

Virtual Reality-Based Mental Wellness Interventions: The Brain Symphony Framework

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ABSTRACT

Mental health plays a critical role in rehabilitation outcomes, influencing patient motivation, adherence to therapy, and overall recovery. Recent advances in virtual reality (VR) technologies have enabled the development of immersive environments designed to reduce stress, anxiety, and cognitive fatigue. This paper presents the Brain Symphony framework, a VR wellness platform combining guided breathing exercises, mindfulness practices, immersive natural environments, and personalized relaxation experiences.

Rather than a controlled clinical trial, this paper reports on a real-world field deployment: Brain Symphony has been publicly available on the Meta Horizon platform for approximately one year, reaching roughly 10,000 users across 35 or more countries, with a 4.1-out-of-5 average store rating ($n = 100$ ratings) and 100 in-app survey responses that were majority positive. The framework has also been delivered through five business-to-business (B2B) wellness workshops in organizational settings.

The paper reviews existing evidence on VR interventions for mental health, describes the framework's architecture and design rationale, and discusses this field data as preliminary, real-world evidence of feasibility and user acceptance. It concludes by outlining future work, including physiological monitoring, AI-driven adaptive interventions, and a formal controlled clinical evaluation.

Keywords - Adaptive intervention, Cognitive fatigue, Field deployment, Mental wellness, Virtual reality

I. INTRODUCTION

Physical and cognitive rehabilitation processes are often long, grueling, and mentally taxing for patients and, more broadly, for anyone undergoing sustained periods of stress, burnout, or cognitive fatigue. Psychological burden frequently manifests as anxiety, low mood, and reduced motivation, which can undermine adherence to therapeutic or self-care routines. Conventional environments, while functionally adequate, often lack the stimulating or soothing attributes necessary to mitigate these psychological stressors [1], [2].

Virtual Reality (VR) has emerged as a disruptive technological tool in healthcare and wellness, capable of transporting users from ordinary settings into controlled, immersive digital environments. By leveraging spatial presence, VR can effectively alter a user's emotional state and foster a mental reset [3].

This paper introduces the Brain Symphony framework, a VR-based application designed to act as a "mini mental vacation." The core contribution of this work is the systemic integration of multi-sensory mindfulness, gamified micro-activities, and low-motion-sickness ergonomics into a unified digital wellness intervention, together with an account of its adoption in real-world use — as a consumer application on the Meta Horizon platform and as a tool delivered through organizational (B2B) wellness workshops. The following sections outline the framework design, mechanisms of action, field deployment data, and directions for future clinical validation.

II. THE BRAIN SYMPHONY FRAMEWORK ARCHITECTURE

The Brain Symphony platform is structurally designed to balance therapeutic intent with an intuitive user interface, offering a low-barrier-to-entry experience for users with varying degrees of

familiarity with VR or physical and cognitive constraints [4].

As shown in Figure 1, the core platform drives three interlocking modules — immersive mindfulness, expressive art and auditory therapy, and ergonomics and comfort engineering — which are delivered to users through two channels: the public Meta Horizon consumer release and facilitated B2B organizational workshops

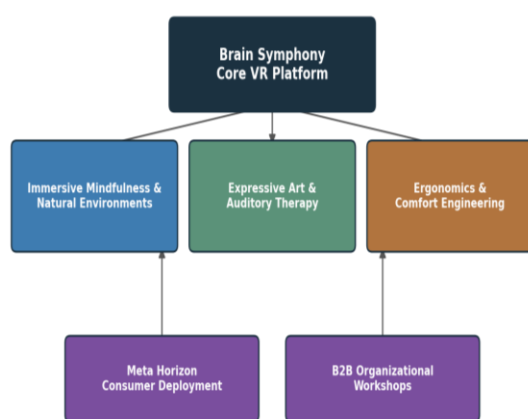


Figure 1: Brain Symphony framework architecture, from core platform to therapeutic modules and deployment channels.

2.1 Core Therapeutic Modules

At the core of the framework are high-fidelity 3D natural environments designed to induce psychological calm, from which users select an atmospheric biome suited to individual preference. Within these environments, the system delivers guided meditations in multiple localized languages (English, French, and German) that pace diaphragmatic breathing through visual cues. Complementing this, Brain Symphony provides 2D and 3D virtual painting toolsets for spatial artistic expression, alongside music-driven relaxation modules and communal vocalization features such as structured singing and karaoke, which prior literature associates with elevated mood states and reduced isolation [5], [6].

