Boone Report

Session Number (Created Date)	Patient Age	Original Title	Reason for Visit	Followup	Change	Hrs. Sleep | Since Meal
Session 1 (5/20/2019)	49 yrs	Routine	Performance Cognitive Evaluation	No	N/A	7-9 | 1-3

Target Ranges: Calculated for ages 50–54 yrs.

See Appendix for explanations of metrics and symbols shown on this page.

Performance Assessments	Session 1 (5/20/2019)	Target Range
Physical Reaction Time	236 (±32) ms	332–402 ms
Trail Making Test A	N/A	35–51 sec
Trail Making Test B	N/A	59–103 sec
Evoked Potentials		
Audio P300 Delay	260 ms	288–336 ms
Test/Retest Change	-	±12%
Audio P300 Voltage	16.7 µV	9–19 µV
Test/Retest Change	-	±24%
Boone Brain Age	23 yrs	-
State (Power)		
CZ Eyes Closed Theta/Beta	0.7	0.1–1.6
F3/F4 Eyes Closed Alpha	1.2	0.9–1.1
Front-Back (F-P) Coherence in Theta and Alpha Bands		
Left (Theta | Alpha)	0.31 | 0.15	≥ 0.35 | ≥ 0.4
Mid (Theta | Alpha)	0.28 | 0.18	≥ 0.35 | ≥ 0.4
Right (Theta | Alpha)	0.20 | 0.08	≥ 0.35 | ≥ 0.4

Maximum P300 Test Depth (µV) — Range: 240–500 ms

Session 1

MAX CP uV
17

0
MIN uV

P300 Common/Rare Comparison - Session 1 (5/20/2019)
For only one session, the common responses are compared to the rare responses.

Color Key
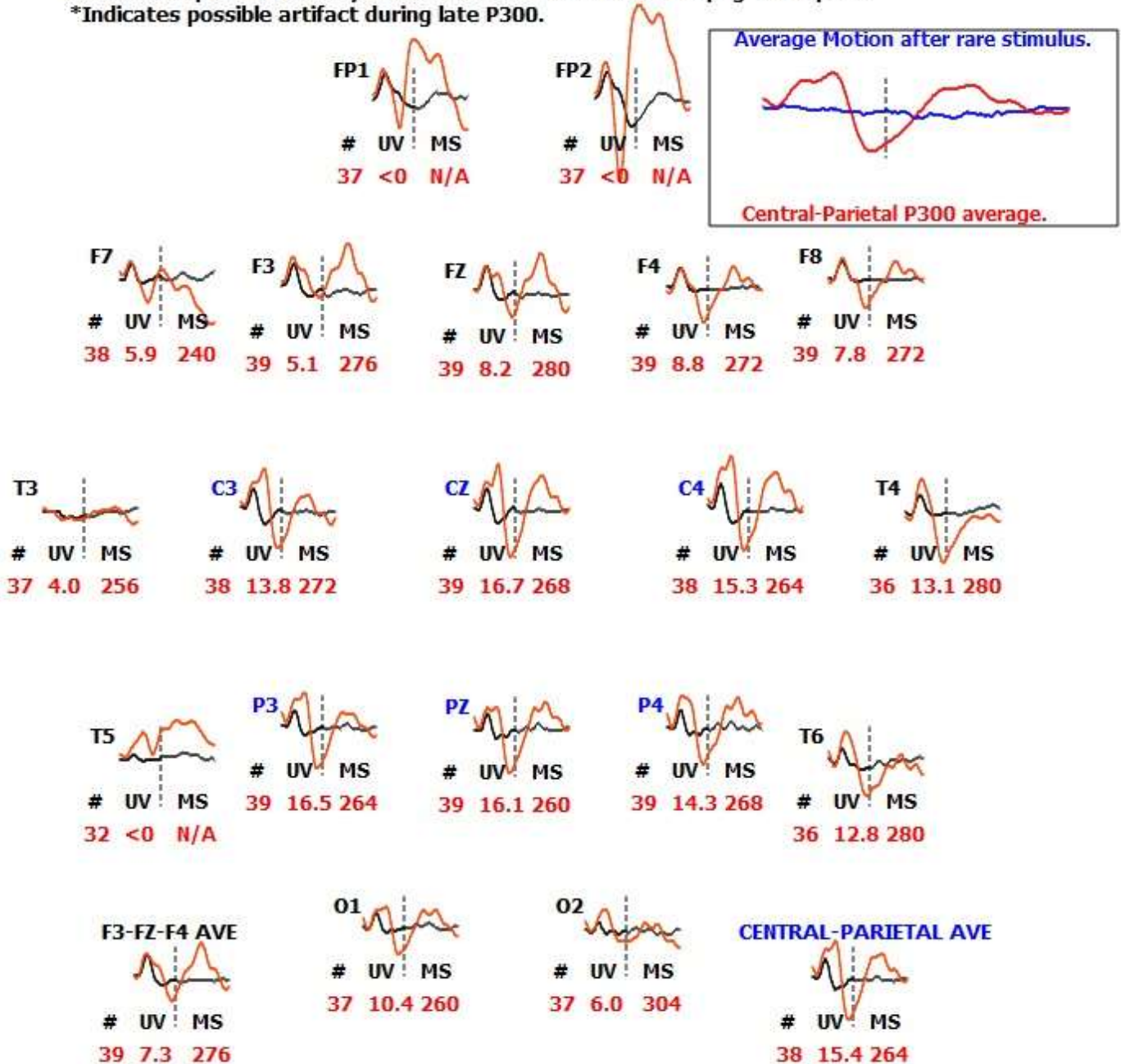
Common ▬ (black)   Rare ▬ (red)

