



Hue Light USA

IMMUNITY CARE SYSTEM



CASE REPORT

# ON A NOVEL APPLICATION

of Molecular Hydrogen  
Inhalation Therapy for  
Parkinson's Disease and  
Persistent Post-Concussive  
Syndrome



Mitchell J. Ghen, D.O., Ph.D.

CMO, Hue Light USA

---

## BACKGROUND

A 72-year-old female attendee at the AMMG conference in Doral, FL, with Parkinson's disease (PD) and severe tremors, which were affecting her quality of life (i.e., difficulty eating, putting on makeup, using her phone, difficulty walking and talking). She stopped at the Hue Light USA booth. She stated that she had experienced a concussion within the last 6 months. Her symptoms included those often seen in persistent post-concussive syndrome (PPCS) and Parkinson's disease (i.e., headaches, balance problems, light or noise sensitivity, anxiety, and depression). The attendee was interested in the potential of a non-invasive and non-pharmaceutical treatment option. The Hue Light USA booth, among other innovative technologies, demonstrated a Korean-manufactured high-flow molecular hydrogen inhalation unit. Simultaneously, we were evaluating brain function with a well-known multi test evaluation study. This author felt WAVi EEG/ERP would be a good testing device to determine acute changes because of its in-depth physiologic brain function evaluation, being non-invasive, and only having a 30-minute test period.

Mitchell J. Ghen, D.O., Ph.D. (Chief Medical Officer for HLUSA), spoke with the attendee, and she was interested and asked to be evaluated with the WAVi EEG/ERP brain assessment system that we were testing attendees with. After the results were shown to her, she was asked and agreed to use the Molecular Hydrogen Inhalation Device. She used the Hue Light H-2000 Molecular Hydrogen Inhalation Device. This device provides 2,100cc/min of hydrogen and oxygen in a ratio of 2:1. This rapid flow is obtained by using a high-flow nasal cannula. The baseline results identified a brain micro voltage output of 0.3  $\mu$ V (age-related norm 6-14  $\mu$ V). This type of finding can be seen in those with persistent post-concussive syndrome and other pathologies such as TBI, MCI, CVA, long COVID, Parkinson's disease, and the like. Additionally, the central parietal and occipital regions of the brain were cool and significantly underactive prior to using the Molecular Hydrogen Inhalation Device. We attempted to test the P300 Auditory Evoked Response and Trail Making A & B, but due to the severity of her tremors, these measurements could not be ascertained.

After she had her baseline evaluation with the WAVi physiological brain test, she underwent 60 minutes of nasal cannula inhalation of molecular hydrogen at a rate of 2,100cc per minute. She tolerated the hydrogen with no reported side effects.

The WAVi was then repeated, and the results are no less than spectacular. See below comparison of 60-minute treatment.

## Boone Report

Female, 3/25/1951 — ID: N/A — Generated: 4/28/2023 9:50 AM

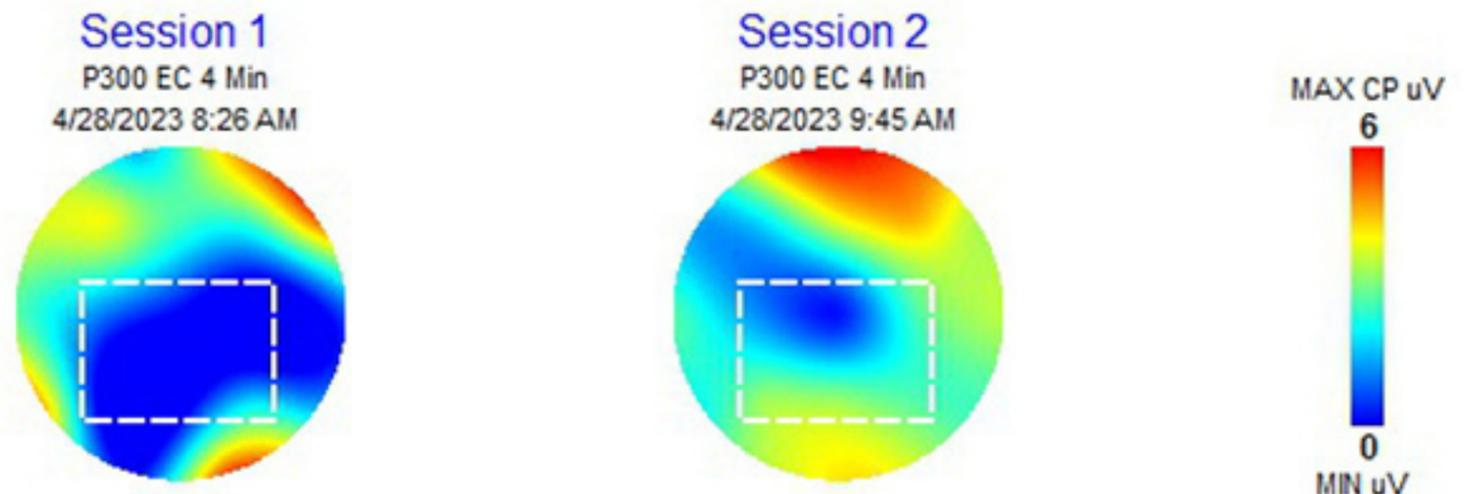
Session Number	Reason for Visit	Presenting Concerns	Change	Sleep	Since Meal	Age
Session 1 (4/28/2023)	Baseline	N/A	N/A	N/A	N/A	72 yrs
Session 2 (4/28/2023)	Followup	N/A	N/A	N/A	N/A	72 yrs

