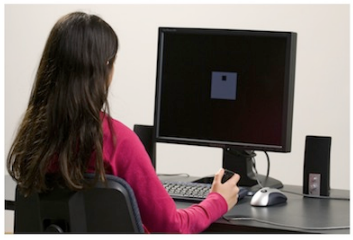
The Test Of Variables of Attention (T.O.V.A.®)

The **Test of Variables of Attention (T.O.V.A.)** is an FDA-cleared, state-of-the-art continuous performance test that provides healthcare professionals with objective measurements of attention and inhibitory control. The T.O.V.A. aids in the assessment of, and evaluation of treatment for, attention deficits, including attention-deficit/hyperactivity disorder (ADHD). T.O.V.A. results are available for children and adults (ages 4 - 80+) and should only be interpreted by qualified professionals.

The T.O.V.A. continuously measures performance during a 10.8-minute task or a 21.6-minute task, depending on age. It records speed, accuracy, and consistency of responses to a series of squares (in the visual T.O.V.A. test) or tones (in the auditory T.O.V.A. test) that are presented in two-second intervals. These measurements (accurate to ±1 ms) are then compared by age and gender to a normative sample (a sample of people without attention problems). This comparison determines whether the test results are "within normal limits" or not. The T.O.V.A. also compares results to a group of people independently diagnosed with ADHD. The T.O.V.A. report is based on these two comparisons, as well as performance, session, and response validity measures.



If you have questions about this report, please contact the person who provided it to you. For more information about attention and the T.O.V.A., please visit our website at https://www.tovatest.com/. To contact us please email info@tovatest.com or call 800.PAY.ATTN (562.594.7700).

ID: **3** **25y Female with PV flags Example Subject** (Jan 1, 1993)
Female - 25y 0m 0d

Visual T.O.V.A. (v9.0-89 sn30000)
Jan 1, 2018 at 9:00 AM

Session, Response, and Performance Validity

CAUTION: There are important performance validity issues that affect the interpretation of this test. Please see the Validity section of the Interpretation Notes page.

T.O.V.A. Interpretation

The results of this T.O.V.A. are not within normal limits, and may be suggestive of a possible attention deficit, including ADHD. Please see the Interpretation Notes page for additional information.

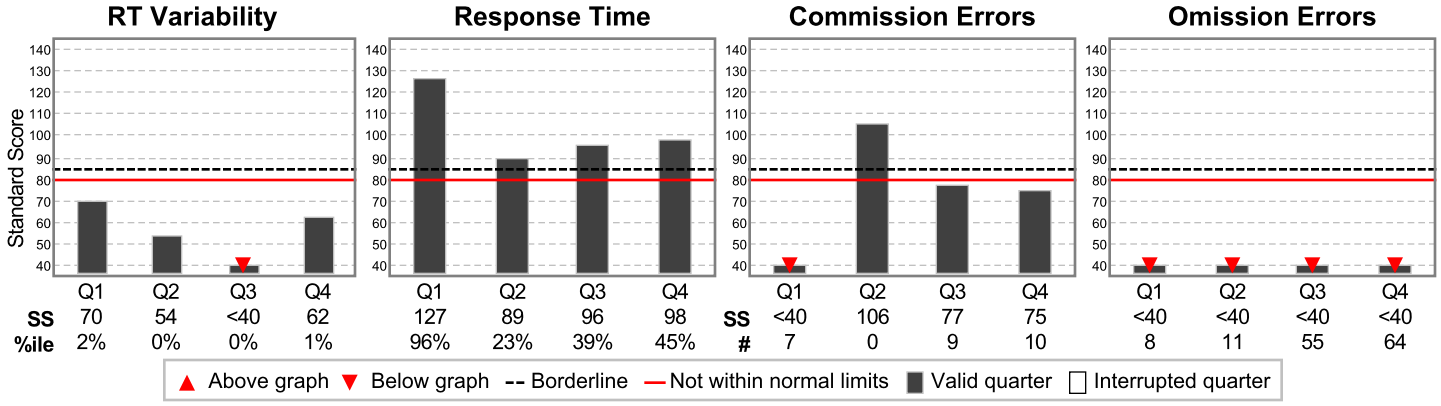
Treatment

No treatments entered.