Yield Display Threshold: 20

Largest depths between 240-500 msec are reported. P300s typically occur between 240 and 450 msec.
Probable depth and latency of true P300 is indicated on 1st page of report.
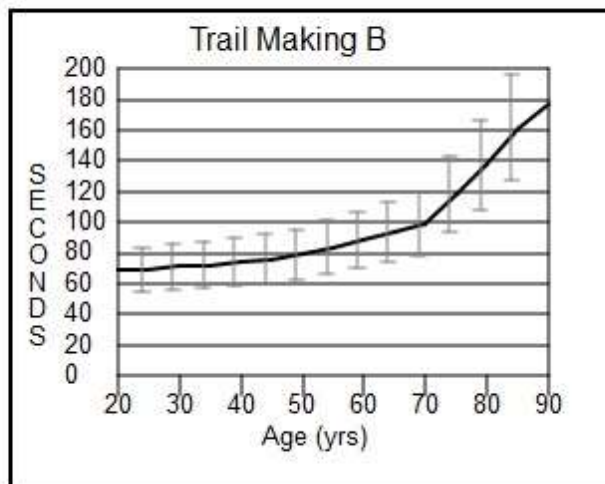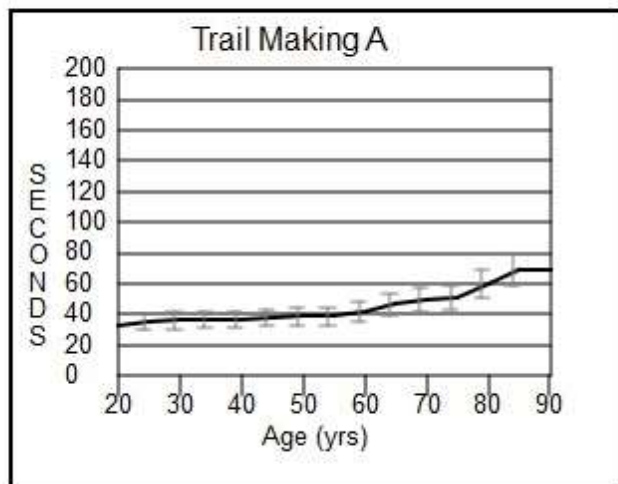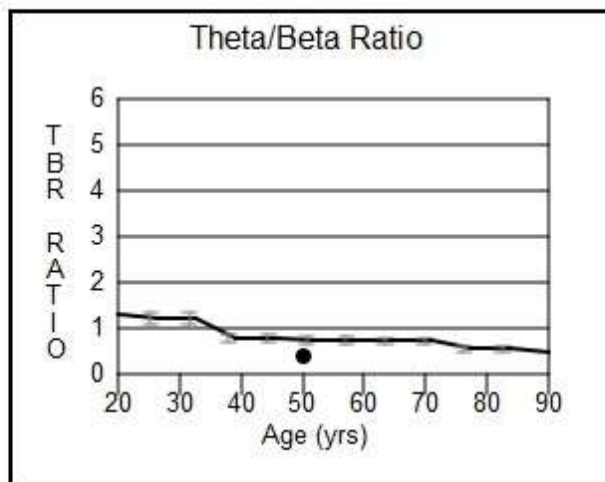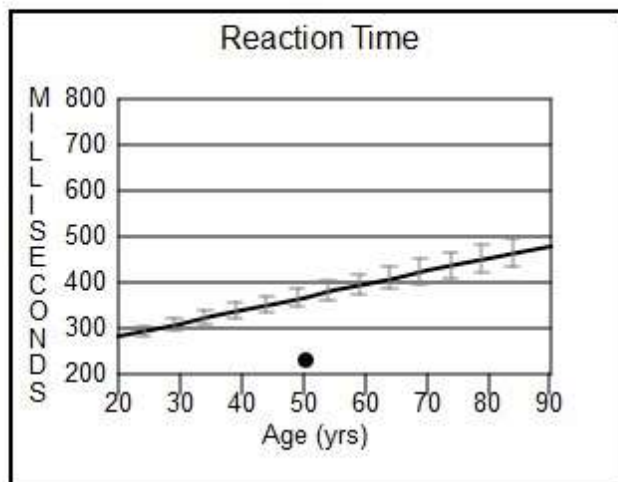*Indicates possible artifact during late P300.

