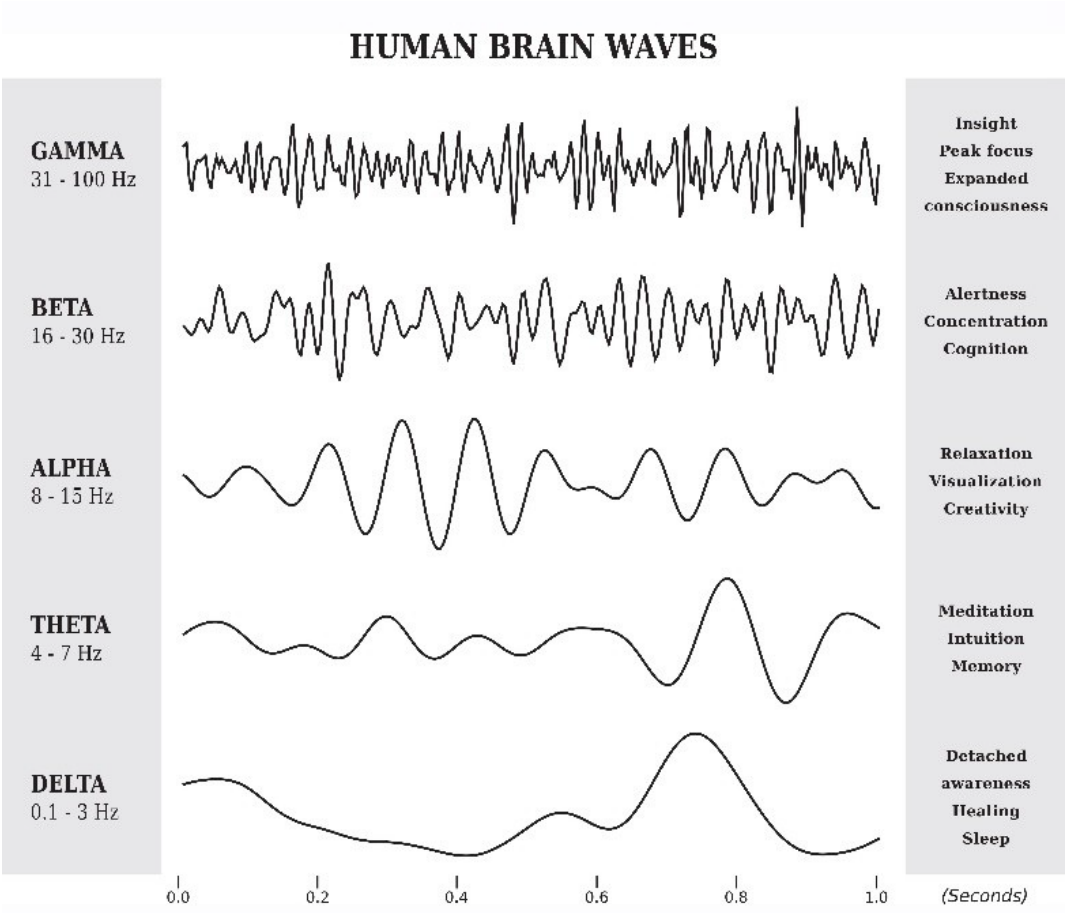
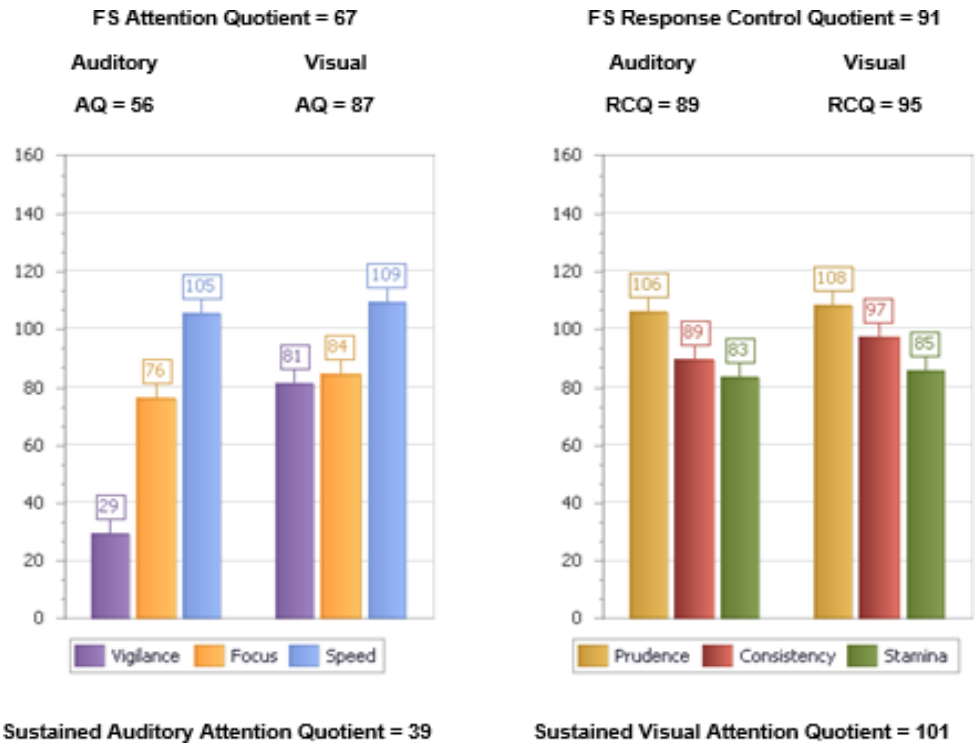
Solving the ADHD Riddle©
Supplemental Materials to Audiobook
Connie McReynolds, Ph.D.

Listing of Graphs

1. Human Brain Waves

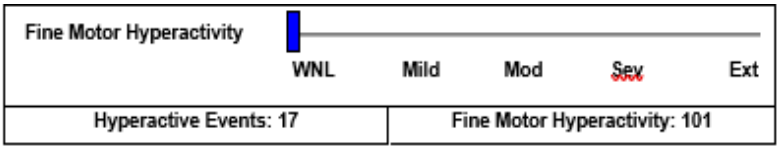


2. Abigail's Initial Assessment Results (2 graphs)



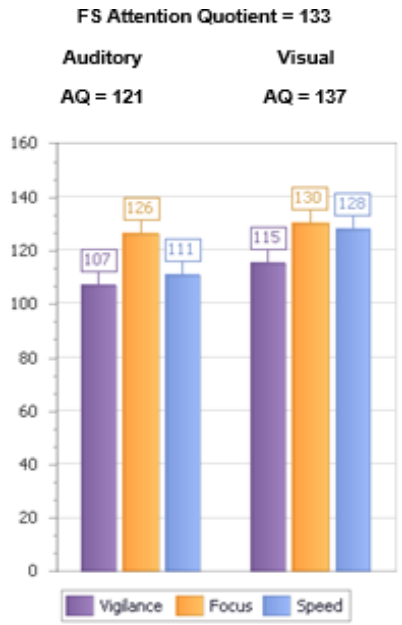
Sustained Auditory Attention Quotient = 39

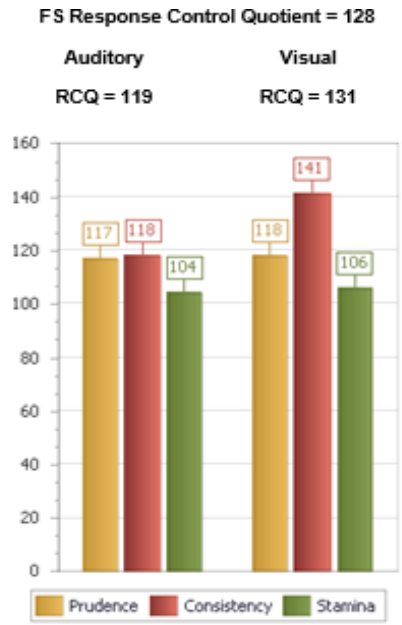
Sustained Visual Attention Quotient = 101



Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	90.0%	72	
Comprehension (V)	97.9%	109	
Persistence (A)	50.8%	77	
Persistence (V)	92.1%	95	
Sensory/Motor (A)	210 ms	124	
Sensory/Motor (V)	244 ms	111	

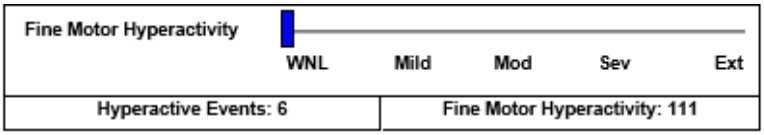
3. Abigail's Assessments after Neurofeedback (2 graphs)





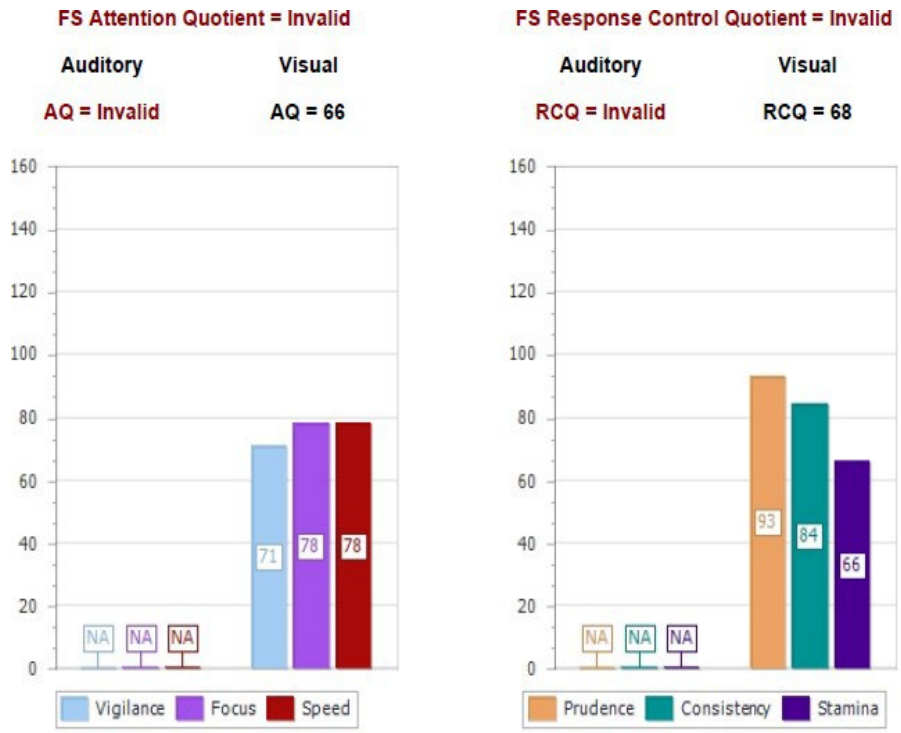
Sustained Auditory Attention Quotient = 112

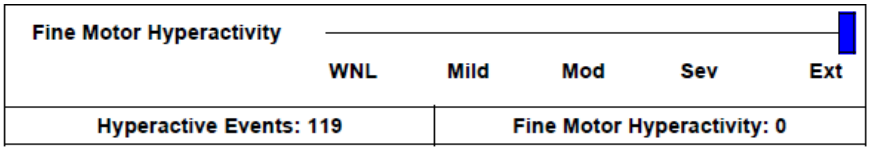
Sustained Visual Attention Quotient = 128



Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	100.0%	115	
Comprehension (V)	100.0%	116	
Persistence (A)	102.5%	105	
Persistence (V)	95.7%	96	
Sensory/Motor (A)	230 ms	120	
Sensory/Motor (V)	229 ms	116	

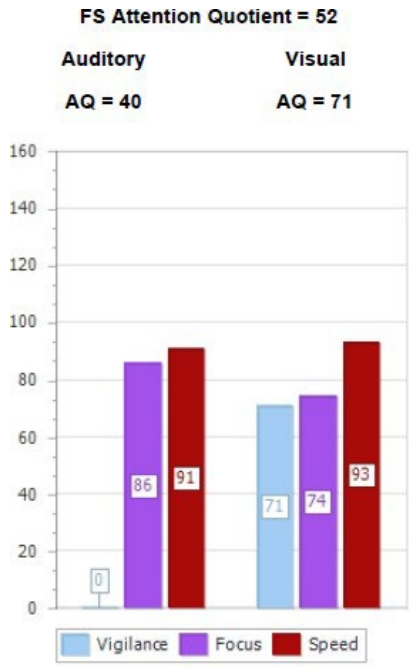
4. Jeremy's Initial Assessment Results (2 graphs)

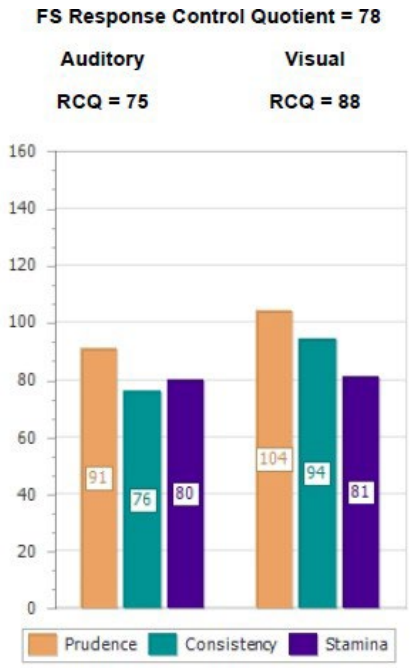


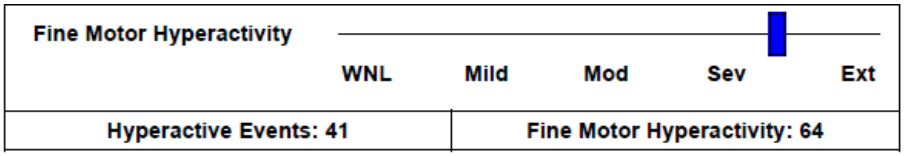


Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	66.2%	0	
Comprehension (V)	87.9%	52	
Persistence (A)	120.5%	115	
Persistence (V)	88.6%	96	
Sensory/Motor (A)	331 ms	95	
Sensory/Motor (V)	240 ms	97	

5. Jeremy's Second Assessment Results (2 graphs)

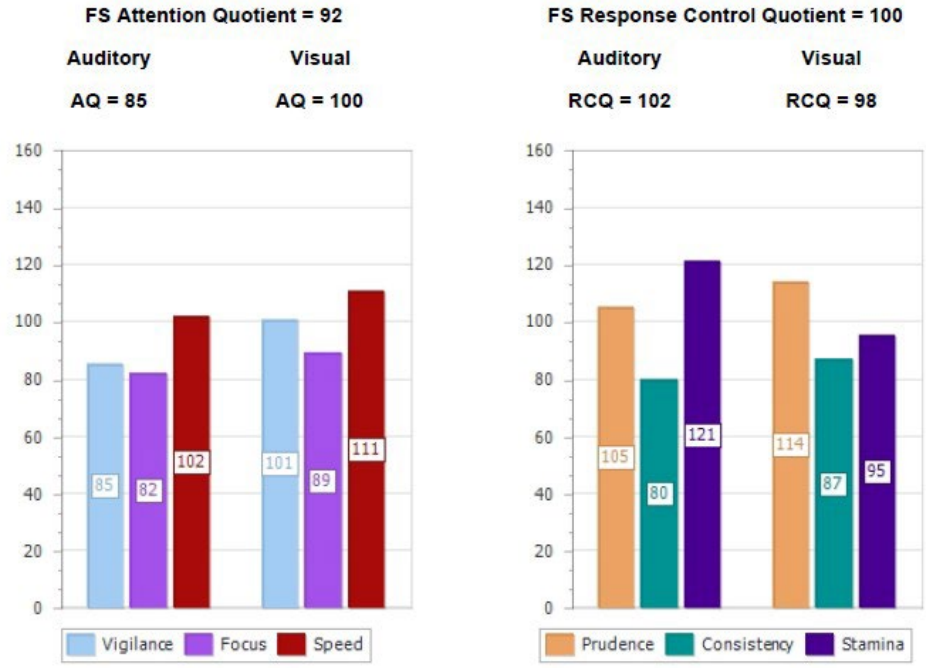


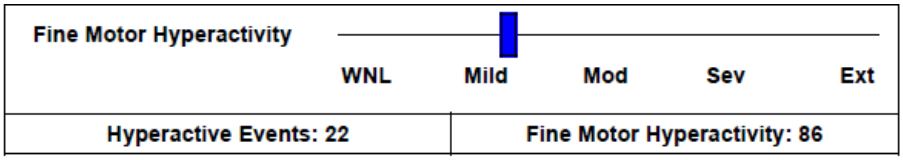




Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	74.6%	0	
Comprehension (V)	91.4%	70	
Persistence (A)	71.4%	86	
Persistence (V)	93.6%	98	
Sensory/Motor (A)	285 ms	103	
Sensory/Motor (V)	230 ms	102	

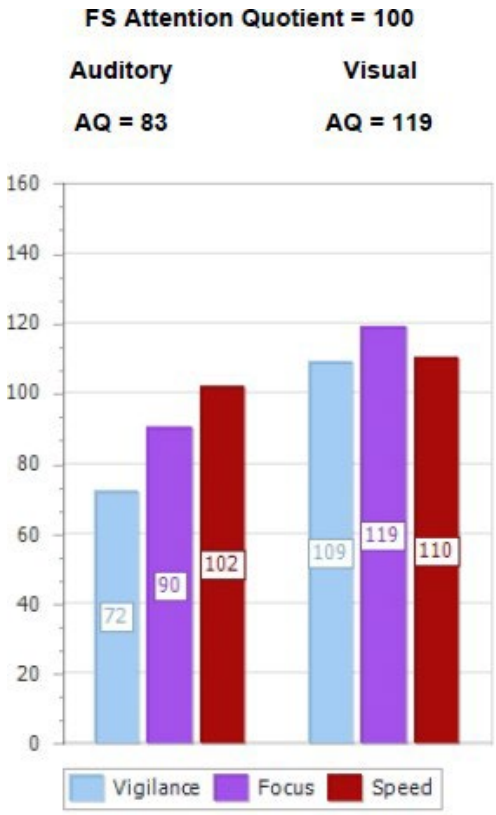
6. Jeremy's Third Assessment Results (2 graphs)

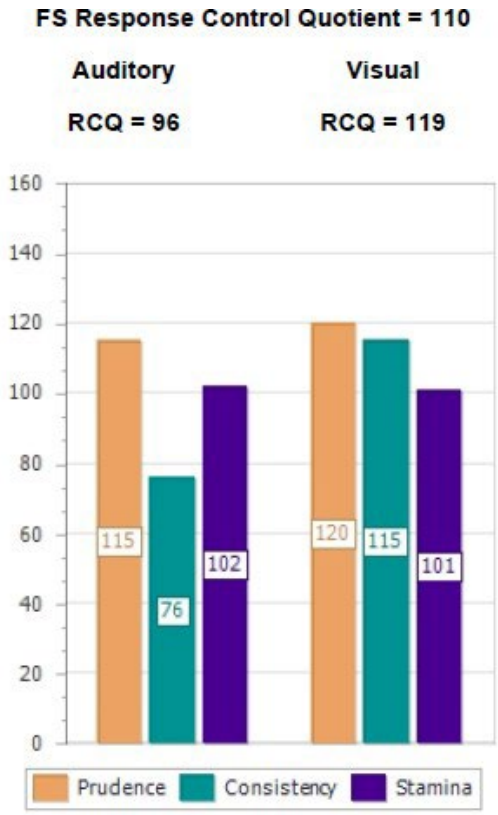




Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	86.2%	0	
Comprehension (V)	97.9%	102	
Persistence (A)	82.2%	92	
Persistence (V)	125.7%	112	
Sensory/Motor (A)	238 ms	110	
Sensory/Motor (V)	183 ms	123	