Comparison to the Normative Sample

These scores compare this subject's performance to the performance of individuals of the same gender and age in the T.O.V.A. Normative Sample, a study of individuals who did not have attention problems.

Results are reported as standard scores (average standard = 100; standard deviation = 15). Standard scores above 85 are considered to be in the normal range, scores between 80 and 85 are considered borderline, and scores below 80 are considered not within normal limits. Scores less than 70 are considered significantly below normal range. Standard scores less than 40 are more than 4 standard deviations from normal, and are denoted as "<40".



Quarters, Halves and the Total are independently calculated and are not averages. Any Quarter, Half or Total that is Borderline or Not Within Normal Limits causes the Interpretation to be Borderline or Not Within Normal Limits. See the Interpretation Notes page for more information on these variables and on the subject's performance.

	Quarter				Half		Total
	1	2	3	4	1	2	
RT Variability	70	54	<40	62	47	48	46
Response Time	127	89	96	98	107	96	99
Commission Errors	<40	106	77	75	42	75	68
Omission Errors	<40	<40	<40	<40	<40	<40	<40
	Infrequent		Frequent				

Key: Borderline, Not within normal limits, Invalid

ID: **3** **25y Female with PV flags Example Subject** (Jan 1, 1993) **Visual T.O.V.A.** (v9.0-89 sn30000)
Female - 25y 0m 0d Jan 1, 2018 at 9:00 AM

Session comments

26-year-old female with unusual pattern of performance which was flagged by Performance Validity rules.

Session, Response, and Performance Validity

Performance Validity

CAUTION: 1 of 4 performance validity rules have been flagged.

Performance Validity is flagged to alert clinicians when there is unusually poor performance on the T.O.V.A. Higher numbers of flags indicate increasingly unusual patterns of performance. Only a clinician can determine if the test performance is due to: (1) ADHD, (2) attention deficits from other conditions such as traumatic brain injury, substance use disorders, sleep disorders, (3) medication effects, (4) poor effort, (5) malingering, or (6) other causes. Clinicians are encouraged to consider the entire clinical picture and seek additional information if needed to determine the cause of performance validity flags. Special caution should be taken when the possibility of secondary gain exists. Performance Validity is only applicable to ages 17 or older.

Rule	Results	Flagged
Total omission errors greater than 30	138	1
Half 1 commission errors (CE) greater than 10	7	0
Half 2 response time (RT) skew greater than +150 ms	+112 ms	0
Half 2 CE RT minus RT greater than +75 ms	+46 ms	0
Total rules flagged:		1

Notes on the Comparison to the Normative Sample

Variability is a precise measure of variations in correct response times, and measures the consistency of response times. **Variability was not within normal limits in Quarters 1, 2, 3, and 4, Half 1 and 2, and Total.**

Response Time is the average speed of correct responses to targets, and is a measure of information processing speed. **Response Time was within normal limits.**

Commission Errors occur when the subject incorrectly responds to a nontarget, and are a measure of inhibitory control. **Commission Errors were not within normal limits in Quarters 1, 3, and 4, Half 1 and 2, and Total.**

Omission Errors occur when the subject does not respond to a target, and are a measure of sustained attention. **Omission Errors were not within normal limits in Quarters 1, 2, 3, and 4, Half 1 and 2, and Total.**

Response Patterns

In Q2, Q3, Q4, there were 9 episodes in which three or more omission errors occurred in a row. Usually, Omission Errors tend to be scattered throughout the test, rather than clustered together. Assuming compliance with test instructions, this unusual pattern of performance may be caused by a significant external distraction, severe distractibility, falling asleep (e.g., narcolepsy), the occurrence of seizure(s), or other causes (poor effort, fatigue, etc.).

Commission Error Response Time is the mean response time for Commission Errors. Since Commission Errors are usually fast, impulsive responses, the Commission Error Response Time is usually faster than the Response Time. In Q1, Q4, H2, T, the Commission Error Response Time was slower than the Response Time, which is an unusual pattern of performance and may indicate non-compliance or impairment.

