

# IVA+Plus™ Standard Interpretive Report

Prepared for Generic Joe on 3/15/2004

Test Date: 5/10/2001 Test Time: 9:21:00 AM Age: 7 years 8 months On Meds: Y  
Diagnosis: Group Code: ID Code:  
Medications: Adderall 10mg  
Comment:  
End Note:

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## OVERVIEW OF THE IVA+Plus CPT AND GENERAL INTERPRETIVE GUIDELINES

The IVA+Plus CPT (Integrated Visual & Auditory Continuous Performance Test) is a test of attention that measures responses to 500 intermixed auditory and visual stimuli spaced 1.5 seconds apart. The task is to click the mouse when the stimulus is a auditory or visual "1" and to refrain from clicking when the stimulus is a auditory or visual "2". A correct response is defined as exactly one click to a target stimulus. The individual taking the test must be able to discriminate between 1s and 2s, switch between sensory modalities, and maintain attention for about thirteen minutes. The targets ("1") occur frequently during some sections of the test and rarely during other sections, thus testing attention under both high and low demand conditions.

The high demand condition is defined as a "block" of 50 trials when the 1s are frequent. However, the first two target presentations are excluded from the measurement of performance under high demand conditions and are categorized as being part of the previous low demand conditions block. The reason that these first two targets are categorized in this way is that they are still pulling for errors of inattention as the test-taker has not yet made the transition to the mode of rapid clicking that is characteristic of the high demand block.

The quotient scores for all of the IVA+Plus scales are reported as standard scores. Standard scores have a mean of 100 and a standard deviation of 15. The Wechsler Intelligence tests, which are commonly used in schools to assess Full Scale, Verbal and Performance IQ, also use standard scores (i.e., Mean = 100, SD = 15). Thus, it is possible to easily compare and contrast an individual's scores on the IVA+Plus Full Scale Response Control scale and the Full Scale Attention scale with all three of the Wechsler Intelligence IQ scores. The relationship between the global Wechsler IQ scores and the IVA+Plus Full Scale Response Control and Attention global scales has not been fully determined at this time.

In addition to reporting standard scores for the IVA+Plus scales, the narrative report below also provides percentile rank. A person with a standard score of 100 has a percentile rank of 50, meaning that about half the people taking the test scored higher on that scale, and about half scored lower. In this narrative report, percentile rank is given in the following format, "(PR=50)," immediately following each standard score that is reported. For example, "John's Auditory Vigilance Score of 80 (PR=9) fell in the mildly impaired range."

This report is designed to aid qualified professionals in evaluating auditory and visual attention. It is confidential and should be distributed in accordance with professional guidelines. The report provides possible suggestions and hypotheses for the examiner, but it is not to be construed as prescriptive, definitive or diagnostic. Only "working" diagnoses are indicated by the test results. A working diagnosis is defined as the first diagnosis that the clinician should consider, but it is by no means conclusive. The IVA+Plus test does not make a diagnosis, but is designed to help the examiner to make a diagnosis. Given the complexity of ADHD symptoms and the limitations of a single test, this working diagnosis is inherently limited and may be incorrect. The clinician should review the report in the context of other information such as behavioral ratings of attention, behavior, social and educational background, emotional state, physical health, medication effects, recent environmental stressors, and data from other tests. As with all mental and performance tests, test conditions and inadequate motivation can significantly compromise a test's validity.

#### VALIDITY OF TEST RESULTS

This individual demonstrated sufficient understanding of the task for the test results to be considered valid in both the auditory and visual modalities for the Global, Primary and Attribute scales. The Fine Motor Regulation Quotient and Comprehension scales are also considered valid. However, this individual's auditory responses were very erratic and the examiner is advised to interpret the results with caution as discussed below. All of the IVA+Plus Global, Primary and Attribute scales will be included in the analysis and interpretation of these test results.

Both Auditory and Visual Persistence quotient scale scores were found to be valid. This individual's responses during both the Warm-up and Cool-down sections indicate that he was able to maintain his effort after the end of the main test. Also, both the Auditory and Visual Sensory/Motor quotient scale scores were identified to be valid. He responded sufficiently either during the Warm-up and/or Cool-down period such that it was possible to calculate his simple reaction time for both auditory and visual stimuli. These scales will be discussed below.

This individual made frequent auditory idiopathic errors that indicate the possibility that he did not fully understand and/or follow the test rules. His motivation to perform may have been low. If the examiner concludes, based on his or her clinical judgment, that this individual was low in his motivation or that he did not fully understand the test task due to gross cognitive deficits or intellectual deficiencies, then the results need to be interpreted with caution. However, if the examiner found that this individual made his best effort in completing the test task and understood the test task adequately, then the IVA+Plus test results can be validly interpreted without any restrictions. In this case, the examiner can better understand the causal factors for this high frequency of auditory "oddball" errors by examining the Auditory Symptomatic Comprehension, Persistence and Sensory/Motor scales.

The validity of the IVA+Plus CPT is assessed by determining whether an individual's responses are characteristic of random responding. An individual may randomly respond for a number of reasons. For example, some individuals may forget the test rules as the test progresses. Other individuals may "give up" or have very low motivation to perform to the best

of their abilities. It is also possible that individuals may fail to comprehend and remember the test rules fully or be cognitively incapable of performing the test task.

There are two validity checks for IVA+Plus. Test responses to the auditory and visual stimuli are separately evaluated for their validity. In interpreting the test results, it is best if both sensory modalities are valid. However, it is possible to interpret an individual's test responses if he responds validly only in one sensory modality.

The validity check is based on a statistical calculation. The test is considered valid only when the individual's decision to click to targets and inhibit clicking to non-targets is based on self-directed responses in accordance with the test rules. Statistically, the test results for a specific sensory modality are considered invalid when the probability of the individual's response pattern being self-directed in accordance with the test rules is less than 1 in 1000.

