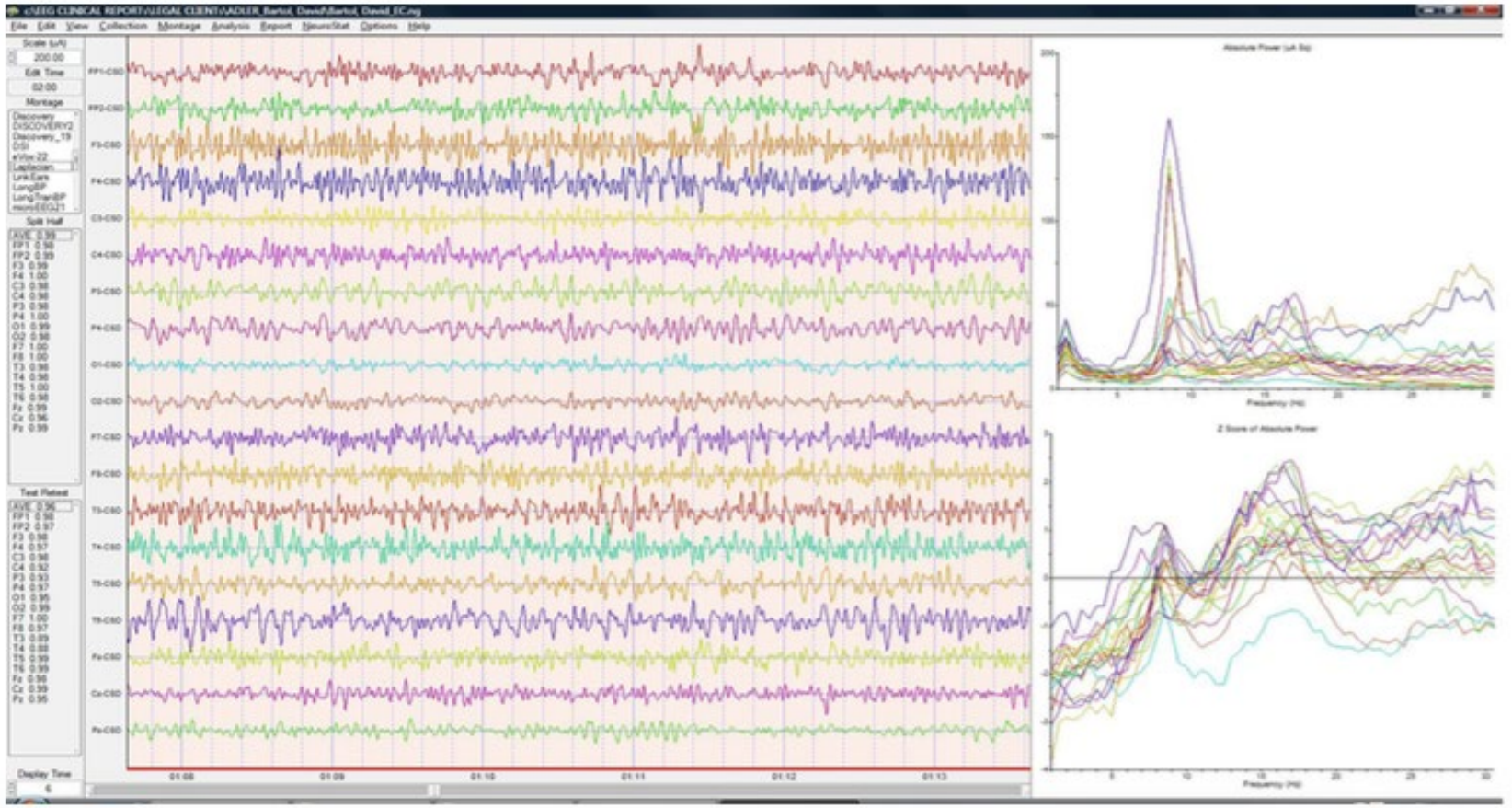
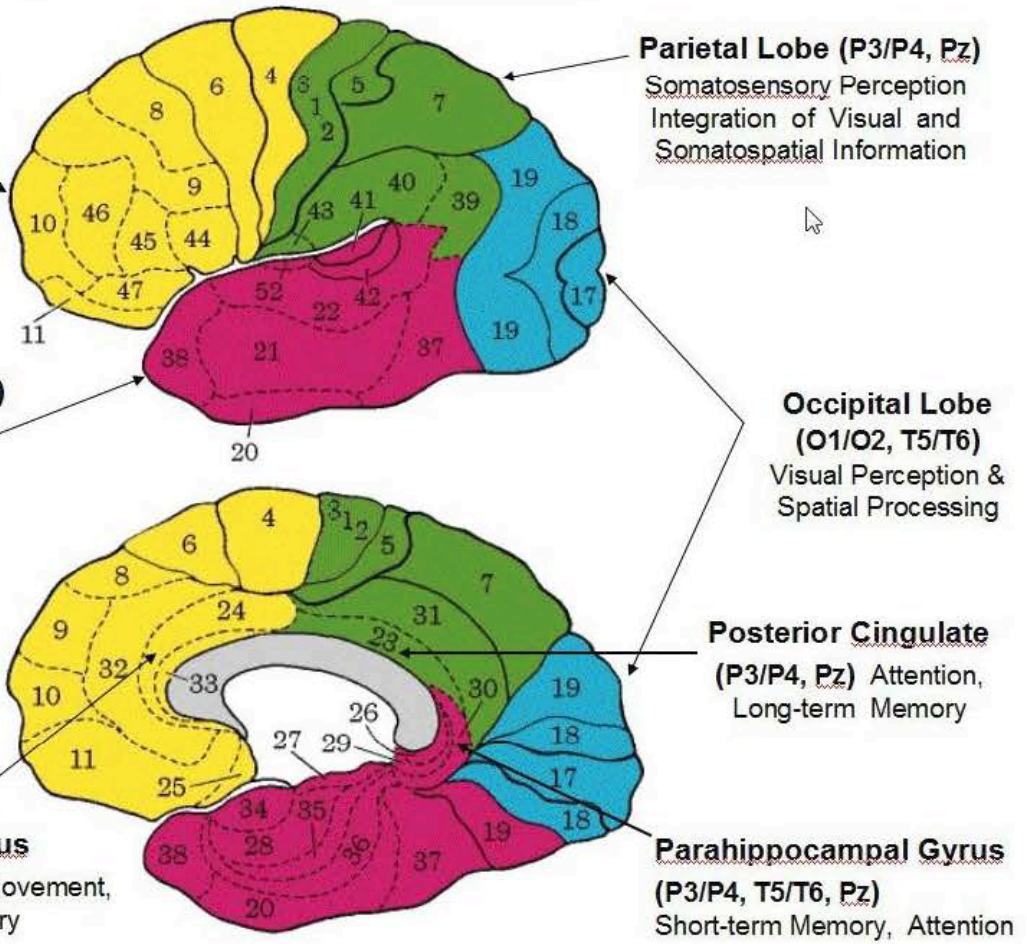