**Symbol Key:**  = Low Yield

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

Performance Assessments	Session 1 (4/28/2023)	Session 2 (4/28/2023)	Target Range
Physical Reaction Time	 N/A	 N/A	277–398 ms
Trail Making Test A	N/A	N/A	76–130 sec
Trail Making Test B	N/A	N/A	73–141 sec
Evoked Potentials			
Audio P300 Delay	N/A	240 ms	304–395 ms
Test/Retest Change	-	N/A	±11 ms
Audio P300 Voltage	0.3 $\mu$ V	3.6 $\mu$ V	6–14 $\mu$ V
Test/Retest Change	-	3 $\mu$ V	±2 $\mu$ V
Boone Brain Age	N/A	56 yrs	-
State			
CZ Eyes Closed Theta/Beta (Power)	0.6	0.5	0.6–1.5
F3/F4 Eyes Closed Alpha (Power)	0.8	1.2	0.9–1.1
Front-Back (F-P) Coherence in Theta and Alpha Bands			
Left (Theta   Alpha)	 0.66   0.31	0.60   0.37	≥ 0.35   ≥ 0.4
Mid (Theta   Alpha)	 0.50   0.34	0.65   0.31	≥ 0.35   ≥ 0.4
Right (Theta   Alpha)	0.56   0.36	0.68   0.27	≥ 0.35   ≥ 0.4

**Maximum P300 Test Depth ( $\mu$ V) — Range: 240–500 ms — Topo scale referenced to Session 2**  
Dashed rectangle indicates Central-Parietal region used for evoked potential metrics



---

## DISCUSSION

Molecular hydrogen inhalation therapy involves inhaling a mixture of hydrogen and oxygen through a nasal cannula. The ratio is 2 hydrogen molecules to 1 oxygen molecule. This therapy has gained attention due to its potential anti-oxidative, anti-inflammatory, and apoptosis-modulating properties.

Many research papers have reported that molecular hydrogen inhalation therapy has potential therapeutic benefits, as noted above. Like carbon dioxide, hydrogen ions in molecular hydrogen inhalation therapy, in the presence of anaerobic metabolism, produce metabolic acidosis. The resulting decrease in pH causes vasodilation, which, in turn, increases cerebral circulation. These findings have led to molecular hydrogen inhalation therapy being used for several neurological disorders, such as Parkinson's disease, CVA, dementia, and hypoperfusion disorders.

## RESULTS

Many disorders, both acute and chronic, can result in poor brain voltage. These include metabolic disorders as well. In cases of acute brain injury, improvement over time is typically expected by clinicians. However, in the case of Parkinson's disease, which is chronic and progressive, medical intervention may not lead to notable improvements in voltage. Therefore, the author was surprised by the rapid 1200% increase in voltage that was observed in the attendee. This improvement was unexpected, given the chronic nature of the condition.

The improved brain voltage, which increased from .3  $\mu\text{V}$  to 3.6  $\mu\text{V}$ , is a marked positive indication of enhanced electrical activity within the brain.

Studies have suggested that oxidative stress is closely linked to the onset and progression of neurodegenerative disorders such as Parkinson's and Alzheimer's disease. However, anti-oxidation technologies, including molecular hydrogen inhalation, have been shown to not only reduce oxidative stress but also exhibit anti-inflammatory and vasodilatory effects. The prominent effect within these 60 minutes was most likely secondary to its vasodilation effect. However, the other properties of molecular hydrogen would likely improve the overall condition of this attendee with multiple treatments over time.