#### SUMMARY OF TEST RESULTS FOR THE IVA+Plus 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. Factors that load on this scale include the ability to inhibit responses to foils (i.e., 2s), the consistency of recognition reaction times and the person's ability to maintain his mental processing speed during the IVA+Plus test.

This individual's overall global quotient scale score for the Full Scale Response Control scale was 118 (PR=88). This score fell in the above average range. His Auditory Response Control quotient scale score was 106 (PR=66). This global scale score fell in the average range. This individual's Visual Response Control quotient scale score was 130 (PR=98). This global scale score fell in the exceptional range.

The Full Scale Attention Quotient provides a measure of an individual's overall ability to make accurate responses, stay focused and sustain his attention. This global scale's factors include the ability to be attentive and accurately respond under low demand conditions, remain focused and stay reliably "on task," and, at the same time, respond quickly when appropriate.

This individual's overall quotient score on the Full Scale Attention scale was 66 (PR=1). This global scale score fell in the moderately to severely impaired range. His Auditory Attention quotient scale score was 45 (PR=1) and this global scale score fell in the extremely impaired range. This individual's Visual Attention quotient scale score was 90 (PR=24). This global scale score was classified as falling in the average 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. This global measure of sustained attention is comprised

of the following scales: Acuity, Dependability, Elasticity, Reliability, Steadiness and Swiftmess. 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 74 (PR=4). This score fell in the moderately impaired range. His global Auditory Sustained Attention quotient scale score was 46 (PR=1) and it fell in the extremely impaired range. This individual's global Visual Sustained Attention quotient scale score was 104 (PR=62). This score was found to fall in the average 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 relating to the Primary Response Control, Attention scales, and the Symptomatic scale called Comprehension. Also, a discussion is included in sections below for the two Attribute scales, Balance and Readiness, and the three Symptomatic scales: Comprehension, Persistence, and Sensory/Motor.

#### RESPONSE CONTROL PRIMARY SCALES

##### Prudence And Reliability

Prudence is a measure of impulsivity as defined by errors of commission. It is an important measure of performance related to response control, and thus, a Primary scale. Three types of commission errors load on this scale. The first type of error occurs when an individual clicks to a 2 during the test period when the 1s are prevalent. The second type is the propensity error of commission which is defined as clicking to the foil, a 2, immediately after a 1 is presented during the period of the test when the 2s are prevalent. The third type is a subtle impulsivity error called a "mode shift" error of commission. A visual mode shift error occurs when the individual clicks to a visual 2 that immediately follows a minimum of two auditory 2s. The auditory mode shift error is defined as clicking to an auditory 2 that immediately follows a minimum of two visual 2s. All of these prudence errors reflect difficulty in making the correct response to an unexpected change in environmental stimuli.

This individual's Auditory Prudence quotient scale score of 116 (PR=86) fell in the above average range. He demonstrated a strength with respect to his ability to inhibit responses to auditory stimuli during the IVA test. This strength indicates the ability to inhibit and shift mental sets better than peers. He may be able to use this ability to compensate for any other areas of weakness in his attentional or cognitive functioning in his life. This ability indicates that he is not likely to make careless errors to auditory stimuli and that he has the ability to stop and think rather than overreact when stressed in his daily life. In cases where there are identified functional problems with inhibition or self-control with respect to auditory stimuli, causal psychological and/or emotional factors other than ADHD would need to be considered.

He did not demonstrate any problems with respect to the Auditory Reliability scale. His quotient score on this scale was 114 (PR=82), which falls in the above average range. Thus, he was able to avoid making impulsive idiopathic errors that would manifest as careless or inappropriate responses in his home and/or school environments. This individual is likely to have the ability to be accurate in detailed tasks and to remember and follow rules well.

This person's Visual Prudence quotient scale score of 116 (PR=86) fell in the above average range. In respect to the visual sensory modality, this individual's score indicated a strength in his ability to avoid careless and impulsive errors when a high demand to overreact exists. This person's ability to inhibit and shift mental sets with respect to visual stimuli is better than most individuals his age. This strength can be used by him to help compensate for any other areas of weakness in his attentional or cognitive functioning. He is not likely to make careless errors or overreact emotionally when stressed or pressured to meet unusual demands to perform in his environment. If other functional problems involving inhibition or self-control to visual stimuli are identified, the examiner would need to consider causal psychological and/or emotional factors other than ADHD.

He did not demonstrate any problems with respect to the Visual Reliability scale. His quotient score on this scale was 115 (PR=84), which falls in the above average range. Thus, he was able to avoid making impulsive idiopathic errors that would manifest as careless or inappropriate responses in his home or school environments. This individual is likely to have the ability to be accurate in detailed tasks and to remember and follow rules well.

This individual was found to have strengths in both auditory and visual sensory modalities of the Prudence scale in terms of his inhibition abilities. Given this profile, he is likely to be capable of inhibiting over-reactivity to both auditory and visual stimuli, and generally avoid making careless errors.

#### Consistency

The Consistency scale is a measure of an individual's ability to respond reliably based on his reaction time. Consistency is a Primary scale, and is considered an important measure in understanding and evaluating response control. It specifically excludes rare cases in which the individual drifts off or suffers a momentary attention lapse, unless these episodes are highly frequent. Consistency is considered indicative of an individual's ability to sustain his attention in order to produce responses that reflect stable, reliable, integrated brain functioning.

This individual was average in his ability to be consistent in his responses to auditory stimuli. His Auditory Consistency quotient scale score was 98 (PR=46). He is able to process new information in a reliable manner and "keep up the pace." He can usually ignore ordinary auditory distractions in the environment. This individual did not show problems in functioning that would indicate difficulties with internal distractions. He was not predisposed to make careless errors, and he demonstrated the ability to process auditory stimuli well.

