Synergistic Impact of 'Bioceramic Resonance and Photoluminescence' with Visual/Auditory Thematic Stimulation System: Evaluating Effects on Body, Emotion, Perception and Consciousness Assessment

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Abstract

Background: This study explores the integration of 'Bioceramic Resonance and Photoluminescence' (BR&PLB) with a Visual/Auditory Thematic Stimulation System (VASS) to address stress, mental imbalances, and altered states.

Objective: Against Taiwan's evolving economic landscape, conventional medical systems often struggle to address health complexities.

Methods: The material and methods section elucidates BIOCERAMIC technology's biophysical effects and PLB development, highlighting VASS's use with thematic stimuli for enhancement. Twenty-five participants, aged 18 to 80, sought relief from pain, emotional distress, or desired self-awareness.

Results: The experimental protocol involved BR&PLB with VASS exposure, assessing improvements in physical, emotional, and consciousness states. Statistical analyses revealed reductions in pain and anxiety, with consciousness level increases post-exposure.

Conclusions: Discussion integrates prior research, emphasizing technology's impact on altered consciousness and therapeutic potential for mental health. Insights from emotional problems, drug withdrawal, and extrasensory perception studies add to understanding. Comparisons with virtual reality studies highlight BR&PLB and VASS integration advantages. This approach shows promise for reducing pain, stress, anxiety, and enhancing consciousness levels, though further research is needed for validation. Combining BR&PLB with VASS could be a significant pathway to overall well-being.
The integration of BR&PLB with VASS demonstrates stress reduction, anxiety alleviation, and heightened consciousness levels. This approach emerges as a valuable intervention for comprehensive well-being, requiring larger-scale studies for validation. The exploration positions it as a noteworthy pathway in holistic well-being pursuit. Considered within the ‘States of Consciousness Questionnaire’ framework, the integrated approach facilitates physical improvement, emotional well-being, and nuanced consciousness shifts, offering a holistic perspective and emphasizing multifaceted benefits. Clinical Trial: The study protocol received approval from the Human Subjects Committee (approval no.: TYGH111092) of Taoyuan General Hospital

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Synergistic Impact of 'Bioceramic Resonance and Photoluminescence' with Visual/Auditory Thematic Stimulation System: Evaluating Effects on Body, Emotion, Perception and Consciousness Assessment

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Abstract:

This study explores the integration of 'Bioceramic Resonance and Photoluminescence' (BR&PLB) with a Visual/Auditory Thematic Stimulation System (VASS) to address stress, mental imbalances, and altered states. Against Taiwan's evolving economic landscape, conventional medical systems often struggle to address health complexities. The material and methods section elucidates BIOCERAMIC technology's biophysical effects and PLB development, highlighting VASS's use with thematic stimuli for enhancement. Twenty-five participants, aged 18 to 80, sought relief from pain, emotional distress, or desired self-awareness. The experimental protocol involved BR&PLB with VASS exposure, assessing improvements in physical, emotional, and consciousness states.

Statistical analyses revealed reductions in pain and anxiety, with consciousness level increases post-exposure. Discussion integrates prior research, emphasizing technology's impact on altered consciousness and therapeutic potential for mental health. Insights from emotional problems, drug withdrawal, and extrasensory perception studies add to understanding. Comparisons with virtual reality studies highlight BR&PLB and VASS integration advantages. This approach shows promise for reducing pain, stress, anxiety, and enhancing consciousness levels, though further research is needed for validation. Combining BR&PLB with VASS could be a significant pathway to overall well-being.

The integration of BR&PLB with VASS demonstrates stress reduction, anxiety alleviation, and heightened consciousness levels. This approach emerges as a valuable intervention for comprehensive well-being, requiring larger-scale studies for validation. The exploration positions it as a noteworthy pathway in holistic well-being pursuit. Considered within the ‘States of Consciousness Questionnaire’ framework, the integrated approach facilitates physical improvement, emotional well-being, and nuanced consciousness shifts, offering a holistic perspective and emphasizing multifaceted benefits.