7. Jeremy's Six-month Assessment (2 graphs)

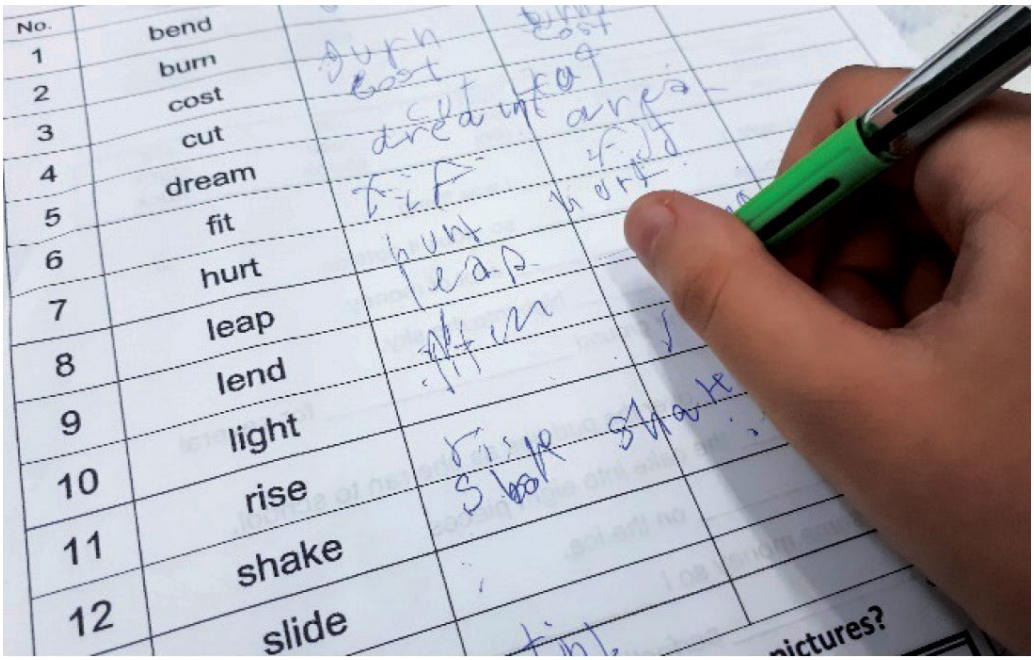




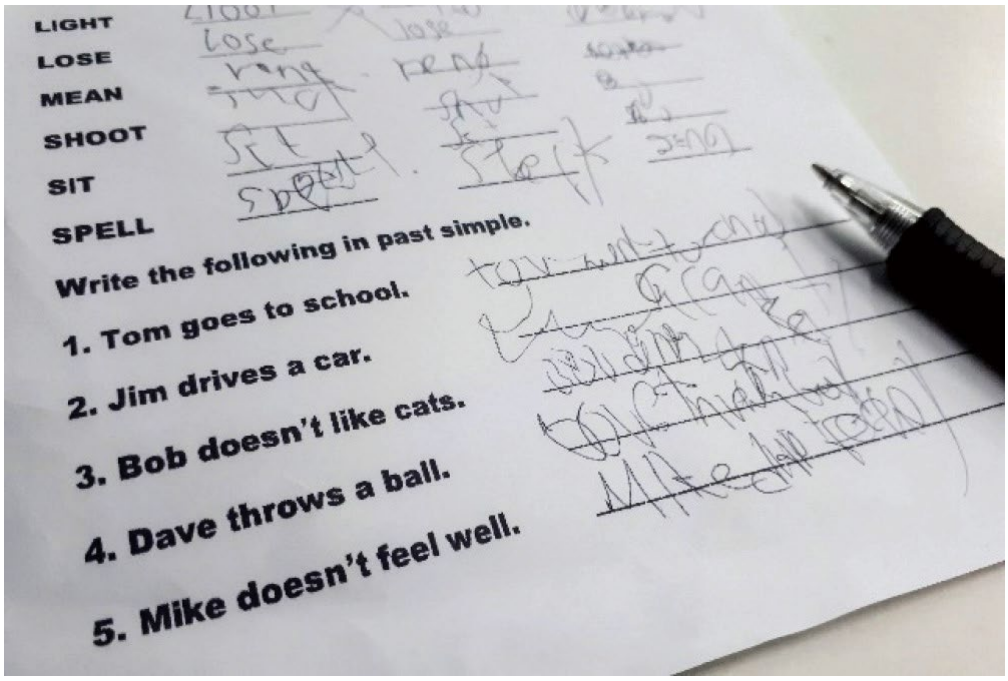
Fine Motor Hyperactivity	WNL	Mild	Mod	Sev	Ext
Hyperactive Events: 4	Fine Motor Hyperactivity: 107				

Symptomatic	Raw	Quotient	WNL	Mild	Mod	Sev	Ext
Comprehension (A)	100.0%	112					
Comprehension (V)	100.0%	113					
Persistence (A)	140.1%	131					
Persistence (V)	117.8%	108					
Sensory/Motor (A)	233 ms	112					
Sensory/Motor (V)	204 ms	112					

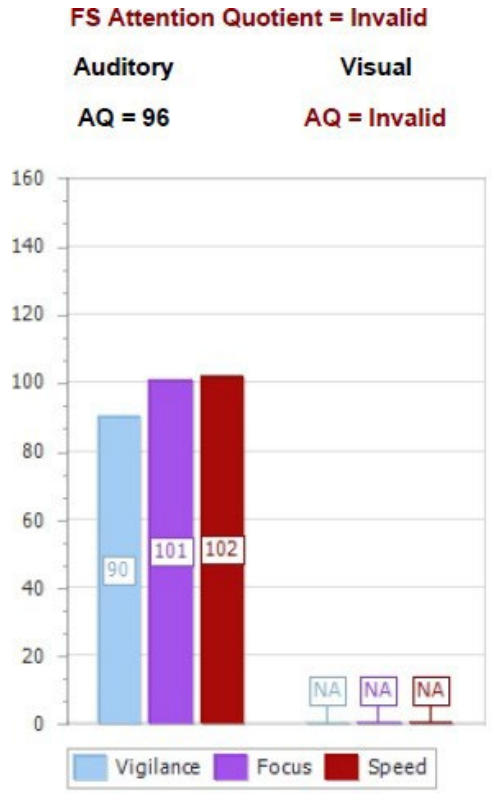
8. First image of child's writing example

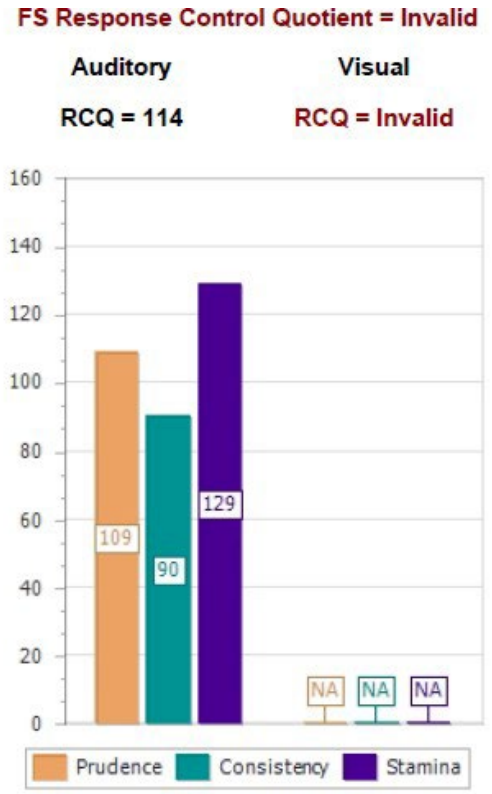


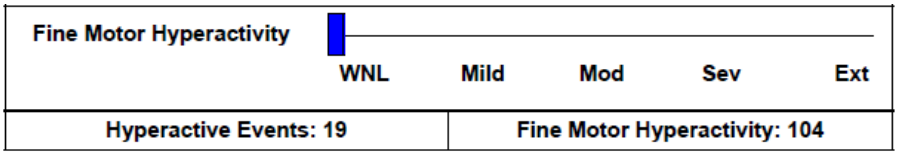
9. Second image of child's writing example



10. Zoe's Initial Assessment Results (2 graphs)

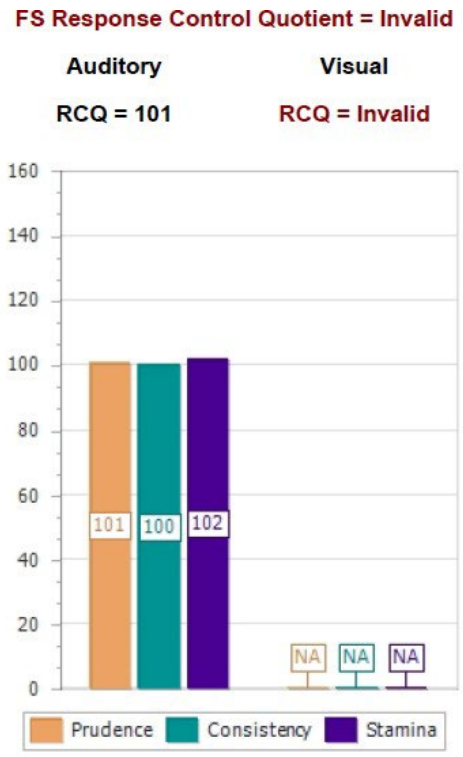


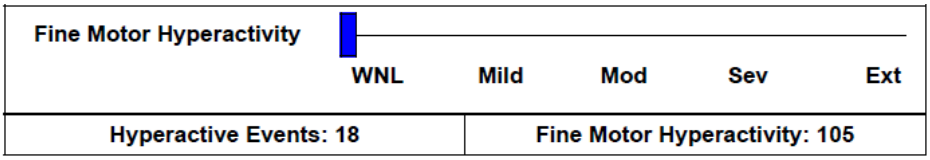




Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	96.2%	102	
Comprehension (V)	67.1%	25	
Persistence (A)	64.8%	87	
Persistence (V)	88.5%	93	
Sensory/Motor (A)	345 ms	105	
Sensory/Motor (V)	359 ms	93	

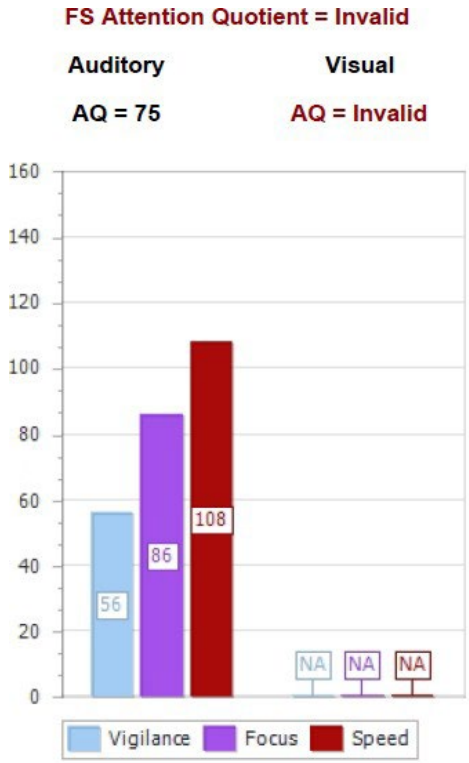
11. Zoe's Second Assessment Results (2 graphs)

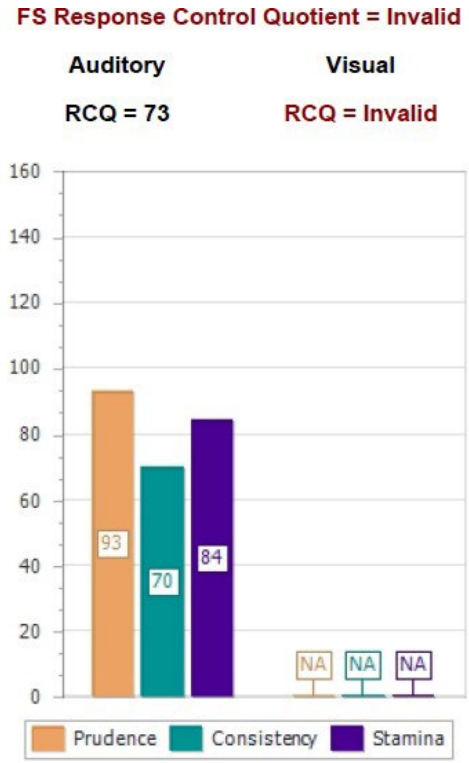


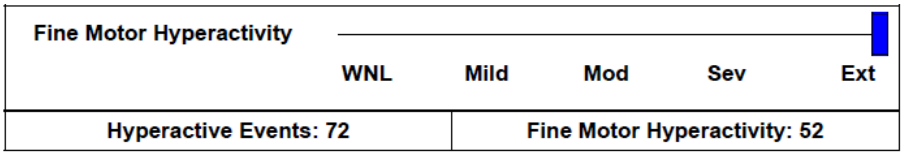


Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	97.7%	107	
Comprehension (V)	73.6%	43	
Persistence (A)	115.8%	109	
Persistence (V)	114.0%	102	
Sensory/Motor (A)	360 ms	103	
Sensory/Motor (V)	333 ms	98	

12. Zoe's Third Assessment Results (2 graphs)

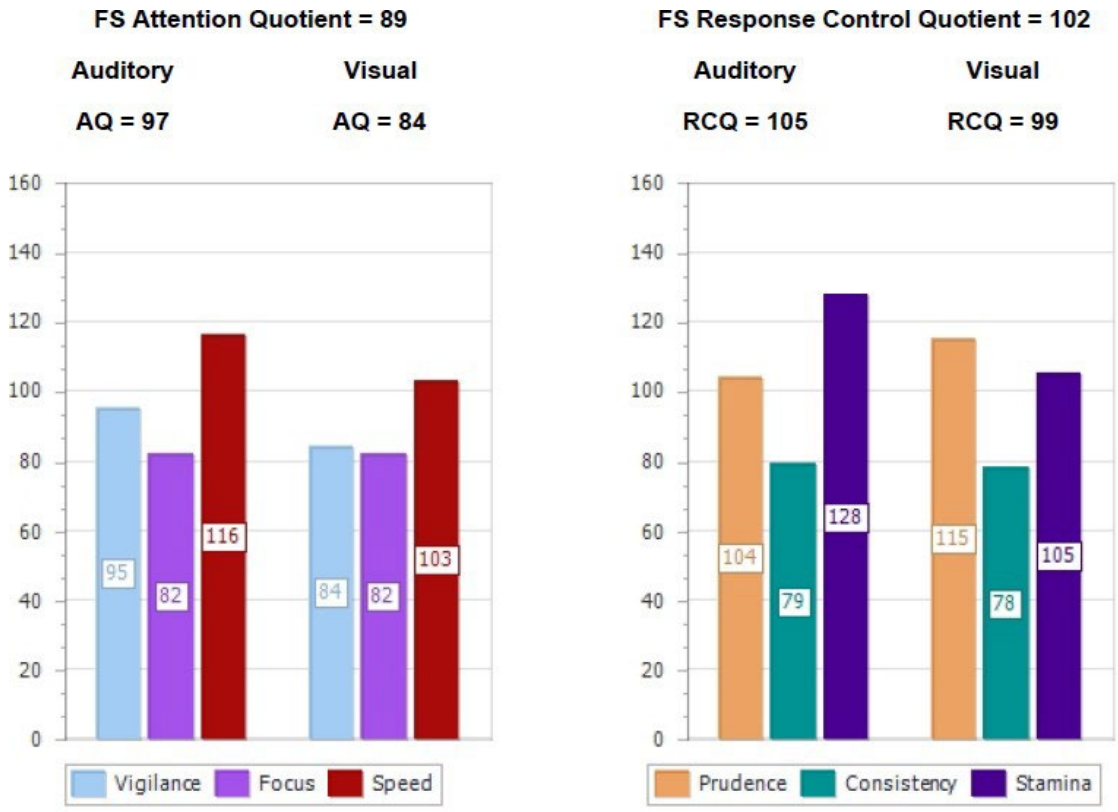


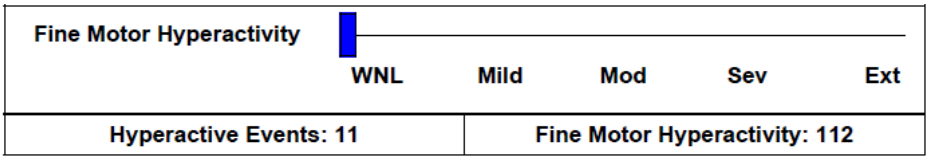




Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	76.9%	36	
Comprehension (V)	58.6%	0	
Persistence (A)	121.2%	111	
Persistence (V)	106.5%	99	
Sensory/Motor (A)	345 ms	105	
Sensory/Motor (V)	322 ms	100	

13. Zoe's Fourth Assessment Results (2 graphs)



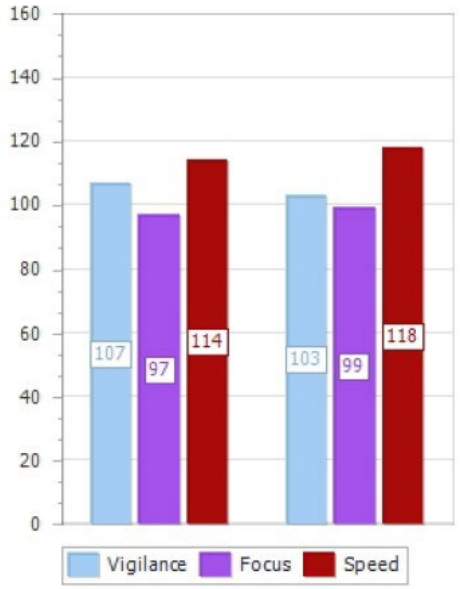


Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	99.2%	112	
Comprehension (V)	92.9%	99	
Persistence (A)	107.0%	105	
Persistence (V)	108.5%	100	
Sensory/Motor (A)	371 ms	102	
Sensory/Motor (V)	369 ms	90	