## Boone Report

Female, 3/25/1951 — ID: N/A — Generated: 4/28/2023 9:50 AM



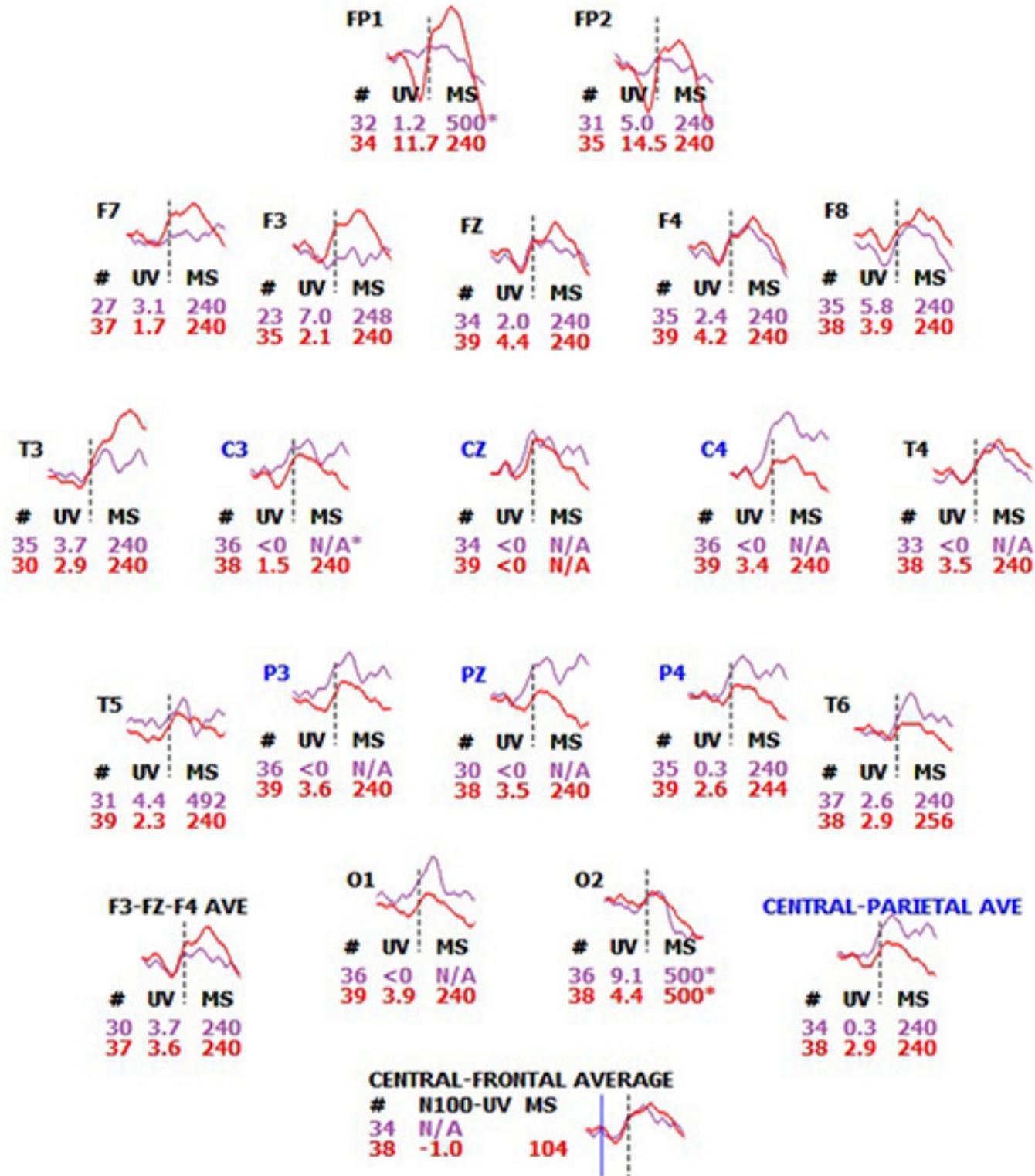
### P300 Rare Comparison

Rare responses are compared across sessions.  
Yield Display Threshold: 20

### Color Key

Session 1 (4/28/2023) ■ Session 2 (4/28/2023) ■

P300s typically occur between 240 and 450 msec.  
Probable depth and latency of true P300 is indicated on 1st page of report.  
# Indicates yield. \*Indicates possible artifact during late P300.



Blue line indicates 100 msec post stimulus.  
Maximum N100 reported between 80-120 msec.

Largest depths between 240-500 msec are reported, except for N100. Dotted lines at 300 msec post stimulus.