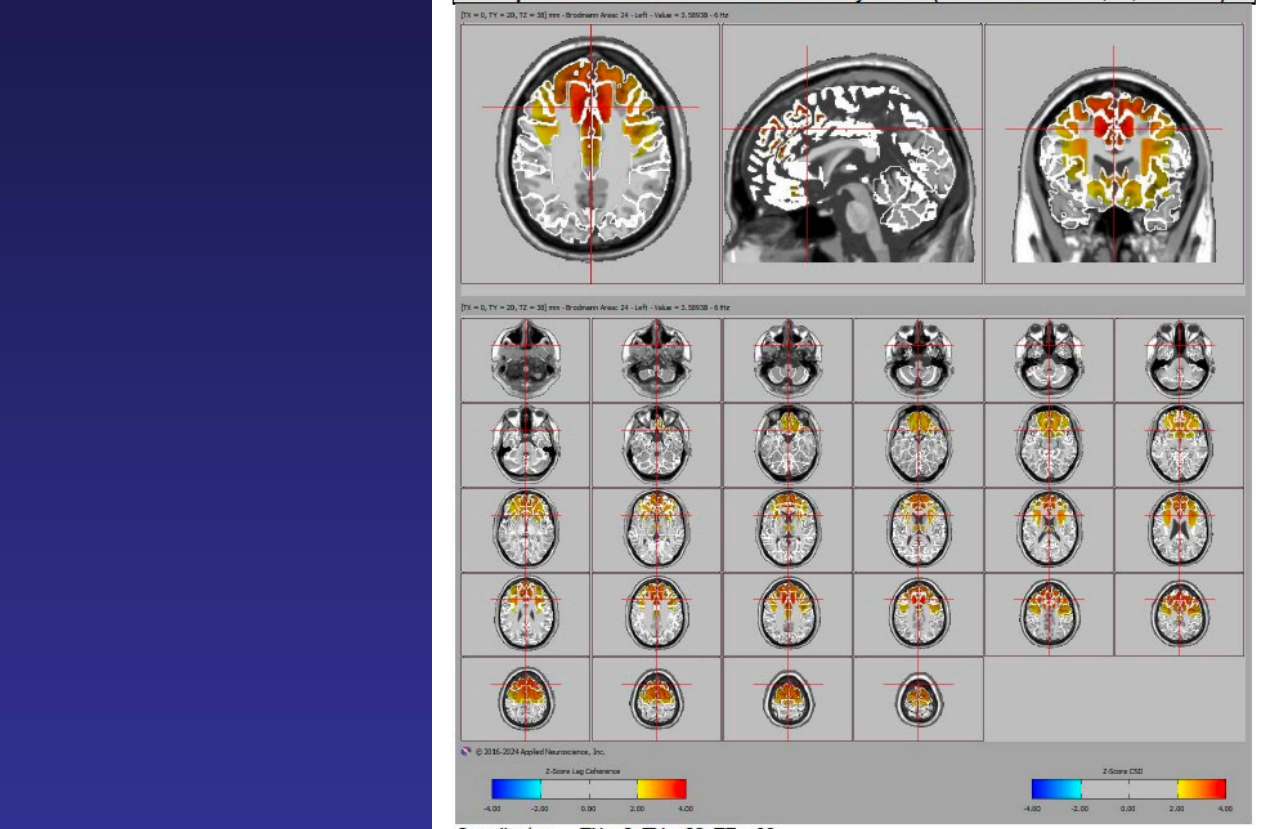
Fig. 2- Example of Laplacian Absolute Power – eyes closed condition