14. Zoe's Assessment Results 4 Months after Treatment (2 graphs)

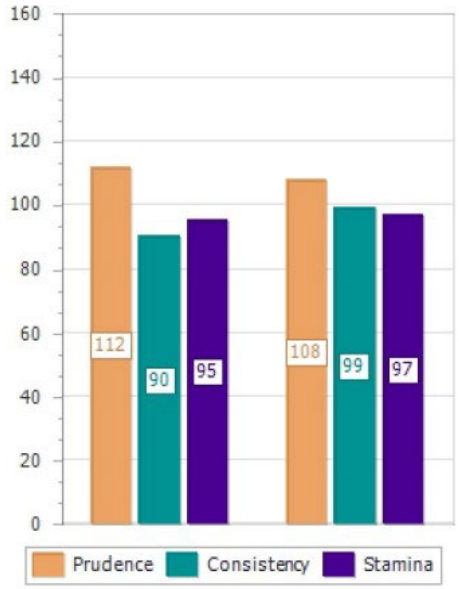
FS Attention Quotient = 110

Auditory	Visual
AQ = 109	AQ = 110



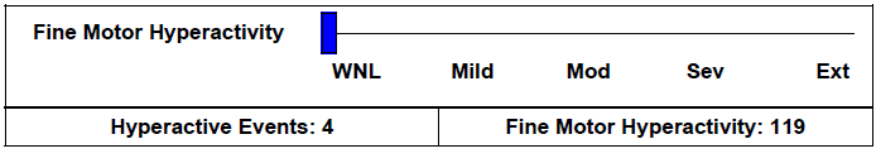
FS Response Control Quotient = 100

Auditory	Visual
RCQ = 99	RCQ = 102



Sustained Auditory Attention Quotient = 108

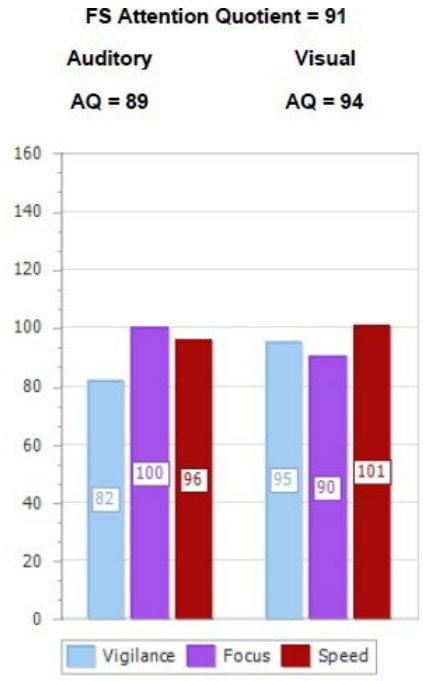
Sustained Visual Attention Quotient = 112

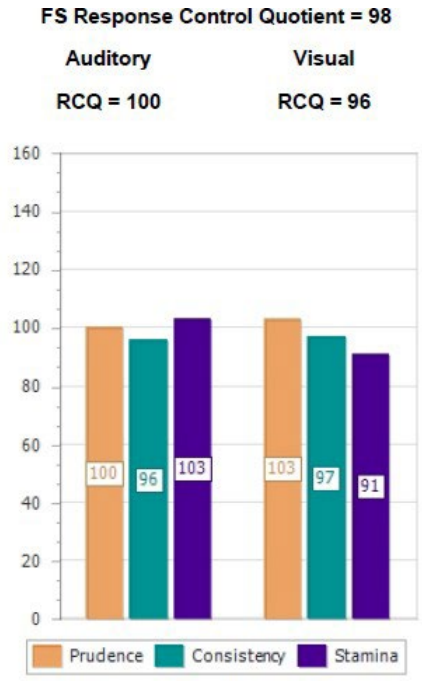


Hyperactive Events: 4	Fine Motor Hyperactivity: 119

Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	97.7%	107	
Comprehension (V)	99.3%	118	
Persistence (A)	60.6%	86	
Persistence (V)	98.3%	97	
Sensory/Motor (A)	329 ms	107	
Sensory/Motor (V)	322 ms	100	

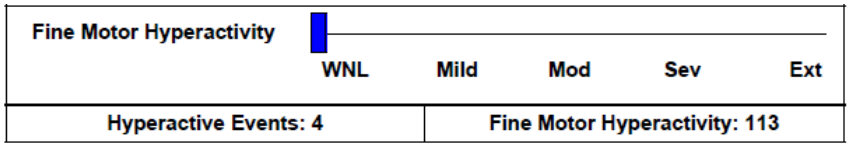
15. Zoe's Assessment Results 21 Months after Treatment (2 graphs)





Sustained Auditory Attention Quotient = 94

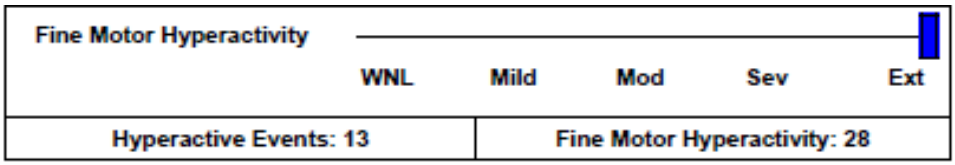
Sustained Visual Attention Quotient = 99



Hyperactive Events: 4	Fine Motor Hyperactivity: 113

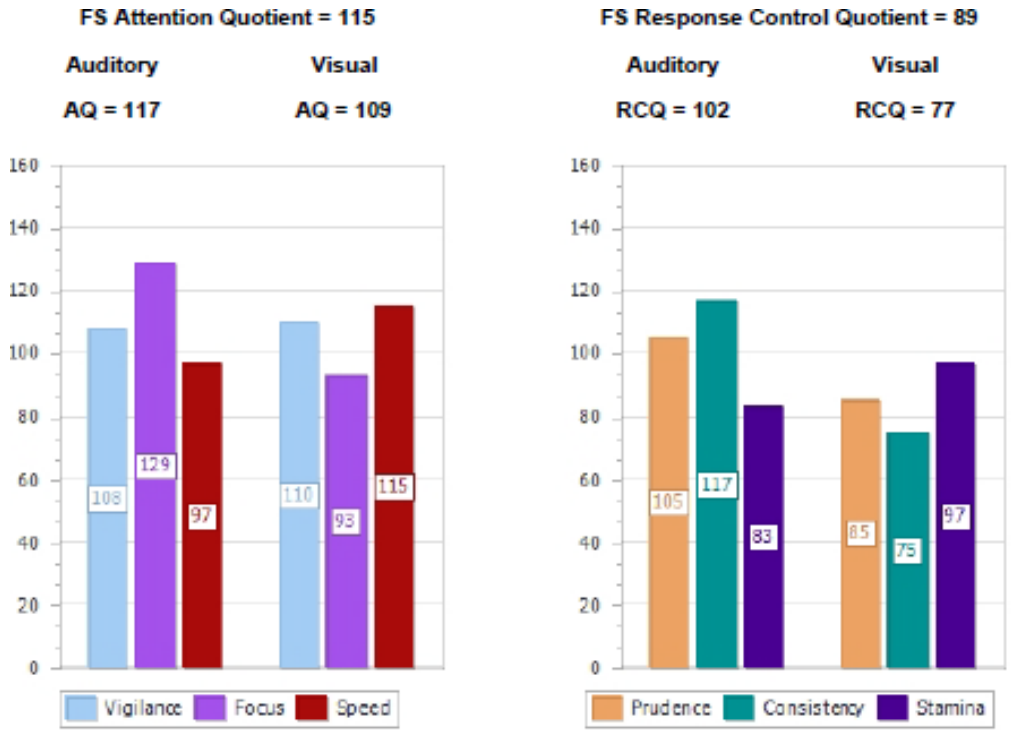
Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	99.2%	108	
Comprehension (V)	97.9%	102	
Persistence (A)	74.9%	88	
Persistence (V)	85.1%	94	
Sensory/Motor (A)	359 ms	93	
Sensory/Motor (V)	265 ms	99	

16. Jasmine's Initial Assessment Results (2 graphs)



Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	67.7%	0	
Comprehension (V)	63.6%	0	
Persistence (A)	102.0%	105	
Persistence (V)	98.0%	107	
Sensory/Motor (A)	251 ms	108	
Sensory/Motor (V)	229 ms	94	

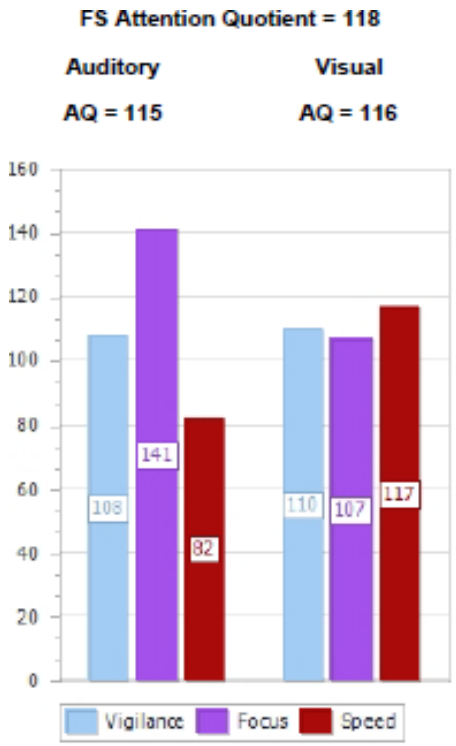
17. Jasmine's Second Assessment Results (2 graphs)

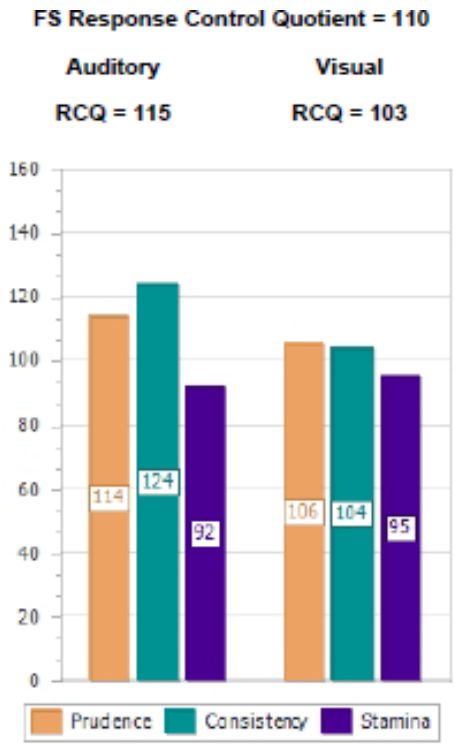


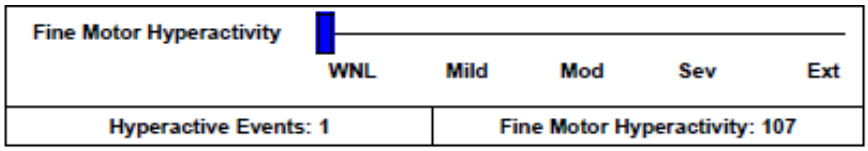
Fine Motor Hyperactivity	WNL	Mild	Mod	Sev	Ext
Hyperactive Events: 15	Fine Motor Hyperactivity: 15				

Symptomatic	Raw	Quotient	WNL	Mild	Mod	Sev	Ext
Comprehension (A)	100.0%	106					
Comprehension (V)	100.0%	105					
Persistence (A)	73.8%	85					
Persistence (V)	97.7%	106					
Sensory/Motor (A)	369 ms	84					
Sensory/Motor (V)	213 ms	103					

18. Jasmine's Third Assessment Results (2 graphs)

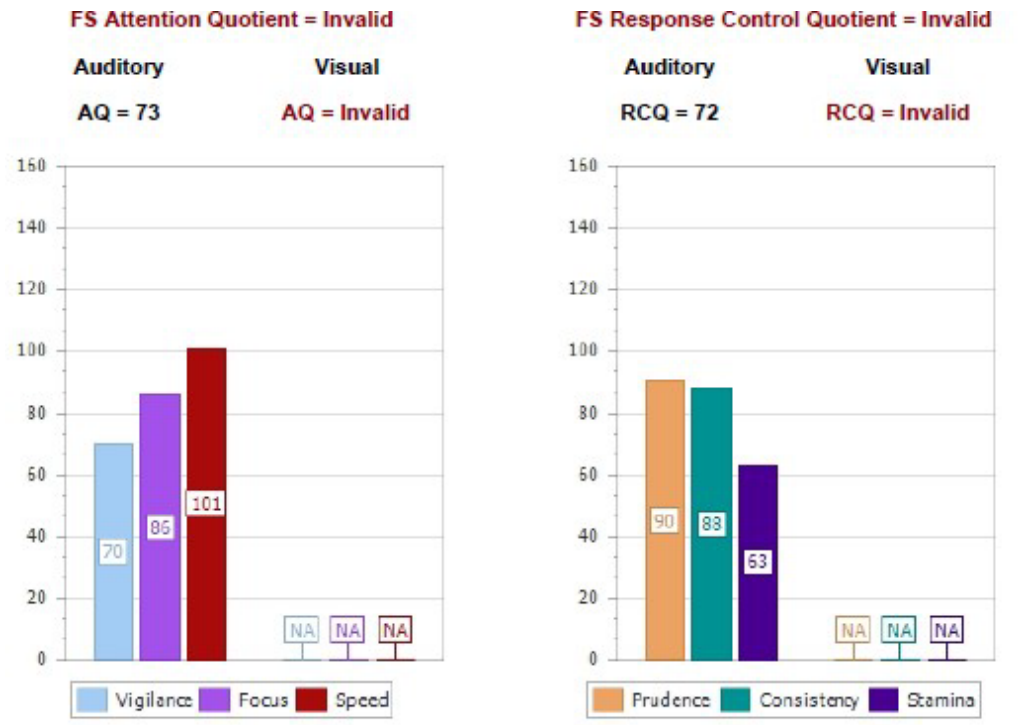






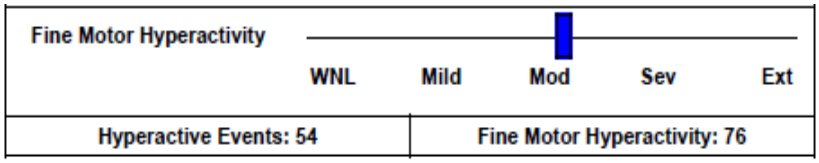
Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	99.2%	94	
Comprehension (V)	99.3%	94	
Persistence (A)	98.7%	103	
Persistence (V)	85.0%	91	
Sensory/Motor (A)	395 ms	79	
Sensory/Motor (V)	208 ms	106	

19. Timmy's Initial Assessment Results (2 graphs)



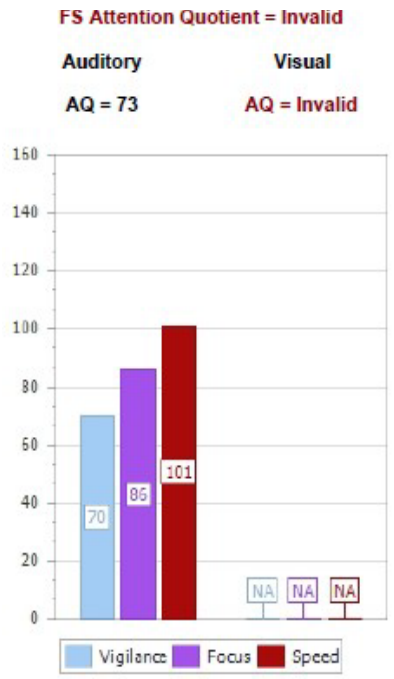
Sustained Auditory Attention Quotient = 69

Sustained Visual Attention Quotient = Invalid

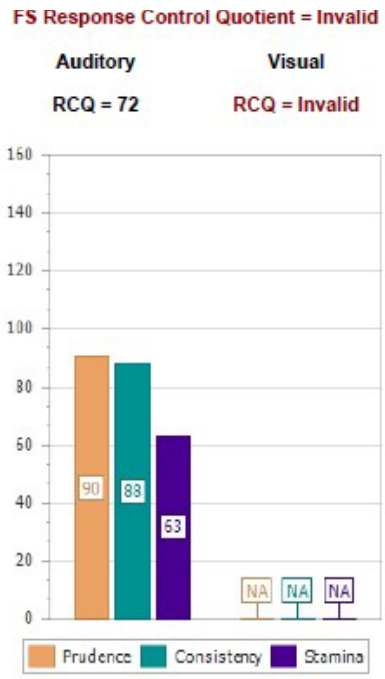


Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	93.8%	94	
Comprehension (V)	49.3%	10	
Persistence (A)	93.8%	101	
Persistence (V)	60.4%	74	
Sensory/Motor (A)	313 ms	102	
Sensory/Motor (V)	311 ms	84	

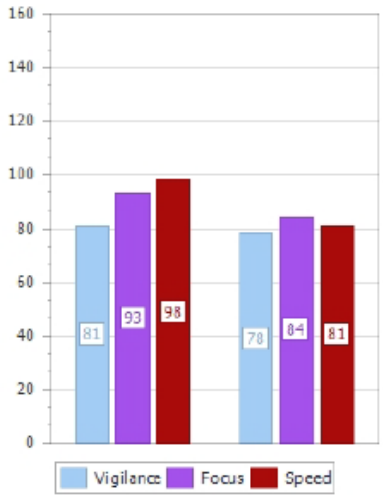
20. Timmy's Initial and Second Assessment Results (4 graphs)



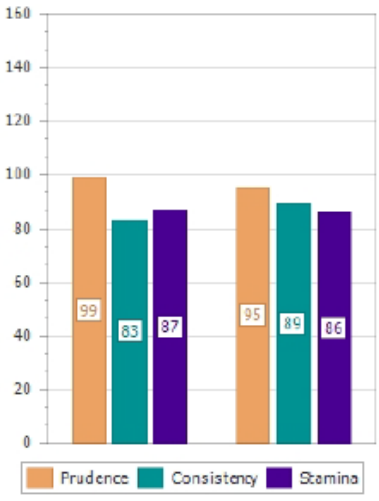
Sustained Auditory Attention Quotient = 69



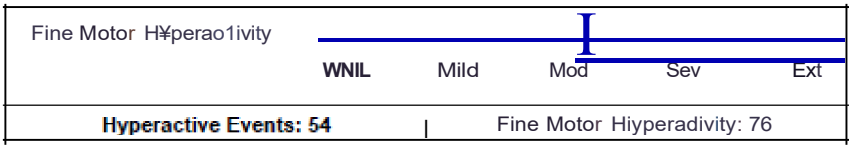
Sustained Visual Attention Quotient = Invalid



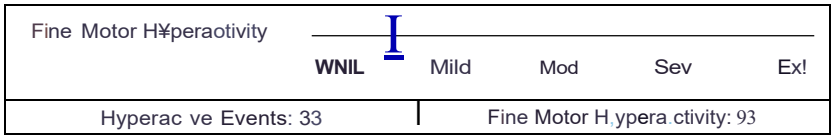
Sustained Auditory Attention Quotient = 50



Sustained Visual Attention Quotient = 61

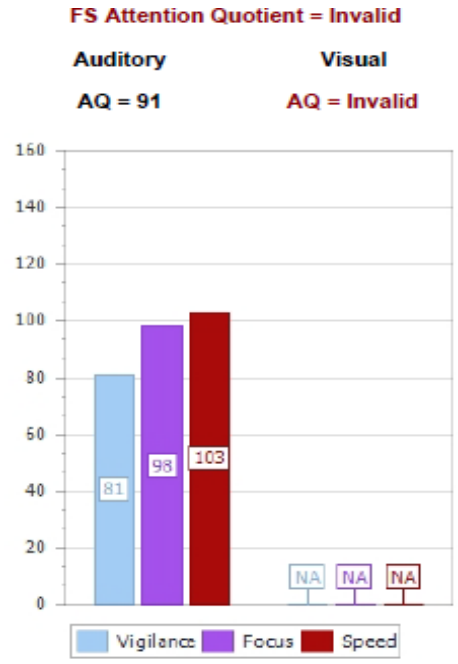


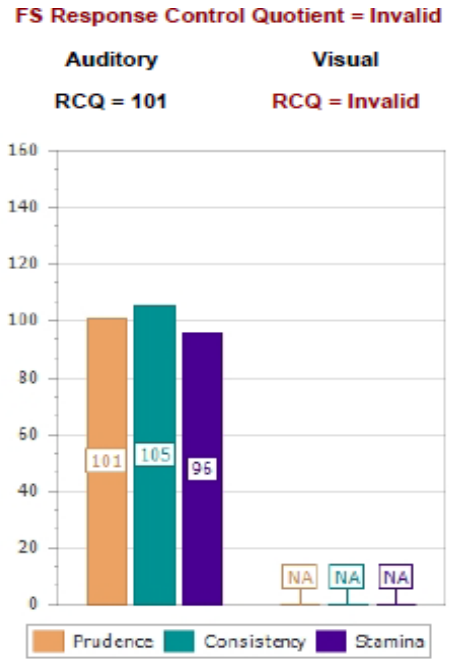
Symptoma.tic	R.aw	Ql!lotieint	WNL M1ld Mod Sev Ext
·Com:prelitensio,m(Al	93.8%	94	
Compr,ehension (VJ	49.J¾	10	
Pe1rsis,te1nce 'IA)	93.8%	10eil	
Persistenoe [V)	60.4%	74	
SeliliSOl'YfMotor (A)	313ms	10.2	
SemsorylMotor 'IV)	311 ms	84	