In Q1, the standard score for inhibitory control (commission errors) was low and the standard score for response time was high. Despite being instructed to balance speed and accuracy, the subject may have adopted a fast response strategy that emphasized responding as quickly as possible, resulting in high commission errors.

Other Notes

Consider administering an Auditory T.O.V.A. to this subject for a more comprehensive assessment of attention. This is important because an individual can have markedly different results on one test versus the other.

ID: **3** **25y Female with PV flags Example Subject** (Jan 1, 1993)
Female - 25y 0m 0d

Visual T.O.V.A. (v9.0-89 sn30000)
Jan 1, 2018 at 9:00 AM

Treatment

No treatments entered.

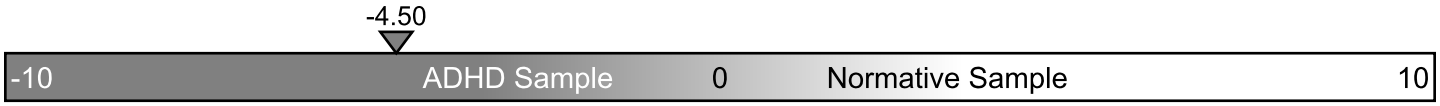
Attention Comparison Score

The Attention Comparison Score (ACS) is a subset of T.O.V.A. variables used to compare the subject's performance to a sample of individuals independently diagnosed with ADHD. Scores below 0 suggest a performance more similar to that of individuals with ADHD.

Note that the ACS does not include important variables from the Comparison to the Normative Sample. In order to understand the overall test results, the ACS should always be used with the Comparison to the Normative Sample, found on the Summary page. In particular, when the ACS is above zero and the Comparison to the Normative Sample is not within normal limits, the results should be considered not within normal limits.

The ACS is calculated by summing the following Z scores:

Response Time (Half 1)	0.48
D Prime (Half 2)	-3.18
Variability (Total)	-3.60
Calibration constant	1.80
Attention Comparison Score	-4.50



ID: **3** **25y Female with PV flags Example Subject** (Jan 1, 1993)
Female - 25y 0m 0d

Visual T.O.V.A. (v9.0-89 sn30000)
Jan 1, 2018 at 9:00 AM

This page contains tabulated raw data and documents T.O.V.A. session parameters.

		Quarter				Half		Total
		1	2	3	4	1	2	
RT Variability	ms	107	178	213	188	173	202	193
Response Time	ms	337	526	432	424	426	428	427
Post-commission responses	#	0	0	2	4	0	6	6
Response Time	ms	0	0	262	534	0	443	443
Variability	ms	0	0	46	117	0	162	162
Commission Errors	#	7/126	0/126	9/36	10/36	7/252	19/72	26/324
Percentage	%	5.6	0	25	27.8	2.8	26.4	8
Response Time	ms	344	0	417	525	344	474	439
Omission Errors	#	8/36	11/36	55/126	64/126	19/72	119/252	138/324
Percentage	%	22.2	30.6	43.7	50.8	26.4	47.2	42.6
D Prime		2.36	4.77	0.83	0.57	2.55	0.7	1.59
Standard Score		<40	70	50	57	47	52	48
Beta		2.66	7827.25	1.24	1.19	5.12	1.22	2.63
Anticipatory	%	0.6	0	4.3	1.2	0.3	2.8	1.5
To Nontargets	#	1	0	2	0	1	2	3
To Targets	#	0	0	5	2	0	7	7
Multiple Responses	#	0	0	0	0	0	0	0
Total Correct	#	146/162	151/162	91/162	86/162	297/324	177/324	474/648
Percentage	%	90.1	93.2	56.2	53.1	91.7	54.6	73.1
Skew	ms	50	126	130	231	112	112	125
User Interrupts	#	0	0	0	0	0	0	0
Hardware errors	#	0	0	0	0	0	0	0
		Infrequent		Frequent				

Session parameters

Format:	1 (standard)
ISI:	2000 ms
Stimulus On Time:	200 ms
Stimulus Off Time:	300 ms
Anticipatory Cutoff	150 ms