His ability to be consistent in his responses to visual stimuli was above average. The Visual Consistency quotient scale score for this individual was 116 (PR=86). Even under distracting conditions or when stressed, this individual is likely to be consistent in his reaction time to visual stimuli. Working memory and the ability to sustain internal attention are indicated as areas of strength. This individual would probably be able to review his written work and to identify any careless errors by himself. Due to his strengths in visual consistency, he is likely to more quickly grasp and retain new concepts presented in a visual format.

This individual was able to use his cognitive strength as shown on the Consistency scale in both the auditory and visual domains to make sustained and consistent responses to test stimuli. He is likely to be able to use this strength to help him compensate when stressed. This stability and strength in his functioning is likely to help facilitate his functioning in a wide variety of different learning environments.

#### 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 scale is a Primary scale and is an important measure of response control. It is derived by comparing the mean reaction time of the first 200 trials to that of the last 200 trials. The raw score for this scale is based on a ratio of these two mean scores and is expressed as a percent. If the individual is slower in his response times at the end of the test, the raw score will be reflected in a percent score of less than 100%. In the rare case where the individual performs faster in the latter half of the test, the raw score will be greater than 100%.

This individual's Auditory Stamina quotient scale score of 98 (PR=46) fell in the average range. This person's response time to auditory stimuli did not change significantly over the course of the test. He was able to maintain his mental processing speed in the auditory domain during the test. However, he demonstrated problems with his auditory processing speed which was moderately to severely impaired. Thus, while he was able to maintain his auditory stamina, he still exhibited difficulties in his ability to respond quickly overall. This deficit indicates that he is likely to have problems at times completing his school tasks quickly.

This person's Visual Stamina quotient scale score of 123 (PR=93) fell in the superior range. This person's response time to visual stimuli became faster over the course of the test. He was able to increase his mental processing speed in the visual domain during the test. However, he demonstrated problems with his visual processing speed which was mildly to moderately impaired. Thus, while he was able to maintain his visual stamina, he still exhibited difficulties in his ability to respond quickly overall. This trait could cause him to have problems getting his work done in the school environment.

Strengths were found in this individual for both the auditory and visual domains of the Stamina scale. However, he demonstrated problems with both his visual processing speed, which was mildly to moderately impaired, and with his auditory processing speed, which was moderately to severely

impaired. Thus, while he was able to maintain his stamina, he still was slow in his mental processing speed in both sensory domains. These deficits may cause him to have difficulty at times completing his school tasks quickly.

#### Fine Motor Regulation

The Fine Motor Regulation Quotient measures off-task, spurious, impulsive and inappropriate fine motor activity using the mouse input device. Errors on this Primary scale are considered reflective of problems with fine motor self-control, but do not reflect gross motor hyperactivity (i.e., "out of seat" behavior). 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. Generally, high incidences of these behaviors are atypical, except for children age 13 and under and older individuals (55+). Quotient scores above the average range are considered reflective of better controlled and more self-regulated responses.

Sometimes, individuals will click impulsively when the instructions are being given to them during the Warm-up and Cool-down sections of the IVA+Plus. Generally, this type of error may be attributed to a person's difficulty listening accurately to instructions; it may also occur for people who have impulsive tendencies and are more impatient than most other people. In the IVA+Plus, this type of error is labeled as a "spontaneous" mouse click and is defined as occurring only during the instructional periods that precede the Warm-up, Cool-down and Practice Sessions.

Some IVA+Plus test-takers will exhibit off-task behavior in another way. These individuals "play" with the mouse by holding the mouse button down. If this behavior occurs during the Warm-up or Cool-down sections of the IVA+Plus test, the test-taker is warned and instructed not to repeat this error. Only during the main section of the test do errors of this type load onto the Fine Motor Regulation scale. These actions generally occur when the individual engages in inappropriate, "testing the limits" behavior. Occasionally, a high incidence of this type of fine motor error is due to the fact that an individual holds down the right mouse button while he uses his index finger to click the left mouse button. If the examiner sees a high number of "holding" errors, he or she needs to be sure that the individual being tested did not keep the right button held down during the course of the test. Such behavior, if done frequently, is very likely to result in invalid IVA+Plus test results.

Spurious errors are also made by some IVA+Plus test-takers. This type of error, which is only measured during the main test, is defined as clicking the mouse in a haphazard, anticipatory or random manner, such that the reaction time speed for that particular trial is less than 125ms. Extensive testing has shown that it is not possible for individuals to perceive and initiate their responses to the IVA+Plus visual or auditory stimuli faster than 125ms. For most people, simple reaction time speed has been found to range between 200 and 600ms. Thus, clicking the mouse such that the reaction time speed is less than 125ms. would comprise an invalid, anticipatory, spurious response.

The most common type of fine motor hyperactivity error is an impulsive one and is due to the test-taker's making one or more additional clicks either to target or non-target stimuli (i.e., 1s or 2s) during the main test.

This person's Fine Motor Regulation quotient scale score was 80 (PR=10). His score fell in the mildly impaired range. He made 6 spontaneous responses while the instructions preceding the Warm-up, Cool-down or Practice sessions were being delivered. During the test, he held down the mouse button 24 times. He made 8 spurious errors, defined as reaction times of less than 125 ms., which is faster than is possible. He clicked the mouse button 11 extra times during the main test.