Symptomatic	R.aw	Ql!lotieini	WNL Mild Mod Sev Ext
Com:prelitensiom'IA)	80 .0%	'46	
Compfehension {V)	77.1%	69	
Pe1rsiste1nc,eIA)	65.9%	88	
Persisteinoe [V)	79 .'6%,	87	
SelilJSmyfM,otor (A)	271 ms	110	
Selil/sorylMoto,r(V),	264ms	104	

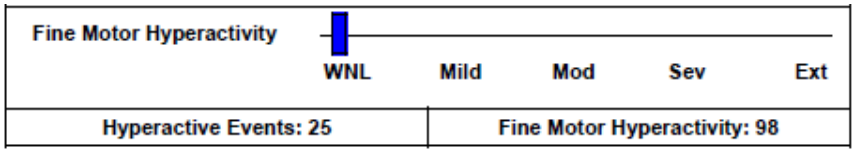
21. Andrea's Initial Assessment Results (2 graphs)





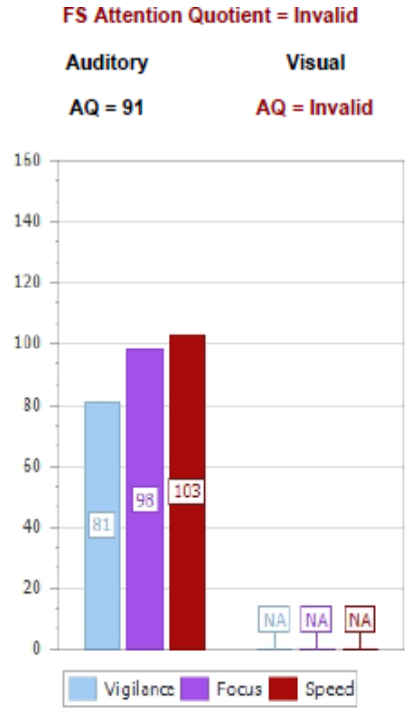
Sustained Auditory Attention Quotient = 74

Sustained Visual Attention Quotient = Invalid

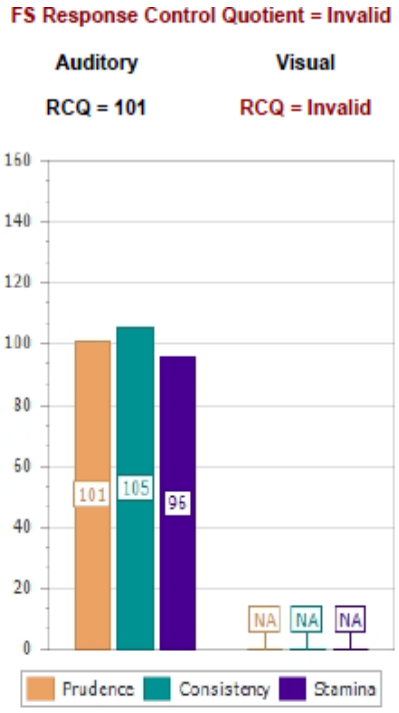


Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	86.9%	70	
Comprehension (V)	76.4%	52	
Persistence (A)	99.9%	102	
Persistence (V)	125.3%	106	
Sensory/Motor (A)	270 ms	114	
Sensory/Motor (V)	290 ms	107	

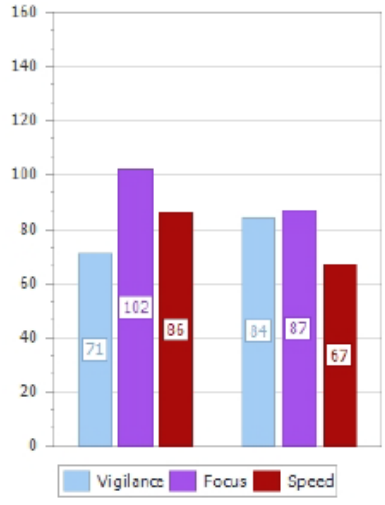
22. Andrea's Initial and Second Assessment Results (4 graphs)



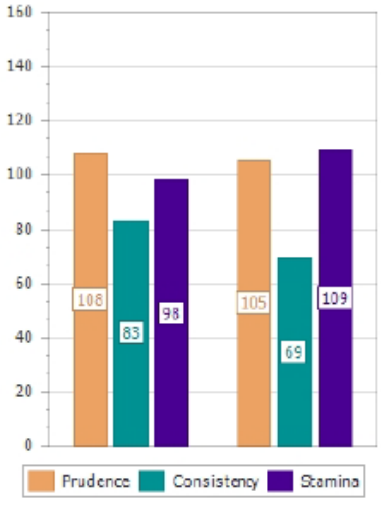
Sustained Auditory Attention Quotient = 74



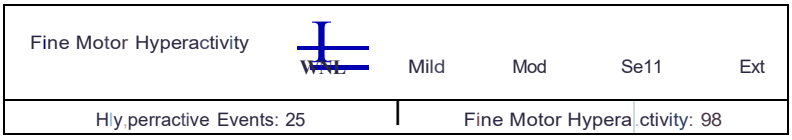
Sustained Visual Attention Quotient = Invalid



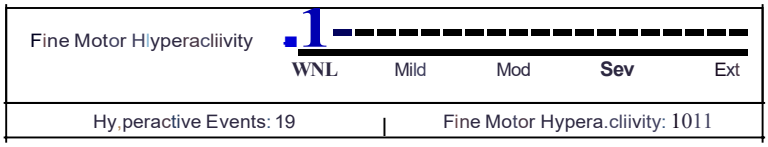
Sustained Auditory Attention Quotient = 60



Sustained Visual Attention Quotient = 63



Syrmptoma.liic	Raw	Quotieint	WNL Mildl Mod Sev Ext
Comprelilension (Al	86.9%	70	
Comprehension (V)	76.4%	52	
Perrsisteinc,e(A)	99.9%	102	
Persistence (V)	1.25.3%	106	
Sen,sorylMotor (A)	270 ms	**114**	
Sensory/Motor fV),	290 ms	107	

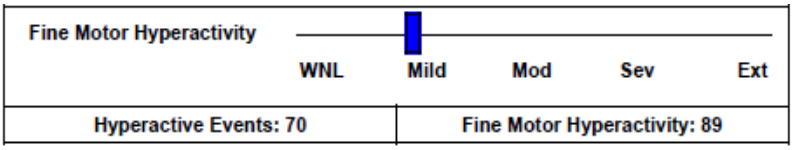


Symptomatic	**Raw**	Quotieinl	WNL Mildl **Mod** **Sev** Ext
Comprehension !Al	85.4%,	52	
Complehension [V)	90.0%,	83	
Persistence IA)	72.!l"/4	**89**	
Persistence (V)	77.9%	91	
SellJSOlfYlMO!or (A)	260 ms	**114**	
Sensory/Motor IV),	274ms	102	

23. Amanda's Initial Assessment Results (2 graphs)

Sustained Auditory Attention Quotient = Invalid

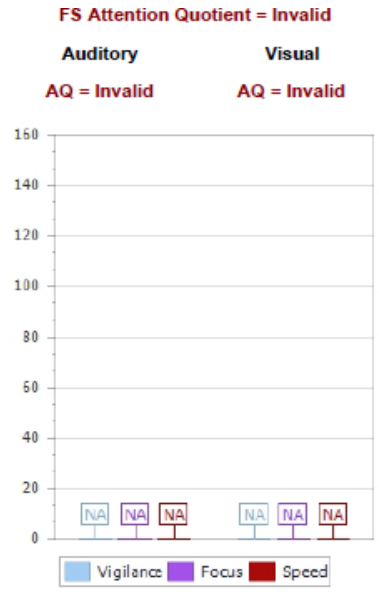
Sustained Visual Attention Quotient = Invalid



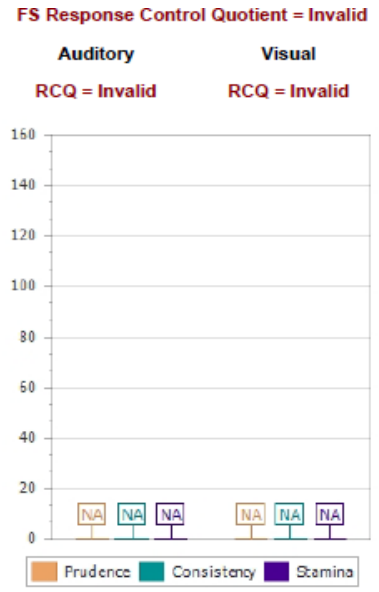
Hyperactive Events: 70	Fine Motor Hyperactivity: 89

Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (A)	70.8%	36	
Comprehension (V)	61.4%	53	
Persistence (A)	73.7%	89	
Persistence (V)	86.8%	92	
Sensory/Motor (A)	365 ms	103	
Sensory/Motor (V)	347 ms	92	

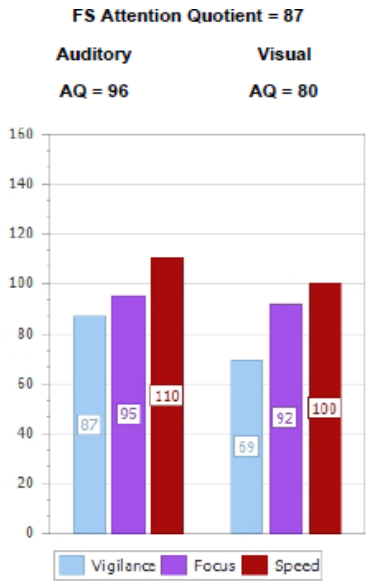
24. Amanda's Initial and Second Assessment Results (4 graphs)



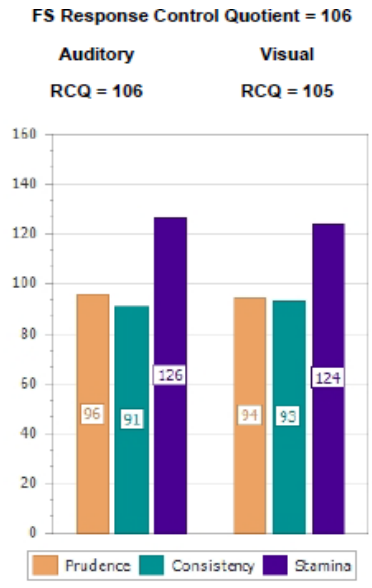
Sustained Auditory Attention Quotient = Invalid



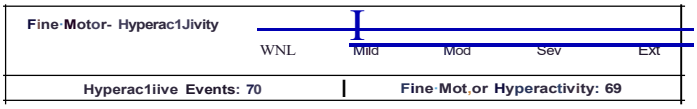
Sustained Visual Attention Quotient = Invalid



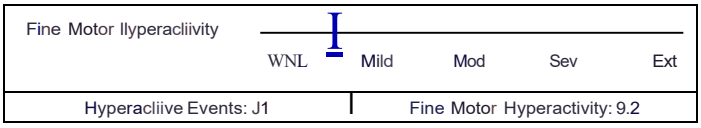
Sustained Auditory Attention Quotient = 89



Sustained Visual Attention Quotient = 83



Symptomatiic	Raw	Quotie nt	WNL Mild Mod Sev Ext
Comprehension CAI	70.8%	36	
Comprehensmon (V)	61.4%	53	
Persistence (A)	73.7%	89	
Persistence (VI	86.8%	92	
SensoryfMotor-(A)	365ms	1°'3	
Sensory/Motor CV)	347ms	92	



Symptomatic	Raw	Quotient	WNL Mild Mod Sev Ext
Comprehension (Al	93.1%	91	
Comp,ehension (V)	93.6"/2	101	
Persistence IA)	94.5%	100	
Persistence [V)	96.9.%	96	
Sensory/Motor (A)	433ms	94	
Sensory/Motor (V▶	321 ms	100	

aPPenDix a

arTifacT correcTeD neurofeeDback

To better understand what artifact corrected neurofeedback is, it is necessary to define the term artifact.[1] As used here, the term 'artifact' refers to facial movements that can affect EEG signals in a neurofeedback system. For neurofeedback processes, research has shown that different kinds of signals can be detected by the EEG unit that are different from brain waves. These different kinds of signals are called electromyographical (EMG) signals that come from the person's scalp, eyes, facial muscles, tongue, and even their heart.

EMG signals are referred to as artifacts and need to be corrected (removed).[2] Because EMG signals are one thousand times stronger than EEG signals, they can contaminate, mimic, and obscure EEG data.[3] As LaMarca reported, "EMG artifact has the potential to degrade, if not entirely negate, the neurofeedback training process.[4] Research has demonstrated that facial EMG activity can create very high-amplitude artifact signals that contaminate the EEG frequencies between 0.025 and 32 Hz5, which is the range of the most commonly trained neurofeedback frequency bands."

So the term artifact corrected means the neurofeedback system is able to remove the unwanted artifacts (EMG signals) from the EEG measurements. Research has demonstrated that in doing so, brain

training results are improved. Specifically, LaMarca found that by using artifact corrected neurofeedback, participants in his double-blind research study saw significantly greater improvements in auditory and visual processing abilities than participants who used non-artifact corrected neurofeedback.[6]

aPPenDix b

DescriPTion of iVa2 scores

IVA2 Global and Standard Composite Scores[1]

The IVA2 provides nine global composite scores to help understand the various ways ADHD-type problems can be identified by this assessment.

IVA2 Measure	Description of Measure
Full Scale Response Control Quotient (FRCQ)	Based on six primary visual and auditory scales each and equal weights (not an average) of ARCQ and VRCQ scales.
Auditory Response Control Quotient (ARCQ)	Derived from auditory Prudence, Consistency, and Stamina scales
Visual Response Control Quotient (VRCQ)	Derived from visual Prudence, Consistency, and Stamina scales
Full Scale Attention Quotient (FAQ)	Based on six primary visual and auditory scales each based on equal measures of visual and auditory Vigilance, Focus, and Speed

IVA2 Measure	Description of Measure
Auditory Attention Quotient (AAQ)	Based on equal measures of auditory Vigilance, Focus, and Speed
Visual Attention Quotient (VAQ)	Based on equal measures of visual Vigilance, Focus, and Speed
Sustained Full Scale Attention Quotient (SFAQ)	Combined global measure of the SAAQ and SVAQ global scales
Sustained Auditory Attention Quotient (SAAQ)	Provides a global measure of a person's ability to respond to auditory stimuli under low demand conditions
Sustained Visual Attention Quotient (SVAQ)	Provides a global measure of a person's ability to respond to visual stimuli under low demand conditions

aPPenDix c

iVa2 DefiniTions

IVA2 Assessment Rating Definitions[1]

The Attention scales for auditory and visual processing are Vigilance, Focus, and Speed:

- The **Vigilance** scale measures problems related to inattention. People with low Vigilance scores may appear to be negligent or indifference. In contrast, when individuals score high on Vigilance they are described as watchful, alert, and attentive.
- The **Focus** scale is sensitive to variability in responses and can indicate problems related to "drifting off." Low scores on the Focus scale suggest the person has trouble remaining attentive and may have difficulty tuning out distractions such as sounds or activity taking place around them. They may be viewed as erratic or inconsistent. In contrast, a high Focus score relates to the person who is directed, efficient, concentrated, steady, or conscientious. People with a high Focus score may be better able to "tune out" distractions.
- The **Speed** scale is related to mental processing or how quickly a person can respond to information. An individual with a low Speed score may be mentally slow or may tend to delay.

In contrast, when individuals score high on Speed scale their performance is described as quick, fast, rapid, and swift.

The Response Control scales for auditory and visual processing are Prudence, Consistency, and Stamina:

- **Prudence** is a measure of impulsivity, or of the ability to stop, think and not automatically react. A person with a low Prudence score can be described as having problems with impulse control. People with low Prudence scores may demonstrate tendencies toward carelessness, thoughtlessness, or over-reactivity. In contrast, individuals with a high score on Prudence are described as careful to consider circumstances and possible consequences, mindful, and cautious.
- **Consistency** is a measure of the ability to perform in a generally reliable manner over time. A low Consistency score suggests the person may have difficulties keeping his or her attention directed. Low Consistency scale scores may be due to wandering of attention causing the person to stray off-task more than others without this problem. In contrast, individuals with a high Consistency score are described as disciplined, purposeful, harmonious thinking, with efficient, coherent, reliable and dependable mental processing. These individuals can ignore or inhibit distracting thoughts, feelings or environmental stimuli.
- **Stamina** is a measure of the increase or decrease in a person's response time speed during the test. Stamina can be useful in identifying difficulty maintaining a sustained effort over time. When a person has a low Stamina score, they can be described as having limited attentional energy and difficulty maintaining their speed of mental processing.

The **Fine Motor Hyperactivity** Scale provides additional information by recording off-task behaviors with the mouse, including multiple clicks, spontaneous clicks during instruction periods, anticipatory clicks, and holding the mouse button down. In behavioral terms, the Fine Motor Hyperactivity score quantifies fidgetiness and restlessness associated with small motor hyperactivity.

aPPenDix D

Differences beTWeen iePs, 504 Plans, anD inDiViDual serVice Plans

Individualized Educational Plans (IEP) and 504 Plans are offered through a public school.

The **IEP** is part of the Individuals with Disabilities Education Act (IDEA). It is a written document developed for each public school child who is eligible for special education. It is designed to meet your child's unique educational needs guaranteeing the necessary supports and services that are agreed upon.

Section 504 is a part of the Rehabilitation Act of 1973 that prohibits discrimination based upon disability. It is an anti-discrimination civil rights statute that requires the needs of students with disabilities to be met as adequately as the needs of the non-disabled are met.

Individual Service Plan (ISP) is offered through a private school. Private schools are not required to offer special education services although some may do so. Some private schools offer ISPs for specialized services within their own system; however, most specialized services are provided through the Local Education Agency (LEA) versus the school. Due to limited funding, these services may be similar, but fewer than those provided through a public school.

Description	IEP	504	Individual Service Plan
What It Does	An IEP spells out the services, supports, and specialized instruction your child with a disability will receive in school. These services are provided at no cost to parents.	Provides services and changes to the learning environment to enable students to learn alongside their peers. As with an IEP, a 504 plan is provided at no cost to families.	A service plan spells out the special education and related services the LEA will make available to your child. These services are provided at no cost to parents. But your child may not be able to receive these services at the private school. Instead, the LEA can require your child to go to a public school for services like speech therapy sessions.
What Law Applies	The Individuals with Disabilities Education Act (IDEA). This is a federal special education law for children with disabilities.	Section 504 of the Rehabilitation Act of 1973. This is a federal civil rights law to stop discrimination against people with disabilities.	§34 CFR 300.130 through §300.144 of IDEA is a specific section that describes how services are provided to children in private school.