Session information

Tester:	
Import Filename:	example-subjects.tova (4 / 7)
Import Date:	Sep 21, 2023 11:23:44 AM
Errors/Warnings:	

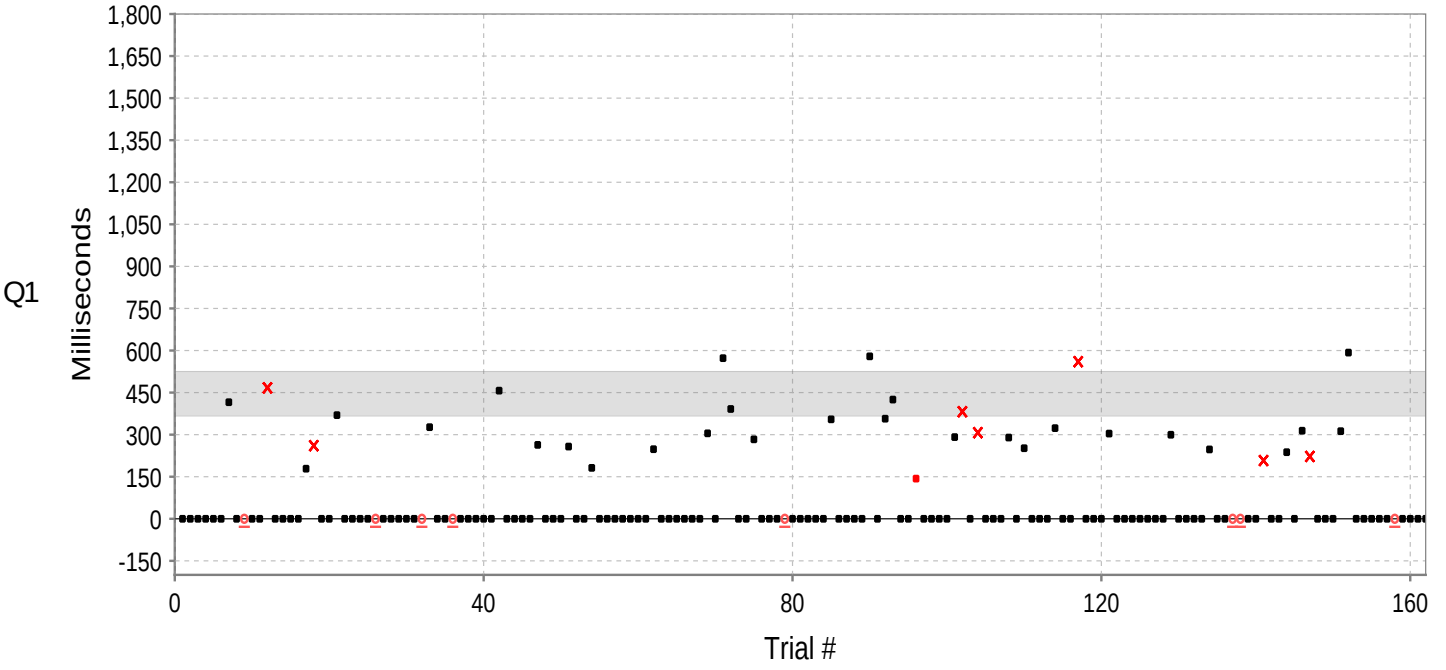
Hardware information

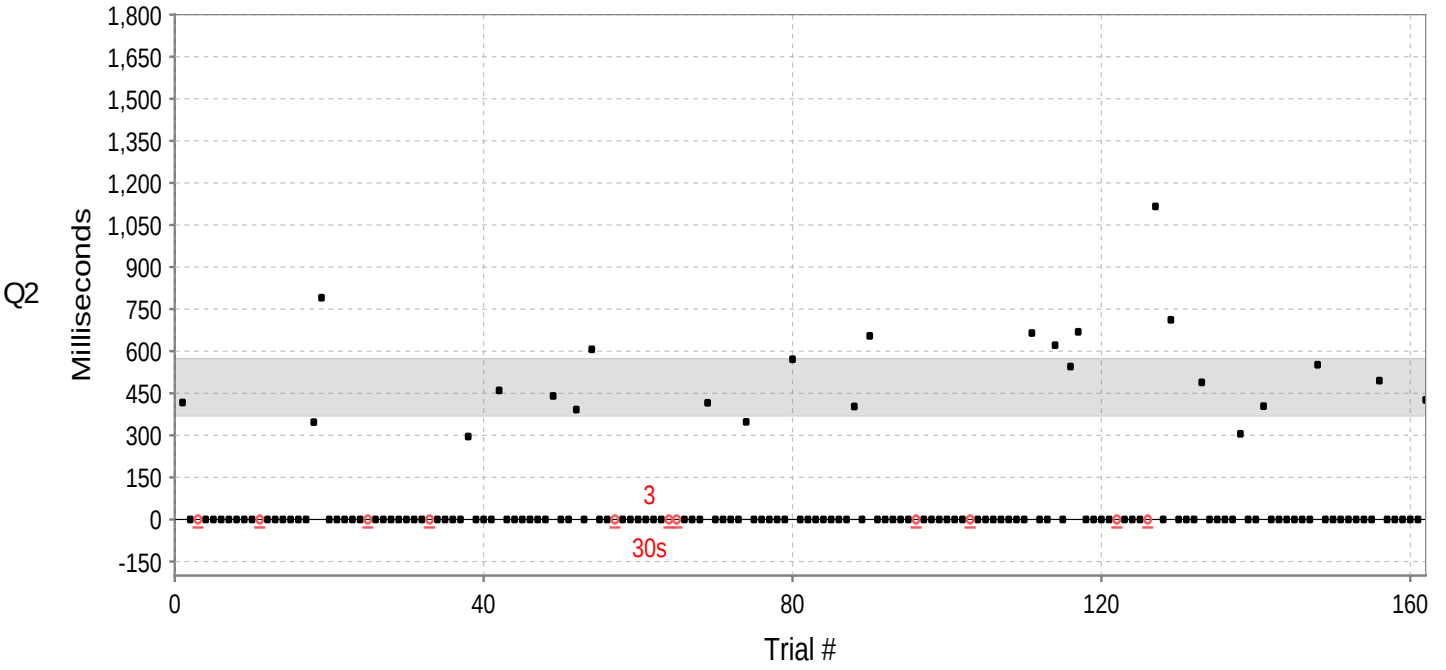
Session mode:	PTE
USB device:	HW 5, BD 0, FW 1.1-219-gd36f0e2
Microswitch:	HW 3, BD 0, FW 9
Monitor calibration:	9000, 9000

ID: **3** **25y Female with PV flags Example Subject** (Jan 1, 1993)
Female - 25y 0m 0d

Visual T.O.V.A. (v9.0-89 sn30000)
Jan 1, 2018 at 9:00 AM

This page graphically displays the subject's responses. Black squares mark correct responses and correct nonresponses. Red 'X's mark commission errors, red squares mark anticipatory responses, and underlined red circles mark omission errors. The light gray region represents the normative range of responses. Commission errors followed by a correct response are linked by a line: an upward slope (light gray) indicates slowing down following an error (typical), and a downward slope (black) indicates speeding up after making an error (unusual). Red numbers above the zero line indicate the number of missed targets (if three or more in a row), and the red number below the zero line indicates the number of seconds elapsed between correct target responses.



