



NEUROVIZR™ STUDY PAPER

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Published October 7, 2023
by TOWNSEND LETTER

NEUROVIZR™ EXECUTIVE SUMMARY

The NeuroVizr™ is a new generation of Audio-Visual Entrainment (AVE) devices, which involves the use of light and sound used to help relax and balance the brain, body, and nervous system.^{1, 4, 5, 7-9, 14, 16}

A significant amount of research, alongside clinical experience, suggests that AVE devices can increase blood flow to the brain, increase levels of neurotransmitters, help improve symptoms of attention deficit hyperactivity disorder (ADHD), worry, depression, anxiety, insomnia, cognitive impairment, memory, PTSD, as well as improve pain. AVE devices also have been shown to improve physical and academic performance as well as emotional wellness in general.^{1, 4-6, 9 21}

After two years of consistently witnessing positive changes in users of the NeuroVizr™, beyond what had been seen with other AVE devices, we designed a small pilot study to

1. Gain greater understanding of how the NeuroVizr™ influences users.

2. Contribute to the data showing AVE devices to be a valuable and promising tool for increased states of relaxation and well-being.
3. Explore how the NeuroVizr™ may be unique to other AVE devices as we investigate the concepts of engagement and bottom up (rather than top down) stimulation.

Our hypothesis for this pilot study was that the NeuroVizr™ device tested in 2 settings—Sleep Angel (SA) and Alpha Primer (AP)—would have a positive effect on relaxation states measured by changes in brain wave states on electroencephalogram (EEG) as well as heart rate variability (HRV), skin conductance (sEMG), respiratory rate and pre- and post-intervention subjective questionnaire.

The results of our study met our objectives and showed that the NeuroVizr™ did increase states of relaxation, presence, and well-being. The subjective data showed most all participants experienced improvements in relaxation with statistical significance; with a mean improvement of 1.6 in score.

Participants also reported significant increased presence, body connection, mental focus, relaxation, and happiness, as well as decreased stress and physical pain. Almost all participants (10/11) responded with maximum score (6) stating that they would recommend this device to a friend; one participant (1/11) responded with a score of 5.

Seventy-three percent (4:6 in SA and 3:5 in AP) of participants fell asleep during the session, and objective measurements in EEG findings showed a statistically significant improvement in high beta brain wave states showing increased relaxation, as well as suggestive improvements in surface electromyography (sEMG) supporting the hypothesis that increased states of relaxation were occurring from a single eleven-minute session on the NeuroVizr™ .

Narrative comments from the brain-mapping practitioner conducting the study included:

"In 13 years of practice, I have never used any device or intervention that consistently delivered the desired results and no abreactions in only 11 minutes...One participant showed changes after one 11-minute session what normally takes 10-30 Neurofeedback sessions."

Her observations were supported by the work of Hoedlmoser¹⁰ and Schabus.¹⁹

Participants narrative comments shared in Appendix A were positive as well, including one that said: *"I am still in shock that I am feeling this way. So calm. Without any chemicals. It is healthy and feels good."*

Our findings show dynamic active changes immediately after the session; and while change usually is stressful for people, the opposite was occurring: not only did people feel better during this change state, but the majority of them were so relaxed, they fell asleep.

Consistent with the principle we are feeling creatures that think, and that we have more afferent neurons going from our body to our brain, tools that can impact this bottom-up signaling do seem to offer greater immediate as well as long lasting neuroplastic changes. This assertion has been explored and supported by other physicians as well, stating that bottom-up level processing of trauma and stress creates more meaningful and sustainable change.²

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In her book, Whole Brain Living, Jill Bolte Talyor states that "At the most basic level, it is the job of our amygdala to conceptually ask moment by moment, 'Am I safe?'"² When people are given an experience of safety in connection with themselves (as shown by a decrease in the high beta hyper-vigilant state and the subjective findings), not only can we become more relaxed, but our courage circuits

can become engaged and help regulate extreme and maladaptive emotional states.

The NeuroVizr™ team and founder Garnet Dupuis are referring to the NeuroVizr™ as "The Change Maker" because it is designed to exercise and stimulate the natural adaptive neural capacities of the brain that are characteristic of positive neuroplastic change. The primarily bottom-up source of information offered in a NeuroVizr™ session, modifies compounded top-down patterns in a positive way. When a novel stimulus does not match old patterns in the brain, the brain can either become more rigid or abandon old ways and develop new ones. This can be called change, adaptation, growth, or learning; and while change is often stressful and challenging, it can also be relaxing and enjoyable.