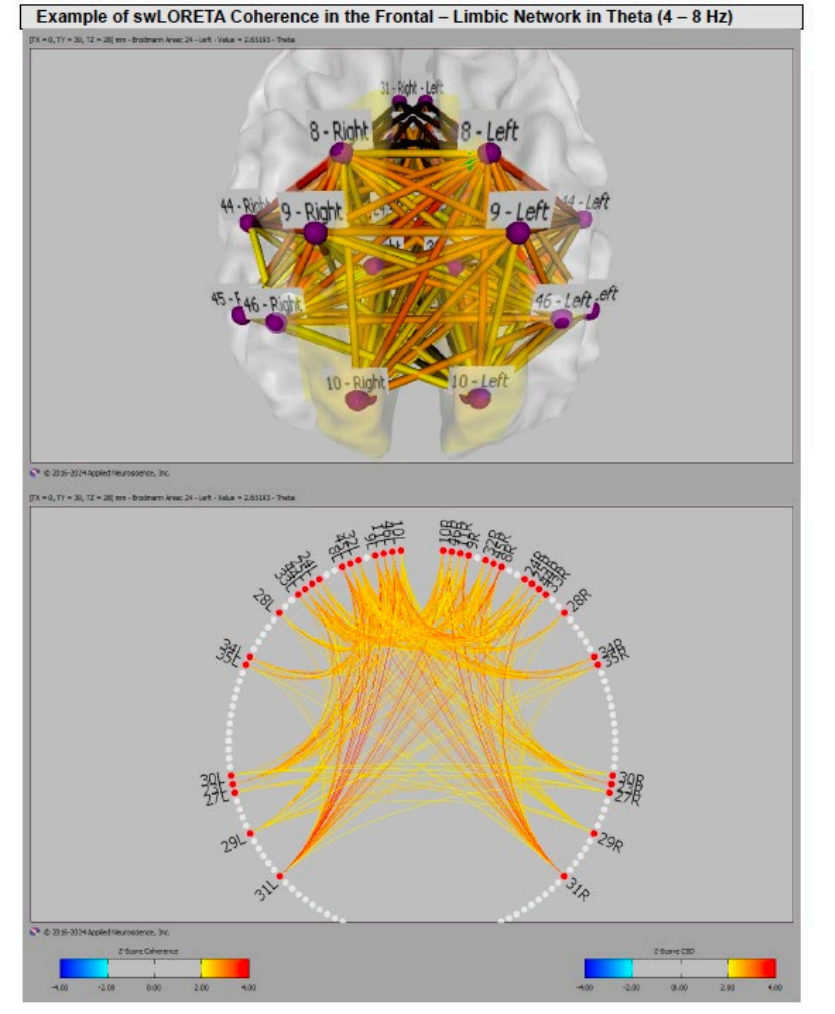
Symptoms, Electrodes & Brodmann Areas

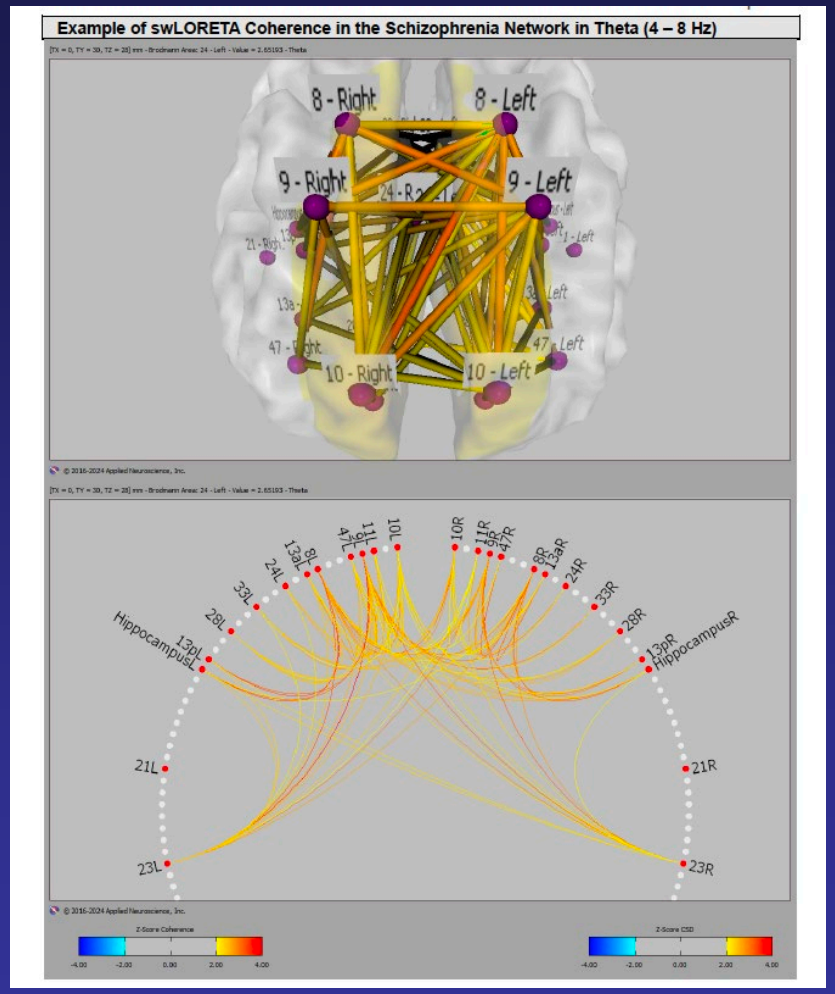


Example of swLORETA Current Source Density at 6 Hz (Brodmann areas 24, 32, & 25 L&R)

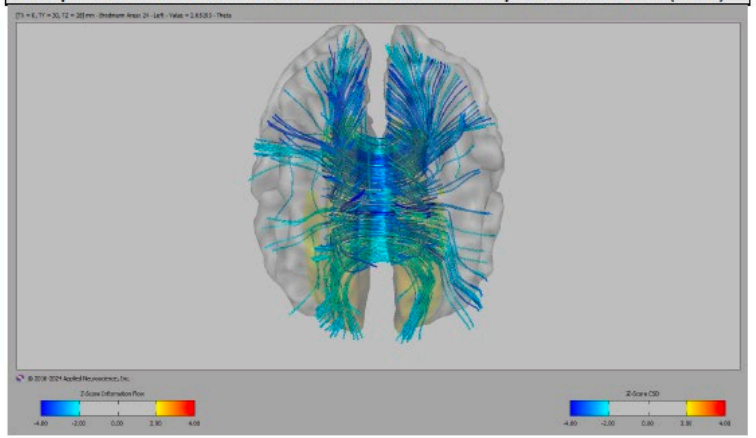


Coordinates: TX = 0, TY = 20, TZ = 38
Sample: 6 Hz
Brodmann Area/ROI: 24 - Left
Anatomical Name: Cingulum_Mid_L
Lobe: Left
Value: 3.58938
Min Value: -0.428346
Max Value: 3.58938

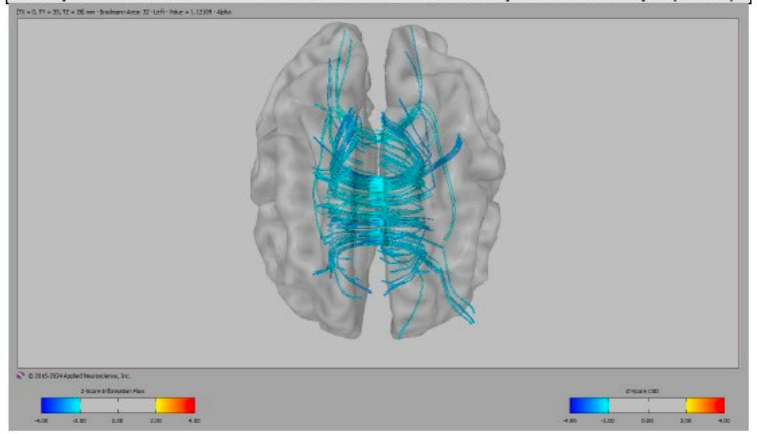

Example of swLORETA Coherence in the Frontal – Limbic Network in Theta (4 – 8 Hz)
8 - Right
8 - Left
9 - Right
9 - Left
46 - Right
46 - Left
10 - Right
10 - Left
28L
28R
35L
35R
30L
27L
30R
27R
29L
29R
31L
31R


Example of swLORETA Coherence in the Schizophrenia Network in Theta (4 – 8 Hz)
8 - Right
8 - Left
9 - Right
9 - Left
10 - Right
10 - Left
47 - Left
10L
10R
11R
47R
9R
13aR
24R
33R
28R
13aR
HippocampusR
13pR
HippocampusL
13pL
28L
33L
24L
13aL
8L
11L
47L
21L
21R
23L
23R
Z-Score Coherence
Z-Score CSD
-4.00
-2.00
0.00
2.00
4.00