Description	IEP	504	Individual Service Plan
Who's Eligible	To qualify for an IEP, your child must: • Have one of the 13 disabilities covered under IDEA • Need special education for their disability in order to successfully benefit from and access a general education curriculum	To get a 504 plan, there are two requirements: 1. A child (age 3-22) has *any* disability. Section 504 covers a wide range of different struggles in school. 2. The disability must interfere with the child's ability to learn in a general education classroom. Section 504 has a broader definition of a disability than IDEA. 504 states that a disability must substantially limit one or more basic life activities. This can include learning, reading, communicating, and thinking. This is why a child who doesn't qualify for an IEP might still be able to get a 504 plan.	To qualify for a service plan, a child must: • Be placed in a private school by the parents, not as an out-of-district placement • Have one of the 13 disabilities covered under IDEA • Need special education in order to successfully benefit from and access a general education curriculum

Description	IEP	504	Individual Service Plan
Independent Educational Evaluation	Families can ask the school district to pay for an (IEE) by an outside expert. The district doesn't have to agree. Families can always pay for an outside evaluation themselves, but the district may not give it much weight.	Does not allow families to ask for an IEE. As with an IEP evaluation, families can always pay for an outside evaluation themselves.	Families can always pay for an outside evaluation themselves, but the school may not give it much weight.
Who Creates the Plan	An IEP must be created by a team that includes: • A parent or legal guardian • A general education teacher • A special education teacher • A professional who can interpret evaluation results • A school administrator who knows about general and special education and who oversees special education services at the school	The rules about who is on the 504 team are less specific than for an IEP. A 504 plan is created by a team of people who are familiar with the child and who understand the evaluation data and special services options. This might include: The child's parent or caregiver General and special education teachers The school principal	A service plan must be created by the same people who make up an IEP team, as well as a representative of the private school.

Description	IEP	504	Individual Service Plan
What's In It	The IEP sets learning goals and describes the services the school will provide. It's a written document. The most important things the IEP must include: • The child's present levels of academic and functional performance—how the child is currently doing in school • Annual education goals for the child and how the school will track progress • The services the child will get—this may include special education, related, supplementary, and extended school year services • The timing of services—when they start, how often they occur, and how long they last • Any accommodations—changes to the child's learning environment	There is no standard 504 plan. Unlike an IEP, a 504 plan is not required to be a written document. A 504 plan generally includes the following: Specific accommodation supports, or services for the child Names of who will provide each service Name of the person responsible for ensuring the plan is implemented	A service plan does not have to ensure your child is provided with FAPE (free appropriate public education); however, services are to be equitable.

Description	IEP	504	Individual Service Plan
	• Any modifications—changes to what the child is expected to learn or know • How the child will participate in standardized tests • How the child will be included in general education classes and school activities		
Parent Consent	Parents must provide written consent for the school to evaluate your child. They also have to provide written consent before the school can provide the services in an IEP.	A parent or caregiver's consent is required for the school district to evaluate your child.	A parent must provide written consent for a child to be evaluated. The LEA will conduct the evaluation. A parent might request that the LEA in which the private school is located evaluate your child instead of the LEA in your local district. But the LEA will make the final decision.

Description	IEP	504	Individual Service Plan
Your Rights and Your Child's Rights	IDEA requires public schools to provide services to students in the least restrictive environment (LRE). Parents have a say in the educational decisions for their children. Under IDEA, there are specific rights and protections for parents, as well as for children with learning and thinking differences. These are called procedural safeguards.	There are fewer rights and safeguards in the 504 process. Parents have a right to receive notice regarding the identification, evaluation, and/or placement of your child. Examine relevant records pertaining to your child. Request an impartial hearing with respect to the district's actions if there is a dispute about the 504 process.	Parents have a say in the educational decisions for your child. LEAs must evaluate students in private schools who may need special education. If a parent thinks the LEA has failed to identify or evaluate their child, they can follow due process procedures. Parents don't have due process rights if they are concerned a school isn't providing a FAPE.
How Often Reviewed and Revised	An IEP must be reviewed at least once a year. Your child must also be re-evaluated every three years to see if services are still needed.	The rules vary by state. Generally, a 504 plan is reviewed each year and a reevaluation is done every three years or when needed.	IDEA says a service plan must be reviewed "to the extent appropriate" as often as an IEP. It doesn't specify how often a service plan must be updated.

See Reference Section for sources.

aPPenDix e

anTonio's iniTial assessMenT iVa2 coMPrehensiVe rePorT (abriDgeD)

Name: Antonio

Age: 14 Sex: M

The IVA2 CPT (Integrated Visual & Auditory 2 Continuous Performance Test) is a test of attention and impulsivity that measures responses to intermixed auditory and visual stimuli. The quotient scores for all of the IVA2 scales are reported as standard scores (Mean = 100, SD = 15).

VALIDITY OF IVA2 TEST RESULTS

The main test results were found to be valid. All global and primary test scale scores can be interpreted without reservation. This individual's response pattern did not reveal any apparent abnormalities in his responses to either visual or auditory test stimuli. The examiner can proceed in an interpretation of all visual and auditory test scores without reservation.

SUMMARY OF TEST RESULTS FOR THE IVA2 GLOBAL SCALES

The Full Scale Response Control Quotient is a global measure of the overall ability for this individual to regulate his responses and respond appropriately. This individual's overall global quotient scale score for the **Full Scale Response Control** scale was 105. This score fell in the average range. His **Auditory Response Control** quotient scale score was 111. This global scale score fell in the above average range. The **Visual Response Control** quotient scale score for this individual was 98. This global scale score fell in the average range.

The Full Scale Attention Quotient provides a measure of an individual's overall ability to accurately and quickly respond while maintaining focus. This individual's overall quotient score on the **Full Scale Attention** scale was 83. This global scale score fell in the mildly impaired range. His **Auditory Attention** quotient scale score was 87, and this global scale score fell in the slightly impaired range. The **Visual Attention** quotient scale score for this individual was 85. This global scale score was classified as falling in the slightly impaired range.

The Combined Sustained Attention quotient scale score provides a global measure of a person's ability to accurately and quickly respond in a reliable manner to stimuli under low demand conditions. In addition, it includes the ability to sustain attention and be flexible when things change under high demand conditions. These are reported as separate scale scores for both the auditory and visual modalities. This individual's global quotient score on the **Combined Sustained Attention** scale was 60. This score fell in the extremely impaired range. His global **Auditory Sustained Attention** quotient scale score was 74, and it fell in the moderately impaired range. The global **Visual Sustained Attention** quotient scale score for this individual was 61. This score was found to fall in the severely impaired range.

ATTENTION PRIMARY SCALES

Vigilance, Acuity, and Elasticity

Vigilance is a Primary scale that measures general attentional ability. This person's **Auditory Vigilance** quotient scale score was 87, which falls in the slightly impaired range. This individual showed a few problems with his general auditory attentional functioning that may on occasion affect his ability to perform adequately and to process auditory information accurately. He missed a few key auditory stimuli. Thus, he is likely to have a few problems with listening and processing auditory information in the school environment. Environmental stressors and social distractors may exacerbate his auditory attention problems at times.

This individual's quotient score was 76 on the **Auditory Acuity** scale. This quotient score was in the mildly to moderately impaired range. The Auditory Acuity scale showed that his ability to pay attention under low demand conditions to the auditory targets was mildly to moderately impaired. In other words, he had significant problems remaining alert when the non-targets were prevalent. This dysfunction in auditory attention indicates that he is likely to "tune out" periodically when there is little demand to perform, unless he is actively engaged in the task at hand. Behavioral interventions need to be considered to keep him on task and better manage his problems sustaining attention. Cognitive behavioral exercises may be beneficial for him as a way to develop his ability to maintain attention to routine tasks or uninteresting school assignments.

This individual's **Auditory Elasticity** quotient scale score was 106. This quotient score fell in the average range. The Auditory Elasticity scale showed a strength in his ability to be mentally flexible and make accurate responses under high demand conditions. In other words, this individual was able to maintain his attention and remain alert, even after inhibiting his response to the non-target. However, under low demand conditions, he showed difficulties in auditory attentional functioning that were discussed above.

He was found to attend relatively better under high demand conditions with respect to his ability to respond accurately to auditory targets than under low demand conditions. He became relatively less attentive under low demand conditions and showed difficulty sustaining his auditory attention when the test task did not actively engage him, as shown by his relatively greater impairment in the Auditory Acuity quotient scale score. Consequently, this individual is most prone to have difficulty attending to auditory stimuli unless the environment or motivational factors require him to be actively engaged. Individuals with this type of problem may generally "tune out" more often under low demand conditions. Problems are likely to manifest in terms of incomplete work or failure to fully perform assigned tasks that are auditory in nature. Individuals who have this type of auditory attentional deficit may benefit from accommodations that help them to stay on task, such as external reminders or immediate feedback of off-task behaviors. In addition, computerized exercises to help them learn how to better sustain their auditory attention and multi-modal sensory instructional techniques are likely to increase their ability to stay engaged and attentive.

This person's **Visual Vigilance** quotient scale score of 84 fell in the mildly impaired range. His general visual attentional functioning showed some problems that will sometimes impact his ability in some areas of his life to perform successfully. He exhibited moments of inattention to key visual stimuli. This is likely to be reflected by occasional issues in the school environment involving difficulties in him being able to maintain visual attention. Social distractions and environmental stressors may worsen his deficits in visual attention. He may also have good and bad days with respect to his attentional abilities.

He had a mildly to moderately impaired **Visual Acuity** scale with a quotient score of 77. He had a mild to moderate impairment in his ability to pay attention to visual targets under low demand conditions. Unless actively engaged in the task at hand, he is likely to "tune out"

when there is little demand to perform. Behavioral interventions may help keep him on task and make him more aware of "drifting off." Cognitive behavioral exercises may assist him in developing his ability to sustain his attention to routine tasks or school assignments that don't interest him.

This individual's **Visual Elasticity** quotient scale score was average with a score of 106. The Visual Elasticity scale showed a strength in his ability to be mentally flexible and make accurate responses to targets under high demand conditions. After inhibiting his response to the non-target stimuli, he was able to maintain his attention and remain alert. However, as discussed above, he showed difficulties in visual attentional functioning under low demand conditions.

A significant difference was found in his abilities under low demand and high demand conditions, specifically in relation to the Visual Vigilance scale. He was found to attend relatively better under high demand conditions with respect to his ability to respond accurately to visual targets than under low demand conditions as reflected in his higher Visual Elasticity quotient scale score. He showed a greater relative ability to shift sets and was able to maintain his visual attention when the pace to perform was high. He showed difficulty sustaining his visual attention when the test task did not actively engage him, as shown by his relatively greater impairment in the Visual Acuity quotient scale score. Consequently, this individual is most prone to have difficulty attending to visual stimuli when the environment or motivational factors do not require him to be actively engaged. Individuals with this type of problem may generally "tune out" more often under low demand conditions. He is likely to fail to fully perform assigned tasks that are visual in nature. External reminders or immediate feedback of off-task behaviors are likely to be of benefit to him. Computerized exercises to help him learn how to better sustain his visual attention and multi-modal sensory instructional techniques are likely to increase his ability to stay engaged and attentive.

This individual's impairments in Vigilance occurred for both the auditory and visual modalities. Low scores in both of these sensory modalities are likely to lead to a compounding of problems in functioning. He showed no specific strengths in any one sensory modality that would enable him to compensate for his attention problems. This individual is likely to make errors of attention that will probably impact his home or school environment. Appropriate interventions will need to be considered with respect to these problems. Accommodations recommended above for both the visual and auditory modalities need to be considered in order to help him.

Focus, Dependability, and Stability

The Focus scale reflects an individual's ability to sustain attention reliably and not "drift off " or "tune out." Impairments in Focus result from relatively frequent slow response times to test stimuli that occur sporadically. These delays in response may occur due to momentary lapses in attention, confusion caused by deficits in working memory, episodic mental fatigue or deficits in sustaining attention.

This individual's **Auditory Focus** quotient scale score of 67 fell in the severely impaired range. Frequent delays in his response times to auditory test stimuli were found. This is likely to significantly impact his ability to process information. These lapses in auditory attention may lead to problems involving recall that affect the performance of this individual in a school environment. Learning new tasks, particularly when the information is presented verbally, is likely to be very challenging for him, and it will be necessary to review the material to help this person "fill in any gaps" in his learning experience. It may become evident that this individual "tunes out" when given verbal instructions. Accommodations may need to be made to help him stay alert in the school environment. This individual also needs to be encouraged to check the notes he takes during lectures or meetings, as "gaps" in his accuracy are likely to occur. Problems with emotional functioning may lead to learned helplessness, and assigned activities

may be incorrectly done due to an incomplete comprehension of the verbal instructions given. Auditory cognitive behavioral exercises can help this person recognize in a supportive way when he momentarily loses his attention when listening. These exercises can also help this individual develop his ability to better sustain attention and to inhibit internal distractions and negative thoughts that may preoccupy him.

He showed some problems with respect to the **Auditory Dependability** scale. His quotient score on this scale was 83, which falls in the mildly impaired range. However, his problems with remaining focused were found to be less prevalent when the required pace to pay attention was slower. Thus, this individual may be better able to make efforts and learn in the school and work environments, if the pace of instruction or presentation of new auditory information is provided more slowly. He may need some modification of his environment in order to help him stay more actively engaged in auditory tasks.

External reinforcement could also prove useful and will need to be considered as a way to stimulate him to be more resolute in sustaining his attention and perform more quickly. He may, though, at times be challenged by more routine tasks or tasks that are not intrinsically motivating for him. In these cases, the above modifications will need to be considered to help him.

A relative strength was found for him with respect to the **Auditory Stability** scale. His quotient score on this scale was 95, which falls in the average range. Consequently, he demonstrated the ability to make reliable responses to auditory stimuli under high demand conditions.

This person's **Visual Focus** quotient scale score of 91 fell in the average range. No problems were found for him with visual focus.

During the IVA2 test, his response times were not excessively variable. He demonstrated that he could cope well with both internal and external visual distractions and stay focused visually.

His **Visual Dependability** scale showed some problems with remaining focused when the required pace to pay attention was less demanding. His quotient score on this scale was 88. Thus, this

individual showed difficulty that may impact his efforts to learn and perform in the school environments. He may need some modification of his environment in order to help him stay more actively engaged in visual tasks. External reinforcements such as rewards or consistent prompting may prove useful as a way to stimulate him to improve his performance. Under stress or extremely demanding conditions, he may become challenged and have difficulty with routine tasks or tasks that are not intrinsically motivating for him. In these cases, the above modifications could very likely help him.

In respect to recognition reaction time, he was able to respond in a reliable manner as evidenced by the **Visual Stability** scale. His quotient score on this scale was 93, which falls in the average range. He demonstrated the ability to maintain his speed of response to visual stimuli under high demand conditions.

Speed, Quickness, and Swiftness

This individual's ability to process information and make decisions, as measured by the Speed scale, is an important variable that is likely to impact his performance in school settings with respect to being able to get work done within a reasonable time frame and with an acceptable degree of accuracy.

This individual's **Auditory Speed** quotient scale score of 119 falls in the above average range. This individual showed a strength in his overall auditory processing speed. His recognition reaction time falls within the above average range. His processing speed shows that he is above average with respect to his ability to perceive and respond to auditory stimuli. If problems exist with respect to listening skills, organizational abilities, working memory, emotional self-regulation, reading, or the ability to finish work tasks in a timely manner, the impact of environmental stimuli and social distractions needs to be evaluated and considered.

This individual's **Auditory Quickness** quotient scale score of 122 falls in the superior range. His quotient score on the **Auditory**

Swiftness scale was 95. This quotient score is interpreted as average. This individual's Auditory Quickness score is significantly higher than his Auditory Swiftness score. This indicates that he performed faster under high demand conditions (i.e., when the targets were frequent) as compared to low demand conditions (when the targets were rare). He was slower to a noticeable degree in his auditory processing speed under low demand conditions. He is likely to perform better in learning situations when the demand to perform is high and the tasks that he is required to do are engaging.

He had an average **Visual Speed** quotient scale score of 97. No problems were found with his overall visual processing speed. His recognition reaction time falls within the average range. His processing speed shows that he is able to perceive quickly and respond adequately to visual stimuli. If problems exist with respect to organizational abilities, visual memory, emotional self-regulation, or the ability to finish work tasks in a timely manner, the impact of other causal factors will need to be evaluated and considered. These factors may include environmental stimuli, social distractions, and emotional, cognitive, or psychological problems.

This individual's **Visual Quickness** quotient scale score of 99 falls in the average range. He had a mildly impaired **Visual Swiftness** scale score of 80. For visual targets, he was significantly faster under high demand conditions, as reflected by his higher Visual Quickness score in comparison to Visual Swiftness. He was slower to a noticeable degree in his visual processing speed under low demand conditions when the targets were rare. Consequently, he is likely to perform better in learning situations when there is a high expectation for performance and when he is actively engaged in the task.

RESPONSE CONTROL PRIMARY SCALES

Prudence and Reliability

Prudence is a measure of impulsivity as defined by errors of commission.

This individual's **Auditory Prudence** quotient scale score of 107 fell in the average range. This individual was found to be functioning in the average range with respect to his ability to inhibit responses to non-target auditory stimuli. Thus, he is able to control his responses and not be excessively distracted by auditory stimuli in his environment. He can shift sets well.

He exhibited some problems with respect to the **Auditory Reliability** scale. His quotient score on this scale was 80, which falls in the mildly impaired range. This pattern of responding indicates periods of random, idiopathic, impulsive clicks to non-target auditory stimuli, in other words, clicking to the non-targets under low demand conditions. The impact of this deficit will in most cases be mild, manifesting as careless errors or inappropriate responses to auditory stimuli in the home and school environments. Given his relatively poor score for the Reliability scale as compared to the Auditory Prudence scale, he may perform better on tasks that are more engaging and demanding. His pattern of responding indicates that he is likely at times to become bored and in these cases his mind may wander; leading to unusual, off-task responses.

This person's **Visual Prudence** quotient scale score of 94 fell in the average range. No problems with inhibition to non-target visual stimuli were identified. This individual demonstrated an average ability to control his responses and inhibit appropriately to non-target visual stimuli. This score on the Prudence scale indicates that he is unlikely to be distracted by visual stimuli. He showed the ability to regulate and shift sets on the IVA2 test which demonstrated self-control for visual stimuli when the environment frequently changes.

No problems were found for his **Visual Reliability** scale. The quotient score on this scale was 105, which falls in the average range. He was able to avoid making impulsive idiopathic errors that would lead to careless or inappropriate responses in his home and school environments.

Consistency

The Consistency scale is a general measure of an individual's ability to respond reliably based on his reaction time.

This individual was severely impaired in his ability to be consistent in his responses to auditory stimuli. His **Auditory Consistency** quotient scale score was 67. This variability reflects a delay in his optimum response time that is likely to significantly impact his ability to process auditory information. Problems in memory due to erratic information processing may be prevalent. This individual may have difficulties learning new tasks in the school environment. Repetition of instructions or information presented to him may help him to better understand new material. It may be necessary to provide a more restrictive environment with less distractions to enable this individual to be more consistent in his mental processing. A slower pace in the presentation of new concepts may also facilitate his ability to master new ideas. This individual needs to be encouraged and reinforced to review and check his work as he is likely to be prone to make careless errors. Cognitive behavioral exercises designed to improve auditory processing and sustained attention need to be considered in order to enhance his ability to process instructional material and to help improve his memory functioning.