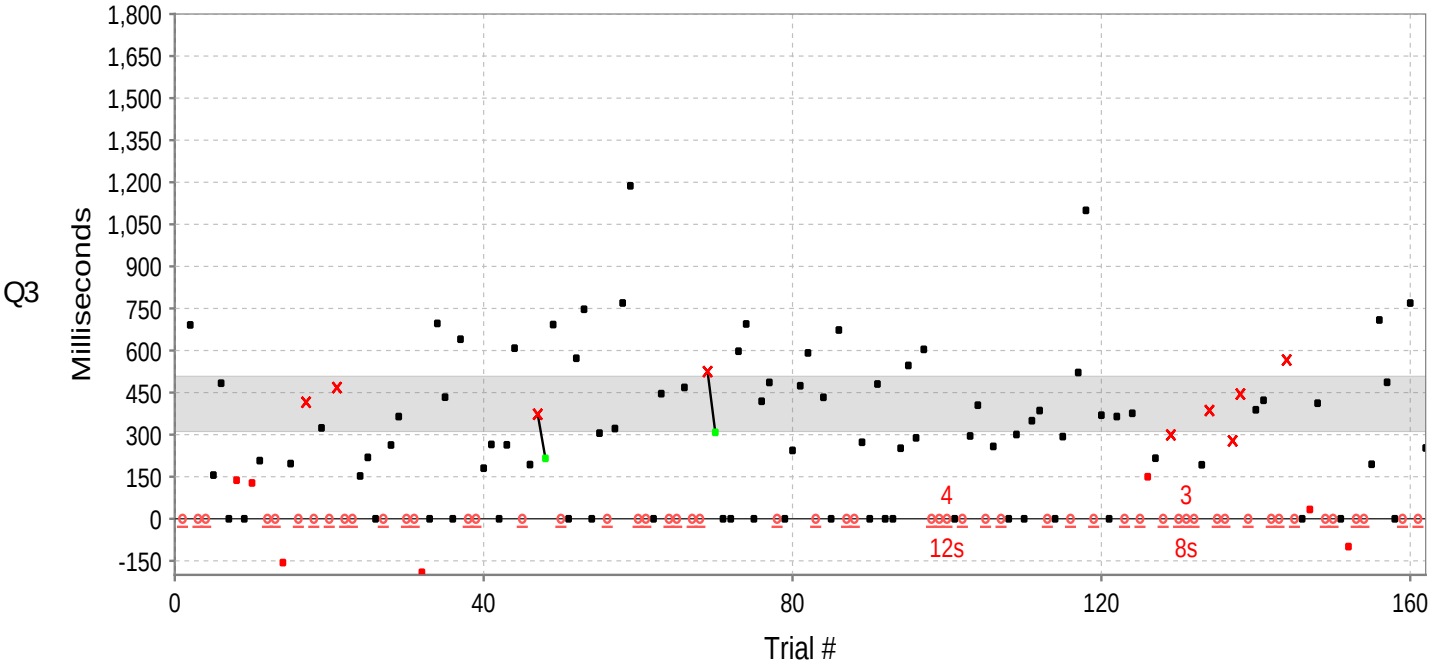


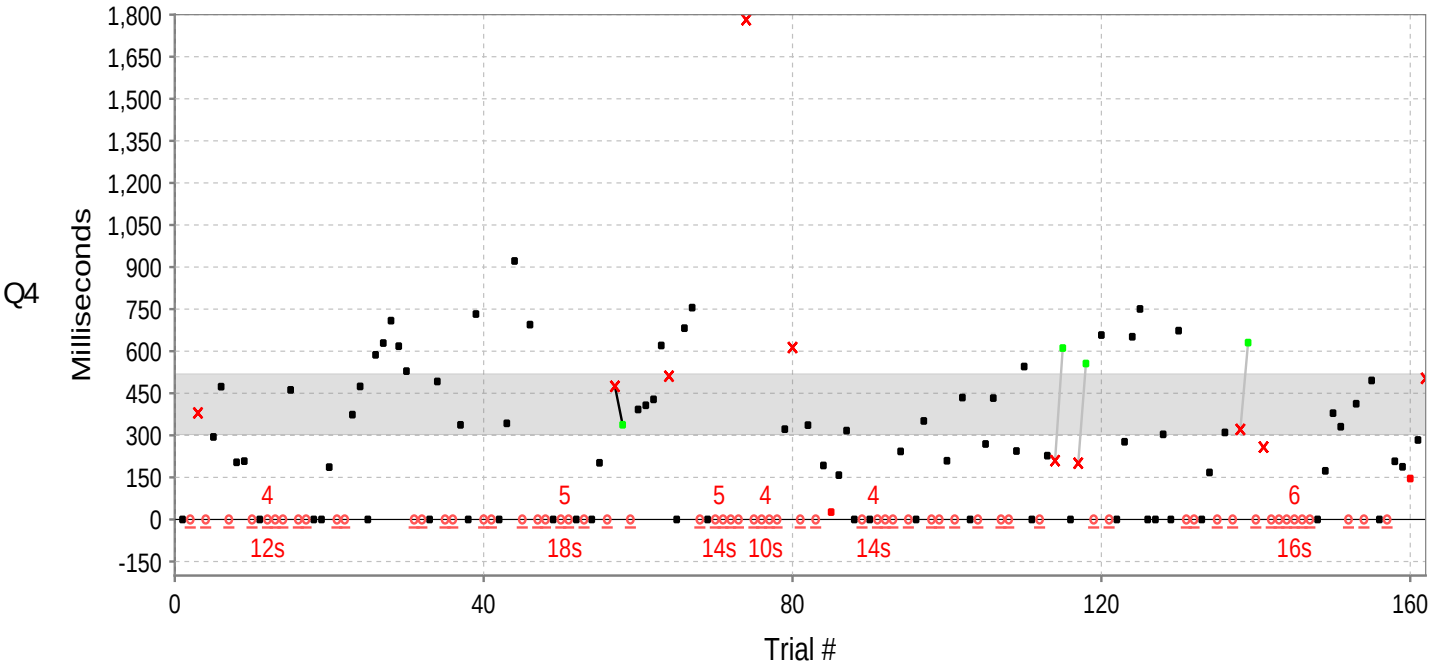
▪ Correct response ▪ Correct non-response ✕ Commission error ○ Omission error ▪ Anticipatory response
▪ Post-commission error correct response ／ Slower post-commission RT ＼ Faster post-commission RT
▲△ Off-scale resp./error ▪ Normative range | Interruption 3 10s Response gap (# Targets and Sec)

ID: **3** **25y Female with PV flags Example Subject** (Jan 1, 1993)
Female - 25y 0m 0d

Visual T.O.V.A. (v9.0-89 sn30000)
Jan 1, 2018 at 9:00 AM

This page graphically displays the subject's responses. Black squares mark correct responses and correct nonresponses. Red 'X's mark commission errors, red squares mark anticipatory responses, and underlined red circles mark omission errors. The light gray region represents the normative range of responses. Commission errors followed by a correct response are linked by a line: an upward slope (light gray) indicates slowing down following an error (typical), and a downward slope (black) indicates speeding up after making an error (unusual). Red numbers above the zero line indicate the number of missed targets (if three or more in a row), and the red number below the zero line indicates the number of seconds elapsed between correct target responses.