Key Words: Bioceramic Resonance ; Photoluminescence ; Visual/Auditory Thematic Stimulation; Body, Emotion, Perception and Consciousness

Running title: BIOCERAMIC Virtual Reality on Consciousness

Introduction:

Taiwanese society is currently experiencing the ramifications of rapid economic growth and shifting lifestyles, characterized by extended working hours and intricate person-to-person communication

dynamics. These factors contribute to a heightened susceptibility to physical, emotional problems, and mental imbalances due to the associated stress. While the mainstream medical system predominantly relies on biochemistry and pharmacology-based technologies, there is an increasing demand for alternative health promotion services.

Traditional medical approaches often center on studying diseases and physical discomfort solely based on abnormal biochemical data and medical imaging. However, the intricate interplay of various physical and mental issues in the human body goes beyond the explanatory scope of these conventional methods. Contemporary attention has shifted towards understanding the holistic physical-mental status[1], encompassing aspects of perception, emotion, and consciousness[2].

This study builds upon our prior research involving the application of Bioceramic material, Bioceramic Resonance (BR), and Photoluminescence of Bioceramic (PLB) in addressing mental and psychiatric disorders. These applications have shown promising results in various domains:1/Alleviation of Stress Condition: BR and PLB demonstrated efficacy in reducing stress levels[3,4].2/Relaxation through Autonomous Nervous System Monitoring: Monitoring Heart Rate Variability (HRV) provided relaxation benefits[5].3/Alleviation of Drug Withdrawal Symptoms: Particularly beneficial for stimulant addiction or hypnotic drug overdose[6].4/Instant Beneficial Effect on Psychopathically Related Spasmodic Torticollis: BR exhibited rapid positive effects on patients with this condition[7].5/Effect on Perception and State of Consciousness: Our research explored the impact on mental activities related to perception and consciousness[8,9].6/Beneficial Effect on Psychological Sleep Disturbance: Findings from questionnaires, Electroencephalogram (EEG), and functional Magnetic Resonance Imaging (fMRI) studies demonstrated positive effects[10].

In this current study, we aim to synergize the therapeutic benefits of 'BR&PLB' with the mindfulness practice. Mindfulness, backed by evidence-based human studies, has proven effective in stress reduction and enhancing overall well-being. Recognizing the challenges associated with individual

mindfulness practice, particularly the need for extensive training, our research introduces an innovative approach—the Visual/Audio Theme and Stimulation System (VASS).

VASS is an amalgamation of generating visual images and auditory stimuli of specific themes, integrated with sophisticated computer software functions. This system utilizes tailored audio and visual output hardware, such as screen projections, virtual reality(VR) headsets, and other visual stimuli. The specific design software interface allows us to select visual images and auditory signals tailored to address candidates' physical, psychological, and emotional challenges effectively. This research design aims to bridge the gap between the therapeutic benefits of 'BR&PLB' and the mindfulness practice, offering a user-friendly and accessible avenue for individuals to enhance their overall well-being.

Material and Methods:

BR&PLB

Bioceramic technology, founded on materials with biological effects [11], generates a non-ionized, weak force field [12] with various biophysical and overall health advantages. The primary mechanism involves the modification of hydrogen bonds[13], influencing the properties of water, interstitial fluid, and microcirculation dynamics[11,13,14]. A significant aspect is the luminescent effect displayed by BIOCERAMIC under photoexcitation in the specific range of the light wave spectrum, with the subsequent development of the 'Photoluminescent of BIOCERAMIC material' (PLB) device employing light-emitting diodes (LEDs) with wavelengths within the visible light spectrum (390 to 750 nm) [15]. In line with our prior studies, the technology involves modifying sound waves influenced by the weak force field of the material. This modification facilitates extended propagation through living tissue and resonance with physiological rhythms, including heart rate and brainwaves. This process optimizes energy transfer into the human body through the concept of resonance effects [6, 10,12]. Our investigation commenced with in vitro cell studies in

material science and advanced through a series of animal and human trials. All these phases were conducted following approved Institutional Review Board (IRB) protocols from reputable institutions, including Taipei Medical University & Hospital, Taipei Hospital, and Taoyuan General Hospital [3,5,6,7,8,9,10,12,16,17].

