

Mixed Reality Android Simulation for Introvert's & Traumatic Patient's Psychological Treatment using Music Therapy

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Abstract

In fostering the era of Artificial Intelligence, the precinct of PhysioTherapy via. Music is notably intended to nurture using AI & modern methodological blueprints. While engaging the focus on chasmic scrutiny proffered in this paper, the hypothetical and pragmatic parameters are manifested precisely. A specified range of Binaural beats (Theta Waves) are utilized alongside the praxis of Augmented Reality & Virtual Reality environment for the patient. The android simulation peer reviewed by professional music therapists and advised healthy and positive growth in medical affliction.

Keywords: Mixed Reality (AR/ VR), Physiotherapy, Music Therapy, Android Simulation, Unity 3d, C#.

I. INTRODUCTION

The unbound scope of refining the psychological treatments using music and arts is exceedingly efficacious. To tackle minor concerns and potent medications of physiotherapy, artificial intelligence has stepped forward with a unique familiar medium for patients via. Their technical devices (mobile phones, laptops, PC, etc.).

The implications of Binaural beats tend to imply the variational sound enrichment to induce human brainwave chemical secretions leading to reduction in anxiety^[1]. The phenomenon is named "Neurochemistry of Music", it supports secretion of multiple neurochemicals resulting in behavioral change & mood swings of human mind ^[2].

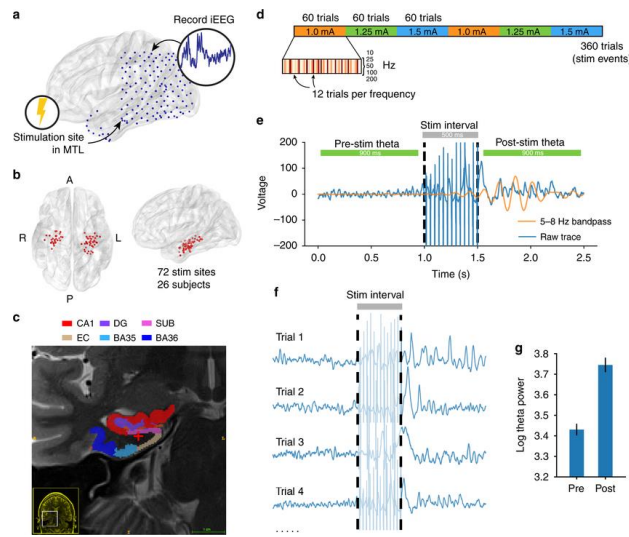


Fig. 01. Comparison Of Pre- Vs. Post-Stimulation Theta (5–8 Hz) Power In An Example Subject^[3]

In the above structured experimental representation, the comparative analysis of Theta waves is discussed in brief to showcase the change in brain waveforms & their simulations.

The brain figure on the upper left of recorded visuals demonstrates the stimulated region of cerebrum (i.e., frontal region of brain or Fore - Brain) with 72 sites of stimulation & 26 subjects acting on it. It also displays the trials of electrochemical reactions with respect to frequency in both diagrams & graphs.

Each trial confirms the slow growth of theta power (i.e., electrochemical changes in brain waves with trials) increment & conclusive final collation.

II. LITERATURE REVIEW

The previous profound research in relation of Music Therapy to indulge the matters of Physiotherapy with conclusive theories recapitulated to explore new techniques in concerns of circumstances like patient dealing with traumatic experience, mental instability, self-insecurity and social anxiety, etc^[4].

Furthermore the deep dive into research has been done briefly, as we're only initiating the android simulation for helping reduce anxiety & increase the level of comfort & positivity in patients, while treating them in the most comfortable way possible.

The probes of literature review are as follows:

1. Crucial Concerns in Physiotherapy:

Besides the influential treatment of psychological patients to avoid social anxiety^[5] issues (i.e., condition of lacking in comfort or bearing fear of being judged by others) leading to paucity stage of treatment.

2. Binaural Beats Competence:

The amalgamation of Delta, Theta, Alpha, Beta & Gamma wavelengths in numerous forms raises a revolutionary perspective to music therapy & advances its functionalities in terms of relaxation,

meditation, creativity & many more aspects. And binaural beats is the intersection link that beholds the capability to inspect and plunge into discoveries.