From the objective and subjective data obtained from this study, it certainly shows the NeuroVizr™ to facilitate increased states of relaxation, as well as non-stressful, enjoyable change. While further studies are needed to understand more, it is clear the NeuroVizr™ is a game changer in this field.

References are listed in the article "NeuroVizr™ Study Paper" by Dawn DeSylvia, MD, and Justin Earl Ballard.

"IN 13 YEARS OF PRACTICE, I HAVE NEVER USED ANY DEVICE OR INTERVENTION THAT CONSISTENTLY DELIVERED THE DESIRED RESULTS AND NO ABREACTIONS IN ONLY 11 MINUTES..."

ONE PARTICIPANT SHOWED CHANGES AFTER ONE 11-MINUTE SESSION WHAT NORMALLY TAKES 10-30 NEUROFEEDBACK SESSIONS."

ABSTRACT

Background: The NeuroVizr™ is a new generation of Audio-Visual Entrainment (AVE) devices, which involves the use of light and sound to help relax and balance the brain, body, and nervous system.^{1, 4, 5, 7-9, 14, 16} After two years of consistently witnessing positive changes in users of the NeuroVizr™, beyond what had been seen with other AVE devices, we designed a small pilot study to:

1. Gain greater understanding of how the NeuroVizr™ influences users.
2. Contribute to the data showing AVE devices to be a valuable and promising tool for increased states of relaxation and well-being.
3. Explore how the NeuroVizr™ may be unique to other AVE devices as we investigate the concepts of engagement and bottom up (rather than top down) stimulation.

Methods: A study was conducted of 12 people between the ages of 18-70 that presented to three clinic sites in Southern California with self-reported PTSD or with self-reported insomnia/sleep disturbances. Data was collected to measure markers of increased relaxation and beneficial health states after a single 11-minute session on the NeuroVizr™. Metrics used were changes in brain wave states on electroencephalogram (EEG), heart rate variability (HRV), skin conductance (sEMG), respiratory rate and pre- and post-intervention subjective questionnaire.

The hypothesis for this pilot study was that the NeuroVizr™ device [tested in two settings: Sleep Angel (SA) and Alpha Primer (AP)] would have a positive effect on relaxation states.

Results: The subjective data showed most all participants experienced improvements in relaxation with statistical significance—with a mean improvement of 1.6 in score. Objective measurements in EEG findings showed a statistically significant improvement in high beta brain wave states showing increased relaxation, as well as suggestive improvements in surface electromyography (sEMG). Participants also reported significant increased presence, body connection, mental focus, relaxation, and happiness, as well as decreased stress and physical pain. Additionally, seventy-three percent (4:6 in SA and 3:5 in AP) of participants fell asleep during the session.

Conclusion: In addition to the results supporting the hypothesis that the NeuroVizr™ has a positive effective on increasing relaxation states, it also suggests it to facilitate sleep as well as non-stressful, enjoyable change.

INTRODUCTION

With a 20-year background in nonconventional technologies and 40 years in integrative healthcare, Garnet Dupuis shifted his focus to adaptive brain change in 2016 with a prototype device called the NeuroLight.

After encouraging results and witnessing positive neuroplastic brain changes using crafted light and sound signaling, the first prototype of the NeuroVizr™ was created in 2018 and the development shifted to an advanced wearable version known as the NeuroVizr™, manufactured by Brain Prime Technologies in Thailand.

Light and sound brain stimulation technologies first gained interest in relation to the Frequency Following Response in the late 1930s, but it was not until the 1970s that the interest was popularized into what we now call brain entrainment.^{4, 5, 6, 9}

Garnet found that by offering the user a deeply personal, and unique experience (no two individuals will see the same patterns or colors of light, despite it being the same light flickering pattern and frequency), the NeuroVizr™ was providing a “bottom up” (feeling-guided) rather than “top down” (thought-guided) experience.

Garnet asserted that the positive sustainable changes we were witnessing were a result of neuroplastic changes that was better explained by what he calls “engagement” vs “entrainment.” He then proposed a theory around how and why this was occurring. Further understanding of this can be found in the writings of Nicholson, et al.¹⁶

BRAIN ENTRAINMENT AND ENGAGEMENT

Important terms to define include:

- **Brain Entrainment** is an applied form of the Frequency Following Response (FFR) and has, in principle, remained unchanged for many decades.
- **Brain Engagement** is a new term used by NeuroVizr™ to indicate an action to “engage” the brain in positive neuroplastic change.
- **Conventional Brain Entrainment** devices are neurologically a “top-down” process whereas Brain Engagement is neurologically a “bottom-up” process.
- **Brain Entrainment** promotes and reinforces various “ordered states” in the brain.
- **Brain Engagement** triggers and stimulates “progressive adaptive responses” and changes in the brain.