This mildly impaired quotient score for the Fine Motor Regulation scale indicates some problems with self-control. He had some difficulty following the test rules and making the appropriate responses. This score is reflective of occasional periods of confusion or impulsivity. Some individuals may exhibit gross motor hyperactivity (based on the examiner's clinical judgment) that is congruent with this mildly impaired score, but for others no significant gross motor hyperactivity will be observed. In other words, a person may be able to sit still, yet engage in fidgety, off-task and impulsive behaviors that are not always obvious to others. This impairment is likely to manifest in the home or school environment as intermittent restlessness, occasional doodling, random fiddling with objects, and some impulsive playing with different items. This type of behavior is most likely to occur when he is bored with assigned tasks or is required to sit still, be quiet and listen. Others in his environment are likely to be somewhat disturbed or distracted by his off-task and impulsive conduct unless it is very carefully hidden from them. At times he is likely to have difficulty getting his work done and to be distracted to the point where he cannot stay focused well. Occasionally he may have a tendency to self-stimulate, particularly when bored. If these problems occur, he may have difficulty completing school assignments in a timely manner.

#### ATTENTION PRIMARY SCALES

##### Vigilance, Steadiness And Acuity

Vigilance is a Primary scale that measures general attentional ability. Deficits in Vigilance result from errors of omission. Errors of omission occur when the individual fails to click to the 1 when the 2s are frequent. Also, a failure to click to a 1 that immediately follows a 2 when the 1s are frequent is labeled a propensity error of omission. In general, Vigilance provides a measure of a person's ability to maintain and make directed attentional efforts and appropriate responses to detailed, important stimuli in their environment.

This person's Auditory Vigilance quotient scale score was 45 (PR=1), which falls in the extremely impaired range. This individual showed significant problems with his general auditory attentional functioning that are likely to have a major impact on his ability to perform successfully in many areas of his life. During periods of the test he failed to stay attentive to key auditory stimuli and was not able to sustain his auditory attention. Consequently, he is likely to have problems in the school environment in maintaining his auditory attention unless he is actively engaged and/or environmental demands to perform are clearly evident to him

and enforced. Further clarification is provided below regarding the specific problems he has with auditory attention and whether his difficulty functioning occurs specifically under high and/or low demand conditions. On the Auditory Acuity scale, he showed a specific aspect of attentional functioning that reflected a relative strength that will be further elaborated.

This person's quotient score on the Auditory Steadiness scale was 15 (PR=1). This score fell in the extremely impaired range. He showed problems with respect to the Auditory Steadiness scale. This pattern of responding indicates that there was either negligence, indifference, impairments in working memory or some mental confusion that resulted in his failure to respond accurately to auditory stimuli when the 1s were frequent. Thus, he needs to be clinically evaluated as to whether this extreme deficit in Vigilance involves a lack of motivation or is the result of one or more of the other factors listed above. In either case, this individual's performance on both the Auditory Vigilance and Steadiness scales reflected gross attentional dysfunction to auditory stimuli. Medication may also need to be considered by the appropriate health professional in order to help him improve his auditory attentional functioning.

This individual's quotient score was 92 (PR=31) on the Auditory Acuity scale. The Auditory Acuity scale showed that his ability to pay attention under low demand conditions fell in the average range. In other words, this individual was able to maintain his attention well specifically under low demand conditions. However, under high demand conditions, he showed significant problems in auditory attentional functioning that will need to be addressed.

This person's Visual Vigilance quotient scale score of 98 (PR=46) fell in the average range. This individual did not show any problems with his general visual attentional functioning. He did not miss many key visual stimuli. He is likely to demonstrate good attention in the school environment. If attention problems do exist, the impact of environmental stimuli and/or social distractions needs to be considered, or other emotional, cognitive or psychological causal factors may need to be explored. Further clarification is provided below regarding any variability in his visual attentional functioning as well as any identified strengths in visual attention.

This person's quotient score on the Visual Steadiness scale was 94 (PR=34). This score fell in the average range. No significant problems with attentional functioning to visual stimuli were identified during high demand conditions. This individual understood the rules well and responded to visual stimuli accurately when the 1s were prevalent.

This individual's quotient score was 95 (PR=38) on the Visual Acuity scale. The Visual Acuity scale showed that his ability to pay attention under low demand conditions fell in the average range. Thus, this individual was able to stay attentive and function well under both low and high demand conditions.

This individual's impairments in Vigilance occurred only in the auditory modality. Consequently, he is likely to learn best if he is first shown information about a topic and then later given verbal instruction relevant to that topic. Other ways to draw out his visual attentional strengths need to be explored in order to help him compensate for his dysfunction in the auditory domain. The errors he is likely to make due to his difficulties in Auditory Vigilance will most likely be reflected in problems listening and recalling discussions and lectures and following instructions in his home or school environment. Given the severity of his inability to be vigilant and accurately process auditory stimuli, emotional and psychological problems are likely to be exacerbated. Appropriate interventions will need to be considered with respect to his problems. Recommended interventions and accommodations for his deficits in the auditory modality are identified above.

#### Focus, Dependability And Stability

The Focus scale reflects an individual's ability to sustain attention reliably and not "drift off" or "tune out." It is a Primary scale that is an important contributing factor in the assessment of global attentional functioning. Impairments in Focus result from relatively frequent slow response times to test stimuli. These delays in response may occur due to momentary lapses in attention, confusion caused by deficits in working memory, episodic mental fatigue or gross problems in sustaining attention.

This individual's Auditory Focus quotient scale score of 102 (PR=54) fell in the average range. No significant problems with auditory focus were identified for him. He was able to maintain his auditory focus throughout the test. On the IVA+Plus test, this individual demonstrated the ability to cope well with both internal and external auditory distractions in his environment, and his response times did not show excessive variability.

On the IVA+Plus test, he showed the ability to respond reliably to auditory stimuli as evidenced by the Auditory Dependability scale. His quotient score on this scale was 98 (PR=46), which falls in the average range. His response times to auditory stimuli did not excessively vary under low demand conditions. He may, though, be challenged at times when the pace to perform is excessively demanding for him or the environment is a highly distracting one, as evidenced by the auditory attention problems that are discussed below. His difficulties in functioning may manifest in terms of either withdrawn behavior, refusal to do work, irritability or feelings of frustration.