## Boone Report

Female, 3/25/1951 — ID: N/A — Generated: 4/28/2023 9:50 AM



### Spectrum Comparison, P300 Eyes Closed

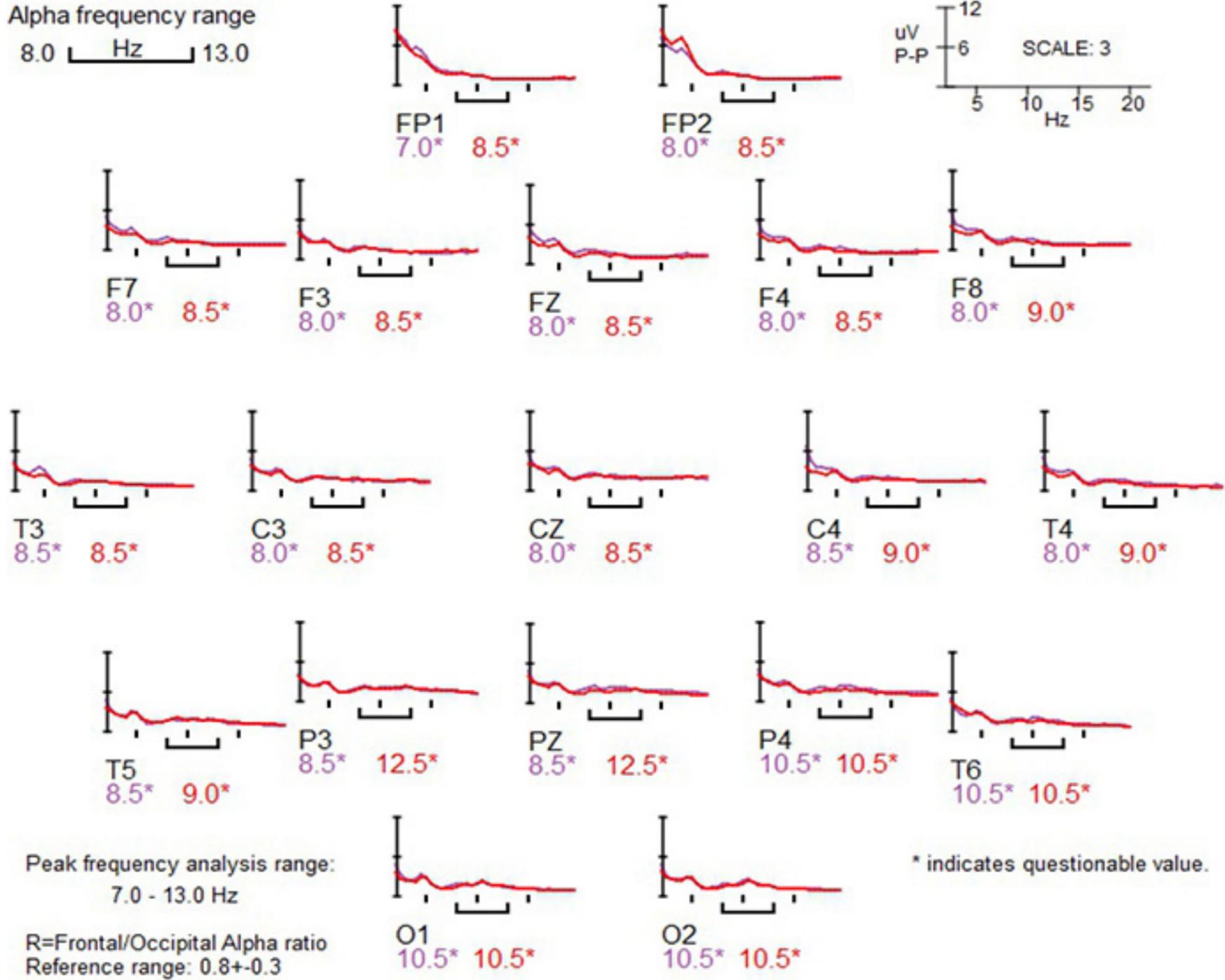
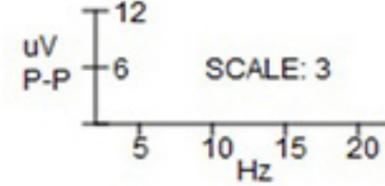
#### Color Key

Session 1 (4/28/2023) ■

Session 2 (4/28/2023) ■

Alpha frequency range

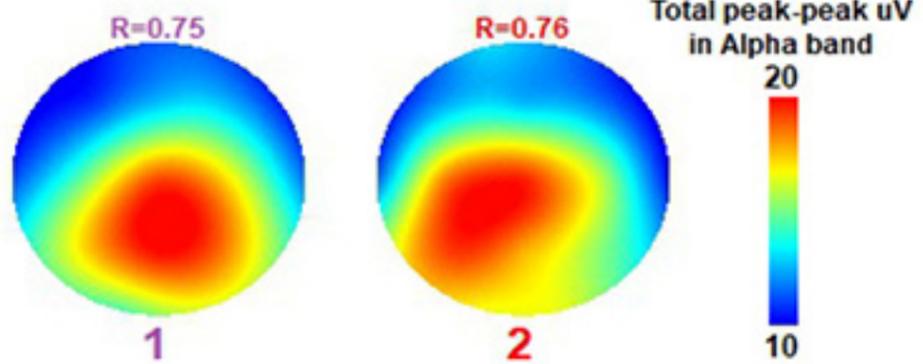
8.0 Hz 13.0



Peak frequency analysis range:  
7.0 - 13.0 Hz

R=Frontal/Occipital Alpha ratio  
Reference range: 0.8+/-0.3

\* indicates questionable value.



