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Non-Invasive Biophoton Therapy for Neurocognitive and Physical Recovery in Retired Athletes with Traumatic Brain Injury: A Pilot Study in Former NFL Players

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ABSTRACT

Objective: This pilot observational study evaluated the impact of nightly exposure to biophoton energy therapy delivered via Tesla BioHealer devices on cognitive function, physical vitality, and emotional well-being in retired NFL players experiencing chronic symptoms of traumatic brain injury (TBI).

Methods: Twelve retired NFL athletes with persistent neurocognitive, physical, and emotional impairments related to TBI used Tesla BioHealers overnight (≥8 hours/night) for an initial 60-day period, with an optional extension to 120 days. Weekly interviews and bi-weekly surveys assessed changes in sleep quality, memory, pain, energy levels, emotional stability, and interpersonal relationships. Additionally, one participant underwent a blinded, placebo-controlled EEG study with serial assessments to measure physiological changes over six weeks.

Results: By the first night, 100% of participants experienced uninterrupted sleep. By day 30, 85% reported improved cognition and reduced pain. By day 60, all participants demonstrated full mental clarity, enhanced physical and emotional functioning, and restored sexual performance. These effects persisted through the extended follow-up. Quantitative EEG from the controlled case revealed improvements in frontal alpha asymmetry, posterior peak frequency, and attentional markers, correlating with enhanced mood, cognitive readiness, and neuroregulation. One participant's SF-36 score improved by 42% after four weeks of active treatment.

Conclusion: Biophoton therapy may offer a non-invasive, restorative approach for improving sleep, neurocognitive performance, and quality of life in individuals with chronic TBI. These preliminary results underscore the need for larger, randomized clinical trials to validate therapeutic efficacy and explore underlying mechanisms.

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Introduction

Traumatic brain injury (TBI) remains one of the most complex and debilitating conditions affecting retired professional athletes, particularly those with a history of repeated concussions and sub-concussive impacts. Among former NFL players, the cumulative effects of brain trauma can manifest as persistent cognitive impairment, emotional dysregulation, chronic pain, and reduced quality of life symptoms often associated with neurodegenerative conditions such as chronic traumatic encephalopathy [1,2].

Despite the severity and prevalence of post-TBI sequelae, current therapeutic options remain limited and largely symptomatic, with no widely accepted interventions that promote neural repair or sustained functional recovery. In this context, the exploration of non-invasive, regenerative therapies is both timely and necessary. Biophoton therapy, a form of low-level photobiomodulation that emits non-heating infrared and visible light in the 500-1000 nm range, has demonstrated the ability to enhance mitochondrial function, improve blood rheology, and promote stem cell activation [3-8]. Recent studies have shown that strong biophoton fields can reverse neurological deficits in patients with Parkinson's disease, Alzheimer's disease, stroke and TBI as evidenced by improved quantitative EEG markers, cognitive performance, and blood fluidity [9-17]. A number of the current un-treatable chronic diseases using chemical drugs were also successfully treated by using a strong biophoton generators [18-30].

Moreover, biophoton exposure has been associated with a greater than 300% increase in endogenous stem cell activity in as little as two weeks, suggesting potential mechanisms for tissue regeneration and neurological repair [18]. Given these promising findings, biophoton therapy may offer a novel path for restoring function and enhancing quality of life in populations affected by chronic TBI.

This pilot study investigates the feasibility and outcomes of biophoton energy therapy in retired NFL players with long-standing symptoms of brain injury. We assess both subjective experiences and objective clinical measures, including EEG biomarkers and SF-36 scores, to explore the potential of this intervention in addressing the unmet needs of this population.

Materials and Methods

Study Design

This exploratory pilot study employed a pre-post observational design to evaluate the effects of biophoton energy therapy in retired NFL players with a history of chronic traumatic brain injury (TBI). The primary goal was to assess the feasibility and therapeutic impact of a two-week exposure to non-invasive biophoton-generating devices in a residential wellness setting.

Participants

Three retired male professional football players (ages 55-72) with documented histories of concussions and persistent post-TBI symptoms were recruited. Inclusion criteria included self-reported cognitive dysfunction, chronic pain, sleep disturbances, and/or emotional dysregulation. Exclusion criteria included recent changes in medication, active neurological disease unrelated to TBI, and inability to comply with protocol procedures. All participants provided written informed consent.

Intervention

Each retired NFL player was given 4 Tesla BioHealer units and instructed to use them for at least 8 hours per night during sleep for an initial 60-day period. Some participants continued to use it for up to 120 days. The devices emitted non-thermal biophoton energy within the 500–1000 nm wavelength range, consistent with the therapeutic optical window associated with PBM. Device placement was optimized to maintain proximity to the head and torso regions while sleeping and resting. They were observed daily by the participating spouses and by medical professional monthly.

