

A Guide to Using the Test of Variables of Attention (T.O.V.A.TM) in Research

As part of our commitment to serving the needs of children and adults who suffer from brain injuries, medical disorders affecting central nervous system functioning, and attention disorders, The TOVA Company has a Special Rate Program with discounted costs to qualified researchers for use in their work. An application can be sent by request to info@tovatest.com.

If you are accepted into the Special Rate Program, we ask that you provide us with updates regarding your work and provide us with a copy of your results when your study is complete. In some cases, we may also ask if you might be willing to share de-identified data from your study to help in creating supplemental T.O.V.A. normative sets or to help us improve the T.O.V.A. in some way.

In any study using the T.O.V.A., we want to help make sure that the results obtained are as valid and accurate as possible. Because of its remarkable sensitivity, we want you to be aware of factors that can impact performance on the T.O.V.A. apart from the intervention or condition that you are studying. These factors include but are not limited to: use of psychoactive substances, sleep deprivation, time of day, test order, and instructions. While these factors impact clinical assessment with the T.O.V.A., they are particularly important when you use the T.O.V.A. in research.

Psychoactive substances.

The T.O.V.A. is the only widely available Continuous Performance Test that measures reaction time with millisecond precision. For this reason, it will show changes in performance on the response time and response time variability scores that are associated with relatively small amounts of psychoactive substances. It is important to query subjects regarding their routine use of coffee, cigarettes, or other central nervous system (CNS) stimulants or depressants, including illicit substances that may affect TOVA performance for days or weeks after use.

You should also be aware that performance on the T.O.V.A. will be impacted by the acute effects of caffeine or nicotine withdrawal, and T.O.V.A. performance will certainly be modified by the CNS effects of a hang-over, stress, or sleep deprivation.

If a subject is already being treated with long acting medications like antidepressants, anticonvulsants, or tranquilizers and is expected to continue to take the medication(s) for some time, they should continue to take the medication(s) as prescribed (Of course, when the dosage of these medications is changed or the medication is discontinued, new baseline [no medication] and on-treatment T.O.V.A.s need to be obtained.)

In addition, you should screen for the incidental use of antihistamines or anxiolytic medications to ensure that the CNS effects of these medications does not contaminate your results. You may want to design inclusion/exclusion criteria that minimize these effects by excluding persons who routinely consume large amounts of caffeinated beverages (and would thus find it difficult to refrain from use before taking the T.O.V.A.), or who are heavy smokers. Scheduling your testing at the start of the day may help participants avoid use of caffeine without experiencing withdrawal.

Sleep deprivation.

The T.O.V.A. is highly sensitive to variations in alertness associated with sleep deprivation. To ensure that your results are not influenced by variations in sleep deprivation, you should screen your participants for disturbed or limited sleep the previous night and reschedule T.O.V.A. administration if it is clear that the individual is sleep deprived.

If your participants include individuals who perform shift work, you should not administer the T.O.V.A. at a time outside of their adapted sleep-wake cycle. That is, you should administer the T.O.V.A. at the start of their work “day” even if this is second or third shift. Note that shift workers routinely experience sleep problems, and it is possible that their performance will not be typical of that of individuals who have more typical sleep-wake cycles (even if you do attempt to match their sleep-wake cycle).

Time of day.

For the T.O.V.A. normative studies, data were collected at the start of the day and as the first test administered. While some normative data was collected with administration times throughout the morning and as late as 1:00 PM, diurnal variation in psychophysiological functioning almost certainly impacts performance on the T.O.V.A. If you wish to compare your participants to the T.O.V.A. normative sample (i.e., make use of T.O.V.A. standard scores), you should administer the T.O.V.A. in the morning and as the first test in a battery. If your study involves repeating the T.O.V.A. at a later date, be sure to repeat the T.O.V.A. the second time at approximately the same time of day as the initial administration.

Test order.

As noted above, performance on the T.O.V.A. can be modified by mental (or physical) fatigue or stress. If you have an extensive research battery, or require participants to complete other physically or mentally demanding tasks as part of your study, be sure that you control for sequence of test administration in your study and, ideally, place the T.O.V.A. at or near the beginning of your sequence. Try to maintain the test order in subsequent administrations.

Test setting.

To minimize distractions, testing should be done in a somewhat dimly lighted and quiet room with no visual distractions in front of the subject. The telephone (and cellular phone) need to be turned off during testing.