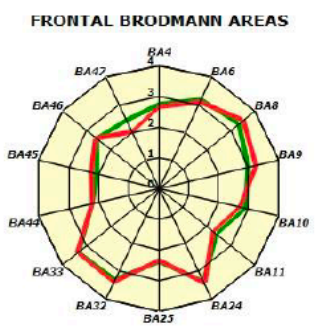
Example of swLORETA Predicted DTI of Information Flow in the Corpus Callosum in Theta (4-8 Hz)

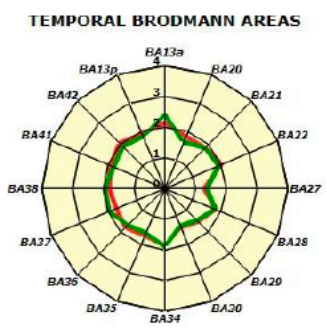


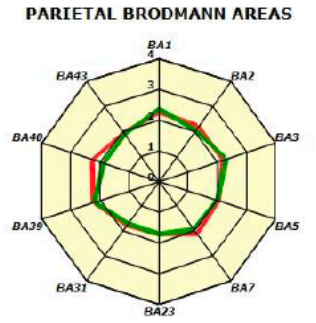
Example of swLORETA Predicted DTI of Information Flow in the Corpus Callosum in Alpha (8-12 Hz)

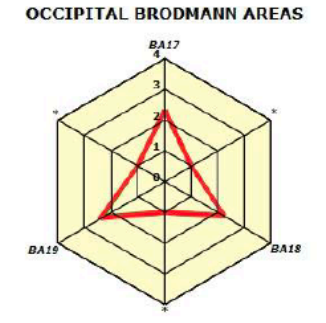


Significant Z-Scores by Brain Lobe & Brodmann Areas







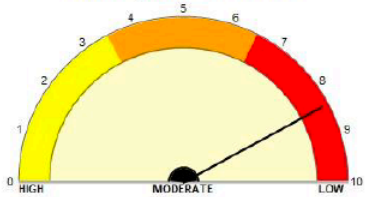


LEFT RIGHT

JAT 082780 q1 EC1

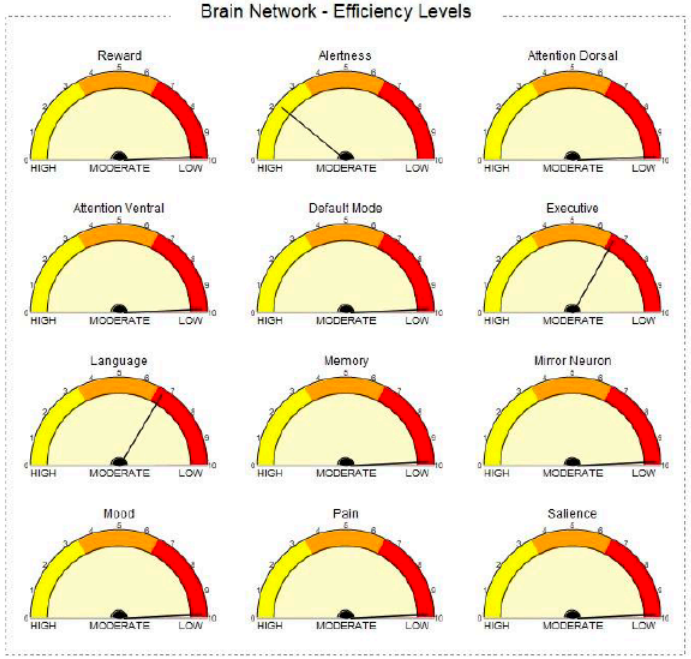
swLORETA Network Function Indices

Brain Optimization Index



OVERALL EFFICIENCY LEVEL

Brain Network - Efficiency Levels



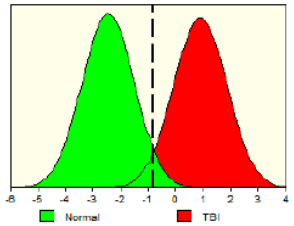
JAT 082780 q1 EC1

Mild Traumatic Brain Injury (mTBI) Discriminant Analysis

TBI DISCRIMINANT SCORE = -0.85

TBI PROBABILITY INDEX = 70.0%

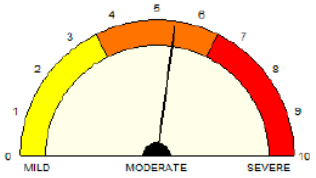
The TBI Probability Index is the subject's probability of membership in the mild traumatic brain injury population. (see Thatcher et al, EEG and Clin. Neurophysiol., 73: 93-106, 1989.)



			RAW	Z
FP1-F3	COH	Theta	81.70	-0.19
T3-T5	COH	Beta	76.34	1.75
C3-P3	COH	Beta	86.88	1.25
FP2-F4	PHA	Beta	-0.45	-0.14
F3-F4	PHA	Beta	0.56	0.29
F4-T6	AMP	Alpha	-3.88	0.51
F8-T6	AMP	Alpha	-74.22	0.08
F4-T6	AMP	Beta	58.00	1.73
F8-T6	AMP	Beta	9.13	1.71
F3-O1	AMP	Alpha	-41.48	0.48
F4-O2	AMP	Alpha	-51.07	0.27
F7-O1	AMP	Alpha	102.67	-0.14
F4-O2	AMP	Beta	45.01	1.55
F3	RP	Alpha	51.75	-0.26
F4	RP	Alpha	55.79	-0.02
O1	RP	Alpha	63.67	0.18
O2	RP	Alpha	69.12	0.33
T4	RP	Alpha	45.61	0.28
T5	RP	Alpha	53.35	-0.11
T6	RP	Alpha	58.68	0.02

TBI SEVERITY INDEX = 5.43

This severity score places the patient in the MODERATE range of severity.