SAFETY HISTORY OF AVE DEVICES

Light/Sound devices, such as generally used in brain entrainment, have been sold directly to the public for more than forty years. In their early introduction, they were labelled “Mind Machines” and are still available today through numerous online vendors. Such devices are considered to be safe for general use with one exception: people with seizure disorders are advised to not use them and a warning regarding photic-induced seizures must be made available to the user.^{4-6, 9, 20} While these devices are sold directly to the public, the authors of this paper always advise consulting with your physician, or working with a provider while using the device, if there are any active physical, mental, or emotional conditions. Many researchers in the field have stated that “AVE devices are low cost, effective and easy to operate with minimal negative side effects.”⁵

CONDITIONS SHOWN TO BENEFIT FROM THE USE OF AVE DEVICES

A literature and research review were completed and summarized here^{1, 4-6, 9, 21}:

A significant amount of research, alongside clinical experience, suggests that AVE devices may effectively modify conditions of high autonomic activity and excitation as well as bring about a more balanced mind state by harmonizing hyper or hypo active areas in the brain. In addition, AVE devices have also been shown to increase blood flow to the brain, increase levels of neurotransmitters, and can produce a sense of calm and safety while reestablishing adaptive and healthy neural networks.

Applications and studies of AVE devices in the literature are wide ranging and have shown efficacy for symptoms of attention deficit hyperactivity disorder (ADHD), worry, depression, anxiety, insomnia, cognitive impairment, memory, PTSD, as well as for pain. AVE devices also have been shown to improve physical and academic performance as well as improved emotional wellness in general.

PROPERTIES INVOLVED IN SA AND AP PROGRAMS

According to inventor Garnet Dupuis, the outcome of a Brain Engagement session does not rely on the Frequency Following Response at all. It stimulates/exercises the brain along a complex vector (complete with periods of destabilization and induced challenge/conflict) so that the brain is better able to make adaptive changes on its own as is required by processing demands leading towards resolution.

Also, the soundscapes are also frequency encoded (and not “just” music).

Periods exist in the composition when destabilizing stimulations are introduced to increase message susceptibility as well as “conflict” stresses to help embed the vector (which is in summary) a classic high theta/low alpha “hypnagogic” state. Even the shifts in periods of theta or alpha appear in steps and stages.

Sleep Angel predominantly uses theta 4-8 and alpha 8-12 frequencies. In the beginning, there is a minimal beta stimulus given to activate attention. It is important to note that these frequency sets are not in linear repetition (as in brain entrainment).

In Alpha Primer the flicker rates used are the alpha frequencies (8-12 Hz). The “alternating bilateral pulsing” begins first at a two-second interval then changes to a one-second interval rate (consistent with manual eye processing and desensitization [EMDR]).

STUDY HISTORY AND DESIGN

Beginning in early 2020, Justin Ballard (Founder of the Just Hope Wellness Center in Southern California) observed that users of the NeuroVizr™ experienced significant positive changes, including resolution of post-traumatic stress disorder (PTSD) symptoms, anxiety, pain, focus, and memory. However, improvements in sleep were the most consistent and significant experience users had. Given this finding along with the significant burden insomnia causes physically, emotionally, and economically, the hypothesis was created and two specific programs on the NeuroVizr™ were chosen: Sleep Angel (SA) and Alpha Primer (AP).

It is well-known that not only does impairment in sleep cause significant comorbidity risks for all diseases, including cancer, heart disease, diabetes, anxiety, and depression,^{7, 8, 10, 12, 14, 19} but it also continues to be an elusive and difficult-to-resolve condition as illustrated from the finding that up to 42.8% of people in the United States alone suffer from insomnia annually.³

In addition to the physical and emotional suffering that ensues from insomnia, the economic burden in the US alone exceeds \$100 billion annually.¹⁹

A study was conducted of 12 people between the ages of 18-70 with no reported history of seizures. Participants were recruited based on presenting with self-reported PTSD or with self-reported insomnia/sleep disturbances.

Those with PTSD symptoms experienced the 11-minute Alpha Primer (AP) program and those with sleep disturbances the 11-minute Sleep Angel (SA) program.