Instructions and maintaining compliance.

Most psychological tests are sensitive to variation in the instructions provided by an examiner, and these concerns are even greater with a task such as the T.O.V.A. Detailed instructions for administration of the T.O.V.A. and T.O.V.A.-A are provided in Appendix A of the *T.O.V.A. Clinical Manual*.

You can take three steps to ensure that your T.O.V.A. administration is as valid as possible:

First, make sure to administer the complete practice test the first time your subjects take the T.O.V.A. The practice test is designed to get them accustomed to the pacing of the task, and to

permit you the opportunity to coach them to make sure they understand the instructions. You can provide coaching, repeat the instructions, and confirm the accuracy of performance during the practice test. *That's what it's there for.* For subsequent tests, the practice test does not need to be given except briefly to remind the subject what to do.

Second, make sure to be clear and consistent in the way you provide instructions for the T.O.V.A. The instructions that you provide should consist of the following:

This test measures your ability to pay attention. Two different kinds of squares will flash on this computer screen. The squares will differ only in that one of them will have a small hole near the top [indicate with DISPLAY STIMULI command on screen], and one will have the hole near the bottom [indicate present nontarget]. We want you to press this button [present microswitch] every time you see the square with the hole near the top [indicate with DISPLAY STIMULI command].

[Find out which hand they use for writing]

I want you to hold this button in your writing hand with your thumb resting lightly on top, like this [indicate]. Here... take the button. Let up after you hear it click; don't hold the button down very long. Push it down only once for each correct picture.

Now we are going to flash the squares on the screen, and your job is to press the button AS FAST AS YOU CAN every time you see a square with a hole near the top [indicate]. But the trick is that you are NOT to press the button when the hole is near the bottom [indicate]. Remember to press the button as fast as you can but only for the square with the hole near the top.

[If you are administering the T.O.V.A.-A., the auditory TOVA, then the target is the higher of the two notes.]

The whole idea of this test is for you to be as fast, but also as accurate as you can. Try not to make any mistakes. But, if you do make a mistake...don't worry. Everyone can make a mistake on this test. Try and press the button as fast as you can but only for the square with the hole in the top. Don't be too fast -- take enough time to see which picture it is. Don't guess. Once you've pressed the button, let up. Don't press it more than once when you see the correct signal. Any questions...?

"Now we are going to have a short practice. After I press the button, you are going to see a dot appear in the middle of the screen. That's where the squares are going to appear. After the dot appears the numbers 3...2...1... are going to appear and then the first square will flash on the screen. Remember, the whole idea is to be as fast AND accurate as you can be.

Increase the validity of your T.O.V.A. administration by printing out these instructions and keeping them nearby so that you can read them to each subject. Practicing these instructions a few times will make the whole process smoother.

Finally, you or a research assistant must remain in the room with the subject for the full duration of the T.O.V.A. test. *This is of paramount importance.* You should position yourself behind and to the right or left of the subject, out of their direct view. *During the T.O.V.A., your job is to be present and maintain the "set" of performing the task.*

Avoid interacting with the subject at all during the task if you do not need to, however be ready to redirect the subject in as straightforward (and “nonrewarding”) a manner as possible. If you have to make numerous redirections, note this fact in your records. If the subject stops complying with the task, also note this and encourage them to continue in whatever manner you feel is appropriate. While episodes of noncompliance do threaten the validity of a T.O.V.A. administration, you should bear in mind that resistance does not necessarily invalidate the test.

By following these guidelines, you will minimize the amount of procedural “noise” that can contaminate test results, and you will get the most valid data possible.

We recognize that it is not always possible to maintain the degree of procedural control described in this document. Failure to adhere to all of these guidelines (particularly with adults) will not necessarily render the results invalid. However, you *must* administer instructions in the manner described above, and you or a research assistant *must* remain with the subject during the task.

Please feel free to call us at 1-800-PAY-ATTN for more information or if you have questions. Remember, we provide free technical, clinical, and research support, and we are very interested in making sure that your study goes well. Please do call us if we can do anything to help, and be sure to take a look at the *TOVA Research Frequently Asked Questions*, available at www.tovatest.com.

Good luck with your project, and thanks for your interest in using the T.O.V.A.!

Sincerely,

The T.O.V.A. Team