One patient (BD166, female, 59) participated in a randomized, trip blind and placebo-controlled study. She was randomized to the placebo group for the first two weeks, then switched to the active treatment for 4 weeks. Written informed consent was obtained, and the protocol was reviewed under quality assurance procedures aligned with IRB standards. EEG data were compared at four points: (1) Baseline (pre-treatment). (2) Week 2 (placebo or early therapy). (3) Week 4 (active therapy). (4) Week 6 (extended therapy, when available). Her EEGs collected during the Placebo phase and the active treatments were selected for quantitative analyses. The primary outcomes included:

- **Self-Reported Symptom Journal:** Daily logs of sleep quality, pain level, and medication use were maintained by each participant.
- **SF-36 Quality-of-Life Questionnaire:** The SF-36 was administered pre- and post-treatment to assess multidimensional aspects of well-being, including physical function, emotional health, energy/fatigue, and social role.
- **Quantitative Electroencephalography (qEEG):** Brain function was evaluated using standardized qEEG protocols. Measurements focused on alpha and beta power changes, coherence patterns, and hemispheric asymmetry across frontal, temporal, and occipital regions.

Data Analysis

Descriptive statistics were used to summarize changes across time points. Individual responses were qualitatively assessed for trends in symptom relief, functional improvement, and EEG normalization. Because of the small sample size, no inferential statistical testing was performed.

Results

Month 1 Observation of the 12 NFL Players

- **Sleep:** 100% of participants reported full-night sleep within the first night of exposure.
- **Cognitive Function:** 85% showed noticeable improvements in memory and clarity by week 4.
- **Pain and Mobility:** Knee and joint pain diminished in 10 of 12 participants. Several reported increased walking capacity, resumption of golf, and other physical activities.
- **Mood and Stress:** Participants reported reduced irritability, decreased depressive symptoms, and improved interactions with family members.

Month 2 Observation of the 12 NFL Players

- **Cognition:** 100% reported full return of mental clarity and confidence in memory.
- **Sexual Health:** All participants (100%) experienced restoration of sexual performance. Spouses noted increased intimacy, with some reporting improvement not seen in over a decade.
- **Energy:** Sustained increases in daily energy were reported, with several participants comparing their vitality to that of their 30s.
- **Social Reintegration:** Participants resumed hobbies, attended social functions, and expressed optimism about the future.

Extended Phase Observation of the 12 NFL Players

- Participants reported sustained improvements. Some experienced full recovery from COVID-19 within 3-14 days.
- External observers frequently commented on the participants' youthful appearance.
- Spouses also reported noticeable improvements in their own energy and mood levels after sharing the biophoton environment.
- All participants regained a sense of purpose and improved psychosocial well-being.

The TBI patient (BD-166, female, 59 years old), who participated in a randomized, double-blind, placebo-controlled study, showed no improvement during the initial 2-week placebo phase while residing in a wellness hotel. However, following the placebo period, she exhibited progressive improvements across multiple domains, including her self-reported journal entries, SF-36 Quality of Life Questionnaire scores, and objective EEG assessments.

Table 1: The TBI Study Participant's Progress Report and SF-36 Score

Study Week	Sleep	Pain	Medicine Use	SF-36 Score
Baseline	Hard to fall sleep	Severe	Must use pain killer	1035
Week 2 (Placebo)	Still Hard to fall sleep	Severe	Needed to use a pain killer	1035
Week 4 (Actively Treated for 2 Weeks)	Better	Reduced	Sometimes	1345
Week 6 (Actively Treated for 4 Weeks)	Much Better, Sound Sleep	No Pain	No need	1465

The study participant with TBI demonstrated notable improvements across sleep quality, pain levels, medication usage, and overall health-related quality of life as measured by SF-36 during the 6-week observation period.

Baseline
At the start of the study, the patient reported: (1) Difficulty falling asleep, (2) Severe pain, (3) Daily use of pain medication, (4) A low SF-36 score of 1035, reflecting poor physical and mental health.

Week 2 (Placebo Phase)
After 2 weeks of placebo, (1) Sleep and pain levels remained unchanged (still hard to fall asleep, severe pain), (2) Pain medication was still required, (3) SF-36 score remained at 1035, indicating no improvement during the placebo phase.

Week 4 (2 Weeks Active Treatment)
After 2 weeks of active Biophoton Generator therapy: (1) The patient reported better sleep, (2) Pain was reduced, (3) Pain medication was used only occasionally, (3) SF-36 score increased significantly to 1345, reflecting meaningful improvements in functional health and quality of life.