Correct response · Correct non-response · Commission error · Omission error · Anticipatory response
Post-commission error correct response · Slower post-commission RT · Faster post-commission RT
Off-scale resp./error · Normative range · Interruption · 3 10s Response gap (# Targets and Sec)

TOVA — Raw Data Tables

ID: **3** **25y Female with PV flags Example Subject** (Jan 1, 1993)
Female - 25y 0m 0d

Visual T.O.V.A. (v9.0-89 sn30000)
Jan 1, 2018 at 9:00 AM

This page shows a trial-by-trial view of T.O.V.A. test data. Each entry in the table indicates the stimulus type (target or nontarget) and the subject's response to that stimulus. Error responses are shown in red, and response times are in milliseconds. A negative response time indicates a response that was made before the stimulus was presented.

1-27	28-54	55-81	82-108	109-135	136-162
N	N	N	N	N	N
N	N	N	N	T 251	O
N	N	N	N	N	O
N	N	N	T 354	N	N
N	O	N	N	N	N
N	T 326	N	N	T 323	C 207
T 415	N	N	N	N	N
N	N	T 248	N	N	N
O	O	N	T 579	C 560	T 237
N	N	N	N	N	N
N	N	N	T 356	N	T 314
C 466	N	N	T 425	N	C 222
N	N	N	N	T 303	N
N	N	N	N	N	N
N	T 456	T 304	NA 143	N	N
N	N	N	N	N	T 312
T 178	N	T 572	N	N	T 592
C 260	N	T 391	N	N	N
N	N	N	N	N	N
N	T 263	N	T 291	N	N
T 369	N	T 283	C 381	T 299	N
N	N	N	N	N	N
N	N	N	C 307	N	O
N	T 257	N	N	N	N
N	N	O	N	N	N
O	N	N	N	T 247	N
N	T 181	N	T 289	N	N

