

**NINDS CDE Notice of Copyright  
Test of Variables of Attention (TOVA)**

<b>Availability:</b>	Please visit this website for more information about the instrument: <a href="#">Test of Variables of Attention</a>
<b>Classification:</b>	<p><b>Supplemental-Highly Recommended:</b> Mitochondrial Disease (Mito):</p> <ul style="list-style-type: none"> <li>• Highly recommended for studies that measure cognitive attention span.</li> </ul> <p><b>Supplemental:</b> Cerebral Palsy (CP) and Epilepsy</p>
<b>Short Description of Instrument:</b>	<p><b>Purpose:</b>The Test of Variables of Attention (TOVA) assesses sustained visual attention and inhibition of impulsivity over time.</p> <p>The TOVA is a computerized measure of attention and impulsivity commonly used in the assessment of attention-deficit hyperactivity disorder (ADHD). Subjects press the space bar whenever any letter except the letter 'X' appears on the computer screen. There are multiple inter-stimulus intervals. Thus, this test reflects, in part, inhibitory control. For a test that uses a more tradition continuous performance paradigm to assess primarily vigilance (as opposed to inhibitory control), the T.O.V.A. may also be considered (Test of Variables of Attention; Greenberg, 2000). The test involves the subject pressing the space bar to one of two simple geometric forms on the screen; as such, it does not require familiarity with letters and may be more suitable for low functioning or pre-literate children.</p> <p><b>Age range:</b> TOVA visual, ages 4–80+; TOVA auditory, ages 6–19</p> <p><b>Administration:</b> Computerized testing with micro-switch response</p> <p><b>Administration Time:</b> 20 minutes</p> <p><b>Scoring Estimate:</b> Automatic computer scored</p> <p><b>Primary Dependent Measures:</b> It was the consensus that there is presently insufficient empirical support to recommend one dependent measure as primary.</p> <p><b>Vendor:</b> Multi-Health Systems, Inc. (MHS), PO. Box 950, North Towanda, NY, 14120-0950</p>

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<p><b>Rationale/ Justification</b></p>	<p><b>Strengths:</b> The TOVA uses geometric or auditory stimuli to minimize the impact of learning disabilities, cultural differences (Boivin 2002) and visual impairment, and is designed to minimize practice effects so it can be used for serial assessments. A microswitch response button is used to increase accuracy in response time measurement and to minimize motor fatigue. A brief version is available for children as young as 4. Can be easily administered by an assistant with simple training.</p> <p>The TOVA has been used to evaluate change over very brief treatment intervals (Goez et al, 2012), as well as across a variety of disease populations that may mimic symptoms of mitochondrial disorders including depression (Canpolat et al., 2014) and HIV (Ruel et al., 2012).</p> <p><b>Weaknesses:</b> Requires specific configuration of computer and specialized microswitch response button. Lengthy to administer, and typically examinees do not enjoy this test.</p> <p>CP: There is very limited use of the TOVA in research on CP, including initial evidence to suggest that biofeedback has positive effects on aspects of attention.</p>
<p><b>Scoring</b></p>	<p>TOVA is computer administered and computer scored. The scoring program provides a report including "variability of response time (consistency), response time, commission (impulsivity), errors of omission (inattention), post-commission response times, multiple and anticipatory responses, and an ADHD score, which is a comparison to an age/gender specific ADHD group.</p> <p>The TOVA immediately analyzes the results quarter by quarter and provides written interpretation and graphics.</p>
<p><b>References</b></p>	<p>Goez HR, Scott O, Nevo N, Bennett-Back O, Zelnik N. Using the test of variables of attention to determine the effectiveness of modafinil in children with attention-deficit hyperactivity disorder (ADHD): a prospective methylphenidate-controlled trial. <i>J Child Neurol.</i> 2012;27(12):1547–1552.</p> <p>Manor I, Meidad S, Zalsman G, Zemishlany Z, Tyano S, Weizman A. Objective versus subjective assessment of methylphenidate response. <i>Child Psychiatry Hum Dev.</i> 2008;39:273–282.</p> <p>Boivin MJ. Effects of early cerebral malaria on cognitive ability in senegalese children. <i>J Dev Behav Ped.</i> 2002;23(5):353–364.</p> <p>Ruel TD, Boivin MJ, Boal H, Bangirana P, Charlebois E, Havlir DV, Rosenthal PJ, Dorsey G, Achan J, Akello C, Kanya MR, Wong JK. Neurocognitive and motor deficits in HIV-infected Ugandan children with high CD4 cell counts. <i>Clin Infect Dis.</i> 2012;54:1001–1009.</p>