			RAW	Z
FP1-C3	COH	Delta	60.74	0.61
FP1-FP2	COH	Theta	89.61	0.65
O1-F7	COH	Alpha	11.27	-1.30
O2-T6	COH	Alpha	87.76	0.56
P3-O1	COH	Beta	82.25	0.93
FP1-T3	PHA	Theta	-2.32	-0.08
T3-T4	PHA	Theta	-3.69	-0.73
O1-F7	PHA	Alpha	-19.44	0.61
F7-F8	PHA	Alpha	-1.71	-0.01
T5-T6	PHA	Beta	0.63	-0.99
C3-F7	AMP	Delta	-25.55	-2.12
FP2-F4	AMP	Delta	40.94	1.14
C4-F8	AMP	Delta	24.74	-0.60
O1-O2	AMP	Theta	4.18	0.19
P3-F7	AMP	Alpha	81.78	-0.42
FP2-P4	AMP	Alpha	-82.21	-0.17

The TBI Severity Index is an estimate of the neurological severity of injury. (see Thatcher et al, J. Neuropsychiatry and Clinical Neuroscience, 13(1): 77-87, 2001.)

***Statement of Indications of Use:**

The Discriminant Analysis and Severity Index are to be used by experienced and qualified professionals for the post-hoc statistical evaluation of the human electroencephalogram (EEG). The Discriminant Analysis and Severity Index are to be viewed as an adjunct to the evaluation of the patient, and they do not serve as a primary basis for a diagnosis. Warning: Inclusion criteria of a history of traumatic brain injury and greater than 13 years of age must be adhered to.

Comparison of Neuropsychological Findings with Neuroimaging: Skylar Meade

Damaged Brain Regions per QEEG	Mr. Meade's Testing (z-scores)
Frontal Lobes, especially the right (impulse control, executive functioning, abstract thinking, mood and social skills)	Finger Tapping (R) = **-1.3** Finger Tapping (L) = **-1.0** Grooved Pegs (R) = -0.6 Grooved Pegs (L) = -0.2 WRAT Word Reading = 0.0 WRAT Reading Comprehension = -0.93 COWAT Letters = 0.0 COWAT Category = **-2.2** RFF Unique Designs = **-1.0** Reynolds Interference Task = **-3.73** Comprehensive Trails 5 = **-1.3** ACT working memory = 0.48 to **-2.27** TOGRA = **-1.1** WCST Trials to First Category = **-1.4** DKEFS Tower Total = -0.33 DKEFS Proverbs Accuracy = **-1.67** GSS Total Suggestibility = **-1.6** ACS Social Perception = 0.0 Affect Naming = -0.33 Prosody = 0.33

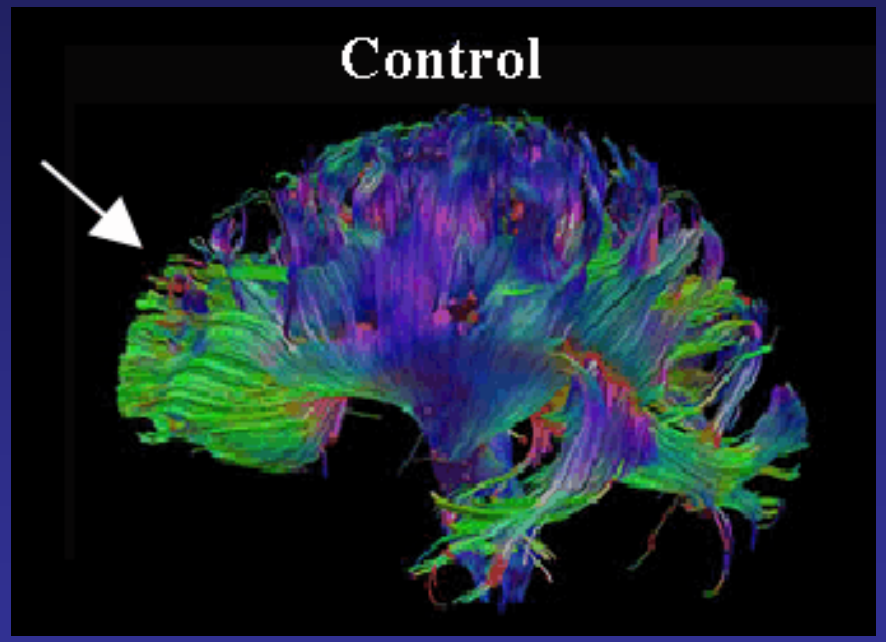
THE VALUE OF AN ONGOING DATABASE

ITEM	MR. JASON THORNBURG	ORIGINAL COHORT (N= 19) MEAN SCORE (Standard Deviation)	CENTER UPDATED COHORT (N=12) MEAN SCORE (Standard Deviation)
TBI Discriminant		- 0.46 (1.27)	- 0.35 (1.01)
TBI Probability Index		71% (39)	75% (36)
TBI Severity Index		2.63 (1.83)	3.03 (2.10)

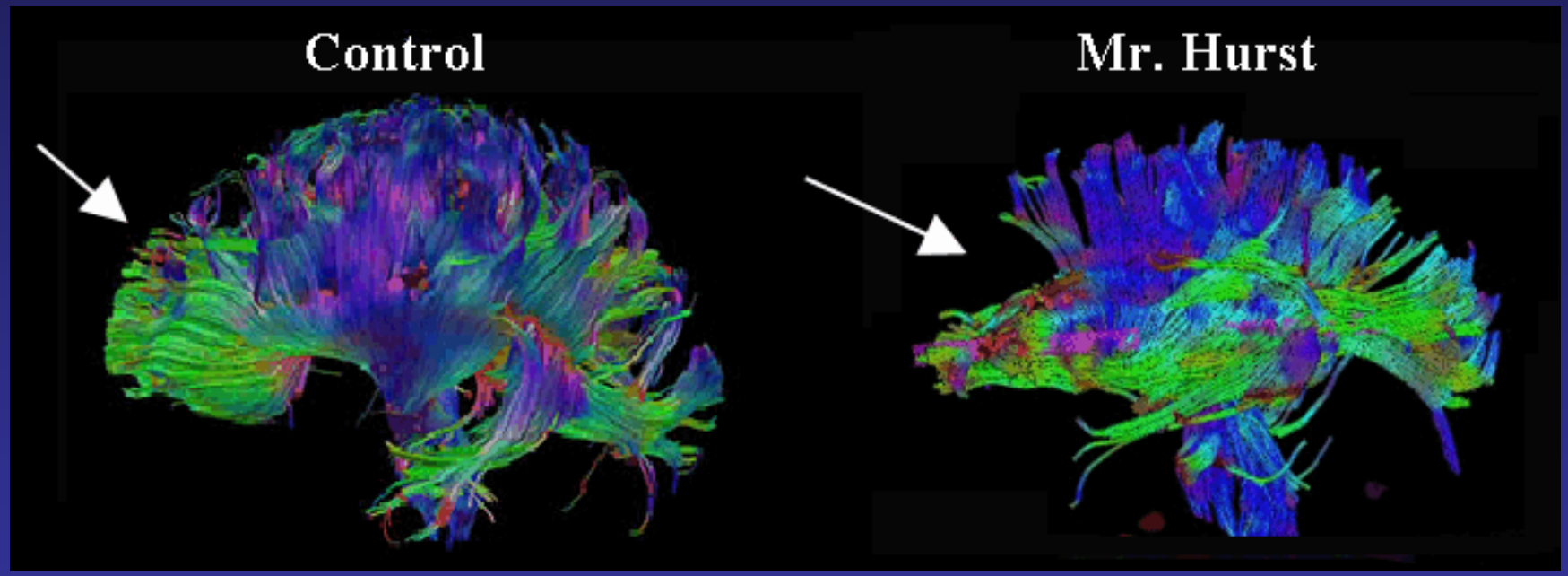
ITEM	MR. JASON THORNBURG	ORIGINAL COHORT (N= 19) MEAN SCORE (Standard Deviation)	CENTER UPDATED COHORT (N=12) MEAN SCORE (Standard Deviation)
TBI Discriminant	- 0.85	- 0.46 (1.27)	- 0.35 (1.01)
TBI Probability Index	70%	71% (39)	75% (36)
TBI Severity Index	5.43	2.63 (1.83)	3.03 (2.10)