He was identified to have more problems with respect to the Auditory Stability scale. His quotient score on this scale was 74 (PR=4), which falls in the moderately impaired range. These problems involved maintaining his processing speed reliably under high demand conditions when the 1s were prevalent. Thus, he showed more variability in his responses when required to perform quickly. This pattern of responding indicates that he is likely to be erratic in his responses to auditory stimuli and make more errors when the demand for him to perform is high. Systematic cognitive training to improve his processing speed and reliability in responding is likely to be the best approach to help him.

This person's Visual Focus quotient scale score of 106 (PR=66) fell in the average range. He did not demonstrate any problems with visual focus. During the IVA+Plus 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. This individual should be able to function adequately and to process visual information well in most environments unless other attention, psychological or emotional problems exist.

His ability to respond reliably to visual stimuli was evidenced by the Visual Dependability scale. His quotient score on this scale was 108 (PR=69), which falls in the average range. His response times to visual stimuli did not excessively vary under low demand conditions. Thus, he was found to show the ability to be intrinsically motivated and perform adequately in most school or work environments specifically with respect to the reliability of his processing speed.

He was identified to show some problems in his ability to respond reliably as evidenced by the Visual Stability scale. His score on this scale was slightly impaired. Generally, he was able to maintain his processing speed under high demand conditions when the 1s were prevalent. Thus, the variability of his responses was slightly impaired when he was required to perform quickly. This pattern of responding indicates that he may at times be somewhat erratic in his responses to visual stimuli and that he may, at times, be prone to make some errors when the demand for him to perform is high. Systematic cognitive training needs to be considered in order to help him improve the stability of his visual attentional functioning.

He was found to have a strength in his ability to stay focused in both the auditory and visual domains. He is likely to maintain his concentration and to be reliable in his responses, even under demanding conditions. These cognitive strengths should help him to perform better in a variety of different learning situations.

#### Speed, Quickness And Swiftness

The Speed scale is based on the mean recognition reaction time (RRT) for all correct responses. This Primary scale is an important measure of global attentional functioning. The recognition reaction time (RRT) of individuals, either to the visual or to the auditory stimuli used in IVA+Plus, can be conceptualized as three separate brain functioning processes. Thus, RRT is the total time it takes the individual (1) to see the target, (2) to recognize that it is a target requiring the initiation of a response, and (3) to make the correct motor response. Correct responses are defined as one or more clicks occurring at 125ms or more either to the auditory or to the visual target. Spurious clicks exhibiting response times of less than 125ms are excluded in the calculation of the mean recognition reaction time for the Speed scale. Based on this theoretical model, the following formula would apply:

$$RRT = PT + DT + MT$$

RRT is Recognition Reaction Time, PT is Perception Time, DT is Discriminatory/Decision Processing Time and MT is Motoric Reaction Time. PT is a measure of the time between the presentation of the stimulus and the individual's detection of that stimulus. DT represents the amount of time it takes the individual to discriminate and decide whether the stimulus is the defined target or not and then whether to initiate a response or not. The MT variable in this formula is the specific time needed for the muscles to implement a response when a "go" decision has been made. 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.

The Quickness scale is a measure of the mean recognition reaction time of correct responses when the targets are frequent and the demand to perform is high (i.e., the 1s are prevalent). When the targets are rare and the demand to perform is low, the mean recognition reaction time of correct responses forms the basis of the Swiftness scale. These two scales together complement each other and are components of the Speed scale. The Speed scale differs from Quickness and Swiftness in that it includes the mean recognition reaction for all correct responses.

This individual's Auditory Speed quotient scale score of 67 (PR=1) falls in the moderately to severely impaired range. This individual demonstrated moderate to severe impairment in his auditory processing speed during the test. This impairment is likely to have a significant impact on his ability to perform in different areas of his life. During the test, his recognition reaction time indicated a moderate to severe difficulty in him being able to perceive and respond quickly to auditory stimuli. This deficit reflects slow mental processing speed and he may be moderately to severely impaired in his ability to listen and comprehend instructions. Thus, he is likely to perform poorly in his ability to recall verbal information presented to him. He may also have difficulty taking accurate and detailed notes in the classroom setting or in meetings. In his interactions with other individuals, he is likely to have problems "catching on" and understanding key information during conversations. In the school setting, he may be labeled as a "slow learner."

His difficulty in processing auditory information quickly is likely to have a substantial negative impact on his emotional and psychological attitude toward himself and toward the demands placed on him in the home or school environments. Individuals with this moderate to severe deficit may develop low self-esteem and "learned helplessness" that manifests in an "I can't do it" attitude or in withdrawn behavior. In some cases, when frustration tolerance or anger control is poor, he may engage in "acting out," irritability and verbal negative outbursts. These emotional problems are likely to exacerbate poor social interactions with peers, causing others to be impatient with him or to fail to understand him. In some cases, people may respond by minimizing contact with him or avoiding him altogether, resulting in his feeling alienated from others.

This delay in his mental processing speed is likely to impact his working memory, which in turn may significantly affect verbal recall and his ability to complete multi-step tasks. Deficits with respect to reaction time are also likely to manifest as very poor organizational skills. He is likely to have difficulty setting priorities, staying on task, and following work

through to completion. In some cases, he may procrastinate or avoid doing his required work altogether.

If this individual has shown difficulty mastering phonemic and phonological skills, the strong possibility exists that he may have problems in reading. If this is the case, his reading difficulties are likely to manifest as deficits in reading speed and fluidity, and these deficits in turn are likely to impact significantly his ability to comprehend what he reads. As a result, he may read just enough to "get by." Such individuals are likely to have been labeled or to report themselves as "slow readers."