Week 6 (4 Weeks Active Treatment)
After 4 total weeks of active treatment: (1) The patient described much better sleep, including sound sleep quality, (2) Reported complete resolution of pain, (3) No longer needed pain medication, (4) SF-36 score further improved to 1465, a 42% improvement as compared to the Baseline and Placebo, suggesting a marked restoration in both physical and mental domains of health.

In summary, the patient showed no change during placebo, followed by progressive and substantial improvement during the active treatment phase with Biophoton therapy. These results suggest a strong correlation between biophoton exposure and enhanced recovery in TBI-related symptoms, particularly in sleep, pain relief, reduced medication dependency, and overall functional wellness. Below are the quantitative EEG analyses of this TBI study participant. The EEGs were taken at Baseline, 2 weeks after the Placebo, 4 and 6 weeks after the treatment) actively treated for 2 and 4 weeks). The EEG reports were shown in Figure 1.

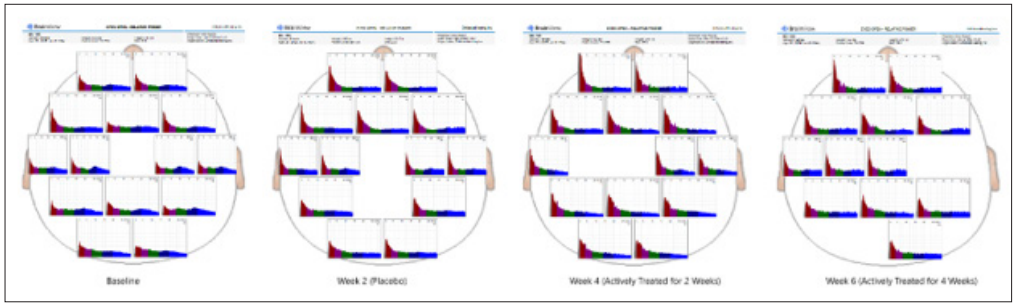

Figure1: EEGs were taken at the Baseline, 2-Week Placebo, 2 and 4 Weeks of Active Treatment

A comparative analysis of the quantitative EEG findings for subject BD-166 across four timepoints was performed and the interpretation is presented below.

Posterior Peak Frequency (PPF) - Cognitive Processing

Condition	Eyes Closed (Hz)	Eyes Open (Hz)	Interpretation
Week 2 - Placebo	12.0	9.8	Normal resting-state alpha and attention-related frequency
Week 4 - Active (2 weeks)	11.8	8.7	Eyes open PPF decreased, indicating reduced cortical arousal or slight cognitive slowing
Week 6 - Active (4 weeks)	11.5	9.8	Eyes open PPF rebounded to baseline levels, suggesting restored cognitive readiness

Theta/Beta Ratio - Attention

Condition	Theta/Beta Ratio (Eyes Open)	Reference	Interpretation
Week 2 - Placebo	0.53	< 1	Normal – no attention deficit
Week 4 - Active (2 weeks)	0.57	< 1	Slight increase; still within normal
Week 6 - Active (4 weeks)	0.49	< 1	Slight decrease from placebo, indicating improved attentional control

Frontal Alpha Asymmetry - Mood Regulation (Depression/Anxiety Indicator)

Condition	Asymmetry (%)	Reference Range	Interpretation
Week 2 - Placebo	-12%	-10% to +10%	Indicates increased risk for depression/anxiety
Week 4 - Active (2 weeks)	-4%	Normal	Improved mood regulation; within normal range
Week 6 - Active (4 weeks)	+2%	Normal	Further stabilization of affect and reduced emotional distress

Alpha Ratio (EC/EO) - Vigilance & Arousal Regulation

Condition	Alpha Ratio	Reference	Interpretation
Week 2 - Placebo	1.21	> 1.2	Borderline impairment of vigilance
Week 4 - Active	1.24	> 1.2	Slight improvement, now within healthy range
Week 6 - Active	1.20	> 1.2	At threshold, consistent vigilance across conditions

Brain Map Z-Score Deviations - Functional Brain Areas

Week 2 - Placebo

- Right BA 38, 44, 45: Alpha1, Alpha2, Beta1 → -2.0 to -2.9 SD: ↓ emotional regulation & attention
- Right BA 6, 8: SMR ↓ → Impulsivity
- Left BA 1–4: Beta2 ↑ → ↑ short-term memory demands

Week 4 - Active

- Left BA 38, 44, 45: Alpha2 ↓ → improving working memory
- Right BA 1–4: Beta1 ↓ → motor/emotion integration improving