## Boone Report

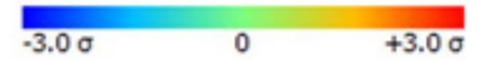
Female, 3/25/1951 — ID: N/A — Generated: 4/28/2023 9:50 AM



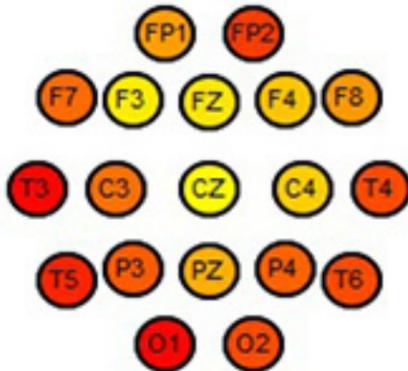
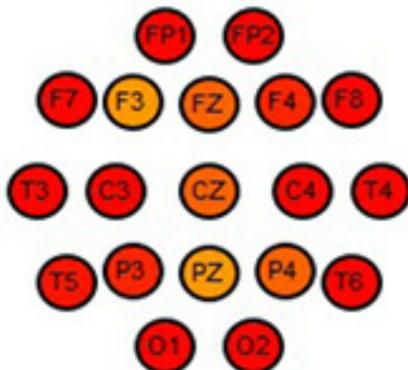
### P300 Eyes Closed Z Scores, Session 1 (4/28/2023)