This individual is likely to benefit from cognitive training exercises to improve his auditory processing speed. Cognitive training could ameliorate his working memory deficits, help him to become better organized in his thinking, and increase his ability to be an "active thinker." He is also likely to respond better to behavioral interventions to help him set priorities, stay on task and "get the job done." Improvement in auditory processing speed can help enable him to process verbal information more accurately when in conversation with others and to listen and comprehend lectures or presentations in the school environment. If he has any deficits in reading speed or comprehension, cognitive training to improve auditory processing speed is likely to contribute to the effectiveness of any reading interventions. Medication may also need to be considered by the appropriate health professional in order to help him improve his auditory processing speed.

Compensatory strategies will need to be explored in order to help this individual cope with his moderate to severe deficits in auditory processing speed. Given that he is very likely to have difficulty taking notes, a reasonable accommodation would be to provide the instructors or speaker's lecture notes to him, or to give him copies of notes taken by other individuals who attend the same presentation or meeting. To-Do lists, Post-Its, daily schedule books, "homework helpers" and/or electronic organizers are possible practical approaches for helping him to improve his organizational skills and complete assigned work. This individual needs to recognize that if he does not write important information down, he is very likely not to remember it.

This individual's Auditory Quickness quotient scale score of 69 (PR=2) falls in the moderately to severely impaired range. His quotient score on the Auditory Swiftness scale was 72 (PR=3). This quotient score is interpreted as moderately impaired. No difference between the quotient scores for the Auditory Quickness and Auditory Swiftness scales was found. Thus, this individual's mean auditory reaction time was generally the same under both high and low demand conditions. He did not show any noticeable difference in his speed of responding to auditory stimuli under the two different test conditions. The interpretation of the Auditory Speed scale discussed above is applicable to his performance under both the high and low demand conditions.

This person's Visual Speed quotient scale score of 75 (PR=4) falls in the mildly to moderately impaired range. This individual exhibited mild to moderate impairment in his visual processing speed during the test. This problem is likely to have some impact on his ability to perform in different areas of his life. During the test, his recognition reaction time indicated a mild to moderate difficulty in him being able to perceive and respond

quickly to visual stimuli. This deficit reflects somewhat slow mental processing speed and he is likely to be mildly to moderately impaired in his ability to read and comprehend written instructions. He may have some difficulty recalling visual information presented to him. At times he may find it hard to take accurate and detailed notes in the classroom setting or in meetings. In the school setting, he may be challenged in some academic areas because of his mild to moderately slow visual processing speed. His difficulty in processing visual information quickly may have a negative impact on his emotional and psychological attitude toward himself. He may develop problems with self-esteem and self-confidence.

This delay in his mental processing speed may occasionally impact his working memory, which in turn may affect reading comprehension, visual recall and his ability to complete multi-step tasks. His problems with respect to reaction time could manifest as poor organizational skills. He may at times have difficulty setting priorities, staying on task, and following work through to completion. In some cases, he may procrastinate or avoid projects that are complex or challenging.

This individual is likely to benefit from cognitive training exercises to improve his visual processing speed. Cognitive training could ameliorate his visual memory deficits, help him to become better organized in his thinking, and increase his ability to be an "active thinker." He is also likely to respond better to behavioral interventions to help him set priorities, stay on task and "get the job done." Improvement in visual processing speed can help enable him to process visual information more accurately in the school environment. Cognitive training to improve visual processing speed is likely to contribute to the effectiveness of any interventions to correct deficits in reading speed or comprehension. Some compensatory strategies may prove useful in helping this individual cope with his mild to moderate deficits in visual processing speed.

This individual's Visual Quickness quotient scale score of 70 (PR=2) falls in the moderately impaired range. His quotient score on the Visual Swiftness scale was 104 (PR=62). This quotient score is interpreted as average. His score on the Visual Swiftness scale is significantly higher than his Visual Quickness score. This indicates that he performed faster under low demand conditions (i.e., when the 2s were prevalent). When the required pace to process visual test stimuli was slower, he was able to respond quicker than when the demand to perform was high. Consequently, this individual is less likely to respond well when pressured to perform. Instead, he is likely to do relatively better when visual information is presented to him slowly.

This individual's significant impairments in Speed were evident for both the auditory and visual modalities. Thus, the problem that he has responding quickly is likely to be compounded. He has no relative strength within or above the normal range to help him compensate for other deficits in functioning.

#### ATTRIBUTE SCALES

##### Balance

The Balance scale is an attribute scale that is used to evaluate relative

differences between auditory and visual reaction times. Attribute scales are not generally used in a diagnostic manner. Instead, they are designed to provide insight into characteristics of the test-taker's functioning. The purpose of the Balance scale is to reveal whether the individual is likely to be faster, and thus, learn better, through the visual or auditory mode, or is equally quick in both modes. This scale can help to identify a relative strength in mental processing speed for one sensory modality or the other. The Balance raw score is derived by dividing the mean recognition reaction time of the Visual Speed scale by the corresponding mean of the Auditory Speed scale. The resulting ratio scale is expressed as a percentage and reflects the differences between the visual and auditory modes relevant only to that individual, not relative to a normative sample. Consequently, a quotient score less than 85 does not indicate any impairment, but reveals that a person was relatively faster in processing auditory information as compared to visual information. Likewise, a quotient scale score of 116 or above shows that an individual is relatively faster in processing visual information compared to auditory information. The use of a ratio as the basis of the Balance scale score provides a way to control for people's innate differences in reaction times to visual and auditory stimuli. Most people are much faster in their mean recognition reaction time to visual as compared to auditory stimuli.

This individual's Balance quotient scale score was 92. He was found to have no relative difference between his visual and auditory mental processing speeds. Thus, he has a balanced ability to process information in these two different sensory modalities. He is likely to be able to learn as well through visual or written instruction, as he would through verbal instruction.