It was determined, based on the research of these markers and how they spoke to increased relaxation and other health benefits, the metrics measured would be^{1, 5, 10, 11, 14, 18} :

- Heart rate variability
- Skin conductance
- Respiratory rate
- sEMG (changes in muscle tension)

Additionally, three sites were recorded on Brain Masters EEG brain mapping to measure alpha, theta, beta and high beta activity in the brain:

- Fz (Frontal cortex) theta, alpha, and beta at 12 to 15 Hz
- Cz (central, sensorimotor area)
- Pz theta, 12 to 15 Hz beta and alpha

NOTES ON SITES FZ, CZ, AND PZ

Of the 19 sites recorded, Fz, Cz, and Pz were selected for analysis due to their involvement in many networks that synchronize the functions of groups of neurons in various states. Particularly they are involved in three key regulatory networks²²:

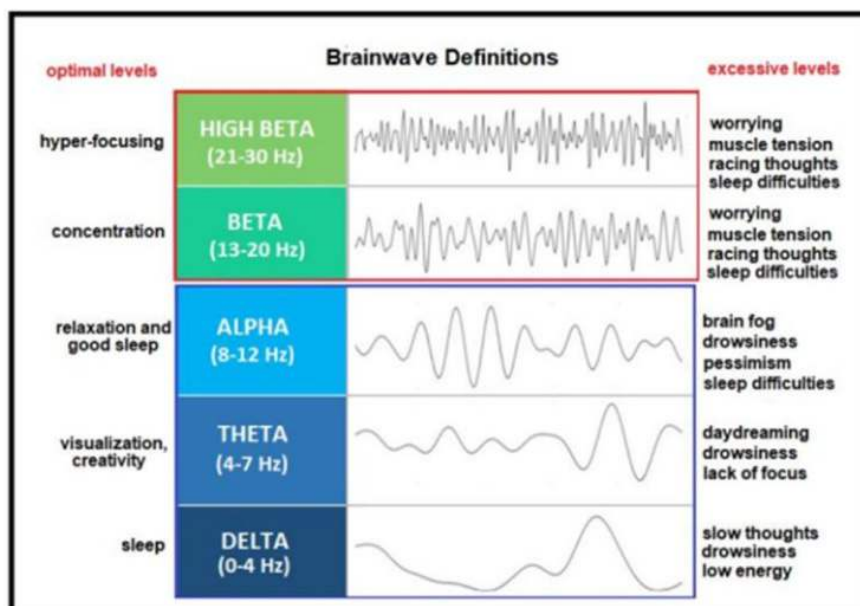
- Both the Attention and Default networks show decreased activity during sleep.
- The Default network is involved in self-reflection, which is important for homeostasis within the brain.
- The Salience network is involved in decisions as to the relevance of incoming information and works with these midline sites of the brain as components of attention.
- High beta is associated with an active, “busy” thinking brain.

The graph below gives a visual of the brain wave states measured. While we didn’t measure delta, it is important to include in the graph here as it will be referred to in our discussion below.

Further understanding of the brain wave states is provided here^{1, 5, 10, 18, 22, 23}:

- Theta waves (4-7 Hz, 20 to 100 uV) are associated with an internal focus, detached from the external environment, or the meditative/hypnagogic state
- Alpha waves (8 to 12 or 13 Hz, 20 to 60 uV) are associated with relaxed wakefulness, produced when a person closes his/her eyes and sits quietly; calmly, consciously with an internal focus.
- Beta waves (14 to 30 Hz, 2 to 20 uV) are dyssynchronous brain waves that occur when a person is engaged in conscious processes (mental or physical activity); in other words, aroused or excited with external focus; thinking, decision making, concentration. SMR (12 to 15 Hz) beta over the sensorimotor strip (Cz), or “The Zone” (12-15 Hz) is associated with a quiet, still, calm, relaxed state of consciousness without movement
- High Beta/Beta 2 waves (greater than 18 Hz) are associated with fight or flight states, as well as subjective feeling states of alertness, agitation, problem solving, anxiety, worrying, rumination, mental effort, associated tasks and behaviors such as mental activity (eg, math), planning; and physiological correlates of general activation of mind.

Because of the data showing associations between increased relaxation and well-being and positive ranges and changes in sEMG, HRV, respiration, and skin conductance, these were measured as well.^{1, 11, 14}



PARTICIPANTS AND METHODS

Participants self-presented to three office sites: Dr. Dawn DeSylvia's practice The Center for Whole Health (Westlake Village, CA), Justin Earl Ballard's Just Hope Wellness Center (Westlake Village, CA) and Rebecca Bassham's Biofeedback/Neurofeedback practice (Oxnard, CA).

Inclusion criteria included people who self-presented with PTSD or insomnia/sleep disturbances between the ages of 18 and 70 years. Participants with history of seizures or any current suicidal thoughts or behaviors were excluded from the study.

No randomization or Institutional Review Board (IRB) approval was sought or needed given the study design; however, patients did sign a consent form to participate that included how their privacy would be protected and how the de-aggregated data would be used. A pretest questionnaire was completed by the participants.