VASS

a/ Audiovisual System Preparation:

We provided participants with two audiovisual system options: 1/ Utilization of screen projection (Figure 1); 2/ Implementation of visual stimuli, including a VR headset (Figure 2a&b). Participants had the flexibility to select either option 1 or option 2 based on their visual condition, comfort with the hardware, and their ability to concentrate and immerse themselves in the virtual environment.

b/ Development of VASS Mindfulness (Mindfulness Practices for Calming Thoughts) Audiovisual Materials:

In the preparation of the VASS Mindfulness (practicing mindfulness to calm thoughts) audiovisual materials, our focus was on creating a tailored experience for participants. This involved the implementation of specific thematic visual and auditory stimuli that could be customized based on individual preferences (Table 1).

To facilitate a detailed assessment of the impact of these stimuli, corresponding questionnaires were designed for eligible participants. Each questionnaire targeted specific areas of improvement, aligning with the thematic content presented to the participants.

First, participants experienced audiovisual themes depicting dynamic skin pathways [2,6,17] with traditional oriental music (Figure 3a). This aimed to address physical issues, assessed through questionnaire 1 (Numerical Rating Scale for Pain Assessment) (Table 2).

Second, participants engaged with dynamic color-themed audiovisual content for mindfulness relaxation [2,9] (Figure 3b), aiming to enhance emotional well-being, evaluated through

questionnaire 2 (Beck Anxiety Inventory for Anxiety Assessment) (Table 2).

Lastly, participants immersed themselves in dynamic geometric/mandala-themed audiovisual content(Figure 3c) [2,9] for mindfulness relaxation, targeting enhanced perception and consciousness. Participants provided insights through questionnaire 3 (States of Consciousness Questionnaire for Assessing Consciousness Experiences) [18,19].

In essence, these participant-tailored interventions allowed us to gather comprehensive data on the diverse aspects of their experiences. By focusing on physical, emotional, and cognitive dimensions, we aimed to understand the nuanced effects of the integrated BR&PLB plus VASS approach. The creation of a customized and immersive environment provided a unique opportunity to explore the potential synergies between thematic stimuli and holistic well-being outcomes.

Participants

The study enlisted the participation of a diverse cohort comprising 25 individuals ranging from 18 to 80 years old. Inclusion criteria were broad, welcoming individuals from the general public interested in addressing minor body pain, enhancing personal emotions, or improving self-awareness and mindset. Gender was not a limiting factor, and the study protocol received approval from the Human Subjects Committee (approval no.: TYGH111092) of Taoyuan General Hospital.

Exclusion criteria were established to ensure the safety and well-being of participants. Individuals with major illnesses such as cerebral stroke, myocardial infarction, or severe limb disability were excluded. Participants reporting allergies to vibration or skin patches were also not included. The experimental procedure and data collection unfolded within the Radiology Department at Taoyuan General Hospital. Participants received a comprehensive introduction and explanation of the single-session medical experiment. The research protocol, approved by the Ethics Committee, was elucidated, and participants proceeded only after providing informed consent.

Responding to participants' specific needs before the intervention, those focusing on physical

improvement completed Questionnaire 1 (Numerical Rating Scale)(n=15), while those concentrating on emotional improvement completed Questionnaire 2 (Beck Anxiety Inventory) (n=12). Participants interested in enhancing perception and consciousness completed Questionnaire 3 (States of Consciousness Questionnaire) (n=20), with many having a religious background. The intervention involved "Bioceramic Resonance and Photoluminescence of Bioceramic" (BR&PLB) treatment for 60 minutes, accompanied by simultaneous exposure to the "Visual/Auditory Thematic Stimulation System" (VASS) for another 60 minutes. Participants had the option of screen projection or a VR headset, personalized according to their preferences.

Post-intervention, participants completed questionnaires assessing physical improvement (Questionnaire 1), emotional improvement (Questionnaire 2), and perception and consciousness enhancement (Questionnaire 3).

The VR Audiovisual System preparation involved screen projection and a choice between a VR headset and other visual stimuli based on participant preference. Thematic visual and auditory stimuli were designed to cater to participant preferences, accompanied by corresponding questionnaires.

