

## **DISCLAIMER**

The information contained within this document does not constitute medical advice or diagnosis and is intended for education and information purposes only. It was current at the time of publication and every effort is made to keep the document up to date.

The information contained herein includes both psychological and non psychological interventions. The delivery of psychological services requires a medical referral whilst non psychological services do not.

Each person is an individual and has a unique psychological profile, biochemistry, developmental and social history. As such, advice will not be given over the internet and recommendations and interventions within this website cannot be taken as a substitute for a thorough medical or allied health professional assessment or diagnosis.

# Integrated Visual and Auditory (IVA) Continuous Performance Test

## Article QUICK LINKS :

[Introduction](#) / [Features of the I.V.A.](#) / [Analysis of Results](#) / [Validity and Reliability](#) / [Clinical use of the I.V.A.](#)

## INTRODUCTION

The Integrated Visual and Auditory (I.V.A.) continuous performance test (CPT) is a screening tool used in conjunction with other diagnostic procedures (parent and teacher behaviour rating scales, QEEG, T.O.V.A.) to assist in the screening of individuals with Attention Deficit Hyperactivity Disorder (ADHD). Developed by John Sandford (psychologist) and Anne Turner (physician). It was designed to discriminate ADHD populations from individuals with Conduct Disorder and without behaviour problems and is based on the research of Chee (1989) and Connors (1994). It can also be used to monitor the effectiveness of neurofeedback training or medication.

## FEATURES OF THE I.V.A.

Like all CPT's the I.V.A. is designed to be mildly boring and demanding of sustained attention producing errors of inattention (omission) and impulsivity (commission) However, unlike other CPT's the I.V.A has some useful features which are listed below.

1. The I.V.A. is a 13 minute computerised test which combines two types of CPTs for both visual and auditory modalities. By combining impulsivity and inattention in a counter-balanced design and presenting each in the auditory and visual mode, the I.V.A. incorporates four CPTs into one.
2. Since the "1"s and "2" are presented in a pseudo-random combination of visual and auditory stimuli, it is more demanding than other CPTs as it challenges an individual's ability to change cognitive sets.
3. Administration of the test is automated to standardise the presentation of auditory and visual stimuli. The computer "speaks" all test instructions in order to minimise test variability.
4. The test task is very simple and requires the person to click the mouse only when he hears or sees the target (in this case the number "1") and not to click when he sees or hears the non-target (foil) item (in this case the number "2").

5. The test contains two conditions in two modalities for a total of 200 trials. The first block of 100 trials consists of 50 trials in the auditory modality and 50 trials in the visual modality. This is a measure of impulsivity utilising a ratio of targets to non-targets of 5.25:1; the second block of 100 consists of 50 trials in the auditory modality and 50 in the visual modality.

This assesses inattention where the number of targets to foils is reversed but the ratio stays the same. This counterbalanced pattern allows the individual to physically rest to some degree and controls for practice and fatigue effects during the course of the test.

6. By using a mouse click as a means of response, the I.V.A. provides an objective means of fine motor hyperactivity by measuring a variety of inappropriate mouse clicking activity.
7. The I.V.A. provides six global composite quotient scores and 22 raw scales to help gain an in-depth understanding of the variety of ways in which ADHD-type problems may manifest.
8. An extensive normative database (n=1700 normals, ages 5 – 90 +) takes into account age and gender differences.
9. Tset-Retest Analysis allows for comparison between any two tests to evaluate the significance of any changes resulting from neurofeedback training or medication.

## **ANALYSIS OF RESULTS**

All scores are presented as raw scores and quotients (Mean 100, Standard deviation 15). The scores are divided into four main categories:

**Attention, Response Control, Attribute and Validity.**

The primary diagnostic scales are the **Full Scale Response Control Quotient** and the **Full Scale Attention Quotient** scores.

The **Full Scale Response Quotient** is based on separate **Auditory** and **Visual Response Control Quotient** scores.

The **Response Control Quotient** score are derived from visual and auditory **Prudence, Consistency and Stamina** scales.

1. **Prudence:** is a measure of impulsivity and response inhibition as evidenced by three different types of errors of commission (impulsivity, propensity and mode shift).

2. **Consistency** : measures the general reliability and variability of the response times and is used to measure the ability to stay on task.

3. **Stamina** : compares the mean reaction times of correct responses during the first 200 trials to the last 200 trials. This score is used to identify problems related to sustaining attention and effort over time.

**The Full Scale Attention Quotient** is derived from separate **Auditory** and **Visual Attention Quotients**.

**The Attention Quotient** scores are based on equal measures of visual and auditory **Vigilance**, **Focus** and **Speed**.

**1. Vigilance** : is a measure of inattention as evidenced by two types of different errors of omission (inattention ie failure to respond to a target when a response set of inhibition has been established and propensity i.e. non-response to a target immediately after a foil has been presented.)

**2. Focus** : reflects the total variability of mental processing speed for all correct responses.

**3. Speed** : reflects the average reaction time for all correct responses throughout the test and helps identify attention problems related to slow discriminatory mental processing.

The **Fine Motor Regulation** scale provides additional information by recording off-task behaviours with the mouse, including multiple clicking, spontaneous clicks during instruction periods, anticipatory clicks and holding the mouse button down. In behavioural terms, the Fine Motor Regulation scale quantifies fidgetiness and restlessness associated with small motor hyperactivity.

The **Attribute** scores provide information regarding the individual's learning style. These scales are **Balance** and **Readiness**.

**1. Balance** : indicates whether the individual processes information more quickly visually or aurally, or is equally quick in both modalities.

**2. Readiness** : indicates whether the individual processes information more quickly when the demand is quicker or when it is slower. This scale also provides a subtle measure of inattention when the test taker just "can't keep up" with the demand.

There are three **Validity** scales used to evaluate whether a test taker's responses can be interpreted in a meaningful way. These scales are **Comprehension**, **Persistence**, and **Sensory / Motor**.

**1. Comprehension** : identifies random responding which would lead to faulty interpretation of other I.V.A. scale scores. Research has shown this to be the single most sensitive sub-scale in discriminating ADHD.

**2. Persistence** : is a measure of motivation when the individual is asked to do "one more thing". It can also reflect mental or motor fatigue.

**3. The Sensory / Motor** : scales are used to rule out neurological, psychological or learning problems as evidenced by slow simple reaction time.

## **VALIDITY AND RELIABILITY**

In the test-retest reliability study, the I.V.A. was found to be a significantly stable measure of performance both globally and in terms of specific scales. The sensitivity of the IVA in being able to correctly identify ADHD children who were previously diagnosed by health professionals is 92%.

The Specificity (proportion of non ADHD children who received a negative finding) was 90%. The positive predictive power is 89% and the number of false negatives 7.7% (lower than most other CPT's).

## **CLINICAL USE OF THE I.V.A.**

- Used as a measure of attention in neurological injuries and disorders
- As a diagnostic tool, as part of a multi-faceted, multi-disciplinary assessment of children, adolescents and adults with suspected ADD/ADHD
- As a tool to predict response to medication and to determine optimum dosage
- To monitor the effectiveness of neurofeedback training and medication in clinical settings
- For research purposes in clinics and institutions.

An objective test like the I.V.A. provides useful data to help clinicians in documenting the presence or absence or response control and attentional problems that support making a clinical, differential diagnosis of ADHD. This is particularly so in the case of adults who often only realise they may have ADHD when their children are diagnosed and who then have to rely almost exclusively on subjective recall of past problem behaviour; going back fifteen or more years.

**For more information or to make an appointment please contact us on (02) 9637 9998 during business hours.**