FP1
#	UV	MS
37	<0	N/A

FP2
#	UV	MS
37	<0	N/A

Average Motion after rare stimulus.
Central-Parietal P300 average.

F7
#	UV	MS
38	5.9	240

F3
#	UV	MS
39	5.1	276

FZ
#	UV	MS
39	8.2	280

F4
#	UV	MS
39	8.8	272

F8
#	UV	MS
39	7.8	272

T3
#	UV	MS
37	4.0	256

C3
#	UV	MS
38	13.8	272

CZ
#	UV	MS
39	16.7	268

C4
#	UV	MS
38	15.3	264

T4
#	UV	MS
36	13.1	280

T5
#	UV	MS
32	<0	N/A

P3
#	UV	MS
39	16.5	264

PZ
#	UV	MS
39	16.1	260

P4
#	UV	MS
39	14.3	268

T6
#	UV	MS
36	12.8	280

F3-FZ-F4 AVE
#	UV	MS
39	7.3	276

O1
#	UV	MS
37	10.4	260

O2
#	UV	MS
37	6.0	304

CENTRAL-PARIETAL AVE
#	UV	MS
38	15.4	264

Black dotted lines at 300 msec post stimulus.

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Trend Graphs

⊥ indicates test-retest ranges.

P300 Voltage (highest central-parietal)

P300 Delay (smallest central-parietal)