DIFFUSION TENSOR IMAGING

CORPUS CALLOSUM TRACTOGRAPHY (DTI)



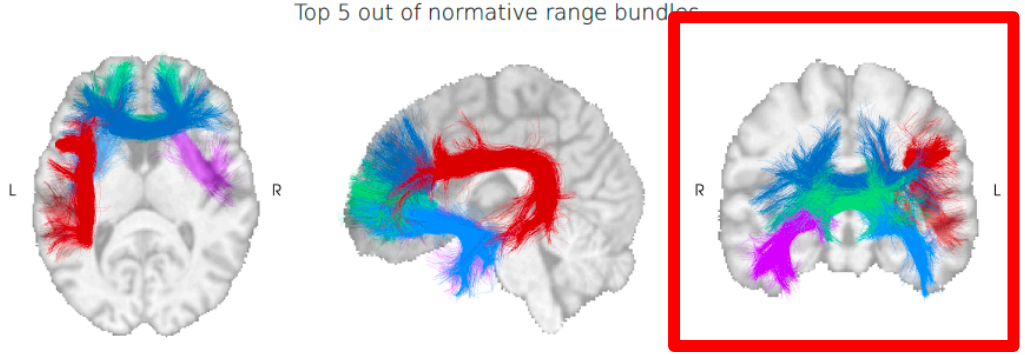
CORPUS CALLOSUM TRACTOGRAPHY (DTI)



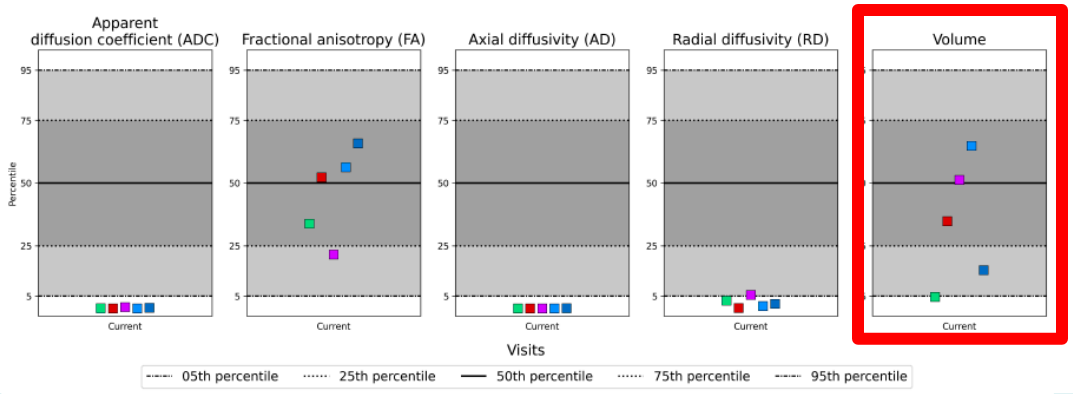
ANDI
Advanced Neuro Diagnostic Imaging

Analysis date: 30 Sep 2024 *Subject ID:* CRIMINAL DTI
Visit: 1 *Age:* 44 *Sex:* M
Version: 1.3.2

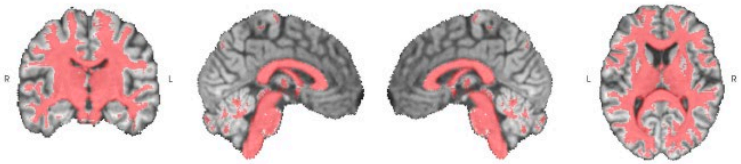
Top 5 out of normative range bundles



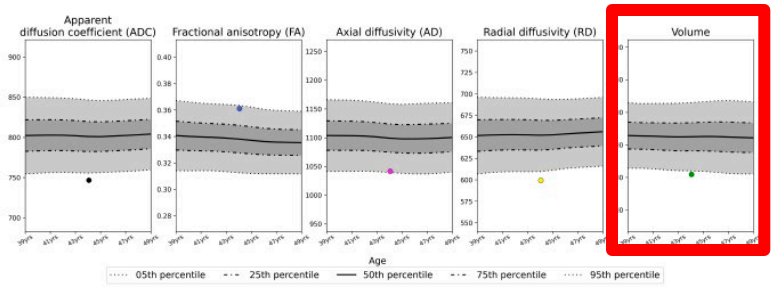
As displayed in the image above, the top 5 out of normative range bundles in terms of microstructural measures are the Anterior genu, Arcuate fasciculus left, Uncinate fasciculus right, Uncinate fasciculus left, Middle genu. These bundles are situated as follow: 2 in the left hemisphere, 1 in the right hemisphere, 2 in the corpus callosum.