The experimental groups included a Control Group, where participants completed pre-BR&PLB plus VASS questionnaires, and an Experimental Group, where participants completed post-BR&PLB plus VASS questionnaires. The participants, categorized into Control and Experimental Groups, were volunteers with a strong interest in comprehending and enhancing both their mental and physical well-being. Inclusion criteria encompassed ages between 20 and 60, while exclusion criteria included vulnerable populations such as psychiatric patients, minors under 20, prisoners, pregnant women, individuals with disabilities, and indigenous people.

Procedures

Participants were thoroughly briefed on the experiment's process and purpose. Their brief medical

history was obtained, and upon voluntary participation, trial dates and times were scheduled. Clinical assessment questionnaire completion was a prerequisite for participants in the Control Group. Participants were explicitly instructed to refrain from engaging in any physical activity and to maintain stable emotions during the experiment. The trial commenced only when the participant's physiological condition stabilized. Participants in the Experimental Group underwent a focused 30-minute session of BR&PLB PLUS VASS. Participants were provided the flexibility to exit the experiment at any point of discomfort. In such cases, evaluation by a radiology physician for medication or emergency referral was undertaken, ensuring no compromise to future medical rights.

Statistical Methods

Statistical analyses, including F-Test for Variances and Paired Samples Mean Difference Tests, were employed to assess the intervention's impact on physical, emotional, and consciousness parameters. The significance level was set at $p < 0.05$ for all tests. The specific statistical methods were chosen post-experiment based on data characteristics and distribution, ensuring a robust evaluation of the intervention's effects.

Results:

Effect of Physical Improvement (Questionnaire 1)

The analysis revealed a substantial reduction in trigger point painfulness post-exposure ($p < 0.05$), as indicated by a noteworthy decrease in the mean score from 4.87 to 2.33. This statistically significant improvement highlights the effectiveness of the intervention in alleviating physical discomfort (Figure 4).

Effect of Emotional Improvement (Questionnaire 2)

Following exposure to the intervention, there was a significant decrease in anxiety scores ($p < 0.05$),

with the mean anxiety score decreasing from 5.92 to 3.33. This marked reduction underscores a tangible enhancement in emotional well-being, indicating the positive impact of the intervention on managing anxiety levels (Figure 5).

Effect of Perception and Consciousness Enhancement (Questionnaire 3)

Post-exposure, there was a notable increase in consciousness levels ($p < 0.05$), with the mean consciousness level rising from 48.20 to 67.20. This statistically significant elevation underscores a considerable enhancement in perception and consciousness, reflecting the efficacy of the intervention in facilitating heightened states of awareness (Figure 6).

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Discussion

Based on the results, the intervention demonstrated significant positive effects across various dimensions, including physical improvement, emotional well-being, and perception and consciousness enhancement. These findings provide compelling evidence of the intervention's efficacy in addressing multifaceted aspects of participants' well-being. To comprehensively elucidate the positive outcomes derived from the integrated approach of BR&PLB plus VASS, addressing physical improvement, emotional well-being, perception, and consciousness enhancement, a thorough examination of our prior research endeavors is indispensable.

In our previous investigation on the impact of BIOCERAMIC treatment on pain, we employed the Visual Analog Scale (VAS) [16]. Participants categorized their pain levels as mild (0-3), moderate (4-6), and severe (7-10). The study aimed to assess various aspects, including the distribution of improvement in pain score (IPS), calculated as the difference between pre-test and post-test pain scores. Analyzing improvement based on initial pain levels, using mixed models, and evaluating improvement among patients with pre-test scores of 4 or higher provided valuable insights into the effectiveness of BIOCERAMIC treatment in reducing trigger point pain [16].

Our preceding studies delved into multiple dimensions of the technology's impact, with a focus on altered states of consciousness (ASC), illusory perception, and potential therapeutic implications for mental and psychiatric disorders[8,9,10]. The foundational study addressing the induction of ASC with illusory perception through Bioceramic Resonance (BR) yielded valuable insights, including subjective descriptions, alterations in brain wave activity, and the activation of neuroanatomical locations, establishing a robust groundwork [4].