Reaction Time

Theta/Beta Ratio

Trail Making A

Trail Making B

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BOONE HEART INSTITUTE | WAVi
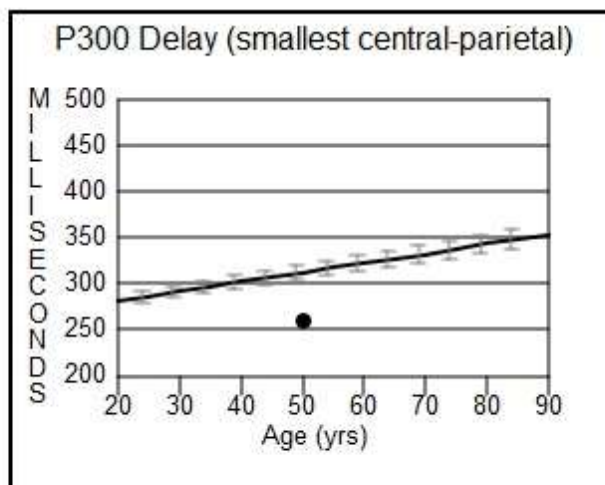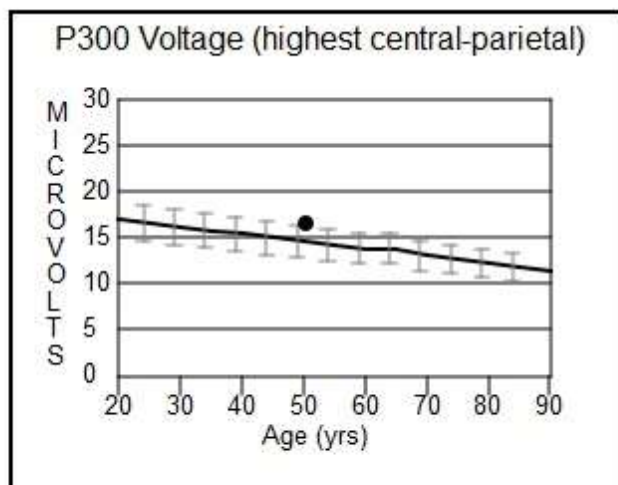
Spectrum, P300 Eyes Closed

Color Key

Session 1
(5/20/2019)

Alpha frequency range

8.0 — Hz — 13.0
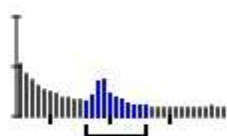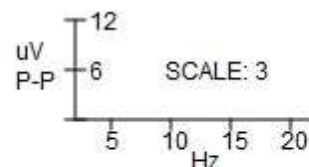
FP1 9.5 Hz
FP2 9.5 Hz*

F7 9.0 Hz
F3 9.0 Hz
FZ 9.0 Hz
F4 9.0 Hz
F8 9.0 Hz
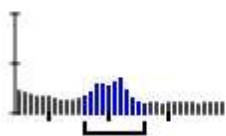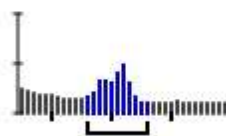
T3 10.5 Hz
C3 11.0 Hz
CZ 11.0 Hz
C4 11.0 Hz
T4 9.0 Hz
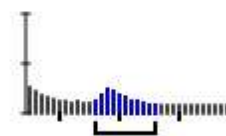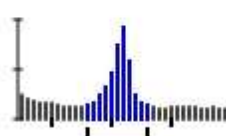
T5 10.0 Hz
P3 11.0 Hz
PZ 11.0 Hz
P4 11.0 Hz
T6 10.5 Hz

O1 11.0 Hz
O2 10.5 Hz

uV P-P 12, 6   SCALE: 3
5 10 15 20 Hz

Peak frequency analysis range: 7.0 - 13.0 Hz

* indicates questionable value.