#### Readiness

The Readiness scale is an attribute scale that is used to compare the test-taker's mean recognition reaction times under high vs. low demand conditions. The Readiness scale is based on the ratio of the mean recognition reaction time under high demand conditions (Quickness) to the corresponding reaction time under low demand conditions (Swiftness). This raw score is expressed as a percentage. Generally, most individuals react somewhat slower under low demand conditions and are relatively faster under high demand conditions. Readiness is defined as an attribute scale and, thus, is a measure of a person's differences in functioning relative to himself rather than a comparison with a normative sample. Consequently, a quotient score less than 85 does not indicate any impairment, but reveals that a person was faster under high demand conditions relative to low demand conditions for their mean recognition reaction time. Likewise, a quotient scale score of 116 or above shows that an individual is faster in their mean recognition reaction time under low demand conditions as compared to high demand conditions. In addition, a person can be generally slow overall in responding to test stimuli as measured by the Speed scale (indicating difficulty in general mental alertness), but not function differently under conditions of high or low demand.

This individual's Auditory Readiness quotient scale score was 103. This individual was able to respond in respect to his auditory mental processing speed at relatively the same speed under both high and low demand conditions. This suggests that he is generally not affected by pressure to perform at a fast pace and is able to respond equally well to auditory

stimuli when the pace of work is slow or not very demanding. Thus, external conditions in his life do not generally affect his innate auditory speed of mental processing. He may be described as "balanced" on this attribute scale.

This individual's Visual Readiness quotient scale score was 140. His recognition response time to visual stimuli under low demand conditions was much quicker than it was under high demand conditions. In other words, his response times to visual stimuli are clearly slower when he is required to make rapid, repeated responses. In this case, the mean reaction time under low demand conditions is considered to be an accurate measure of his optimal mental processing speed, and he is less able to respond when the pressure to perform is high. In some cases, this response pattern could be a subtle indication of visual attention problems that would be manifested in life as difficulty "keeping up the pace" when visual information is presented rapidly. When individuals have this attribute of having better visual mental processing speed when the demand is low, it may be useful to accommodate them by giving them more time or help in processing written instructions.

#### SYMPTOMATIC SCALES

##### Comprehension

The Comprehension scale is a measure of idiopathic errors both of commission and omission occurring under both low and high demand conditions. It is one of the three Symptomatic scales and, thus, is useful in identifying factors that may impact performance and possibly reflect the test-taker's motivation toward taking and understanding the IVA+Plus test. These errors occur when an individual clicks to a 2 or does not click to a 1. These idiopathic errors are divided into separate auditory and visual scales. In designing the test, the test authors identified specific trials under both high and low demand conditions when these types of errors may occur. There are a number of possible causes for these errors.

When an individual responds in a random, impulsive manner to test stimuli, there will be a high frequency of idiopathic errors of commission. This random pattern will be evident to the examiner in most cases, because the individual's Reliability quotient score will be very low. As discussed above, the Reliability scale is a measure solely of idiopathic errors of commission. An extremely high degree of random, impulsive responding may result in an invalid test profile for either the auditory or visual sensory modality or for both. When one or more of the sensory modalities is found to be invalid, the Comprehension score is still reported and in almost all cases, will fall in the extremely impaired range.

When the Comprehension scale quotient score is very low, it may also be the result of very careless responding or extreme inattention. In some cases, when an individual frequently fails to respond to test targets or stops responding altogether, this response pattern will invalidate the IVA+Plus results due to the very high degree of idiopathic errors of omission. The Steadiness scale provides a measure of these idiopathic errors of omission. It needs to be pointed out that errors on the Prudence and Vigilance scales do not "load" in any way on the Comprehension scale. Comprehension errors

may be described as "oddball" errors and are not specifically pulled for by the IVA+Plus test pattern design.

The Comprehension scale is a composite scale based on the Steadiness and Reliability scales. The Steadiness scale is comprised of idiopathic errors of omission that occur under high demand conditions; in other words, the individual fails to click to a 1 when the 1s are frequent. The Reliability scale is comprised of idiopathic errors of commission that occur under low demand conditions. For example, a Reliability error occurs when the individual clicks one or more times to a 2 under low demand conditions.

This individual's Auditory Comprehension quotient scale score of 41 (PR=1) fell in the extremely impaired range. Significant and severe problems were identified for this individual with respect to the Auditory Comprehension scale. He made a large number of idiopathic errors, showing significant problems with test performance and difficulties in following the test rules. His problems are clarified and explored below in a review of the Steadiness and Reliability scales, the two scales that comprise the Comprehension scale.

His Auditory Steadiness quotient scale score was 15 (PR=1). This quotient score fell in the extremely impaired range. This impairment is very likely to impact his ability to respond appropriately to auditory stimuli when the demand to perform is high. This pattern of responding indicates that this individual was either negligent, indifferent, impaired in working memory or had some mental confusion that resulted in his failure to respond accurately to auditory stimuli under high demand conditions. He needs to be evaluated clinically to determine whether this extreme deficit in Comprehension is due to one of these causal factors or is the result of other emotional or psychological factors that impair his functioning. In either case, this individual's performance on both the Auditory Comprehension and Steadiness scales reflects gross attentional dysfunction to auditory stimuli.

On the Auditory Reliability scale, he had a quotient score of 114 (PR=82). This quotient score was in the above average range. He did not have problems with respect to the Auditory Reliability scale. He did not make an excessive number of impulsive idiopathic errors of commission. He was not impulsive in this way and made few "oddball" responses to auditory stimuli under low demand conditions.

This person's Visual Comprehension quotient scale score of 93 (PR=31) fell in the average range. No major problems with functioning and performing adequately on the IVA+Plus test were found for the Visual Comprehension scale. Overall, he performed well with respect to his ability to follow the test rules. He did not demonstrate any significant problems with respect to the Visual Comprehension scale that would impact his life. Further discussion regarding any relative weaknesses or strengths is presented below for the Steadiness and Reliability scales that comprise the Comprehension scale.

