Objective:

Quickly help you interpret, understand, and communicate the results of the Test of Variables of Attention (T.O.V.A.)
Module topics:
- General overview of the T.O.V.A
- "Official" Interpretation
- Empirical interpretation
- Communicating the results to parents
- Real case studies from my practice

Introduction
- By no means a complete picture of interpretation
- Based on my personal clinical experience
- TOVA company has many resources:
  - Clinical guide
  - Phone: Monday - Friday, 8:30am - 5:00pm PST
    at 800.PAY.ATTN (800.729.2886 or 562.594.7700) extension 14.
  - Workshop and conferences
T.O.V.A

- 22 minutes continuous performance test (half time for 4-5 yo)
- Assesses attention in neurobehavioral disorders
- Visual and auditory mode [I use only the visual version]
- Non-language based
- Sensitivity of 84% (ability to correctly identify true cases => 16% false negative)
- Specificity of 90% (ability to correctly identify normals => 10% false positive)
- Test-retest reliability
- Virtually no practice effect

Administering the T.O.V.A

- Should be administered in the morning before noon
- Pre/post should be administered at same time of morning
- In neuropsychiatric evaluation, administer first
- Norms were obtained with 3 minute practice test
- Norms were obtained with observer present
- Ensure that lighting does not cause any glare on the screen
- Reframe from prompting unless absolutely necessary
Empirical tips in administering T.O.V.A.

- Ask the child if s/he needs to go to the bathroom (ask twice!!)
- Being present and observing can teach you a lot about the child’s overall behavior
- Not being present while still being able to observe the child’s can teach you A LOT about the child’s overall behavior
- Adapt the T.O.V.A to the needs of the child (eg someone who would really only display lots of problem at end of the day)
- Bottom line: perform pre/post in identical conditions
T.O.V.A.

- First half (Q1 and Q2) is infrequent target mode
  - 36T and 126 NT per quarter
  - Boring task, traditional to measure vigilance
  - Individuals with "low CNS arousal" do poorly
- Second half (Q3 and Q4) is frequent target mode
  - 126 T and 36 NT per quarter
  - Stimulating task, traditional to measure inhibition
  - Individuals with "high CNS arousal" do poorly

Errors of omission

- Forgets to press when should have
- Measure of inattention
- Measure of inattention - focused attention (quality of attention)
- Ceiling effects in adults
- Also look at absolute raw number (Form 6), as 1 or 2 errors create statistical significance yet are of little clinical significance.
- Associated with high impact/high sensitivity from toxicity (especially heavy metals)
**Errors of commission**

- Presses when should not have
- Measure of impulsivity/inhibition ("prefrontal brake")
- More frequent in second half
- Excessive commission errors will tend to lead to decrease omission errors, quicker reaction times and increase variability.
- "Invalid" quarters due to excessive commission errors are not invalid, you just need to interpret the score keeping the commission score in mind.

**Response Time**

- Time it takes to respond to target
- ADD/ADHD individuals have slower response time
- One of the most important measure in T.O.V.A (12% of variance)
- Evaluation of the speed of processing information in CNS
Response Time Variability

- Measure of variability or inconsistency
- ADD/ADHD individuals are highly inconsistent [HALLMARK]
- The most important measure in T.O.V.A (80% of variance)
- Measure of inattention – sustained attention (quantity of attention)

Anticipatory responses (AR)

- Measure of guessing
- Occurs when a response is made between 200 msec before and 200 msec after any stimulus is presented
- Had to review that to 150 msec as overall children population response time seems to get faster due to video games.
- Excessive AR usually tend to decrease omission, increase commission, make response time faster and increase or decrease variability
- In extreme cases, excessive AR can “invalidate” the other measures to the point where they all show within normal.
Anticipatory responses (AR)

- Excessive AR is usually a sign of ADHD
- Disinhibition leads to lack of restrain
- Oppositional behavior may lead to "beating" the game
- Keep in mind that some individuals may just have extremely well developed response time (experienced game players, athletes or musicians in Auditory TOVA)

Post-Commission Response Time

- Response time immediately after a commission error
- Awareness of mistake should lead to a slow down for the next response
- Hyperactive and conduct disorder tend to not slow down or get faster
Multiple responses

- Reflection of neurological status
- Multiple response tend to correlate with non-specific neurological immaturity

D’

- Response sensitivity
- Measure of performance decrement or rate of deterioration of performance over time
- 6% of the variance in T.O.V.A.
- My observations tend to suggest a correlation with distractability
Summary of errors

- Omission – inattention / focused attention (quality)
- Commission – impulsivity (« prefrontal brake »)
- RT – speed of processing of information in CNS
- Variability – inattention / sustained attention (quantity)
- D’ – distractibility

Picture of what’s going on

Focused attention (quality – omission)

Sustained attention (quantity – variability)
### T.O.V.A. Interpretation

**Standard score:**

Norm is 85 – 115 for Normal IQ

This is what I use to interpret data.