P300 Eyes Closed Z Scores, Session 1 (5/20/2019)
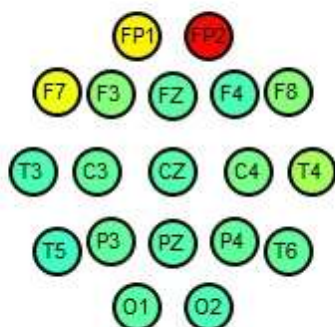
Band Ranges
Theta: 4.5–7.5 Hz
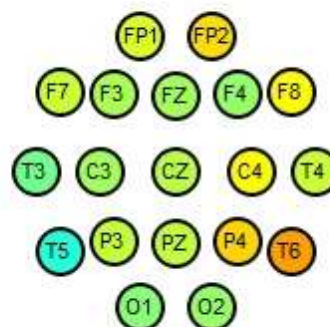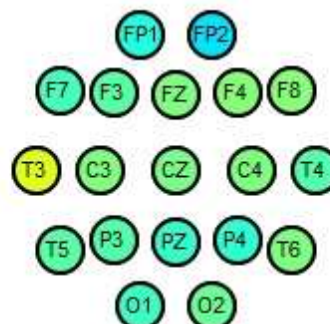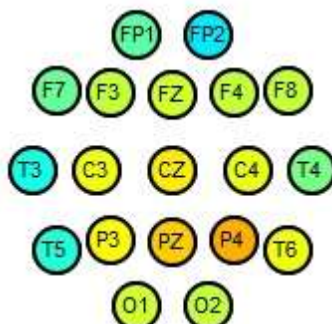Alpha: 8.0–13.0 Hz
Beta: 13.5–20.0 Hz

Color Key
-3.0   0   +3.0

THETA   ALPHA   BETA
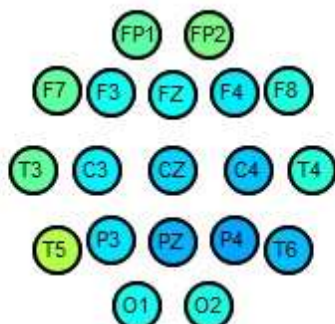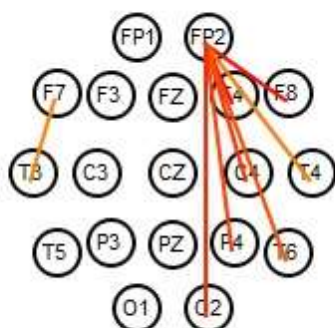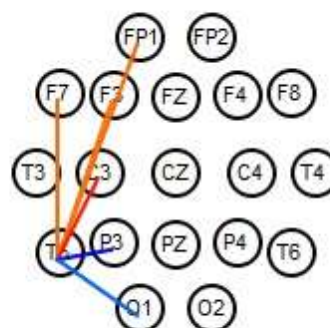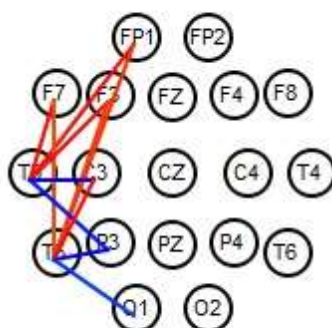
-ABSOLUTE POWER-