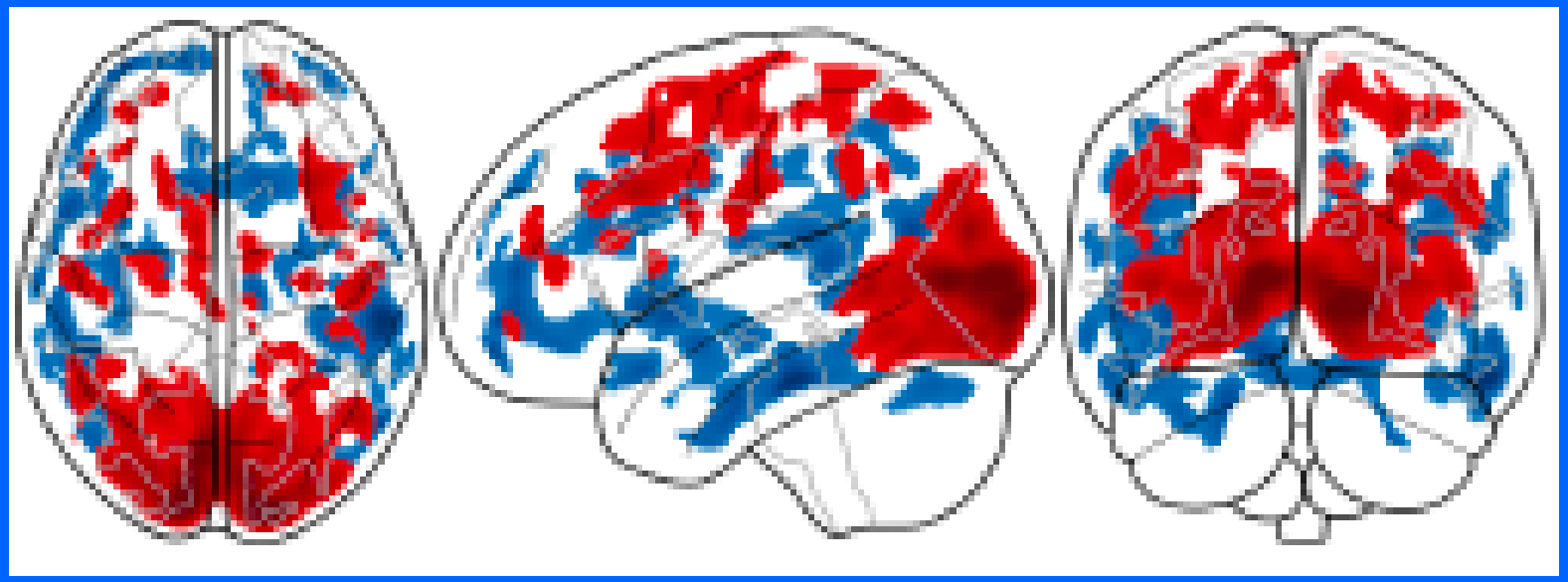
Whole white matter



Measure	Percentile	Value	Normative range (mean (std))
Apparent diffusion coefficient (10^{-6} mm^2/s)	**2.472**	746.754	801.025 (27.622)
Fractional anisotropy	93.169	0.36108	0.33798 (0.01552)
Axial diffusivity (10^{-6} mm^2/s)	5.627	1041.447	1099.159 (36.368)
Radial diffusivity (10^{-6} mm^2/s)	**2.036**	599.407	651.958 (25.680)
Volume (cm^3)	**3.488**	709.269	824.874 (63.746)



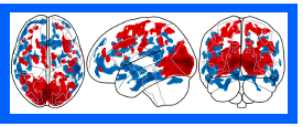
POSITRON EMISSION TOMOGRAPHY



Glass brain

NEUROCLOUD PET

PatientID: 9912988378CTL
Study: THORNBURG, Jason A 08271980
Age: 44
Id: 10551 Date: 2024-11-19 22:01:05



Glass brain

Hypometabolism

Standard deviation 2 SD 2.5 SD 3.0 SD

Frontal

ROI	Left Diff.	Right Diff.	Asymetry	Laterality
Precentral gyrus	1.30	0.09	1.72	
Superior frontal gyrus	1.23	2.92	1.43	
Middle frontal gyrus	2.31	0.95	1.25	
Inferior frontal gyrus (Broca area)	-0.61	-0.74	0.77	
Subgenual anterior cingulate gyrus	-4.38	-6.56	7.00	
Cingulate gyrus (gyrus cinguli), anterior part	-2.07	-1.45	0.48	
Anterior orbital gyrus	-3.63	-3.77	0.23	
Medial orbital gyrus	-6.08	-3.30	2.12	
Posterior orbital gyrus	-7.66	-1.75	5.63	
Lateral orbital gyrus	-5.43	-8.55	4.46	
Straight gyrus	-5.92	-3.77	1.26	

Temporal

ROI	Left Diff.	Right Diff.	Asymetry	Laterality
Amigdala	-8.53	-10.68	3.92	
Hippocampus	-9.63	-10.76	2.63	
Parahippocampal and ambient gyri	-11.58	-14.31	3.72	Bilateral
Anterior temporal lobe, medial part	-6.19	-5.54	0.37	
Anterior temporal lobe, lateral part	-0.31	-1.71	0.69	
Temporal Superior, Anterior Part	-3.22	-6.42	2.89	
Temporal Superior, Posterior Part	-0.36	-3.24	3.78	
Middle temporal and inferior	-4.99	-5.99	0.92	
Posterior temporal lobe	-2.16	-1.46	0.59	
Fusiform gyrus	-7.84	-10.47	4.29	

Parietal

ROI	Left Diff.	Right Diff.	Asymetry	Laterality
Postcentral gyrus	0.32	-0.40	0.87	
Inferiolateral remainder of parietal lobe	-2.86	-2.17	0.99	
Precuneus	1.84	1.27	1.93	
Cingulate gyurs (gyrus cinguli), posterior part	0.81	-0.39	1.03	

Occipital

ROI	Left Diff.	Right Diff.	Asymetry	Laterality
Lateral remainder of occipital lobe	9.55	8.40	1.18	
Cuneus	12.66	13.17	2.35	
Lingual gyrus	16.44	15.14	0.46	