The participant was then connected to the Brain Masters EEG biofeedback device that recorded HRV, respiratory rate (RR), and skin conductance, sEMG, and brain wave changes. Based on the self-presented category, either Sleep Angel or Alpha Primer program was administered on the NeuroVizr™. The participants completed a subjective post-assessment questionnaire.

DESCRIPTIVE STATISTICS

Subjective Data and Analysis: The subjective data included seven questions about the wellbeing of participants, which they answered just before the NeuroVizr™ session began and then again afterwards. Their responses were on a scale from 1 (low) to 6 (high). The primary hypothesis is that participants would experience an overall increase in wellbeing and the secondary hypothesis was that they would experience improvement in each of the seven areas in question.

A series of matched-pair, one-sided t-tests were used to determine if there were significant changes in study variables before and after treatment. These parametric tests can be applied to such Likert data.¹⁷

The test of overall wellbeing was performed by calculating the t-test on the mean change across seven scores towards improvement, when taking the difference from pre- to post-session. Improvement was recorded as an increase in score for questions about positive outcomes (e.g., relaxation) but a decrease in score for negative outcomes (e.g., stress).

Results: One participant's data was not useable because the participant's age was outside the age range of the

protocol. We are reporting on findings from six participants with insomnia that experienced the program Sleep Angel (SA) and five participants with PTSD symptoms that experienced the program Alpha Primer (AP).

Results of Subjective Analysis: The wellbeing of the participants increased in all outcomes tested by the questionnaire. In all seven outcomes across 11 participants, almost all scores showed either improvement or no change from pre- to post-session; there was only one score that slightly decreased. Almost all participants responded with maximum score (6) that they would recommend this to a friend; one participant responded with a 5. The overall wellbeing improvement showed clear statistical significance ($p < 0.0001$), with a mean improvement of 1.6 in score (standard error = 0.15).

Participants reported significantly increased presence, body connection, mental focus, relaxation, and happiness, as well as decreased stress and physical pain (Table 1).

Having observed such positive results, we also analyzed the five participants in the AP study and the six in the SA study separately. Both independently showed a significant overall increase in wellbeing ($p < 0.001$): AP participants had a mean score increase of 1.8 (standard error [SE] 0.15) and SA participants had a mean increase of 1.5 (SE 0.24). Testing the seven individual outcomes here was promising but less conclusive, and a larger study may shed more light here.



Table 1: Pre-session and Post-session Scores Analyzed with Matched-Pairs t Tests

| Outcome | Pre-Session M (SD) | Post-Sessions m (SD) |
|-----------------|--------------------|----------------------|
| Stress | 3.82 (0.98) | 1.82 (1.47)** |
| Presence | 3.64 (1.29) | 5.45 (0.52)** |
| Body Connection | 4.05 (1.52) | 5.18 (0.75)** |
| Mental Focus | 3.55 (0.93) | 4.82 (0.75)** |
| Relaxation | 2.64 (1.12) | 5.36 (0.67)** |
| happiness | 3.35 (1.12) | 4.45 (1.13)** |
| Physical Pain | 2.82 (1.66) | 1.55 (0.69)** |

M = mean, SD = standard deviation, t test significant at * $p < 0.01$ and ** $p < 0.001$

OBJECTIVE DATA AND ANALYSIS

Method: The objective data includes EEG measurements of four frequency ranges: beta 2; 12 to 15Hz beta; alpha; and theta. Each was measured at three brain sites: Fz, Cz, and Pz. One hypothesis is that participants would be more relaxed after the session, so their beta 2 activity would decrease. As they achieved more internal states, we further hypothesize that alpha and theta would increase. We did not generate a hypothesis for 12 to 15 Hz beta, but rather viewed it purely as exploratory. A series of matched-pair one-sided t-tests on each metric was used to determine if there were significant pre/post changes in study variables.

Results: The participants displayed a significant decrease in beta 2 at all three brain sites, confirming our hypothesis. However, there was not a significant change in alpha or theta, and the direction was not always an increase as we

had hypothesized. While theta showed small increases at Fz and Cz sites, alpha decreased at all three sites (**Table 2**).

A separate analysis of the five AP participants and six SA participants shed some more light. The SA participants were mainly responsible for the decrease in alpha, with the Cz site showing significant decrease ($p = 0.02$) and Fz ($p = 0.07$) and Pz ($p = 0.06$) sites showing suggestive decreases, whereas AP participants showed small changes in alpha.