This individual's ability to be consistent in his responses to visual stimuli was mildly impaired. The **Visual Consistency** quotient scale score for this individual was 83. In order to sustain attention to visual stimuli when required, this individual will need to learn to ignore internal and external distractions. Cognitive training exercises are likely to help him to enhance his ability for sustained detailed visual attention and visual memory. Written materials should be made available so that he can review them and better comprehend any new concepts or ideas presented. Otherwise, gaps in learning may occur. Careless visual errors are also likely to impair the accuracy of his responses. He needs to be encouraged to review all written responses and to learn how to "catch his own errors."

Stamina

The Stamina scale is a measure of the individual's ability to sustain his speed of response time during the course of the test.

This individual's **Auditory Stamina** quotient scale score of 148 fell in the exceptional range. This person's response time to auditory stimuli became faster over the course of the test. He was able to increase his mental processing speed in the auditory domain during the test. In a school setting, he is likely to be capable of meeting the demand to perform and to achieve goals in a timely manner. In respect to his auditory processing speed, his work habits are likely to reflect the ability to increase his efforts and to "rise to the occasion" even when he is faced with challenging tasks.

He had an above average **Visual Stamina** quotient scale score of 119. He was able to increase his mental processing speed in the visual domain during the test. He is unlikely to have any significant deficits in terms of meeting the demand to perform and to achieve goals in a timely manner. In his work habits, he is likely to double his efforts and meet the demand even when he is faced with visually challenging work.

Strengths were found in this individual for both the auditory and visual domains of the Stamina scale. This individual is likely to be able to get his work done quickly because of his strengths in stamina. He showed the ability to process and maintain his attention to both visual and auditory information over time.

Fine Motor Hyperactivity

The Fine Motor Hyperactivity Quotient measures off-task, spurious, impulsive, and inappropriate fine motor activity using the mouse input device. A person who is squirmy, restless, or who doodles or fiddles with small objects may score low on this scale. These kinds of response tendencies may be described as fidgetiness and restlessness. Quotient scores above the average range are considered reflective of better controlled and more self-regulated responses.

This person's **Fine Motor Hyperactivity** quotient scale score was 111. His score fell in the above average range. He made no spontaneous responses while the instructions preceding the Warm-up and Practice sessions were being delivered. This above average quotient score for the Fine Motor Hyperactivity scale indicates no significant problems in fine motor hyperactivity.

The lack of problems shown on the Fine Motor Hyperactivity scale suggests that he is likely to be able to follow simple general rules and not demonstrate fidgetiness. In many cases, this above average score on the Fine Motor Hyperactivity scale is considered a positive indicator regarding his ability to refrain from distracting others while they are working. His above average quotient score is interpreted as reflecting a high degree of fine motor control that is likely to benefit this individual. He is very likely to be able to engage in controlled and directed responses with respect to his general motoric skills.

SYMPTOMATIC SCALES

Comprehension, Steadiness, and Reliability

The Comprehension scale is a measure of idiopathic errors both of commission and omission occurring under both low and high demand conditions.

This individual's **Auditory Comprehension** quotient scale score of 86 fell in the slightly impaired range. Generally, he exhibited only slight problems with functioning adequately in terms of the Auditory Comprehension scale. His response pattern indicates that he is not very likely to have difficulties related to comprehension unless he is stressed or significantly fatigued. Further discussion regarding any relative weaknesses or strengths is presented below for the Steadiness and Reliability scales that comprise the Comprehension scale.

His **Auditory Steadiness** quotient scale score was 92. This quotient score fell in the average range. No significant problems with attention to auditory stimuli for this individual as measured by the Steadiness scale were identified as occurring under high demand conditions.

This individual demonstrated that he understood the test rules when required to respond to auditory targets when they were prevalent. His scale score showed no impairment.

On the **Auditory Reliability** scale, he had a quotient score of 80. This quotient score fell in the mildly impaired range. He showed some problems with respect to the Auditory Reliability scale. His pattern of responding indicates that there were a few periods when he engaged in random or impulsive clicking to non-target auditory stimuli. The impact of his deficit is likely to be mild, manifesting as occasional careless errors or inappropriate responses to auditory stimuli in his home and/or school environment.

This individual's **Visual Comprehension** quotient scale score of 54 fell in the extremely impaired range. Severe problems were identified for this individual with respect to the **Visual Comprehension scale**. He made a large number of idiopathic errors, showing significant trouble with test performance and difficulties in following the test rules.

His **Visual Steadiness** quotient scale score was 16. This quotient score fell in the extremely impaired range. When the requirement to perform is high his ability to respond appropriately to visual stimuli was found to be significantly impaired. His pattern of responding suggested a number of possible factors that could account for his poor visual functioning, including gross negligence, an attitude of indifference, or visual working memory deficits. In any case, his scale scores on both the Visual Comprehension and Steadiness scales reveal major impairments involving visual attentional functioning.

He had a quotient score of 105 on the **Visual Reliability** scale. This quotient score was in the average range. No problems with respect to the Visual Reliability scale were identified for him. He made few impulsive idiopathic visual errors of commission. He responded well to visual stimuli under low demand test conditions and was careful not to make errors.

Persistence

This individual's **Auditory Persistence** quotient scale score of 90 fell in the average range. There was no significant difference in his auditory reaction time during the Cool-down as compared to the Warm-up. Thus, his quotient score on the Persistence scale did not indicate any problems with his motivation that would impair his functioning on the IVA2 test. Given that his Auditory Stamina quotient score fell in the exceptional range, he was not identified by the test as being mentally fatigued in his ability to respond to auditory stimuli. This pattern of responding suggests that he does not get fatigued easily when required to process auditory stimuli.

This person's **Visual Persistence** quotient scale score of 90 fell in the average range. No significant difference was found in his visual reaction time during the Cool-down as compared to the Warm-up. Thus, his quotient score on the Persistence scale did not indicate any problems with his motivation that would impact his functioning on the IVA2 test. Given that his Visual Stamina quotient score fell in the above average range, he was not found to show any mental or motoric fatigue in respect to his ability to respond to visual stimuli. This pattern of responding indicates that he is not likely to become easily fatigued when he has to process visual stimuli.

Sensory/Motor

This individual's **Auditory Sensory/Motor** quotient scale score of 122 fell in the superior range. This scale score was computed based on the mean of the three fastest reaction times of his auditory responses during the Warm-up test period. His auditory simple reaction time was faster than most peers his age. This superior score on the Sensory/Motor scale indicates that he is likely to be able to process and respond quickly to auditory stimuli. His quotient score on the Sensory/Motor scale did not reveal any problems with functioning that would impair his test performance or affect him in his life. Given that his Auditory

Speed quotient score fell in the above average range, he was not found to have difficulties related to his auditory recognition reaction time.

This person's **Visual Sensory/Motor** quotient scale score of 113 was in the above average range. The mean of his three fastest visual reaction times during the Warm-up test period was used in determining this scale score. His visual simple reaction time scores were higher than most individuals his age. This above average score on the Sensory/Motor scale indicates that he is generally able to quickly process and respond quickly to simple visual stimuli. His quotient score on the Sensory/Motor scale did not identify any problems with functioning that would impair his test performance or affect him in his daily life. Given that his Visual Speed quotient score fell in the average range, he was not found to have problems related to his Visual Speed reaction time.

IVA2 DIAGNOSTIC CONSIDERATIONS

Even though this individual's global Full Scale Response Control quotient scale score did not indicate a significant impairment in functioning, his global Sustained Visual Attention quotient scale score did reveal a severe impairment. In addition, a moderate impairment was found in respect to this individual's Sustained Auditory Attention quotient scale score. There were two Attention Primary scales that fell in the substantially impaired range. One scale (Auditory Reliability) measuring commission errors showed that he had significant response control deficits.

aPPenDix f

anDrea's seconD assessMenT iVa2 coMPrehensiVe rePorT (abriDgeD)

Name: Andrea

Age: 7 Sex: F

The IVA2 CPT (Integrated Visual & Auditory 2 Continuous Performance Test) is a test of attention and impulsivity that measures responses to intermixed auditory and visual stimuli. The quotient scores for all of the IVA2 scales are reported as standard scores (Mean = 100, SD = 15).

VALIDITY OF IVA2 TEST RESULTS

The main test results were found to be valid. All global and primary test scale scores can be interpreted without reservation. This individual's response pattern did not reveal any apparent abnormalities in her responses to either visual or auditory test stimuli. The examiner can proceed in an interpretation of all visual and auditory test scores without reservation.

SUMMARY OF TEST RESULTS FOR THE IVA2 GLOBAL SCALES

The Full Scale Response Control Quotient is a global measure of the overall ability for this individual to regulate her responses and respond appropriately. Factors that load on this scale include the ability to inhibit responses to non-targets, the consistency of recognition reaction times and the person's ability to maintain her mental processing speed during the IVA2 test. This individual's overall global quotient scale score for the **Full Scale Response Control** scale was 92. This score fell in the average range. Her **Auditory Response Control** quotient scale score was 95. This global scale score fell in the average range. The **Visual Response Control** quotient scale score for this individual was 92. This global scale score fell in the average range.

The Full Scale Attention Quotient provides a measure of an individual's overall ability to accurately and quickly respond while maintaining focus. This global scale primarily measures performance under low demand conditions. This individual's overall quotient score on the **Full Scale Attention** scale was 71. This global scale score fell in the moderately to severely impaired range. Her **Auditory Attention** quotient scale score was 80, and this global scale score fell in the mildly impaired range. The **Visual Attention** quotient scale score for this individual was 68. This global scale score was classified as falling in the moderately to severely impaired range.

The Combined Sustained Attention quotient scale score provides a global measure of a person's ability to accurately and quickly respond in a reliable manner to stimuli under low demand conditions. In addition, it includes the ability to sustain attention and be flexible when things change under high demand conditions. These are reported as separate scale scores for both the auditory and visual modalities. This individual's global quotient score on the **Combined Sustained Attention** scale was 57. This score fell in the extremely impaired range. Her global **Auditory Sustained Attention** quotient scale score was 60, and it fell in the extremely impaired range. The global **Visual**

Sustained Attention quotient scale score for this individual was 63. This score was found to fall in the severely impaired range.

The identified strengths, weaknesses, and interrelationships of the Auditory and Visual Response Control and Attention scales are reported and discussed below. The specific scales that comprise the Auditory and Visual Sustained Attention scales and their meanings are discussed in the sections related to the Primary Response Control and Attention scales. Also, a discussion is included in the sections below for the three Symptomatic scales: Comprehension, Persistence, and Sensory/Motor.

ATTENTION PRIMARY SCALES

Vigilance, Acuity, and Elasticity

Vigilance is a Primary scale that measures general attentional ability. This person's **Auditory Vigilance** quotient scale score was 71, which falls in the moderately to severely impaired range. This individual showed significant problems with her general auditory attentional functioning. These problems are likely to have a major impact on her ability to perform successfully in many areas of her life. During periods of the test, she failed to stay attentive to key auditory stimuli and was not able to sustain her auditory attention. Consequently, she is likely to have problems in the school environment in maintaining her auditory attention unless she is actively engaged or environmental demands to perform are clearly evident to her and enforced. Social distractors or stress may further exacerbate her attentional problems. She is likely to have "good and bad days" with respect to auditory attentional functioning.

This individual's quotient score was 86 on the **Auditory Acuity** scale. This quotient score was in the slightly impaired range. The Auditory Acuity scale showed that her ability to pay attention under low demand conditions to the auditory targets was slightly impaired. Some problems were found for her in being able to pay attention when the non-targets were prevalent. This finding suggests that she

is likely to occasionally "tune out" and may do so when stressed or when performance is not inherently engaging. Social distractors may impact her attentional functioning and influence her ability to stay on task. Environmental changes may prove beneficial in correcting her auditory attentional functioning. Cognitive training may prove beneficial in improving her ability to perform routine tasks.

This individual's **Auditory Elasticity** quotient scale score was 65. This quotient score fell in the severely impaired range. Her lapses in attention specifically occurred immediately after being required to inhibit responding. This reflects difficulties in auditory attentional functioning and indicates that she had problems being able to quickly get "back on track." Cognitive training focusing on improving the speed of mental processing and mental flexibility may prove beneficial for her in correcting this "shift-set" deficit in auditory attentional functioning. An individual with these specific types of problems is likely to be very easily distracted and have problems with mental alertness as well. Compensatory techniques to increase her awareness of her problems in maintaining and accurately responding to changes in her environment need to be considered. In addition, cognitive training exercises to enhance attentional focus and response accuracy when the demand to perform is high are likely to benefit her.

This individual's ability to attend under high demand conditions significantly differed from her ability to respond accurately to auditory targets under low demand conditions. When the pace is slower, she showed the ability to attend relatively better and her response accuracy was higher. Individuals with this pattern are likely to benefit from accommodations that minimize auditory distractions in their environment and will generally do better if provided additional time to get work done, so that they do not feel pressured to perform.

This person's **Visual Vigilance** quotient scale score of 84 fell in the mildly impaired range. Her general visual attentional functioning showed some problems that will sometimes impact her ability

in some areas of her life to perform successfully. She exhibited moments of inattention to key visual stimuli. This is likely to be reflected by occasional issues in the school environment involving difficulties in her being able to maintain visual attention. Social distractions and environmental stressors may worsen her deficits in visual attention. She may also have good and bad days with respect to her attentional abilities.

She had an average **Visual Acuity** scale with a quotient score of 90. In terms of visual attention, a relative strength was found in her ability to pay attention under low demand conditions, as shown in the Visual Acuity scale. This individual was able to maintain her attention and stay alert when the demand to perform was relatively low. However, her Elasticity scale showed significant problems in visual attentional functioning under high demand conditions that will need to be addressed.

This individual's **Visual Elasticity** quotient scale score was mildly to moderately impaired with a score of 78. Her lapses in attention showed difficulty in her visual attentional functioning which impaired her ability to quickly get "back on track." Cognitive training that focuses on improving her speed of mental processing may be helpful for her. She is likely to be very easily distracted and report difficulty with mental alertness. Compensatory techniques need to be considered to increase her awareness of her problems with accurately responding to changes in her environment.

A significant difference was found in her abilities under low demand and high demand conditions, specifically in regards to the Visual Vigilance scale. She is likely to have problems with respect to her visual attentional functioning more often when she has to shift sets or under conditions that distract her. Minimizing visual distractions in her environment is likely to improve performance. Providing accommodations with regards to additional time to get work done is likely to minimize stress on her and also would likely increase performance.

This individual's impairments in Vigilance occurred for both the auditory and visual modalities. Low scores in both of these sensory modalities are likely to lead to a compounding of problems in functioning. She showed no specific strengths in any one sensory modality that would enable her to compensate for her attention problems. This individual is likely to make errors of attention that will probably impact her home or school environment. Appropriate interventions will need to be considered with respect to these problems. Accommodations recommended above for both the visual and auditory modalities need to be considered in order to help her.

Focus, Dependability, and Stability

The Focus scale reflects an individual's ability to sustain attention reliably and not "drift off" or "tune out."

This individual's **Auditory Focus** quotient scale score of 102 fell in the average range. No significant problems with auditory focus were identified for her. She was able to maintain her auditory focus throughout the test.

On the IVA2 test, she showed the ability to respond reliably to auditory stimuli as evidenced by the **Auditory Dependability** scale. Her quotient score on this scale was 97, which falls in the average range. Her response times to auditory stimuli did not excessively vary under low demand conditions.

She was identified to show some problems in her ability to respond reliably as evidenced by the **Auditory Stability** scale. Her quotient score on this scale was 89, which falls in the slightly impaired range. Generally, she was able to maintain her processing speed under high demand conditions when the targets were prevalent. This pattern of responding indicates that she may at times be somewhat erratic in her responses to auditory stimuli and that she may, at times, be prone to make some errors when the demand for her to perform is high. Systematic cognitive training needs to be considered in order to help her improve the stability of her auditory attentional functioning.

This person's **Visual Focus** quotient scale score of 87 fell in the slightly impaired range. Most of the time this individual is able to process and stay focused on visual stimuli. Infrequent lapses in visual response times were found. These lapses in visual processing may be due to slight fatigue or to a preoccupation with distracting thoughts. She needs to be encouraged to ask for any information she misses due to her slight problems with visual focus, and she should learn to ask others for help when necessary. Generally, her problems with visual focus will only manifest in highly distracting environments or when she is emotionally upset. Cognitive training exercises can help her learn to be better focused to visual stimuli and to recognize how to maintain her visual attention.

She showed significantly greater problems in her variability of responding under low demand conditions as evidenced by the extremely impaired **Visual Dependability** scale of 53. This individual's problems with maintaining her speed of responding to visual stimuli were clearly evident when little demand was placed on her to maintain her sustained attention. She becomes more variable in her attentional functioning when she is not actively engaged in a task. Either environmental conditions will need to be modified or external reinforcements may need to be implemented to help her stay on task.

Significant problems were found for her with respect to the **Visual Stability** scale. Her quotient scale was moderately to severely impaired with a score of 69. This indicated she had problems with maintaining her processing speed reliably under high demand conditions when the targets were prevalent. She showed more variability in her responses when the pace of test was faster. This pattern of responding indicates that she is likely to be more erratic in her response time to visual stimuli and make more errors when the demand for her to perform is high. Systematic cognitive training to improve her processing speed and reliability in responding is likely to be the best approach to help her.

Speed, Quickness, and Swiftness

This individual's ability to process information and make decisions, as measured by the Speed scale, is an important variable that is likely to impact her performance in school settings with respect to being able to get work done within a reasonable time frame and with an acceptable degree of accuracy.

This individual's **Auditory Speed** quotient scale score of 86 falls in the slightly impaired range. This individual was slightly impaired in her auditory processing speed during the test. This problem is likely to have some impact on her ability to perform in different areas of her life. This deficit reflects slightly impaired mental processing speed to auditory stimuli. She is likely at times to have a little difficulty in listening, comprehending, and recalling verbal information presented to her. The impact of this slight deficit is likely to be minimal in her social interactions with others and in her ability to meet the demands of the school environment. Her problems in listening and processing auditory information are likely to occur only when she is stressed by very complex and challenging tasks. Occasionally, she may show some slight difficulties with working memory, but she would generally be expected to perform most auditory tasks at an adequate pace. Cognitive training exercises may help this individual to "normalize" her auditory processing speed. This individual may want to consider using various organizational techniques and tools in order to improve her functioning.

This individual's **Auditory Quickness** quotient scale score of 84 falls in the mildly impaired range. Her quotient score on the **Auditory Swiftness** scale was 92. This quotient score is interpreted as average. When the required pace to process auditory test stimuli was slower, she was able to respond quicker than when the demand to perform was high. This individual is not likely to respond well when pressured to perform. She is likely to do better when auditory information is presented to her more slowly.

She had a severely impaired **Visual Speed** quotient scale score of 67. This indicated she had a significant delay in her visual processing speed during the test. This deficit would be expected to have a major impact on her ability to perform in different areas of her life. This deficit reflects a very slow visual mental processing speed, and she is likely to be severely impaired in her ability to read and understand written instructions or directions. She will probably have difficulty with comprehension and recall of information presented to her in a visual format. She may also have some difficulty taking accurate and detailed notes in the classroom setting or in meetings, because these tasks require her to shift sets. She may be described as a "slow learner" in a school setting.