Comparing neuroanatomical locations activated by BR with ASC and illusory perception to findings from transcranial brain stimulation (TBS) highlighted the non-invasive advantages inherent in BR. Our exploration of BR-related technology in mental and psychiatric disorders contributed to a comprehensive understanding of its versatility in mental health treatment. Studies on psychopathically related spasmodic torticollis [7], drug withdrawal symptoms [6], and extrasensory perception[9] provided quantitative frameworks for assessing clinical efficacy, collectively demonstrating BR's impact on neurological movement disorders and its potential applications in substance abuse treatment.

To delve deeper into our positive results regarding integrated BR&PLB plus VASS, we referenced studies on audiovisual simulation and virtual reality (VR) utilizing similar concepts but without BIOCERAMIC stimulation. Emphasizing the combined impact on various aspects—body, emotion, perception, and consciousness—we referred to a relevant study examining how visual and auditory stimuli influence emotional experiences.

In this referenced study, participants were exposed to emotionally charged pictures and classical music to elicit happiness, sadness, and fear [20]. Our investigation aligns with this study, as both explore the effects of combining visual and auditory stimuli on emotional and physiological responses. The study found that emotional experiences were most accurately and intensely felt when stimuli were presented together—a pattern echoing our findings with integrated BR&PLB plus VASS. Our results reveal significant reductions in trigger point pain, anxiety scores, and an increase

in consciousness levels, akin to heightened emotional experiences observed in the referenced study [20]. Additionally, the study's use of classical music to evoke specific emotions aligns with our approach. In our study, the Experimental Group experienced a targeted 30-minute session of BR&PLB plus VASS, indicating a deliberate design to elicit specific emotional and physiological responses.

Both studies consistently demonstrate that combining stimuli surpasses the impact of individual auditory or visual stimuli, highlighting the effectiveness of integrated approaches in enhancing emotional and physiological well-being. These consistent findings strongly support our claim that the synergistic use of BR&PLB plus VASS has the potential to positively affect physical well-being, emotional states, and heightened consciousness. The exploration of how the brain responds to combined stimuli in the referenced study provides a valuable theoretical foundation for understanding the mechanisms involved in our intervention. By integrating these comparative insights, we fortify the rationale behind our combined approach, positioning it as an innovative and effective strategy for overall well-being.

The integration of VR platforms into studies exploring altered states of consciousness, such as the "Hallucination Machine," offers unique experimental tools for simulating altered phenomenology [21]. These studies provide insights into the mechanisms underlying conscious perception, offering promise for consciousness science and psychiatry. In regenerative virtual therapy (RVT) [22], VR addresses mental disorders, particularly schema rigidity related to bodily self-consciousness (BSC). While acknowledging evaluation challenges, RVT aims to restructure maladaptive bodily representations and promote well-being. VR therapy systems for delirium prevention and treatment [23], immersive virtual environments for positive consciousness impact, and VR-based sensory stimulation in pediatric disorders of consciousness indicate the diverse applications of VR in studying and positively impacting consciousness, perception, and psychology. A pilot study exploring virtual reality-based sensory stimulation in pediatric disorders of consciousness suggests

potential benefits when combined with standard rehabilitation [24]. The VR group showed better improvement in clinical behavioral response and neuroelectrophysiology compared to the control group (4). The study lays the groundwork for future randomized controlled trials to further explore the efficacy of VR in improving consciousness in pediatric disorders. Lastly, the integration of VR in mindfulness practice, as explored in a pilot study with meditation experts, indicates encouraging preliminary evidence of feasibility and acceptability [25]. The VR-based mindfulness training, utilizing a virtual river environment, showed increases in the state of mindfulness and reductions in negative emotional states [25]. The moderate to strong illusion of presence in the virtual environment and high acceptance of VR for mindfulness practice suggest the potential for VR to facilitate mindfulness in clinical settings [25].