In addition, SA participants showed a somewhat clearer decrease in beta 2 than AP participants, while AP participants showed some suggestive decreases in theta. It is also worth noting that four of the five AP participants showed unusually large changes in alpha at the Fz site, some increasing and some decreasing.

Table 2: EEG Outcomes Analyzed with Matched-Pairs t Tests

| Brain Site | Frequency | Pre-Sessions M (SD) | Post-Session M (SD) |
|------------|----------------|---------------------|---------------------|
| Fz | Theta | 1.56 (0.53) | 1.57 (0.56) |
| Cz | Theta | 1.62 (0.62) | 1.65 (0.85) |
| Pz | Theta | 1.58 (0.58) | 1.43 (0.62) |
| Fz | Alpha | 2.21 (1.04) | 2.04 (0.76) |
| Cz | Alpha | 1.92 (0.64) | 1.86 (0.62) |
| Pz | Alpha | 2.34 (1.22) | 2.2 (1.03) |
| Fz | 12 -15 Hz beta | 1.34 (0.43) | 1.29 (0.4) |
| Cz | 12 -15 Hz beta | 1.31 (0.37) | 1.03 (0.42) |
| Pz | 12 -15 Hz beta | 1.4 (0.46) | 1.38 (0.44) |
| Fz | Beta 2 | 1.05 (0.32) | 0.97 (0.32)* |
| Cz | Beta 2 | 1.17 (0.45) | 1.09 (0.41)* |
| Pz | Beta 2 | 1.07 (0.34) | 1.01 (0.34)* |

M = mean, SD = standard deviation, t test significant at * $p < 0.05$

PERIPHERAL DATA

Method: In addition to measuring the brain with EEG, the objective data included measurements of various areas of the body.

Hypotheses are proposed for each of the measurements based on the expectation that participants are more relaxed after the session, corresponding to a shift from sympathetic to parasympathetic nervous systems. The heart rate is hypothesized to decrease as nervous system activation is reduced.

The skin conductance is hypothesized to decrease with reduced stress and sweating. The hand temperature is hypothesized to increase as a relaxed system allows more blood to flow to the extremities. The sEMG is hypothesized

to decrease as muscle tension decreases. The breath rate is expected to decrease as breathing deepens and slows. The HRV is expected to increase with an improvement in emotional wellbeing.

A series of matched-pair one-sided t-tests on each metric was used to determine if there were significant pre/post changes in study variables.

Results: The participants did not display any significant changes at the $p < 0.05$ level corresponding to the hypotheses proposed (Table 3). However, the sEMG measure shows a suggestive decrease in muscle tension ($p = 0.06$).

A separate analysis of the five AP participants and six SA participants suggests that this decrease in muscle tension was more present in SA than AP participants.

Table 3: Peripheral Data Outcomes Analyzed with Matched-Pairs t Tests

| Outcome | Pre-Session m (SD) | Post-Session M (SD) |
|------------------|--------------------|---------------------|
| Heart Rate | 66.77 (14.45) | 67.46 (14.6) |
| Skin Conductance | 1.53 (1.74) | 1.31 (1.51) |
| Hand Temperature | 87.25 (8.89) | 87.48 (8.07) |
| sEMG | 5.9 (4.63) | 5.35 (4.75)* |
| Breath Rate | 15.55 (4.93) | 14.81 (5.1) |
| HRV LF% | 0.45 (0.15) | 0.46 (0.18) |

M = mean, SD = standard deviation, t test significant at * $p < 0.1$

Narrative comments from participants and brain mapping provider Rebecca Bassham were collected as well, and reported in **Appendix A**.

DISCUSSION

This pilot study met our objectives and showed that the NeuroVizr™ did increase states of relaxation, presence, and well-being.

The subjective data was consistent with our two-year clinical experience in that the majority showed improvements in relaxation with statistical significance; with a mean improvement of 1.6 in score.

Participants also reported significant increased presence, body connection, mental focus, relaxation, and happiness, as well as decreased stress and physical pain. We also saw statistically significant improvements (decrease) in high beta states (that is associated with a busy, thinking brain).

This is a less talked about marker of relaxation and sleep support, however, potentially more impactful as seventy-three percent of participants fell asleep during the session (4:6 in SA and 3:5 in AP fell asleep).

In addition to the reduction in high beta amplitude, we also saw a reduction in sEMG, which further suggests an increased state of relaxation occurs from a single session of the NeuroVizr™.

What was interesting, is that we saw a decrease in alpha states in many participants. Further studies and statistical trend analysis will be needed to explore this observation, but one hypothesis is that participants were reaching lower brain waves states, possibly entering delta brainwaves. (Consistent with seventy-three percent falling asleep during the session).