**Band Ranges**  
 Theta: 4.5–7.5 Hz  
 Alpha: 8.0–13.0 Hz  
 Beta: 13.0–25.0 Hz

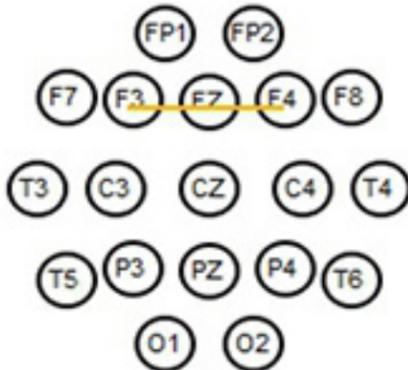
#### Color Key



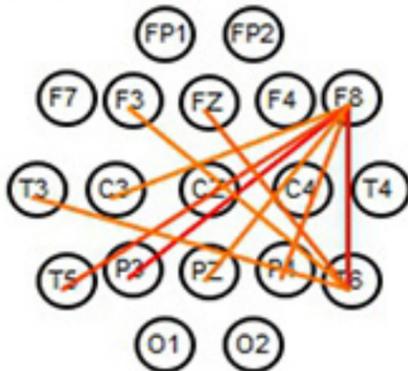
#### THETA



Z-Scores above 1.0 and below -1.0

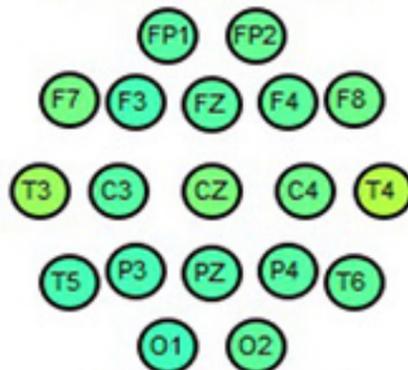


Z-Scores above 2.0 and below -2.0

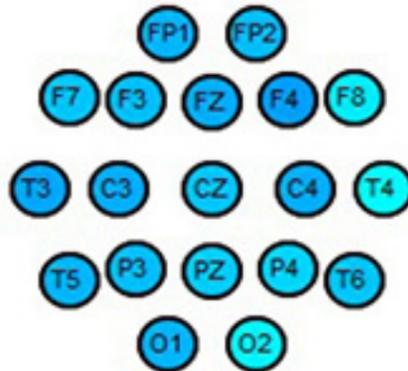


#### ALPHA

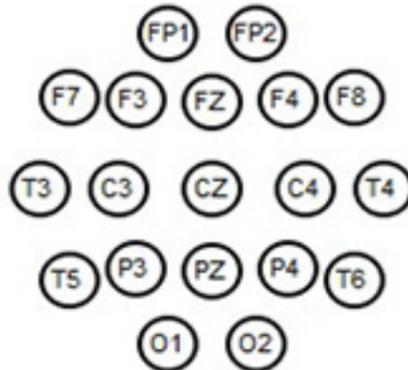
##### -ABSOLUTE POWER-



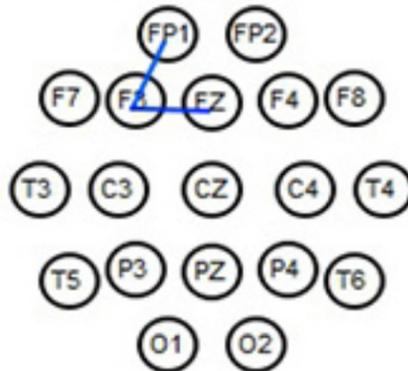
##### -RELATIVE POWER-



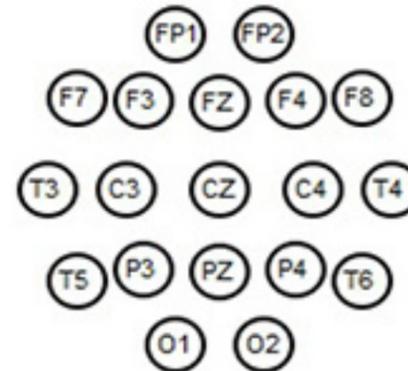
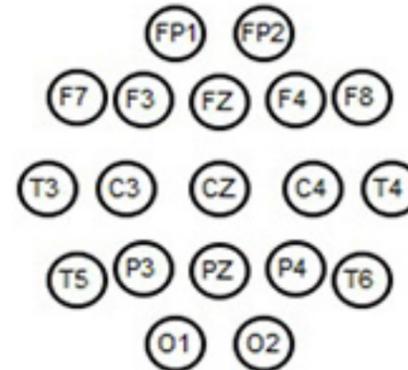
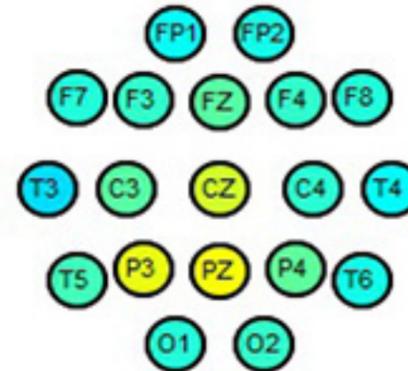
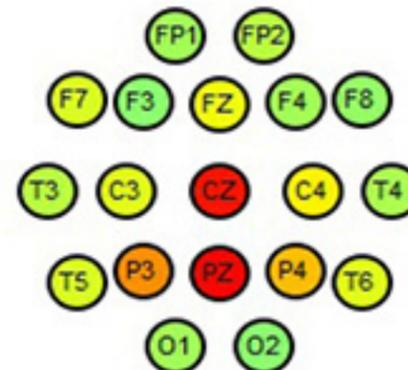
##### -AMPLITUDE ASYMMETRY-



##### -COHERENCE-



#### BETA



## Boone Report

Female, 3/25/1951 — ID: N/A — Generated: 4/28/2023 9:50 AM



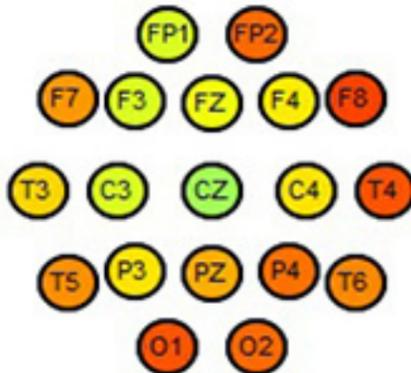
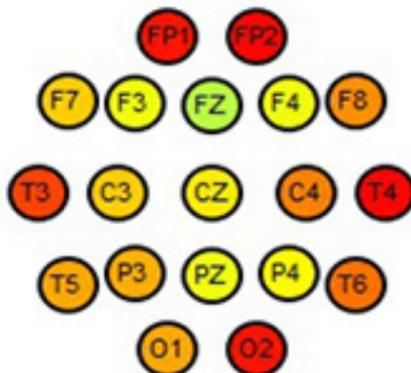
### P300 Eyes Closed Z Scores, Session 2 (4/28/2023)