In short, binaural beats use two different wave spectrum frequencies to create a blend of multi - functional music for advancement in mental health adroitly^{[6][7]}.

3. Theta Waves Range & its Utilitarian:

Deceptive with the range of Theta waves, as it verily lies in 3.5 Hz to 7.5 Hz but hypothetically considered to be either 3 Hz to 8 Hz or 4 Hz to 7 Hz.

The foremost usage of theta waves is to reduce anxiety, help in meditation, relaxation & creativity. Theta waves are found to be efficient for reducing stress & anxiety^[8].

III. IDEATION

Intercepting the concern of social anxiety with modern solutions i.e., “Mobile Application”. With flexibility to access & virtual interactive environment, patients are engaged in treatment for a healthy amount.

Unity 3D provides the platform to design applications for a wide range of devices, Android, Mac, Linux, etc. with simple user interface to work on.

Developed a realistic Virtual Reality environment in Augmented Reality frame - structure to abstain from any potent public incidents/ accidents.

A simple yet relatable natural scenery with 3 different seasons to bring-up the beauty of nature in treatment encouraging patients in positive forms.

For keeping the human - mind active & creative, we’ve included an unfussy maze activity.

IV. METHODOLOGY

Psychological experimentation is often precarious & the error ratio increases as artificial involvement is introduced in it.

Henceforth, knowingly the flaws we deceived the utmost research to bring up the precise idea possible.

The steps involved in development of Android simulation are as follows:

1. Terrain Designing:



Fig. 02. Loner Space - Unity Terrain Design

Unity delivers a variety of assets that can be imported using “Unity Assets Store”, varying in necessity & price range. The asset neon for Brush Texture helps thoroughly to create realistic effects of the island. The developed terrain was then considered as prefab.

2. Environment Building:

As discussed earlier, assets required for construction of jungle, sand or snow regions could be easily made available.

The Jungle/ Rainforest, Sand/ Beach & Snow regions are built to spotlight vital seasons in nature. With the texture brush & Tree/ Grass & Flower implant features the environment is successfully developed at ease. Due to an inbuilt error few prefabs (cube) are not rendering in default textures.

3. Character Fabrication:

Character is a medium for the user/ patient to explore the island and is designed in Character Creator 4, a Reallusion^[9] software.

Reallusion in collaboration with Unity introduces its animation features to work in fathomless levels^[10].

4. Music Integrity:

Music integration is the process of indulging music components with the custom volume feature in application.

A specified level of 7 Hz Theta Binaural Beats is imported to assist on the music therapy part.

5. Model Analysis & Examination:

The assessment phase of the model results in smooth operating of application with effective music sessions observed on - campus experiments on students.



Fig. 03. Loner Space (Android Simulation/ Application) Model Testing

Furthermore, the model has been approved by medical professionals & also recommended in initial stages of Psychiatric treatment.

6. Peer Review Sessions:

For real - time application & use cases of model, peer review sessions were held with Music Therapists & Counselors. One significant mention of them is, Santosh Ghatpande Sir/ Music Therapist. The peer review session conducted on the Mixed reality simulation model describes the necessity of advancement in initiative methodologies of Music Therapy, that indulges Artificial Intelligence. To conclude the test phase, we've reviewed with positive remarks.

V. CONCLUSION

Music Therapy is one of the ways to treat Psychological (Traumatic, Social Anxiety) Patients likewise, Arts Therapy. But yet comparatively, Music Therapy displays more efficiency than others. Loner Space (Android Simulation/ Application) Model is a step-towards AI in PhysioTherapy. With great potential and profuse enhancements Loner Space has accomplished milestones.

VI. FUTURE SCOPE

This field showcases a great scope & future involvement of many features such as, quoted messages in specified terrain regions, small real time tasks to complete, like, planting a tree in a house/ area & examining for 5 days, to make application more interactive & likely socially healthy. Other fusion of Binaural beats also could be a plus factor to annex in future, as per the improvement of patient's behavioral pattern in sessions.

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