What we can say is there is something dynamic happening in the brain after a single session on the NeuroVizr™; and while change usually is stressful for people, the opposite was occurring; not only did people feel better during this change state, but the majority of them were so relaxed, they fell asleep.



It also has been hypothesized that the utilization and neuroplastic benefits of the NeuroVizr™ occur after the session. Like eating a meal, the digestion and integration of the nutrients occurs after you stop eating.

Future studies would include post-session analysis five to ten minutes after the session, as well as exploring other brainwave states that became active or quieted during or immediately after the session.

CONCLUSION

We assert that through an experience that allowed users to have a unique and engaging emotional, physical, and mental experience, there was increased awareness and an enhanced mind/body connection, which is consistent with the ingredients of Brain Engagement discussed in the Introduction, and as such, relaxation and well-being significantly improved.

Whether it was insomnia or PTSD the participants presented with, the maladaptive loops in the brain actively changed after a single session on the NeuroVizr™.

The resulted decreased activity in the high beta band range (which is associated with stress or “fight-or-flight” brain state) show that the NeuroVizr™ may be an effective and promising tool to support peoples’ states of relaxation and well-being.

Consistent with the principle we are feeling creatures that think, and that we have more afferent neurons going from our body to our brain; tools that can impact this bottom-up signaling do seem to offer greater immediate as well as long lasting neuroplastic changes.

This assertion has been explored and supported by other physicians as well, stating that a bottom-up level processing of trauma and stress creates more meaningful and sustainable change.^{2, 16}

In her book, *Whole Brain Living*, Jill Bolte Taylor states that “At the most basic level, it is the job of our amygdale to conceptually ask moment by moment, ‘Am I safe?’”²

When people are given an experience of safety in connection with themselves (as shown by a decrease in the high beta hyper-vigilant state and the subjective findings), not only can we become more relaxed, but our courage circuits can become engaged and help regulate extreme and maladaptive emotional states.

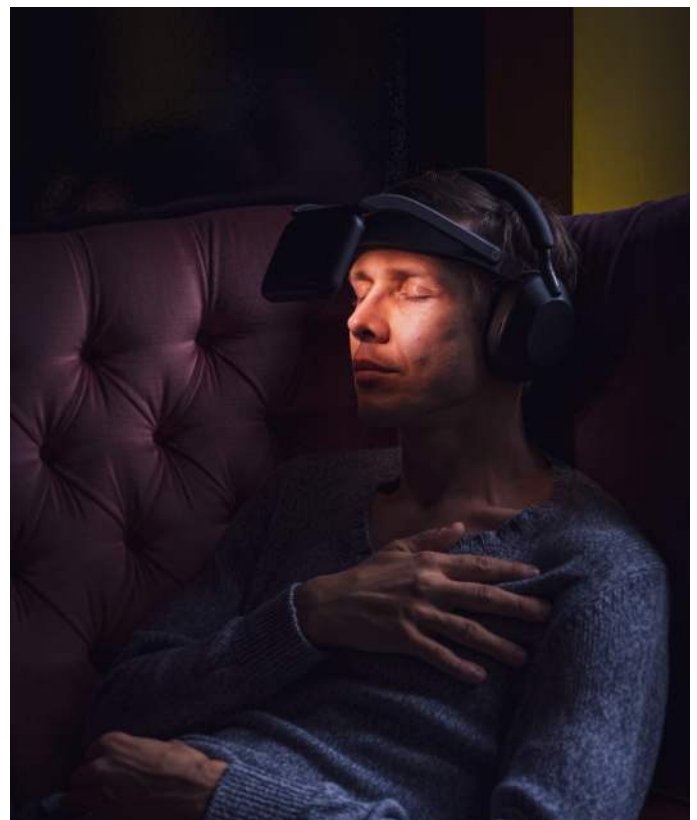
The NeuroVizr™ team and founder Garnet Dupuis, are referring to the NeuroVizr™ as “The Change Maker” because it is designed to exercise and stimulate the natural adaptive neural capacities of the brain that are characteristic of positive neuroplastic change.

The primarily bottom-up source of information offered in a NeuroVizr™ session modifies compounded top-down patterns in a positive way.

When a novel stimulus does not match old patterns in the brain, the brain can either become more rigid or abandon old ways and develop new ones.

This can be called change, adaptation, growth, or learning; and while change is often stressful and challenging, it can also be relaxing and enjoyable. From the objective and subjective data obtained from this study, it certainly shows the NeuroVizr™ to facilitate increased states of relaxation, as well as non-stressful, enjoyable change.

While further studies are needed to understand more, it is clear the NeuroVizr™ is a game changer in this field.