Week 6 - Active

- Right BA 38, 44, 45: Persisting Alpha1/Alpha2/SMR ↓ → continued emotional processing deficits
- Right BA 9–10: Beta1 ↓ → reduced hyperarousal
- BA 37, 22, 36: Beta3 ↑ → increased emotional awareness
- Left BA 20–21: Beta2 ↑ → enhanced language & memory function

Summary: EEG Trends Over Time

Metric	Placebo (Week 2)	Active Week 4	Active Week 6	Trend
PPF Eyes Open	9.8 Hz	8.7 Hz ↓	9.8 Hz ↑	Recovery
Theta/Beta	0.53	0.57	0.49 ↓	Slight improvement
Frontal Alpha Asymmetry	-12%	-4%	+2%	Significant improvement in mood
Alpha Ratio EC/EO	1.21	1.24	1.20	Stabilized vigilance
Emotional Attention (BA 38–45)	-2.9 SD	-2.0 SD	-2.8 SD	Persistent but slightly improved
Language/Memory BAs	↑Beta in L-BA 1–4	Alpha2 ↓ in L-BA 38–45	↑Beta2 in L-BA 20–21	Improved language & memory functions

Conclusion of the Quantitative EEG Over the 6-Week Study

- Cognitive and emotional performance improved with active biophoton therapy.
- Frontal asymmetry shifted from a depressive risk marker (-12%) to a balanced positive state (+2%), indicating notable affective regulation.
- Attention markers (theta/beta) remained normal, with a slight positive trend in Week 6.
- Functional EEG maps showed improvements in memory, mood, and verbal comprehension, although emotional processing deficits (BA 38-45) persisted somewhat.

This EEG profile supports neuroregulatory improvement over 4 weeks of biophoton therapy, particularly in mood stabilization, attentional engagement, and language memory integration.

Discussion

This pilot study provides preliminary but compelling evidence that biophoton energy therapy may offer meaningful cognitive, emotional, and physical recovery for retired NFL players suffering from chronic effects of traumatic brain injury (TBI). Participants reported rapid and sustained improvements in sleep quality, pain reduction, memory, focus, emotional regulation, and interpersonal functioning. These self-reported improvements were supported by quantitative assessments, including SF-36 quality-of-life scores and EEG biomarkers.

The most notable gains occurred after the initiation of nightly exposure to Tesla BioHealer devices, which emit non-heating biophotons within the 500–1000 nm wavelength range. These wavelengths are consistent with those shown in photobiomodulation research to activate cytochrome c oxidase, enhance mitochondrial ATP production, and reduce neuroinflammation [3-8]. Notably, improvements in frontal alpha asymmetry and posterior peak alpha frequency observed in this study mirror findings from prior EEG-based biophoton studies, which reported enhanced cognitive readiness and affective balance following biophoton therapy in patients with stroke, Parkinson's disease, TBI, and Alzheimer's disease [9-12].

The consistent upward trend in SF-36 scores, including a 42% increase over four weeks in one participant—further underscores the therapeutic potential of this intervention. These findings echo prior work showing that biophoton therapy improves both physical functioning and emotional well-being in individuals with neurodegenerative conditions and chronic pain [9-17].

Importantly, the absence of adverse effects across all participants aligns with the safety profile observed in over 40,000 biophoton users reported in real-world settings [28]. This non-invasive, drug-free approach may be particularly valuable for former athletes who are often reluctant to take pharmacological treatments due to dependency risks or prior side effects.

While these results are promising, limitations include the small sample size and lack of randomization across the broader participant cohort. However, the blinded, placebo-controlled sub-study adds a layer of rigor and supports the observed trends. Future studies should aim to confirm these findings in larger, randomized controlled trials using standardized neurological and behavioral outcome measures.

Overall, this study contributes to a growing body of evidence suggesting that biophoton therapy may serve as a novel, integrative approach to brain repair, energy restoration, and functional recovery in TBI. Given the high prevalence of long-term neuropsychiatric consequences in former contact-sport athletes, this modality may represent a safe, scalable intervention with the potential for nationwide public health impact.

Conclusion

This pilot study offers promising evidence that biophoton energy therapy may serve as a safe, non-invasive intervention to support cognitive, emotional, and physical recovery in individuals with chronic traumatic brain injury. Retired NFL players exposed to Tesla BioHealer devices experienced rapid improvements in sleep, memory, pain reduction, emotional regulation, and overall vitality. Objective assessments, including EEG markers and SF-36 quality-of-life scores, corroborated these self-reported gains. The sustained benefits observed over the treatment period, paired with the absence of adverse effects, suggest that biophoton therapy could be an innovative and scalable strategy for long-term neurorehabilitation. Given the growing public health need for safe and effective treatments for TBI, further large-scale, controlled studies are warranted to confirm these results and clarify the underlying mechanisms of action.

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