2.2 Ergonomics and Comfort Engineering

A well-documented limitation of VR applications in healthcare and wellness contexts is the onset of visually induced motion sickness [7]. Brain Symphony's comfort design follows Meta's official Horizon OS guidelines for immersive

experiences: locomotion favors teleportation over continuous ("slide") movement to minimize vestibular-visual mismatch, and where continuous movement is used, avatar speed is capped near real-world walking pace (~1.4 m/s) to limit optic flow [8], [9].

The framework supports both seated and standing postures, prioritizes hand-tracking over complex controller schemes for users with limited fine-motor skills, and keeps virtual locomotion to a minimum, concentrating micro-activities within the user's immediate field of view. In line with Meta's Comfort Rating system, Brain Symphony is designed to qualify for a "Comfortable" rating, avoiding significant camera movement, forced player motion, or disorienting effects [8].

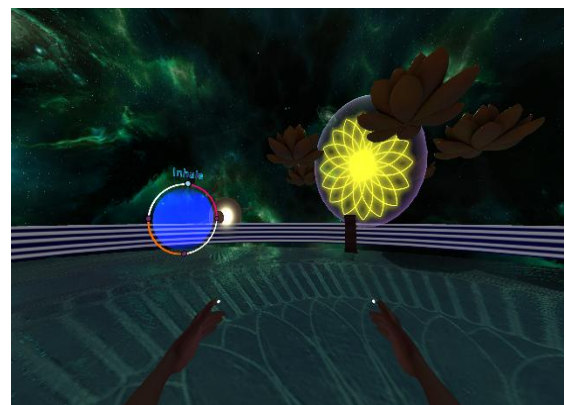


Figure 2: Brain Symphony Breathing exercise

III. MECHANISMS OF ACTION

3.1 Emotional Regulation

Immersive environments engage the user's attentional capacity, effectively diverting cognitive processing away from stress and distress. By presenting calming visual landscapes and harmonious auditory stimuli, the platform is hypothesized to support a shift from a sympathetic (fight-or-flight) state toward a parasympathetic (rest-and-digest) state [10].

3.2 Mitigation of Cognitive Fatigue

Sustained cognitive or physical effort depletes executive resources. The non-taxing, playful micro-activities within the framework are intended to act as a cognitive reset. The relationship between environmental immersion and cognitive restoration can be modeled broadly by evaluating the change in a stress index (SI) over time:

$$SI(t) = SI_0 \cdot e^{-\lambda t} + \alpha \cdot C(t) \quad (1)$$

where SI_0 represents the baseline stress index, λ is the environmental relaxation coefficient, and $C(t)$ represents the cognitive load introduced by interactive micro-activities over time t . The design aims to keep the term $\alpha \cdot C(t)$ minimized. This model is presented as a conceptual framing device rather than a fitted empirical result, pending controlled measurement (see Section 6).

3.3 Engagement and Adherence

Gamification of wellness interventions can provide immediate positive reinforcement. By transforming relaxation exercises into rewarding, sensory-rich experiences, the design intent is to sustain engagement over repeated use, which store-rating and survey data (Section 4) offer preliminary support for [11].

IV. REAL-WORLD DEPLOYMENT AND FIELD EVALUATION

Rather than a controlled clinical trial, the evidence presented in this section reflects real-world, uncontrolled field deployment of the Brain Symphony application. This is reported transparently as preliminary evidence of feasibility, reach, and user acceptance not as a substitute for a randomized controlled trial, which is identified as necessary future work in Section 6.

4.1 Deployment Overview

Brain Symphony has been publicly available on the Meta Horizon platform for approximately one year. Over this period, it has been used by approximately 10,000 registered users across 35 or more countries. In parallel, the framework has been delivered directly to organizations through five business-to-business (B2B) wellness workshops, in which groups of employees or members used the application in a facilitated, in-person/ hybrid setting.

4.2 Usage and Feedback Metrics

Table 1 summarizes the available field metrics collected to date. Average session length was approximately 10 minutes, consistent with the framework's design intent as a brief "mental reset" rather than an extended immersive experience. The application holds a 4.3-out-of-5 average rating on the Meta Horizon store, based on 100 ratings. A separate in-app survey completed by 100 users indicated overall positive sentiment regarding perceived relaxation and ease of use.