-RELATIVE POWER-

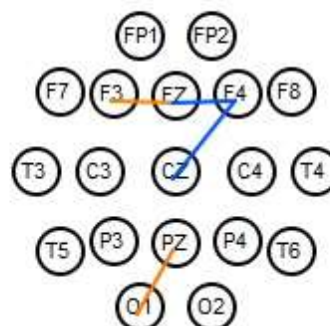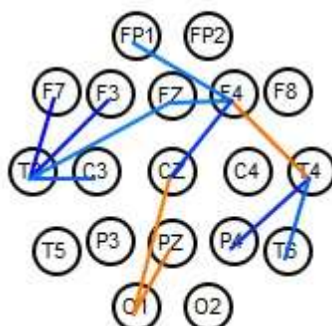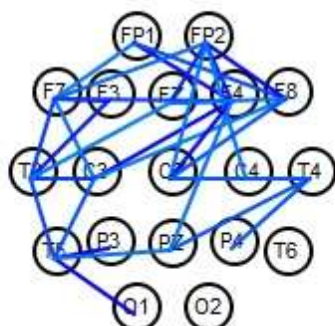Z-Scores above 2.0 and below -2.0   -AMPLITUDE ASYMMETRY-
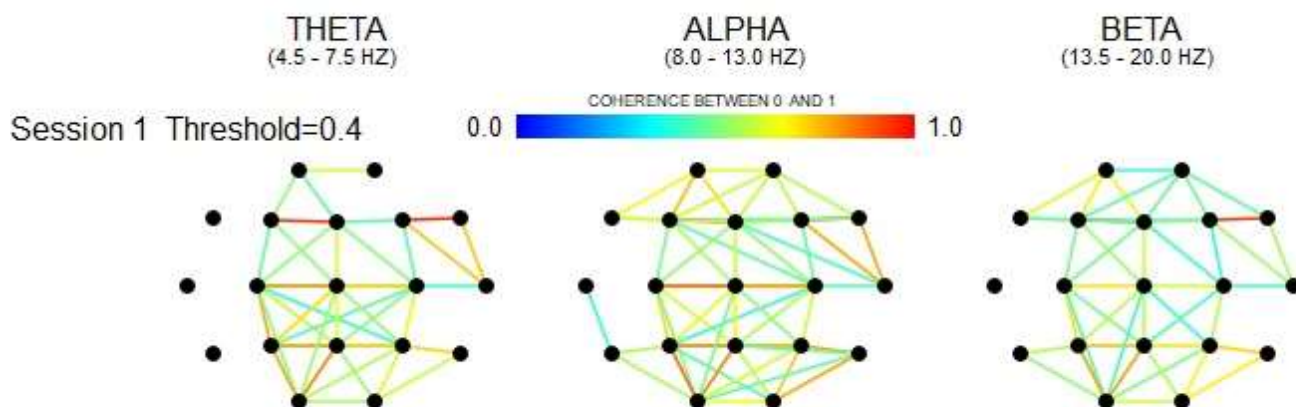
Z-Scores above 2.0 and below -2.0   -COHERENCE-

Coherence Network Graphs, P300 Eyes Closed
Row shows color-mapped coherence between head locations.

THETA (4.5 - 7.5 HZ) ALPHA (8.0 - 13.0 HZ) BETA (13.5 - 20.0 HZ)

Session 1 Threshold=0.4

COHERENCE BETWEEN 0 AND 1 0.0 1.0

Appendix

Possible Artifact (▣): This is reported when the amount and/or quality of the acquired data are insufficient to generate an accurate number. This may result from the presence of one or more artifact sources such as motion, sweating, poor electrode-scalp contact, or interference from nearby electronic equipment.

Sync Blinks (▽): Short for "synchronized eye blinks," this is reported when FP1 or FP2 is greater than or equal to 20 μV. Sync Blinks may affect the reported P300 and/or Flanker test depths and latencies at other electrode locations.

Questionable Value (**?**): Possibly due to low Alpha or Peak Frequency magnitude relative to background EEG noise.

Excess Synchrony: A type of artifact which may affect multiple channels equally at the same time. This may be due to improper electrode connections or environmental interference. Excess Synchrony can reduce the accuracy of background EEG metrics.

P300 Metrics

Physical Reaction Time: The **average** time of the physical response to rare tones, derived from mouse or keyboard input.

- Reported as "**N/A**" if there were **less than 15** physical responses to rare tones.

Audio P300 Delay and **Audio P300 Voltage** metrics are derived from **Central-Parietal (C-P)** locations **CZ, C3, C4, PZ, P3, and P4**.

- For these metrics, "**yield**" is defined as the number of brain responses to rare tones which contain **minimal artifact**.

Audio P300 Delay: The **fastest** C-P latency **between 240-499 ms** after a rare tone, among locations that are **at least 3 μV**.

- Reported as "**N/A**" if **no** C-P location is **at least 3 μV**, or **no** C-P location has a yield of **at least 20** rare events.

Audio P300 Voltage: The **largest** C-P amplitude **between 240-499 ms** after a rare tone.

- Reported as "**N/A**" if **no** C-P location has a yield of **at least 20** rare events.
- Reported as "**< 0 μV**" if the voltage at **all** C-P locations is **less than 0 μV**.

Possible Artifact (▣) is shown next to values for Audio P300 Delay or Audio P300 Voltage if:

- **Less than 3** C-P locations have a yield of **at least 30**; OR
- **40% or more** data segments contain **excessive Delta artifact** at the location from which the metric was derived.