In the context of our investigation into the impact of BR&PLB plus VASS on altered states of consciousness, we leverage insights gleaned from previous research on bioceramic stimulation and the utilization of Questionnaire 3 for consciousness assessment. Our study expands upon the understanding of perceptual shifts and heightened states of awareness by drawing parallels with the States of Consciousness Questionnaire (SCQ) [18,19]. The SCQ, a comprehensive tool with 100 questions encompassing the Pahnke-Richards Mystical Experience Questionnaire, serves as a robust instrument for evaluating participants' consciousness-related experiences. Our specific focus on the integrated BR&PLB plus VASS allows for an exploration of how this combined approach influences consciousness, aligning with the broader exploration of altered states. While Questionnaire 3, or SCQ, primarily gauges mystical experiences, our research aligns with the broader concept of altered consciousness. The seven dimensions probed in the Mystical Experience Questionnaire, namely internal unity, external unity, transcendence of time and space, ineffability and paradoxicality, sense of sacredness, noetic quality, and deeply-felt positive mood, collectively contribute to a nuanced understanding of altered states.

Our study, grounded in the assessment of BR&PLB plus VASS, introduces a distinctive perspective

to the discourse on consciousness. By concurrently examining physical improvement, emotional well-being, and heightened consciousness, we contribute to the evolving comprehension of how integrative approaches impact altered states. The observed reductions in trigger point pain, anxiety scores, and the elevation of consciousness levels resonate with dimensions explored in the SCQ, reinforcing the intricate interplay between physical and consciousness-related outcomes[3,6, 9,10].

Conclusion:

The integration of BR&PLB with VASS has demonstrated promising outcomes, showcasing immediate stress reduction, anxiety alleviation, and heightened consciousness levels. This pioneering approach emerges as a potentially valuable complementary or alternative therapeutic intervention for individuals seeking comprehensive well-being. Nevertheless, the imperative for further research, specifically through larger-scale studies, is underscored to validate and refine these preliminary findings, establishing the sustained impact of this unique combination on both mental and physical health. The thorough exploration of this integrative approach positions it as a noteworthy pathway in the pursuit of holistic well-being.

In summary, our study, when considered within the framework of the SCQ, adds significant value to the investigation of altered consciousness. The integrated BR&PLB plus VASS not only facilitates physical improvement and emotional well-being but also serves as a potential catalyst for nuanced shifts in consciousness. This provides a holistic perspective on well-being, emphasizing the multifaceted benefits of the integrated approach.

ACKNOWLEDGMENTS

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Data Availability

The original contributions presented in this study are included in the paper or multimedia appendices, and further inquiries can be directed to the corresponding author.

Author' Contributions

LTK was involved in study conceptualization and investigation and wrote the original draft and other major works.

Conflicts of Interest

None declared.

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Figures and Tables

Figure 1: Screen projection

Figure2a (left) Wearing the VR headset; 2b(right): Iin the desired position.

Figure 3a-c: Audiovisual themes: (a,upper) Dynamic skin pathways for physical issues; (b,middle) Color-themed for mindfulness; (c,lower) Geometric/mandala for perception and consciousness.

Table 1: Thematic Audiovisual Stimulation and Corresponding Questionnaires

Audiovisual Theme	**Suitable Participants**	**Questionnaire Used**	**References**
Dynamic skin pathways for self-ideation projection	Individuals hoping to improve physical issues	Questionnaire 1	[17]
Specific dynamic color-themed audiovisual content for mindfulness relaxation	Individuals aiming to improve emotional well-being	Questionnaire 2	[7]
Dynamic geometric/mandala-themed audiovisual content for mindfulness relaxation	Individuals seeking improvement/experience in perception and consciousness	Questionnaire 3	[9]

Table 2: Assessment Tools for Questionnaires

Content	Assessment Tools	Descriptions	References
Questionnaires 1	Numerical Rating Scale (NRS) for Pain Assessment:	The Numerical Rating Scale (NRS) was employed to gauge and quantify the extent of physical pain experienced by participants.	[16]
Questionnaires 2	Anxiety Assessment:	Administered to assess and measure the level of anxiety experienced by participants.	[3]
Questionnaires 3	States of Consciousness Questionnaire	The SCQ was utilized to capture and evaluate participants' experiences related to consciousness, providing valuable insights	[9]

	(SCQ) for Assessing Consciousness Experiences	into perceptual changes and heightened states of awareness. The SCQ has 100 questions, including the Pahnke-Richards Mystical Experience Questionnaire. Participants rated their experiences from 0 to 5, covering seven areas: Internal Unity, External Unity, Transcendence of Time and Space, Ineffability and Paradoxicality, Sense of Sacredness, Noetic Quality, and Deeply-Felt Positive Mood. Exploring altered consciousness, the study looked at different aspects of mystical experiences.	