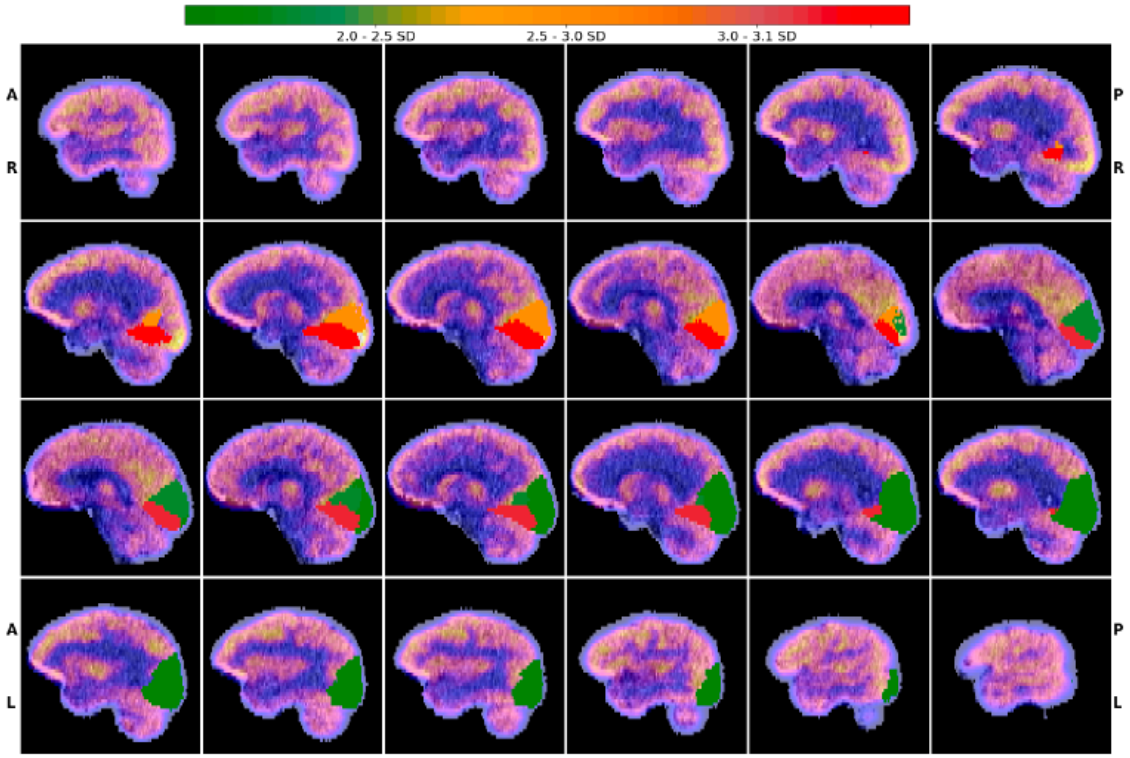
Internal structures

ROI	Left Diff.	Right Diff.	Asymetry	Laterality
Insula	-2.37	-2.80	0.26	
Caudate nucleus	-8.59	-7.46	0.18	
Putamen	-4.46	-6.11	2.16	
Thalamus	1.69	1.70	1.49	
Cerebellum	-1.04	-2.33	1.13	

NEUROCLOUD PET

PatientID: 9912988378CTL
Study: THORNBURG, Jason A 08271980

ROIs analysis - Hypermetabolism - SAGITTAL

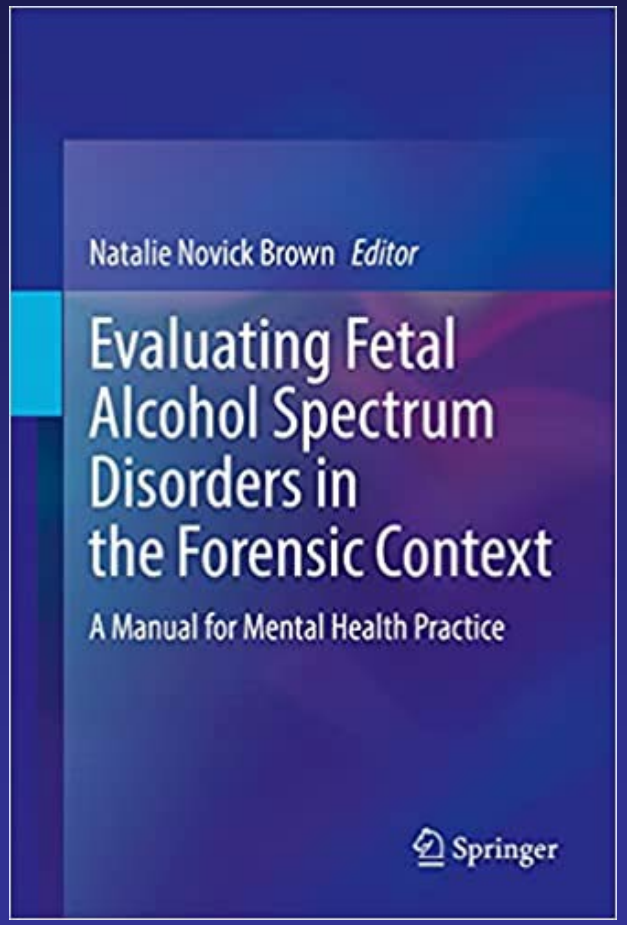


In Press:

An Updated FASD Assessment Protocol for the Forensic Context

Natalie Novick Brown, Paul Connor, Richard S. Adler

ABSTRACT:
This article updates a recommended standard of practice for assessing fetal alcohol spectrum disorders (FASDs) in the forensic context. Initially published in 2010 to operationalize the forensic assessment process for FASD, this protocol has evolved in a continuous quality improvement (CQI) process that has incorporated relevant scientific developments with real-world forensic experience in hundreds of FASD cases around the United States, consistently meeting with general legal acceptance over the past 15 years. Based upon the same integrated multidisciplinary approach used in the clinical context to diagnose FASD disorders and **incorporating forward-thinking intervention (FTI) to improve post-evaluation adjustment and reduce risk of problematic behaviors,** the step-by-step process in this update is useful for both forensic mental health and legal professionals.



CHAPTERS

1. Diagnostic History
2. Forensic Relevance (case law review)
3. Prevalence & Screening
4. Interviewing for PAE
5. Neuropsychological Assessment
6. Medical Assessment & Differential Diagnosis
7. **NEUROIMAGING**
8. Functional/Adaptive Assessment
9. Comorbidity
10. Assessing Severity
11. Assessing Juveniles
12. Alternative Sentencing for Juveniles
13. Violence Risk Assessment in Prenatal Drug Exposure Cases
14. Sexually Violent Predator Civil Commitment Assessment
15. Competency Assessment
16. **PHARMACOTHERAPY**
17. Prosecutorial Perspective (USA, Canada)
18. Views from the Bench (USA, Canada, New Zealand)

RICHARD S. ADLER, M.D.

FORENSIC & CLINICAL PSYCHIATRY
1700 7th Avenue, Suite 210
Seattle, WA 98101

(206) 624 – 3800
www.fcpsych.com
richadler@fcpsych.com