Her deficit in processing visual information quickly is likely to negatively impact her self-confidence. She may be easily discouraged and attempt to avoid tasks that she believes will be difficult. In some cases, her problem may manifest in the expression of her feelings of frustration or anger. She may also become irritable or lash out with negative verbal outbursts. Any of these types of emotional problems, if they occur, are likely to impair her social interactions with peers such that others avoid her, and, thus, further contributing to her negative self-image.

It is highly likely that her working memory is impacted by her mental processing speed, which in turn may significantly affect reading comprehension, visual recall, and her ability to complete multi-step tasks. She may also have poor organizational skills due to problems with setting priorities, staying on task, and following work through to completion. In some cases, she may avoid doing her required work altogether.

Cognitive training exercises which focus on improving visual processing speed and working memory are likely to be of benefit to her. A successful program could help her to become better organized in her thinking, and increase her ability to be an "active thinker." She is

also likely to respond well to behavioral interventions that help her set priorities, stay on task, and "get the job done." Improvement in visual processing speed can help enable her to process visual information more accurately in the school environment. Due to her severe deficits in visual processing speed, additional compensatory strategies may also need to be explored in more detail.

This individual's **Visual Quickness** quotient scale score of 65 falls in the severely impaired range. She had a moderately impaired **Visual Swiftness** scale score of 72. No significant difference was found between the quotient scores for the Visual Quickness and Visual Swiftness scales. Her mean visual reaction time was generally the same under both high and low demand conditions.

This individual's significant impairments in Speed were evident for the visual modality. She was found to have some impairment for the auditory modality. Thus, she may benefit from interventions to help improve both her visual and auditory processing speed.

RESPONSE CONTROL PRIMARY SCALES

Prudence and Reliability

Prudence is a measure of impulsivity as defined by errors of commission. This individual's **Auditory Prudence** quotient scale score of 108 fell in the average range. This individual was found to be functioning in the average range with respect to her ability to inhibit responses to non-target auditory stimuli. Thus, she is able to control her responses and not be excessively distracted by auditory stimuli in her environment.

She did not demonstrate any problems with respect to the **Auditory Reliability** scale. Her quotient score on this scale was 95, which falls in the average range. Thus, she was able to avoid making impulsive idiopathic errors that would lead to careless or inappropriate responses in her home and school environments. This individual is

likely to be able to be accurate in detailed tasks and to remember and follow rules well.

This person's **Visual Prudence** quotient scale score of 105 fell in the average range. No problems with inhibition to non-target visual stimuli were identified. This individual demonstrated an average ability to control her responses and inhibit appropriately to non-target visual stimuli. This score on the Prudence scale indicates that she is unlikely to be distracted by visual stimuli.

No problems were found for her **Visual Reliability** scale. The quotient score on this scale was 108, which falls in the average range. She was able to avoid making impulsive idiopathic errors that would lead to careless or inappropriate responses in her home and school environments. This individual is likely to be able to be accurate in detailed tasks and to remember and follow rules well.

Consistency

The Consistency scale is a general measure of an individual's ability to respond reliably based on her reaction time.

This individual was mildly impaired in her ability to be consistent in her responses to auditory stimuli. Her **Auditory Consistency** quotient scale score was 83. This individual will need to learn to ignore internal or external auditory distractions in order to improve her performance when sustained attention is required. Cognitive training exercises may help improve her ability to listen, attend, and follow multi-step directions. Training in auditory processing is likely to improve memory and functioning in a variety of other tasks as well. Written or taped presentation materials need to be provided to this individual so that she can review the concepts and ideas presented in order to "fill in the gaps." Reinforcement of "double-checking" her work is also recommended in order to minimize careless errors.

This individual's ability to be consistent in her responses to visual stimuli was moderately to severely impaired. The **Visual Consistency**

quotient scale score for this individual was 69. Her impairment, as demonstrated by this very low quotient score on the Visual Consistency scale, is likely to significantly impact her functioning in her life. This deficit may be due to internal or external distractions. Consequently, the minimization of visual distractions in the environment could help her to respond more consistently and to reduce careless errors. Any visual instructional material should be available for her review in order to compensate for possible deficits in her ability to process new information quickly and reliably. She needs to be encouraged to review and check her work for careless visual errors. Routine or repetitive exercises will need special attention as she is likely to make more errors in this type of work. Improvements in her visual processing abilities, sustained attention, and visual memory may be achieved through cognitive training exercises.

Stamina

The Stamina scale is a measure of the individual's ability to sustain her speed of response time during the course of the test.

This individual's **Auditory Stamina** quotient scale score of 98 fell in the average range. This person's response time to auditory stimuli did not change significantly over the course of the test. She was able to maintain her mental processing speed in the auditory domain during the test. In a school setting, she is likely to be capable of meeting the demand to perform and to achieve goals in a timely manner.

She had an average **Visual Stamina** quotient scale score of 109. This person's response time to visual stimuli did not change significantly over the course of the test. She was able to maintain her mental processing speed in the visual domain during the test. However, she did demonstrate problems with her visual processing speed which was severely impaired. While she was able to maintain her visual stamina, she still exhibited difficulties in her ability to respond quickly overall. This deficit indicates that she is likely

to have problems at times completing her school tasks within the available time allotted.

Fine Motor Hyperactivity

The Fine Motor Hyperactivity Quotient measures off-task, spurious, impulsive, and inappropriate fine motor activity using the mouse input device. A person who is squirmy, restless, or who doodles or fiddles with small objects may score low on this scale. These kinds of response tendencies may be described as fidgetiness and restlessness. Quotient scores above the average range are considered reflective of better controlled and more self-regulated responses.

This person's **Fine Motor Hyperactivity** quotient scale score was 100. Her score fell in the average range.

This average quotient score for the Fine Motor Hyperactivity scale indicates no significant problems in fine motor hyperactivity. She is unlikely to exhibit problems with fidgety, impulsive, or off-task behavior in her home or school environment.

SYMPTOMATIC SCALES

Comprehension, Steadiness, and Reliability

The Comprehension scale is a measure of idiopathic errors both of commission and omission occurring under both low and high demand conditions.

This individual's **Auditory Comprehension** quotient scale score of 52 fell in the extremely impaired range. Severe problems were identified for this individual with respect to the **Auditory Comprehension** scale. She made a large number of idiopathic errors, showing significant trouble with test performance and difficulties in following the test rules.

Her **Auditory Steadiness** quotient scale score was 35. This quotient score fell in the extremely impaired range. This impairment is very likely to impact her ability to respond appropriately to auditory

stimuli when the demand to perform is high. This individual's performance on both the Auditory Comprehension and Steadiness scales reflects gross attentional dysfunction to auditory stimuli.

On the **Auditory Reliability** scale, she had a quotient score of 95. This quotient score was in the average range. She did not have problems with respect to the Auditory Reliability scale. She avoided making an excessive number of impulsive idiopathic errors of commission. She was found to show good self-control and did not react in an impulsive manner to auditory stimuli under low demand conditions.

This individual's **Visual Comprehension** quotient scale score of 83 fell in the mildly impaired range. Her Comprehension scale showed some problems with functioning and performing adequately on the IVA2 test. These difficulties led to a mild degree of idiopathic errors during the test. Her response pattern suggests that she has some problems related to comprehension that may possibly affect her.

Her **Visual Steadiness** scale was mildly to moderately impaired with a quotient score of 77. Her Visual Steadiness scale reflected significant issues indicating possible lapses in visual attention during the more demanding periods of the test when the targets are prevalent.

On the **Visual Reliability** scale, she had a quotient score of 108. This quotient score was in the average range. She did not have problems with respect to the Visual Reliability scale. She did not make an excessive number of impulsive visual idiopathic errors of commission.

Persistence

The Persistence Scale is one of the three Symptomatic scales and is used to compare the speed of simple reaction time at the beginning of the test to that measured at the end of the test.

This individual's **Auditory Persistence** quotient scale score of 89 fell in the slightly impaired range. She was slower in her auditory reaction time during the Cool-down as compared to the Warm-up period. This slower reaction time after the main section of the IVA2 test indicates the possibility of some motor or mental fatigue for auditory stimuli. However, given the range that her Auditory Persistence score fell in, her slower processing speed during the Cool-down period is not considered a significant factor that would impact her auditory test performance or her functioning in life related to auditory processing.

This person's **Visual Persistence** quotient scale score of 91 fell in the average range. No significant difference was found in her visual reaction time during the Cool-down as compared to the Warm-up. Thus, her quotient score on the Persistence scale did not indicate any problems with her motivation that would impact her functioning on the IVA2 test. Given that her Visual Stamina quotient score fell in the average range, she was not found to show any mental or motoric fatigue in respect to her ability to respond to visual stimuli. This pattern of responding indicates that she is not likely to become easily fatigued when she has to process visual stimuli.

Sensory/Motor

The Sensory/Motor scale provides a measure of an individual's simple reaction time.

This individual's **Auditory Sensory/Motor** quotient scale score of 114 fell in the above average range. This scale score was computed based on the mean of the three fastest reaction times of her auditory responses during the Warm-up test period. Her auditory simple reaction time was faster than most peers her age. This above average score on the Sensory/Motor scale indicates that she is likely to be able to process and respond quickly to auditory stimuli.

This person's **Visual Sensory/Motor** quotient scale score of 102 was in the average range. The mean of her three fastest visual reaction times during the Warm-up test period was used in determining this scale score. This individual's visual simple reaction time revealed her to be similar in performance to most other people her age.

IVA2 DIAGNOSTIC CONSIDERATIONS

This individual's pattern of responding was indicative of impairments likely to impact her functioning in the home and school settings. The global Full Scale Attention quotient scale score indicated a moderate to severe impairment. In addition, there were three Attention Primary scales that fell in the substantially impaired range.

remote neurofeedback services

Remote neurofeedback services provide access to the same services available in my clinics but you participate from home. You work with a clinician at a scheduled time and receive the same assessments and neurofeedback services as if you were attending in person.

A free 15-minute consultation can be scheduled to discuss the technology and licensing requirements for remote services. Some limitations may exist depending on internet speed and other factors.

Contact Dr. Connie McReynolds for more information.

Email: connie@mcreyno.com

Website: www.conniemcreynolds.com

educational consultation services

Educational consultation services are available to obtain guidance on 504, IEP, and ISP service plans to support your child at school.

Even if your child does not qualify for a 504, IEP or ISP plan, it may be beneficial to identify the types of accommodations and learning supports that will enhance your child's ability to succeed in school.

Without a true understanding of the way auditory and visual processing problems affect your child's ability to learn, parents (and teachers) are often at a loss as to how to help children succeed at home and in school.

Contact Dr. Connie McReynolds to schedule a free 15-minute discovery call.

Email: connie@mcreyno.com

Website: www.conniemcreynolds.com

resource list

IEP/504/Independent Services Plans
www.understood.org
www.nea.org/resource-library/know-your-rights-section-504-rehabilitation-act
www.greatschools.org/gk/articles/section-504-2/
www.greatschools.org/gk/articles/what-is-an-iep/
www.ed.gov for information from the U.S. Department of Education
https://www.additudemag.com/504-plan-for-adhd-accommodations-at-school/

Information on Neurofeedback
https://isnr.org/visitor-landing
www.conniemcreynolds.com

references

Chapter 2 – Understanding the Real Cause

1. Norman, D.A. (1982). *Memory and attention: An introduction to human information processing* (2nd ed.). New York, NY: Wiley
2. Norman (1982)
3. McReynolds, C.J., Villalpando, L.S., & Britt, C.E. (2018). Using neurofeedback to improve ADHD symptoms in school-aged children. *NeuroRegulation*, *5*(4), 109–128. https://dx.doi.org/10.15540/nr.5.4.109
4. Sparks. S.D. (2011). Study: Third Grade Reading Predicts Later High School Graduation http://blogs.edweek.org/edweek/inside-school-research/ 2011/04/ the_ disquieting_ side_ effect_of.html
5. Hernandez, D.J. (2011). Double jeopardy: How third-grade reading skills and poverty influence high school graduation. Annie E. Casey Foundation.
6. Hernandez (2011)
7. Hernandez (2011)
8. Sparks (2011)
9. Hernandez (2011)
10. Dillon, S. (2009). Study Finds High Rate of Imprisonment Among Dropouts https://www.nytimes.com/2009/10/09/education/09drop-out.html?
11. McReynolds (2018)

Chapter 3 – Misunderstanding the Problem

1. McReynolds, C.J., Villalpando, L.S. & Britt, C.E. (2018). Using neurofeedback to improve ADHD symptoms in school-aged children. *NeuroRegulation*, *5*(4), 109–128. https://dx.doi.org/10.15540/nr.5.4.109
2. Saul, R. (2014). *ADHD Does Not Exist*. New York, NY: HarperCollins Publishers.
3. Lee, S.S., Lahey, B.B., Owens, E.B. & Hinshaw, S.P. (2008). Few preschool boys and girls with ADHD are well-adjusted during adolescence. *Journal of Abnormal Child Psychology, 36*(3), 373–383. https://dx.doi.org/10.1007/s10802-007-9184-6
4. Owens, E.B., Hinshaw, S.P., Lee, S.S. & Lahey, B.B. (2009). Few girls with childhood attention-deficit/hyperactivity disorder show positive adjustment during adolescence. *Journal of Clinical Child & Adolescent Psychology, 38*(1), 132–143. https://dx.doi.org/10.1080/15374410802575313
5. Fleming, M., Fitton, C.A., Steiner, M.F.C., McLay, J.S., Clark, D., King, A., … Pell, J.P. (2017). Educational and health outcomes of children treated for attention-deficit/ hyperactivity disorder. *JAMA Pediatrics*, 171(7). https://dx.doi:10.1001/jamapediatrics.2017.0691
6. Fletcher, J.M. (2014). The effects of childhood ADHD on adult labor market outcomes. *Health Economics*, 23(2), 159–181.
7. Groenman, A.P., Janssen, T.W.P., & Oosterlaan, J. (2017). Childhood psychiatric disorders as risk factor for subsequent substance abuse: A meta-analysis. *Journal of the American Academy of Child and Adolescent Psychiatry*, 56(7), 556–569.
8. Molina, B.S.G., Hinshaw, S.P., Arnold, L.E., Swanson, J.M., Pelham, W.E., Hechtman, L., … Marcus, S. (2013). Adolescent substance use in the Multimodal Treatment study of Attention-Deficit/Hyperactivity Disorder (ADHD) (MTA) as a function of childhood ADHD, random assignment to childhood treatments,

and subsequent medication. *Journal of the American Academy of Child and Adolescent Psychiatry*, 52(3), 250–263.

9. Ros, R. & Graziano, P.A. (2017). Social functioning in children with or at risk for attention deficit/hyperactivity disorder: A meta-analytic review. *Journal of Clinical Child and Adolescent Psychology*, 1–23. https://dx.doi:10.1080/15374416.2016.1266644
10. Grohol, J.M., (2013). Is ADHD overdiagnosed? Yes & no. Retrieved May 2016 from http://psychcentral.com/blog/archives/2013/11/21/is-adhd-overdiagnosed-yes-no/
11. Visser, S.N., Zablotsky, B., Holbrook, J.R., Danielson, M.L. & Bitsko, R.H. (2015). Diagnostic experiences of children with attention-deficit/hyperactivity disorder. *National Health Statistics Reports; 81*, 1–7. Hyattsville, MD: National Center for Health Statistics.
12. Danielson, M., Bitsko, R.H., Ghandour, R.M., Holbrook, J.R., Kogan, M.D., & Blumberg, S.J. (2018). Prevalence of Parent-Reported ADHD Diagnosis and Associated Treatment Among U.S. Children and Adolescents, 2016. *Journal of Clinical Child & Adolescent Psychology, 47*(2), 199–212, 2018 ISSN: 1537-4416 print/1537-4424 https://dx.doi.org/10.1080/15374416.2017.1417860
13. Fabiano, G.A., Pelham, W.E., Coles, E K., Gnagy, E.M., Chronis-Tuscano, A., & O'Connor, B.C. (2009). A meta-analysis of behavioral treatments for attention-deficit/ hyperactivity disorder. *Clinical Psychology Review, 29*(2), 129–140. https://dx.doi.org/10.1016/j.cpr.2008.11.001
14. Sonuga-Barke, E.J.S., Brandeis, D., Cortese, S., Daley, D., Ferrin, M., Holtmann, M., … European ADHD Guidelines Group. (2013). Nonpharmacological interventions for ADHD: Systematic review and meta-analyses of randomized controlled trials of dietary and psychological treatments. *The American Journalof Psychiatry, 170*(3), 275–289. https://dx.doi.org/10.1176/appi.ajp.2012.12070991

15. Danielson (2018)
16. Fabiano (2009)
17. Daley, D., van der Oord, S., Ferrin, M., Danckaerts, M., Doepfner, M., Cortese, S., & Sonuga-Barke, E.J.S. (2014). Behavioral interventions in attention-deficit/hyperactivity disorder: A meta-analysis of randomized controlled trials across multiple outcome domains. *Journal of the American Academy of Child & Adolescent Psychiatry, 53*(8), 835–847.e5. https://dx.doi.org/10.1016/j.jaac.2014.05.013
18. Ellis, M. (2016, March 3). "ADHD medication and low bone density: Are kids at risk?" *Medical News Today*. Retrieved May 30, 2016, from https://www.medicalnewstoday.com/articles/307389.php
19. Brazier, Y. (2015, November 25). "ADHD medication: Is it a good idea?" *Medical News Today*. Retrieved May 2016 from https://www.medicalnewstoday.com/articles/303090.php
20. Poulton, A.S., Melzer, E., Tait, P., Garnett, S.P., Cowell, C.T., Baur, L.A. & Clarke, S. (2013). Growth and pubertal development in adolescent boys on stimulant medication for attention deficit hyperactivity disorder. *The Medical Journal of Australia, 198*(1), 29–32. https://dx.doi.org/10.5694/mja12.10931
21. MTA Cooperative Group. (2004). National Institute of Mental Health multimodal treatment study of ADHD follow-up: Changes in effectiveness and growth after the end of treatment. *Pediatrics, 113*(4), 762–769.
22. Swanson, J.M., Arnold, L.E., Molina, B.S.G., Sibley, M.H., Hechtman, L.T., Hinshaw, S.P., … for the MTA Cooperative Group. (2017). Young adult outcomes in the follow-up of the multimodal treatment study of attention-deficit/hyperactivity disorder: Symptom persistence, source discrepancy, and height suppression. *The Journal of Child Psychology and Psychiatry, 58*(6), 663–678. https://dx.doi.org/10.1111/jcpp.12684

23. Hoagwood, K., Jensen, P., Feil, M., Vitiello, B. & Bhatpara, V. (2000). Medication management of stimulants in pediatric practice settings: a national perspective. *Journal of Developmental Behavioral Pediatrics, 21*, 322-331.

24. Gleason, M.M. (2013). Finding the tools for effective early intervention for preschool attention-deficit/hyperactivity disorder. *Journal of the American Academy of Child & Adolescent Psychiatry, 52*(3), 228–230. https://dx.doi.org/10.1016/j.jaac.2012.12.008

25. Prasad, V., Brogan, E., Mulvaney, C., Grainge, M., Stanton, W. & Sayal, K. (2013). How effective are drug treatments for children with ADHD at improving on-task behaviour and academic achievement in the school classroom? A systematic review and meta-analysis. *European Child & Adolescent Psychiatry, 22*(4), 203–216. https://dx.doi.org /10.1007/s00787-012-0346-x.