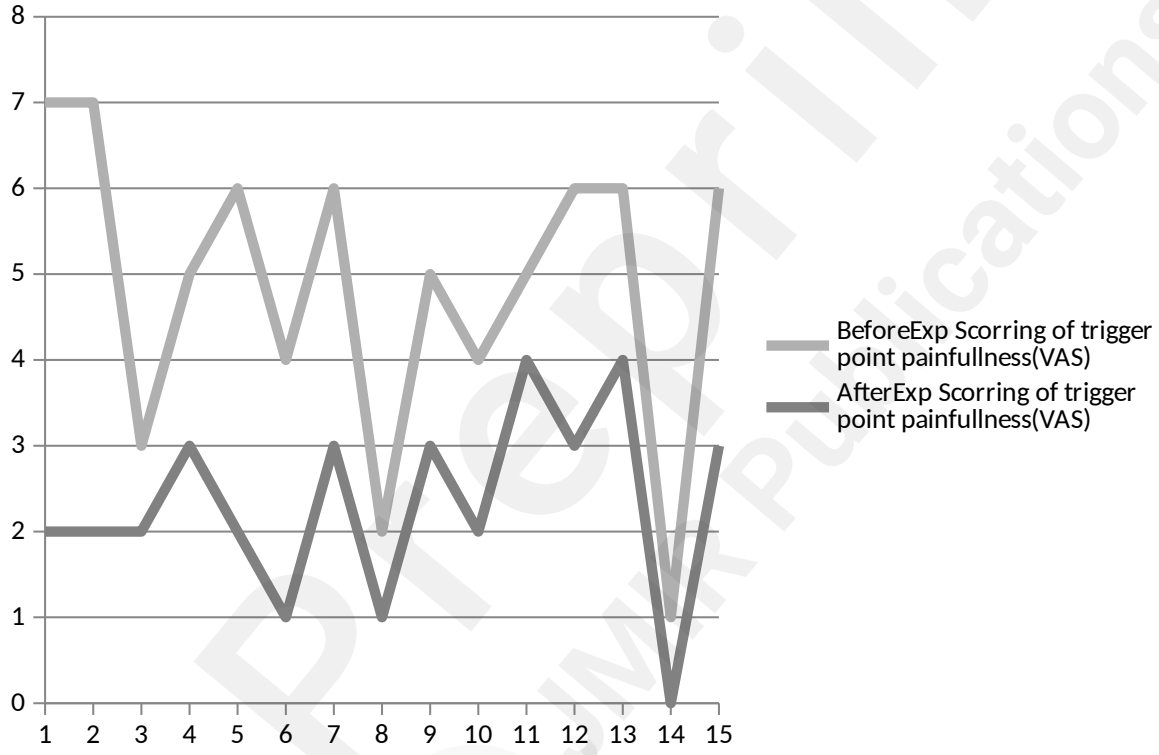

Figure 4: Questionnaire 1 shows significant trigger point pain reduction.