163-189	190-216	217-243	244-270	271-297	298-324
T 417	N	N	N	N	N
N	N	N	N	N	N
O	N	O	N	T 664	T 305
N	N	N	N	N	N
N	N	N	N	N	N
N	O	N	N	T 621	T 404
N	N	N	T 402	N	N
N	N	N	N	T 545	N
N	N	N	T 654	T 669	N
N	N	O	N	N	N
O	T 295	O	N	N	N
N	N	N	N	N	N
N	N	N	N	N	T 551
N	N	N	N	O	N
N	T 460	T 415	O	N	N
N	N	N	N	N	N
N	N	N	N	N	N
T 346	N	N	N	O	N
T 790	N	N	N	T 1116	N
N	N	T 348	N	N	N
N	N	N	N	T 711	T 495
N	T 440	N	O	N	N
N	N	N	N	N	N
N	N	N	N	N	N
O	T 391	N	N	T 488	N
N	N	T 571	N	N	N
N	T 606	N	N	N	T 426

325-351	352-378	379-405	406-432	433-459	460-486
O	T 263	T 305	T 591	T 300	O
T 691	T 364	O	O	N	C 277
O	O	T 321	T 433	T 349	C 444
O	O	T 769	N	T 385	O
T 155	NA -190	T 1187	T 673	O	T 388
T 483	N	O	O	N	T 422
N	T 696	O	O	T 293	O
TA 137	T 433	N	T 272	O	O
N	N	T 446	N	T 521	C 566
TA 127	T 640	O	T 480	T 1099	O
T 207	O	O	N	O	N
O	O	T 468	N	T 369	TA 33
O	T 180	O	T 251	N	T 412
TA -156	T 265	O	T 546	T 364	O
T 196	N	C 524	T 288	O	O
O	T 263	T 308	T 604	T 376	N
C 415	T 608	N	O	O	NA -99
O	O	N	O	TA 149	O
T 324	T 193	T 597	O	T 216	O
O	C 372	T 694	N	O	T 194
C 467	T 215	N	O	C 298	T 708
O	T 692	T 419	T 295	O	T 486
O	O	T 486	T 405	O	N
T 152	N	O	O	O	O
T 218	T 572	N	T 257	T 192	T 769
N	T 747	T 243	O	C 385	O
O	N	T 474	N	O	T 252

487-513	514-540	541-567	568-594	595-621	622-648
N	T 708	T 202	T 336	T 244	T 310
O	T 617	O	O	T 545	O
C 379	T 528	C 474	T 192	N	C 321
O	O	T 337	TA 26	O	T 630
T 294	O	O	T 158	T 227	O
T 473	N	T 392	T 316	C 209	C 257
O	T 492	T 407	N	T 611	O
T 203	O	T 428	O	N	O
T 207	O	T 620	N	C 200	O
O	T 337	C 511	O	T 556	O
N	N	N	O	O	O
O	T 732	T 682	O	T 657	O
O	O	T 755	T 242	O	N
O	O	O	O	N	T 173
T 462	N	N	N	T 277	T 379
O	T 342	O	T 351	T 651	T 330
O	T 921	O	O	T 750	O
N	O	O	O	N	T 412
N	T 694	O	T 209	N	O
T 186	O	C 1781	O	T 303	T 495
O	O	O	T 434	N	N
O	N	O	N	T 673	O
T 373	O	O	O	O	T 207
T 474	O	O	T 269	O	T 187
N	N	T 322	T 432	N	TA 145
T 587	O	C 613	O	T 167	T 283
T 629	N	O	O	O	C 503

T = Correct response to target
N = Correct nonresponse to nontarget
Green = Post-Commission-error correct response
O = Omission error
C = Commission error
U = User interrupt
A = Anticipatory response
M = Multiple response
H = Hardware interrupt