26. Swanson, J.M. & Volkow, N.D. (2009). Psychopharmacology: Concepts and opinions about the use of stimulant medications. *The Journal of Child Psychology and Psychiatry, 50*(1–2), 180–193. https://dx.doi.org/10.1111/j.1469-7610.2008.02062.x

27. Riddle, M.A., Yershova, K., Lazzaretto, D., Paykina, N., Yenokyan, G., Greenhill, L., … Posner, K. (2013). The preschool attention deficit/hyperactivity disorder treatment study (PATS) 6-year follow-up. *Journal of the American Academy of Child & Adolescent Psychiatry, 52*(3), 264–278.e2. https://dx.doi.org/10.1016/j.jaac.2012.12.007

28. Gleason (2013)

29. American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Washington, DC: Author. Retrieved from https://dx.doi.org/10.1176/appi.books.9780890425596

30. Riddle (2013)

31. Dunlop, A.J. & Newman, L.K. (2016). ADHD and psychostimulants—Overdiagnosis and overprescription. *The Medical Journal of Australia*, 204(4), 139. https://dx.doi.org/10.5694/mja15.01387

Chapter 4 – Identifying and Treating the Root Cause

1. Woliver, R. & Ibrahim, M. (2012). *Auditory processing disorder: The hidden disability*. Long Island Press. Retrieved May 2016 from http://newideas.net/auditory-processing-disorder
2. Chronis-Tuscano, A., Molina, B.S.G., Pelham, W.E., Applegate, B., Dahlke, A., Overmeyer, M. & Lahey, B.B. (2010). Very early predictors of adolescent depression and suicide attempts in children with attention-deficit/hyperactivity disorder. *Archives in General Psychiatry, 67*(10), 1044–1051. https://dx.doi.org/10.1001/archgenpsychiatry.2010.127
3. Hinshaw, S.P., Owens, E.B., Zalecki, C., Huggins, S.P., Montenegro-Nevada, A.J., Schrodek, E. & Swanson, E.N. (2012). Prospective follow-up of girls with attention deficit/hyperactivity disorder into early adulthood: Continuing impairment includes elevated risk for suicide attempts and self-injury. *Journal of Consulting and Clinical Psychology, 80*(6), 1041–1051. https://dx.doi.org/10.1037/a0029451
4. Dillon, S. (2009). Study Finds High Rate of Imprisonment Among Dropouts https://www.nytimes.com/2009/10/09/education/09dropout.html?
5. Breslau, J., Miller, E., Chung, W.J. J. & Schweitzer, J. B. (2011). Childhood and adolescent onset psychiatric disorders, substance use, and failure to graduate high school on time. *Journal of Psychiatry Research, 45*(3), 295–301. https://dx.doi.org/10.1016/j.jpsychires.2010.06.014
6. Hinshaw, S.P. & Ellison, K. (2016). *ADHD: What everyone needs to know*. New York, NY: Oxford University Press.

7. Lee, S.S., Lahey, B.B., Owens, E.B. & Hinshaw, S.P. (2008). Few preschool boys and girls with ADHD are well-adjusted during adolescence. *Journal of Abnormal Child Psychology, 36*(3), 373–383. https://dx.doi.org/10.1007/s10802-007-9184-6
8. Owens, E.B., Hinshaw, S.P., Lee, S.S. & Lahey, B.B. (2009). Few girls with childhood attention-deficit/hyperactivity disorder show positive adjustment during adolescence. *Journal of Clinical Child & Adolescent Psychology, 38*(1), 132–143. https://dx.doi.org/10.1080/15374410802575313
9. Pingault, J.B., Tremblay, R.E., Vitaro, F., Carbonneau, R., Genolini, C., Falissard, B. & Côté, S. M. (2011). Childhood trajectories of inattention and hyperactivity and prediction of educational attainment in early adulthood: A 16-year longitudinal population-based study. *The American Journal of Psychiatry, 168*(11), 1164–1170. https://dx.doi.org/10.1176/appi.ajp.2011.10121732

Chapter 5 – How the Brain Works

1. Doidge, N. (2016). *The Brain's Way of Healing.* New York: NY: Penguin Books.
2. Doidge (2016)
3. Doidge, N. (2007). *The Brain that Changes Itself.* New York: NY: Penguin Books.
4. Doidge (2016)
5. Doidge (2007)
6. Hebb, D.O. (2002). *The Organization of Behavior: A Neuropsychological Theory* (1st ed.). Psychology Press. https://dx.doi.org/10.4324/9781410612403
7. Hebb (2002)
8. Hebb (2002)
9. Helmstetter, S. (2013). *The Power of Neuroplasticity.* Gulf Breeze, FL: Park Avenue Press.

10. McReynolds, C.J., Villalpando, L.S. & Britt, C.E. (2018). Using neurofeedback to improve ADHD symptoms in school-aged children. *NeuroRegulation*, *5*(4), 109–128. https://dx.doi.org/10.15540/nr.5.4.109
11. McReynolds, C., Villalpando, L.S. & Britt, C. (2019). Identifying auditory and visual processing difficulties in school-aged children with ADHD. *Discovering New Educational Trends: A Symposium in Belize, Central America, V3*. Cambridge Scholars Publishing
12. McReynolds, C., Bell, J. & Lincourt, T.M. (2017). Neurofeedback: A noninvasive treatment for symptoms of post-traumatic stress disorder in veterans. *Journal of NeuroRegulation, 4*(*3-4*), 114-124. https://dx.doi:*10.15540/nr.4.3-4.114*
13. Doidge (2016)
14. McReynolds (2018)
15. McReynolds (2019)
16. McReynolds (2017)
17. Demos, J. (2005). *Getting Started with Neurofeedback.* New York, NY: Norton & Company.
18. Swingle, P.G. (2015). *When the ADHD Diagnosis is Wrong.* Santa Barbara, CA: Praeger.
19. Neurotransmitters. Retrieved from https://my.clevelandclinic.org/health/articles/22513-neurotransmitters
20. Neurotransmitters and their Functions. Retrieved from https://human-memory. net/ neurotransmitters/
21. Sousa, D.A. (2017). *How the Brain Learns.* 5th ed. Thousand Oaks, CA: Corwin.
22. Koepp, M.J., Gunn, R.N., Lawrence, A.D., Cunningham, V.J., Dagher, A., Jones, T .....& Grasby, P.M. (1998). Evidence for striatal dopamine release during a video game. *Nature*, *393*(6682), 266-268.
23. Greenfield, D. (2014, June/July). Video Gaming. *Neurology Now.* American Academy of Neurology.

24. Koepp (1998)
25. Paturel, A. (2014). How Do Video Games Affect Brain Development in Children and Teens? *Wellness.* (June/July). https://www.brainandlife.org/articles/how-do-video-games-affect-the-developing-brains-of-children/
26. Greenfield (2014)
27. Greenfield (2014)
28. Hummer, T.A., Wang, Y, Kronenberger, W.G., Mosier, K.M., Kalnin, A.J., Dunn, D.W. & Mathews, V.P. (2010). Short-Term Violent Video Game Play by Adolescents Alters Prefrontal Activity During Cognitive Inhibition Published online: 11 Jun 2010. https://dx.doi.org/10.1080/15213261003799854
29. Hummer (2010)
30. Paturel (2014)
31. Greenfield (2014)
32. Hummer (2010)
33. Greenfield (2014)
34. Hummer (2010)
35. Exelmans, L., Custers, K. & Van den Bulck, J. (2015). Violent video games and delinquent behavior in adolescents: A risk factor perspective. *Aggressive Behavior*, 41: 267-279. https://dx.doi.org/10.1002/ab.21587
36. Paturel (2014)
37. Greenfield (2014)
38. Hummer (2010)
39. Greenfield (2014)
40. Greenfield (2014)
41. Paturel (2014)
42. Hummer (2010)
43. Paturel (2014)

Chapter 6 – Auditory Processing Problems

1. McReynolds, C.J., Villalpando, L.S. & Britt, C.E. (2018). Using neurofeedback to improve ADHD symptoms in school-aged children. *NeuroRegulation*, *5*(4), 109–128. http://dx.doi.org/10.15540/nr.5.4.109
2. McReynolds, C., Villalpando, L.S. & Britt, C. (2019). Identifying auditory and visual processing difficulties in school-aged children with ADHD. *Discovering New Educational Trends: A Symposium in Belize, Central America, V3*. Cambridge Scholars Publishing
3. Saul, R. (2014). *ADHD Does Not Exist*. New York, NY: Harper-Collins Publishers.
4. Saul (2014)

Chapter 7 – Visual Processing Problems

1. McReynolds, C.J., Villalpando, L.S. & Britt, C.E. (2018). Using neurofeedback to improve ADHD symptoms in school-aged children. *NeuroRegulation*, *5*(4), 109–128. https://dx.doi.org/10.15540/nr.5.4.109
2. Epstein, V. (2015, June 17)."Visualprocessingdisorder: Isthiswhat your child has?" Kars4Kids Smarter Parenting. Retrieved May 2016 from https://www.kars4kids.org/blog /visual processing-disorder-is-this-what-your-child-has
3. Epstein (2015)
4. McReynolds (2018)
5. Epstein (2015)
6. McReynolds (2018)
7. Farrar, R., Call, M. & Maples, W.C. (2001). A comparison of the visual symptoms between ADD/ADHD and normal children. *Optometry*, *72*(7), 441–451.
8. Epstein (2015)

9. New Brunswick Department of Education. (1999). Resource for the identification and teaching of students with specific learning disability. Retrieved from https://www2.gnb.ca/content/dam/gnb/Departments/ed/pdf/K12/ResourceForIdentificationTeachingStudentsSpecificLearningDisability.pdf

Chapter 8 – Combined Auditory and Visual Processing Problems

1. McReynolds, C.J., Villalpando, L.S. & Britt, C.E. (2018). Using neurofeedback to improve ADHD symptoms in school-aged children. *NeuroRegulation*, *5*(4), 109–128. https://dx.doi.org/10.15540/nr.5.4.109
2. Epstein, V. (2015, June 17). "Visual processing disorder: Is this what your child has?" Kars4Kids Smarter Parenting. Retrieved May 2016 from https://www.kars4kids.org/blog /visual processing-disorder-is-this-what-your-child-has

Chapter 9 – Neurofeedback and the IVA2 Assessment

1. McReynolds, C.J., Villalpando, L.S. & Britt, C.E. (2018). Using neurofeedback to improve ADHD symptoms in school-aged children. *NeuroRegulation*, *5*(4), 109–128. https://dx.doi.org/10.15540/nr.5.4.109
2. Ghaziri, J., Tucholka, A., Larue, V., Blanchette-Sylvestre, M., Reyburn, G., Gilbert, G., … Beauregard, M. (2013). Neurofeedback training induces changes in white and gray matter. *Clinical EEG and Neuroscience, 44*(4), 265–272. https://dx.doi.org/10.1177/1550059413476031
3. Zhonggui, X., Shuhua, S. & Haiqing, X. (2005). A controlled study of the effectiveness of EEG biofeedback training on children with attention deficit hyperactivity disorder. *Journal of Huazhong University of Science and Technology, 25*(3), 368–370. https://dx.doi.org/10.1007/BF02828171

4. McReynolds, C., Villalpando, L.S. & Britt, C. (2019). Identifying auditory and visual processing difficulties in school-aged children with ADHD. *Discovering New Educational Trends: A Symposium in Belize, Central America, V3*. Cambridge Scholars Publishing
5. Gevensleben, H., Holl, B., Albrecht, B., Vogel, C., Schlamp, D., Kratz, O., … Heinrich, H. (2009). Is neurofeedback an efficacious treatment for ADHD? A randomized controlled clinical trial. *Journal of Child Psychology and Psychiatry*, *50*(7), 780–789. https://dx.doi:10.1111/j.1469-7610.2008.02033.x
6. Gevensleben, H., Kleemeyer, M., Rothenberger, L.G., Studer, P., Flaig-Röhr, A., Moll, G. H. & Heinrich, H. (2014). Neurofeedback in ADHD: Further Pieces of the Puzzle. *Brain Topography*, *27*(1), 20–32. https://dx.doi:10.1007/s10548-013-0285-y
7. Hillard, B., El-Baz, A.S., Sears, L., Tasman, A. & Sokhadze, E.M. (2013). Neurofeedback Training Aimed to Improve Focused Attention and Alertness in Children with ADHD A Study of Relative Power of EEG Rhythms Using Custom-Made Software Application. *Clinical EEG and Neuroscience*, *44*(3), 193–202. https://dx.doi:10.1177/1550059412458262
8. Lubar, J.F. (1991). Discourse on the development of EEG diagnostics and biofeedback for attention-deficit/hyperactivity disorders. *Biofeedback and Self- Regulation*, *16*(3), 201– 225. https://dx.doi:10.1007/BF01000016
9. Monastra, V.J., Monastra, D.M. & George, S. (2002). The Effects of Stimulant Therapy, EEG Biofeedback, and Parenting Style on the Primary Symptoms of Attention-Deficit/ Hyperactivity Disorder. *Applied Psychophysiology and Biofeedback*, *27*(4), 231– 249. https://dx.doi:10.1023/A:1021018700609
10. Pop-Jordanova, N., Markovska-Simoska, S., Zorcec, T. & others. (2005). Neurofeedback treatment of children with attention deficit hyperactivity disorder. *Prilozi*, *26*(1), 71–80.

11. Sherlin, L., Arns, M., Lubar, J. & Sokhadze, E. (2010). A Position Paper on Neurofeedback for the Treatment of ADHD. *Journal of Neurotherapy*, *14*(2), 66–78. https://dx.doi:10.1080/10874201003773880
12. Steiner, N.J., Sheldrick, R.C., Gotthelf, D. & Perrin, E.C. (2011). Computer-based attention training in the schools for children with attention deficit/ hyperactivity disorder: A preliminary trial. *Clinical Pediatrics*, *50*(7), 615–622. https://dx.doi.org/10.1177/0009922810397887
13. Cannon, R. & Lubar, J. (2011). Long-term effects of neurofeedback training in anterior cingulate cortex: A short follow-up report, *Journal of Neurotherapy*, *15*(2), 130–150. https://dx.doi.org/10.1080/10874208.2011.570688
14. Hammond, D.C. (2011). What is neurofeedback: an update. *Journal of Neurotherapy*, *15*(4), 305–336. https://dx.doi.org /10.1080/10874208.2011.623090
15. Lubar, J.F. (1995). Neurofeedback for the management of attention-deficit/ hyperactivity disorders. In M. S. Schwartz (Ed.), *Biofeedback: A practitioner's guide* (pp. 493–522). New York, NY: Guilford Press.
16. Sandford, J.A. & Sandford, S.E. (2015). *IVA2: Integrated Visual and Auditory Continuous Performance Test Manual*. North Chesterfield, VA: Brain Train, Inc.
17. Sandford (2015)
18. Sandford (2015)

Chapter 10 – Interventions to Empower Your Child at Home and School

1. Helmstetter, S. (2017). *What to Say When You Talk to Yourself*. New York, NY: Gallery Books.
2. Helmstetter (2017)

3. Helmstetter (2017)
4. Church, D. (2018). *Mind to Matter.* Carlsbad, CA: Hay House, Inc.
5. Helmstetter (2017)
6. Helmstetter (2017)
7. Britt, C. (2022). Personal Communication.
8. Britt (2022)

Chapter 11 – Interventions for Teachers to Help Their Students

1. Britt, C. (2022). Personal Communication.
2. Britt (2022)

Chapter 12 – The Elementary School Pilot Project

1. Britt, C. (2021). The Implementation of the IVA2 and Neurofeedback as Supplementary Support for Elementary Students. [Unpublished manuscript].
2. Britt (2021)
3. Britt (2021)
4. Britt, C. (2022). Personal Communication.

Chapter 13 – Finding a Lasting Solution

1. McReynolds, C., Bell, J. & Lincourt, T M. (2017). Neurofeedback: A noninvasive treatment for symptoms of post-traumatic stress disorder in veterans. *Journal of NeuroRegulation, 4*(*3-4*), 114-124. https://dx.doi:*10.15540/nr.4.3-4.114*

Appendix A – Artifact Corrected Neurofeedback

1. Sandford, J.A. (2017). SmartMind-4. BrainTrain Inc, Richmond
2. Sandford (2017)
3. La Marca, J.P., Cruz, D., Fandino, J., Cacciaguerra, F.R., Fresco, J.J. & Guerra. A.T. (2018). Evaluation of artifact-corrected

electroencephalographic(EEG) training: A pilot study. *Journal of Neural Transmission*. https://dx.doi: 10.1007/s00702-018-1877-1

4. Goncharova, I.I., McFarland, D.J., Vaughan, T.M. & Wolpaw, J.R. (2003). EMG contamination of EEG: Spectral and topographical characteristics. *Clinical Neurophysiology*. *114*:1580–1593. https://dx.doi.org/10.1016/S1388-2457(03)00093-2
5. Brunner, D., Vasko, R., Detka, C., Monahan, J., Reynolds, C. III & Kupfer, D. (1996). Muscle artifacts in the sleep EEG: automated detection and effect on all-night EEG power spectra. *Journal of Sleep Research, 5*(3):155–164. https://dx.doi.org/10.1046/j.1365-2869.1996.00009.x
6. La Marca (2018)

Appendix B – Description of IVA2 Scores

1. Sandford, J.A. & Sandford, S.E. (2015). *IVA2: Integrated Visual and Auditory Continuous Performance Test Manual*. North Chesterfield, VA: Brain Train, Inc.

Appendix C – IVA2 Definitions

1. Sandford, J.A. & Sandford, S.E. (2015). *IVA2: Integrated Visual and Auditory Continuous Performance Test Manual*. North Chesterfield, VA: Brain Train, Inc.

Appendix D - Differences Between IEPs, 504 Plans, and Individual Service Plans

1. www.understood.org
2. www.nea.org/resource-library/know-your-rights-section-504-rehabilitation-act
3. www.greatschools.org/gk/articles/section-504-2/
4. www.greatschools.org/gk/articles/what-is-an-iep/

abouT The auThor

Connie McReynolds, Ph.D. is a Licensed Psychologist, Certified Rehabilitation Counselor, and Certified Vocational Evaluator with more than 30 years of experience in the field of rehabilitation counseling and psychology. She earned her Ph.D. in Rehabilitation Psychology at the University of Wisconsin-Madison gaining valuable experiences in the Outpatient Substance Abuse Treatment Program at the William S. Middleton VA Hospital, at the Physical Medicine and Rehabilitation Neuropsychological Clinic at Meriter Hospital, and the Mendota Mental Health Institute.

Dr. McReynolds is Professor Emeritus and former Program Coordinator of the Rehabilitation Counseling master's degree program at California State University, San Bernardino where she worked for more than 14 years. Previously, she taught ten years at Kent State University, Ohio in the Rehabilitation Counseling master's degree program and served in numerous leadership roles. As a Fellow of the National Rehabilitation Counseling Association, she served on the Executive Committee for more than two decades advocating for individuals with disabilities. She has contributed to 40+ publications and given more than 200 presentations on a multitude of conditions

and topics. She was also inducted into the Phi Kappa Phi Honor Society for scholarly distinction.

Dr. McReynolds has shared her expertise across the United States and Europe at conferences in Vienna, Oslo, Oxford University, Bucharest, Belize, Prague, London, and Toronto. She is the founder of neurofeedback clinics in southern California working with children and adults ages five to 90 to reduce or eliminate conditions of ADHD, anxiety, anger, depression, chronic pain, learning problems, and trauma.