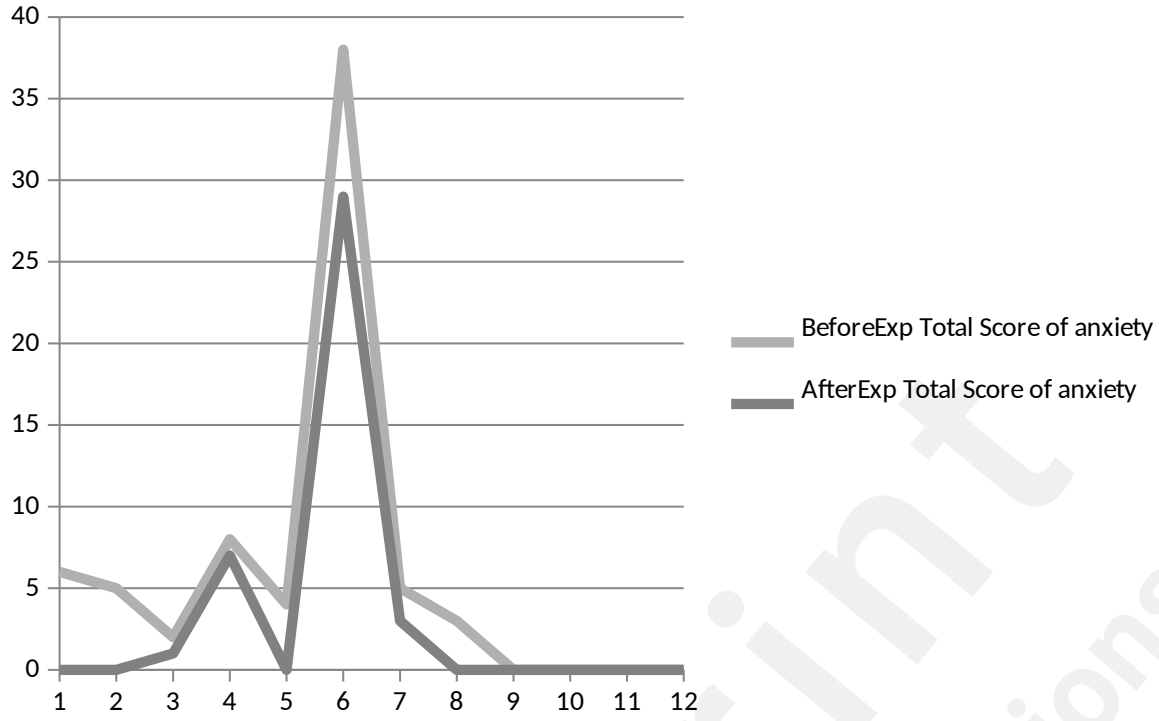

Figure 5: Questionnaire 2 depicts significant anxiety score reduction.

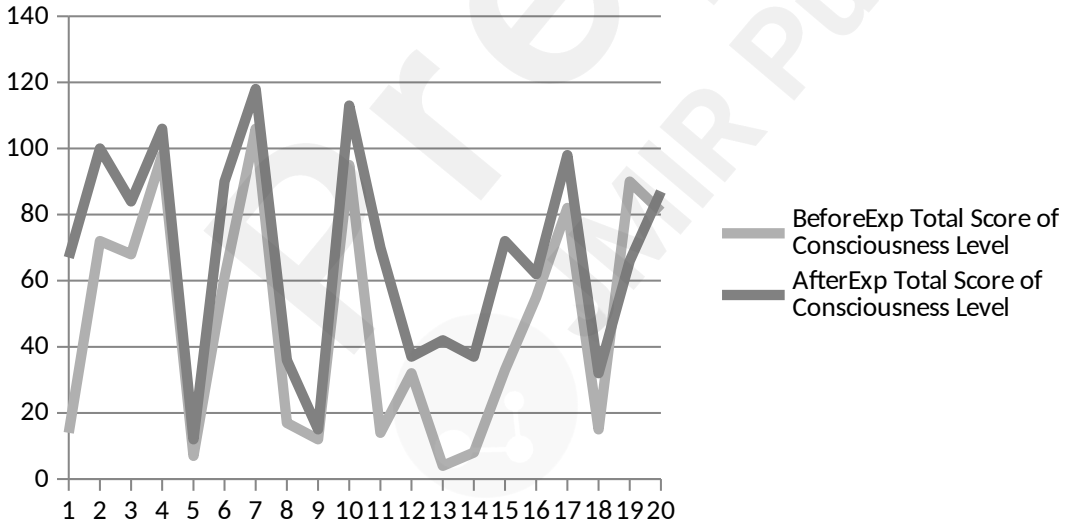

Figure 6: Questionnaire 3 shows notable consciousness level increase.