**Standard deviation:**

Norm is -1.00 to +1.00

This is what is used to calculate ADHD score

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### ADHD SCORE

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1 = Invalid Quarter
b = Borderline result
* = Significantly Deviant Result
**ADHD SCORE**

The T.O.V.A. ADHD Score

The ADHD Score is a comparison of the subject’s responses to those of an ADHD group. An ADHD Score of -1.80 or less (more negative) fits the profile of the ADHD sample. A score of more than -1.60 (more positive) does not fit the ADHD profile. When comparing ADHD Scores (such as with medication challenges), the higher the ADHD Score the better the performance. Thus, the ADHD Score can be used as an indicator of response to treatment.

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**T.O.V.A. Interpretation**

1. **Sometimes needs to be calculated manually.**

- 1.80

Score compared to « ADHD »
- Severe attention problems
- The more to the left, the worst

Score compared to « Normal »
- Not necessarily normal
  1. Normal
  2. Light
  3. Moderate
**TOVA CLINICAL**

**INTERPRETATION GUIDELINES**

**Clinical Interpretation Rules**

- The following results are compatible with attention deficit:
  - $O + C + RT + V \geq -3.6$ and $O + RT + V \geq -2.6$
  - $O$ or $RT$ or $V \geq -2.0$
  - $O + RT + V \geq -3.0$
  - If $O + RT + V \geq -2.0$ and $\leq -3.0$, then « borderline score »
  - If $RT \geq -2.0$, $O$ and $V$ each $>-1$, and $C < -2$
  - If any two $(O, RT, V) \geq -1.5$

p. 25 Clinical Guide
Impact of Intelligence

- Normal TOVA results for normal IQ (100): 85-115
- Individual with above average IQ is expected to perform above average TOVA
- For individuals with high IQ, adapt the cut-off point:
  - IQ -15 points = new cut-off point

E.g. For an IQ of 120, the cut-off is 105 (instead of 85)

Things to remember

- TOVA performance is influenced by intelligence
- Some people can successfully self-medicate with caffeinated beverages
- Any other medication may affect attention
- People with extensive video game experience or highly trained athletes may perform normally due to eye-hand training
- Bottom line:
  
  the test never diagnoses, it is the clinician that does
TOVA FORM 1

- "Results are within normal limits"
- "Results are not within normal limits and are suggestive of an attentional disorder"

Personally, I never really pay attention to the interpretation here. I am more interested in the ADHD Score (Form 2) and the Data (Form 4). Visual individuals may like the Graph Analysis (Form 3).

I always look at "Notes to the Clinician" (Form 7) to see if there are some abnormal results that I need to take into considerations (such as excessive omission or commission errors, or anticipatory responses).

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School Intervention Report

- Do not forget that you can print a "School Intervention Report" from the TOVA on the basis of the test result.
- This is a great added-value
- This is something you might want to use in your marketing material
COMMUNICATING RESULTS
TO PARENTS

Communication Tips

- In order to facilitate communication, I suggest that you invite the parent to be present when instructing the child about the TOVA.
- In my ROF, you remember that I report what we have found from the 3 neurological levels: spinal/postural – cerebellar – prefrontal cortex.
- I say something like this:

  “The clinical exam has shown that the [right/left] hemisphere is not functioning up to par or is delayed in its development, leading to communication problems within the brain. Now let’s look at what these do to your child’s ability to concentrate and control him/herself”
T.O.V.A. Interpretation

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T.O.V.A. Interpretation

Drawing the ADHD Score

- 7.81
- 1.80
T.O.V.A. Interpretation

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Communication

- Go through the clinical cases
- Review the interpretation
- Review the communication and language to report results

T.O.V.A. Interpretation