**Band Ranges**  
 Theta: 4.5–7.5 Hz  
 Alpha: 8.0–13.0 Hz  
 Beta: 13.0–25.0 Hz

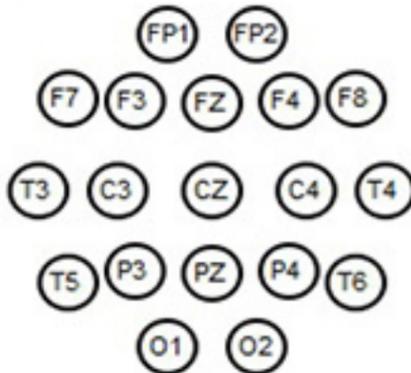
#### Color Key



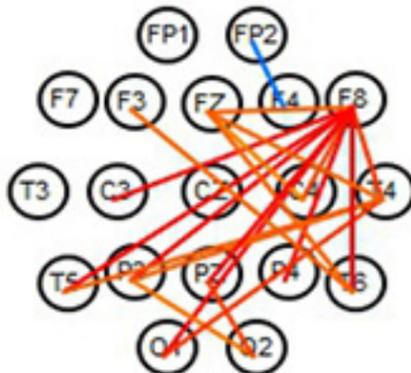
### THETA



Z-Scores above 1.0 and below -1.0

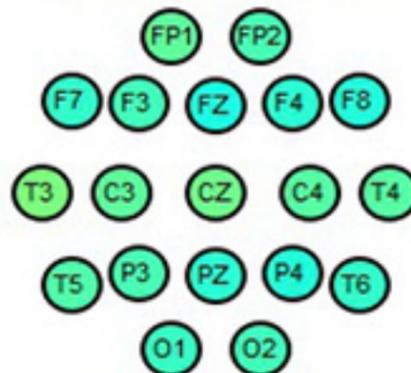


Z-Scores above 2.0 and below -2.0

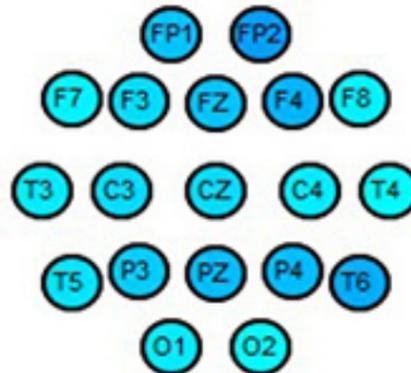


### ALPHA

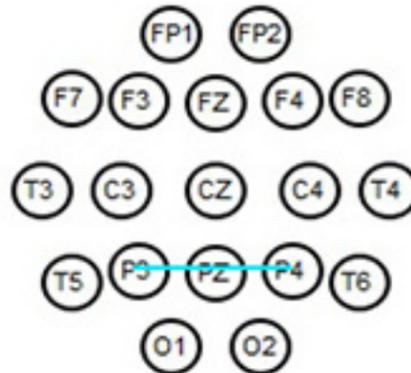
#### -ABSOLUTE POWER-



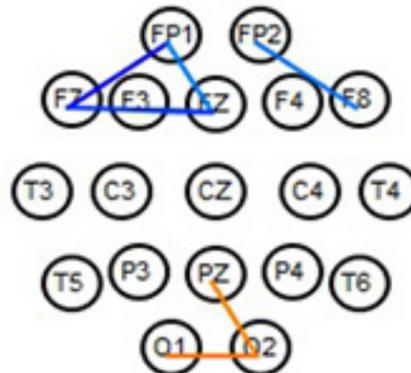
#### -RELATIVE POWER-



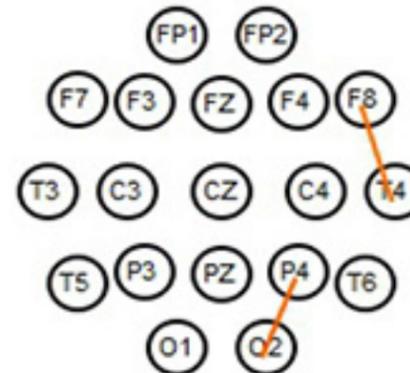
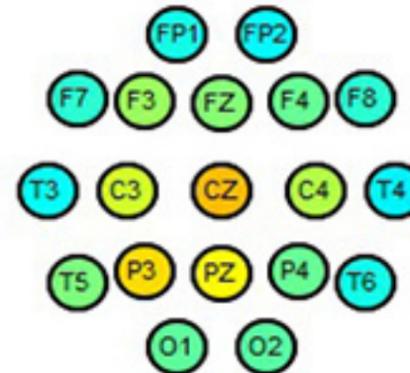
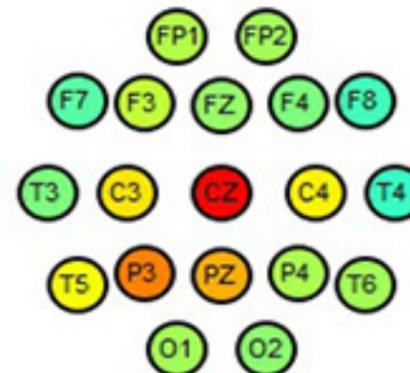
#### -AMPLITUDE ASYMMETRY-



#### -COHERENCE-



### BETA





## Boone Report

Female, 3/25/1951 — ID: N/A — Generated: 4/28/2023 9:50 AM



### Coherence Network Graphs, P300 Eyes Closed

The first row shows color-mapped coherence between head locations in the first session. Subsequent rows show color-mapped percent changes in additional sessions compared to the first session.

Coherence Threshold: 0.4

Percent Change Threshold: 40

Comparison Mode: Both

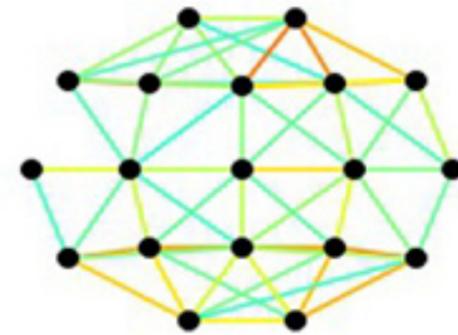
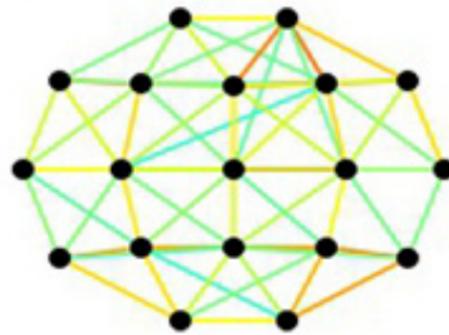
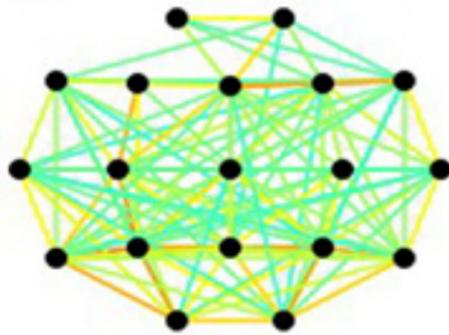
THETA  
(4.5 - 7.5 HZ)