His Visual Steadiness quotient scale score was 94 (PR=34). This quotient score fell in the average range. No significant problems with attention to visual stimuli under high demand conditions were identified. This individual understood the rule that required him to respond to visual 1s, and he did this well.

On the Visual Reliability scale, he had a quotient score of 115 (PR=84). This quotient score was in the above average range. He did not demonstrate any problems with respect to the Visual Reliability scale. He did not make an excessive number of impulsive idiopathic errors of commission. He was not impulsive in this way and made few "oddball" responses to visual stimuli under low demand conditions.

#### 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. It is useful in helping to identify factors that may affect performance and/or possibly reflect underlying attitudinal or behavioral characteristics of the test-taker. It is derived by dividing the mean simple reaction time of the fastest three responses occurring during the Warm-up by the mean simple reaction time of the fastest three responses occurring during the Cool-down. This calculation is done for both the auditory and visual modalities. The resulting ratio is converted into a percentile raw score. Percentile scores of less than 100% reflect that the individual's mean simple reaction time was slower during the Cool-down than during the Warm-up period. In other words, the test-taker slowed down between the beginning and the end of the test. Likewise, if the percent raw score is greater than 100%, the individual's mean reaction time during the Cool-down period was faster than the mean reaction time measured during the Warm-up period.

The Warm-up period provides practice in using the mouse and establishes a baseline in terms of simple reaction time. When the mean reaction time of the Cool-down period is significantly slower than that measured during the Warm-up period, this score indicates possible problems performing after the main test task is completed. This slower mean reaction time may be due to motor or mental fatigue, an oppositional attitude, or a decrease in motivation to do any additional tasks. In contrast, when an individual demonstrates a faster mean reaction time after completing the IVA+Plus, this score is indicative of an effort to continue to perform well all the way to the end of the test.

This individual's Auditory Persistence quotient scale score of 94 (PR=34) 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 IVA+Plus test. Given that his Auditory Stamina quotient score fell in the average 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 95 (PR=38) fell in the average range. There was no significant difference 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 impair his functioning on the IVA+Plus test. Given that his Visual Stamina quotient score fell in the superior range, he was not

identified by the test as being mentally fatigued in his ability to respond to visual stimuli. This pattern of responding suggests that he does not get fatigued easily when required to process visual stimuli.

#### Sensory/Motor

The Sensory/Motor scale provides a measure of an individual's simple reaction time. This scale is one of the three Symptomatic scales and can be useful in identifying factors that may affect performance on other IVA+Plus scales. First, the simple reaction time of the three fastest trials on the Warm-up section of the IVA+Plus test is computed. Second, the same calculation is made to derive the mean simple reaction time for the Cool-down section. These two scores are then compared, and the faster mean reaction time becomes the raw score for the Sensory/Motor scale. During both the Warm-up and Cool-down test periods, ten visual 1s are presented, followed by ten auditory 1s. There are no foils (i.e., 2s) presented during either of these two periods. Thus, the simple reaction time used as the raw score for the Sensory/Motor scale is theoretically based on PT (Perception Time) + MT (Motoric Reaction Time).

The purpose of the Sensory/Motor scale is to identify any problems related to the underlying integrity of an individual's sensory/motor system. A very slow simple reaction time may possibly influence the Speed and/or Global Attention scale scores. In some rare cases, a very slow reaction time may indicate possible underlying neurological problems. People can be challenged by the demand to focus and react quickly to stimuli for a variety of different reasons, including emotional, psychological, and learning difficulties. A person with a high level of anxiety may hesitate and respond more slowly than others, due to feelings of insecurity and the fear of making mistakes. Individuals may also vary in their interpretation of the instructions given for the Warm-up and Cool-down. In response to the instruction to "be as quick as you can, but be careful, too," some individuals may respond as soon as they see a 1 on the screen (given that they are also told that they will only see 1s). Others may wait just a little before clicking to be sure that they are seeing a 1.

For these reasons, only the fastest three reaction times are used to derive the mean of the Sensory/Motor raw scale score in an effort to obtain a relatively accurate and reliable measure of simple reaction time for each individual. However, it is recommended that this scale be interpreted with some caution due to the numerous factors that may affect it and the limited number of trials used to derive it. Usually, only when the scores are in the severe or extreme range should the examiner give weight to this scale's possible impact on the IVA+Plus test performance and/or life functioning.

This individual's Auditory Sensory/Motor quotient scale score of 92 (PR=31) fell in the average range. His auditory simple reaction time was very similar to that of most of his peers. However, he demonstrated significant impairments in respect to his Auditory Speed scale score, which fell in the moderately to severely impaired range. In cases where this occurs, the Speed scale is considered a much more reliable measure for assessing possible emotional, psychological and/or cognitive difficulties. Thus, the examiner will need to discount the potential positive effect of his average score on the Sensory/Motor scale and rely more on the Speed scale

score as an indicator of latent problems that may affect his auditory attentional functioning in the home and/or school environments.

This person's Visual Sensory/Motor quotient scale score of 70 (PR=2) fell in the moderately impaired range. His visual simple reaction time was moderately slower compared to his peers. Fatigue, psychological or emotional problems will need to be considered as possible causal factors for his slower visual reaction time. However, based on his Visual Sensory/Motor quotient score, his slow visual reaction time is not considered to be a significant factor that would impact his visual test performance or his functioning in life.

I have reviewed the findings of this automated IVA+Plus Interpretive report. Any changes in the interpretation, based on my clinical judgment, are noted above and initialed.

Signature: \_\_\_\_\_

Examiner's Name: \_\_\_\_\_  
Please Print

Date: \_\_\_\_\_