GLOSSARY/ABBREVIATIONS

| | |
|------|---|
| ADHD | Attention Deficit Hyperactivity Disorder |
| AP | Alpha Primer |
| AVE | Audio Visual Entertainment |
| EEG | Electroencephalogram |
| EMDR | Eye Movement Desensitization and Reprocessing |
| FFR | Frequency Following Response |
| HRV | Heart Rate Variability |
| PTSD | Post-Traumatic Stress Disorder |
| RR | Respiratory Rate |
| SA | Sleep Angel |
| SAD | Seasonal Affective Disorder |
| SE | Standard Error |
| sEMG | Surface Electromyography |

APPENDIX A: COMMENTS

What was particularly impressive was the subjective comments from Rebecca Bassham as well as participants.

REBECCA BASSAHAM'S STATEMENTS:

"In only 11 minutes I saw the brain change. These were measurable changes in the brain and peripheral physiology.

In 13 years of practice, I have never used any device or intervention that consistently delivered the desired results and no abreaactions in only 11 minutes.

One participant showed changes after one 11-minute session in what normally takes 10-30 Neurofeedback sessions.

This is consistent that changes in high beta can generally be seen after (a minimum of) 10 sessions of traditional neurofeedback (and these changes do indeed impact sleep quality and memory performance).^{10, 19}

NARRATIVE COMMENTS FROM PARTICIPANTS:

"Everybody needs to experience that. That was amazing. Where it took me...I felt so relaxed. It was close to falling asleep. That is how peaceful and calm I felt... It was amazing. Almost an out of body experience to me. "

"I am still in shock that I am feeling this way. So calm. Without any chemicals. It is healthy and feels good."

"It felt like wiping the slate clean."

"It was mind blowing. I got instant results."

"I feel calm and clear headed."

"It is simply amazing how much better overall I am feeling now, after 11 minutes of the NeuroVizr™."

"I feel relaxed, hopeful and have much less pain."

"I feel amazing."

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ABOUT THE AUTHORS



Dawn DeSylvia, MD, a nationally recognized, board-certified family medicine doctor, attended medical school at UCLA and went on to practice and teach at UCLA Medical Centers until opening her own integrative and functional medical practice in 2013. Drawing from her diverse background, she brings together a new model of patient care that synthesizes modalities from functional and integrative medicine, quantum physics, energy medicine and technology.

Dr. DeSylvia works with patients of all needs and specializes in helping those experiencing the effects of complex, chronic disease. She utilizes various therapies that work harmoniously together to encourage the body to not only heal- but thrive! Examples of these include endo-nasal balloon treatments, IV-therapy, neural therapy and more. “Using many unique modalities, we are better able to identify what is keeping you from your natural state of health, as well as more effectively and safely removing what isn’t serving you.”

Dr. DeSylvia’s expertise and unique perspective have been shared as a guest-speaker at conferences and on podcasts including The Upgrade Labs (with Dave Asprey), The Better Health Guy, and Organic Authority...just to name a few. Her engaging presence and insightful contributions have captivated audiences from numerous backgrounds, further establishing her as an influential figure in the field of integrative healthcare.

Learn more about Dr. Dawn DeSylvia and The Center here: www.thecenterforwholehealth.net @centerforwholehealth @TheCenterforWholeHealth



Justin Ballard is a scientist, inventor, technology expert, and a well-known public speaker on frequency healing, water science, and human genetics. He formerly worked for Fortune 500 companies creating platforms for nationwide analytics. He has invented algorithms involving speech patterns and obtained a U.S. technology patent for work on human vision abnormalities.

His care for humanity, though, is what inspires and fuels his deeply powerful work. Justin uses his skill set as a scientific researcher to seek out the best use of technology to assist people with health conditions facing the world today.

One of the most rewarding things for Justin is to watch people overcome various obstacles to their health and regain their zest for life! “I am inspired to share my work globally, as well as create a space for individuals to come to, that can help align and support their health and wellness. I do not offer or claim to cure or treat anything, but simply want to share the science of what can support our well-being. I am committed to bringing forth any knowledge and applications that can help people live with less suffering, and greater joy.”

Learn more about Justin Ballard & the Just Hope Center: <http://www.just-hope.com> @justhopehealing

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Garnet was born and raised in Canada and is a naturalized USA citizen. He is an Integrative Health and Wellness expert, teacher & inventor with specialties in inter-disciplinary methodologies. With a wide experience in advanced technologies, Garnet has taught neuromodulation applications in major USA universities, professional sports teams, the Marine Corp and Naval Hospitals and lectured in European and Asian countries.

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Original Publication :

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