ALPHA  
(8.0 - 13.0 HZ)

BETA  
(15.0 - 35.0 HZ)

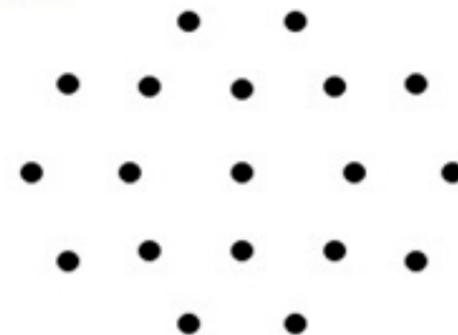
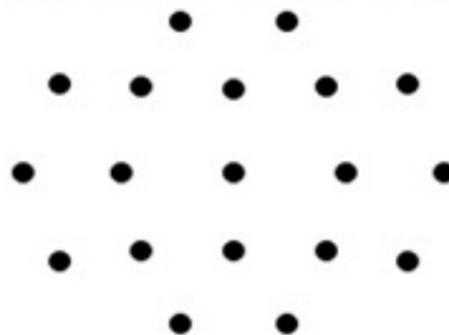
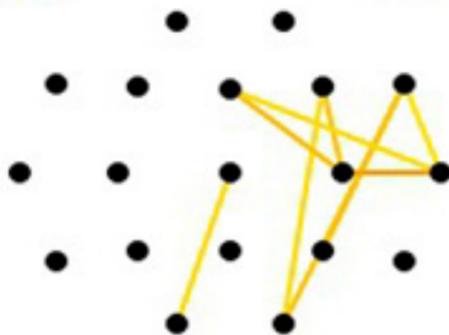
Session 1  
4/28/2023 8:26 AM

0.0 1.0  
COHERENCE BETWEEN 0 AND 1



Session 2  
4/28/2023 9:45 AM

-100% +100%  
PERCENTAGE CHANGE COMPARED TO SESSION #1



## Boone Report

Female, 3/25/1951 — ID: N/A — Generated: 4/28/2023 9:50 AM

## Appendix

**Low Yield (☐):** 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.

**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.

**Manually Modified Artifacts (★):** Shown next to sessions in which at least one input file has manually modified artifacts.

**Sync Blinks:** Short for "synchronized eye blinks," this is reported when FP1 or FP2 is greater than or equal to 20  $\mu\text{V}$ . Sync Blinks may affect the reported P300 and/or Flanker test depths and latencies at other electrode locations.

### 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 with sufficient yield.

- 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  $\mu\text{V}$ .

- Reported as "N/A" if no C-P location is at least 3  $\mu\text{V}$ , 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  $\mu\text{V}$ " if the voltage at all C-P locations is less than 0  $\mu\text{V}$ .

**Low Yield (☐):** 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

Metrics include CZ Theta/Beta, F3/F4 Alpha, Coherence, Muscle Tension, Peak Frequency. For eyes closed metrics, P300 needs to be run, otherwise reported as "N/A"

Low Yield (  ): 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.

Black Xs indicate topo locations with a yield of less than 20 rare events. For graphical interpolation purposes, these locations are also set to 0  $\mu$ V 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  $\mu$ V.

The warning "No consistent 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  $\mu$ V value is at 500 ms after a rare even.

For more information, please see [wavimed.com/whitepapers](http://wavimed.com/whitepapers).

## CONCLUSION

Molecular hydrogen inhalation therapy is a non-invasive treatment option that has the potential to improve neurological disorders due to its anti-inflammatory, anti-oxidative, and apoptosis-modulating properties, along with its vasodilating effects. It is the author's contention that further evaluation and investigation of this treatment modality as an acute and chronic intervention is warranted.

### Reference Link

Molecular hydrogen is a promising therapeutic agent for pulmonary disease

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8861563/>

Randomized double-blind placebo-controlled trial of hydrogen inhalation for Parkinson's disease: a pilot study

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8861563/>



#### ADDRESS

146 Rock Hill Dr  
Rock Hill, NY 12775



#### CONTACT DETAILS

Phone: 845-796-9951  
Email: [info@huelightusa.com](mailto:info@huelightusa.com)