Background EEG Metrics

CZ Eyes Closed Theta/Beta | F3/F4 Eyes Closed Alpha | Front-Back Coherence | Muscle Tension: Derived from P300 Eyes Closed protocol if available; otherwise reported as "**N/A**".

CZ Eyes Open Theta/Beta: Derived from Eyes Open Focused protocol if available; otherwise reported as "**N/A**".

Possible Artifact (▣) is shown next to a background EEG metric if:

- **Less than 30** segments of data are clean or contain **minimal artifact**; OR
- For metrics using Delta or Theta, **over 40%** of data segments contain **excessive Delta artifact**.

"**N/A**" is reported for a background EEG metric if:

- **Less than 20** segments of data are clean or contain **minimal artifact**; OR
- For metrics using Delta or Theta, **over 50%** of data segments contain **excessive Delta artifact**.

P300 Topos

A P300 topo is generated for a session if **at least 3** C-P locations have a yield of **at least 20** rare events. Otherwise, "**N/A**" is shown instead of a topo.

Black dots indicate topo locations with a yield of **less than 20** rare events. For graphical interpolation purposes, these locations are also set to 0 μV regardless of their actual values.

A topo location is considered "**good**" if its yield is **at least 20** rare events, and its voltage is **at least 3 μV**.

The warning "**Inconsistent P300**" is shown below a topo if:

- **At least 2** good locations are **less than 350 ms**, and **at least 2** good locations are **greater than 450 ms**; OR
- **Less than 40%** of good C-P location pairs are **within 75 ms**; OR
- The C-P location with the **largest μV** value is **at 500 ms** after a rare event.

References

P300:

Gordeev, S. (2007). The use of endogenous P300 event-related potentials of the brain for assessing cognitive functions in healthy subjects and in clinical practice. *Human Physiology, 33*(2), 236-246.

Iragui, V. J., Kutas, M., Mitchiner, M. R., & Hillyard, S. A. (1993). Effects of aging on event-related brain potentials and reaction times in an auditory oddball task. *Psychophysiology, 30*(1), 10-22.

Reaction Time:

Tun, P. A., & Lachman, M. E. (2008). Age differences in reaction time and attention in a national telephone sample of adults: Education, sex, and task complexity matter. *Developmental Psychology, 44*(5), 1421-1429.

Trail Making:

Ashendorf, L., Jefferson, A. L., O'Connor, M. K., Chaisson, C., Green, R. C., & Stern, R. A. (2008). Trail making test errors in normal aging, mild cognitive impairment, and dementia. *Archives of Clinical Neuropsychology, 23*(2), 129-137.

Tombaugh, T. N. (2004). Trail Making Test A and B: Normative data stratified by age and education. *Archives of Clinical Neuropsychology, 19*(2), 203-214.

Theta Beta Ratio:

Monastra, V. J., Lubar, J. F., Linden, M., VanDeusen, P., Green, G., Wing, W., . . . Fenger, T. N. (1999). Assessing attention deficit hyperactivity disorder via quantitative electroencephalography: An initial validation study. *Neuropsychology, 13*(3), 424-433.

Snyder, S., & Hall, J. (2006). A meta-analysis of quantitative EEG power associated with attention-deficit hyperactivity disorder. *Journal of Clinical Neurophysiology, 23*(5), 440-455.

Alpha F3/F4:

Thibodeau, R., Jorgensen, R. S., & Kim, S. (2006). Depression, anxiety, and resting frontal EEG asymmetry: A meta-analytic review. *Journal of Abnormal Psychology, 115*(4), 715-729.

Coherence:

Rossini, P. M., Del Percio, C., Pasqualetti, P., Cassetta, E., Binetti, G., Dal Forno, G., . . . Babiloni, C. (2006). Conversion from mild cognitive impairment to Alzheimer's Disease is predicted by sources and coherence of brain electroencephalography rhythms. *Neuroscience, 143*(3), 793-803.