Table 1: Field Deployment and Usage Metrics (Meta Horizon Platform, ~1-Year Period)

Metric	Value	Metric	Value
Total registered users	~10,000	Countries represented	35+
Average session duration	~10 minutes	Time in market	~1 year
Platform store rating	4.3 / 5 (n = 100 ratings)	In-app survey responses	n = 100
Reported survey sentiment	Majority positive	B2B organizational workshops delivered	5

These figures should be interpreted as observational, uncontrolled field data. There was no comparison or control group, no standardized clinical instrument (e.g., HADS, VAS-S) was administered, and self-selection of reviewers and survey respondents likely biases the sample toward more engaged or satisfied users. These metrics support a claim of feasibility, reach, and general user acceptance, but not a claim of clinical efficacy.

4.3 B2B Workshop Observations

The five organizational workshops delivered to date provided qualitative, informal feedback from facilitated group sessions, including participant comments on ease of onboarding within a shared physical space and perceived stress relief immediately following a session. This feedback has not yet been collected or analyzed using a standardized instrument and is reported here only as a directional signal supporting further, more rigorous evaluation.

V. FUTURE DIRECTIONS

While the current deployment of Brain Symphony has demonstrated reach, sustained usage, and generally positive user sentiment, further work is required before clinical claims can be made.

5.1 Physiological Monitoring and Neurofeedback

Future iterations will incorporate real-time physiological data capture via photoplethysmography (PPG) and electroencephalography (EEG) sensors embedded within the VR headset strap, allowing assessment of heart rate variability (HRV) and alpha-wave

changes to evaluate relaxation states more objectively.

5.2 Artificial Intelligence Adaptation

Integrating machine learning models would allow the environment to adapt dynamically to a user's state — for example, softening lighting, slowing an auditory guide's cadence, or adjusting micro-activity complexity in response to elevated real-time stress indicators.

5.3 Companion Mobile Application and Mood Tracking

To extend engagement beyond discrete VR sessions, a companion mobile application is planned, allowing users to log their mood before and after each session and to track subjective wellbeing trends over time. This lightweight mood-tracking layer is intended to (i) give users a persistent, low-friction way to reflect on their own progress between VR sessions, (ii) generate longitudinal, self-reported data that can complement the in-headset survey and rating data reported in Section 4, and (iii) eventually feed into the AI adaptation layer described in Section 5.2, allowing session content to be tailored not only to real-time physiological signals but also to a user's recent mood history. The mobile companion is planned as a natural extension of the existing deployment rather than a replacement for it.

VI. CONCLUSION

The Brain Symphony framework addresses a frequently overlooked component of wellness and rehabilitation support: accessible, low-barrier psychological relief delivered through virtual reality. By combining immersive guided mindfulness, expressive art, auditory relief, and high-comfort ergonomics grounded in established platform design guidelines, the framework offers a coherent, modular architecture (Figure 1) rather than a single-purpose application. This modularity is deliberate: it allows the mindfulness, expressive-art, and ergonomics layers to be recombined for different contexts — an individual consumer session at home, or a shared, facilitated experience in a workplace wellness workshop without redesigning the underlying platform.

Unlike a purely conceptual proposal, Brain Symphony has already been validated as a deployable product: it has run on the Meta Horizon platform for approximately one year, reached roughly 10,000 users across 35 or more countries,

sustained an average session length of about 10 minutes, and earned a 4.3-out-of-5 store rating across 100 ratings, alongside 100 majority-positive in-app survey responses. Beyond individual consumer use, the framework has been delivered five times in organizational B2B workshop settings, indicating early commercial and institutional interest beyond the single-user case.

At the same time, this field evidence should be read for what it is: real-world usage and satisfaction data, not a substitute for controlled clinical measurement. No comparison group, standardized psychometric instrument, or blinded assessment was used, and self-selected reviewers likely skew positive. The framework's next stage of maturity therefore depends on three complementary directions outlined in Section 5: objective physiological monitoring (PPG/EEG) to move beyond self-report; AI-driven adaptation so the environment responds to a user's real-time state rather than a fixed script; and a companion mobile application with mood tracking to extend engagement and generate longitudinal wellbeing data between sessions. Taken together, these directions chart a path from a well-received consumer wellness product toward a more rigorously evidenced tool suitable for formal integration into rehabilitation and organizational wellness programs.

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