Journal of Advanced Zoology

ISSN: 0253-7214

*Volume **43** Issue 1 **Year 2022** Page **531-535***

Investigating The Efficacy of Neuro-Acoustic Loop Methodology (NALM) As A Therapeutic Avenue for Dementia and Alzheimer's Disease: A Computational Approach.

Dr. Shahzad Aasim[1*], Dr Rakesh Banal[2], Dr Sanjeev Rana[3] Dr Hilal Ahmad[4], Dr Muheet Butt[5]

[1*]*Director/Musicologist/Neuro Acoustician KASRC Cluster University Srinagar J&K India.*
[2]*Asst. Professor Neuro Psychiatry Govt Medical College and Associate hospital Jammu*
[3] *Genomic Medicine/Cognitive Neuroscience SMVD Jammu*
[4]*Asst Professor Bio Chemistry Cluster University Srinagar*
[5]*Data Scientist Computer Science New Jersy USA*

***Corresponding Author:** Dr. Shahzad Aasim*
**Director/Musicologist/Neuro Acoustician KASRC Cluster University Srinagar J&K India.*

Article History

Received: 12/10/2022
Revised: 13/10/2022
Accepted: 15/10/2022

Abstract

Dementia and Alzheimer's disease (AD) are among the most challenging neurodegenerative conditions facing healthcare systems worldwide. These conditions significantly impair memory, cognitive function, and overall quality of life for affected individuals. With over 25 million individuals currently affected globally and projections suggesting a doubling of cases every 20 years, the urgency to develop innovative therapeutic strategies cannot be overstated. While existing approaches primarily focus on symptomatic relief, regeneration, or disease modification, there is a pressing need for novel therapeutic approaches that can address the underlying mechanisms of these diseases and offer effective treatment options.

In response to this need, this study proposes a novel therapeutic avenue: Neuro-Acoustic loop methodology. This non-invasive methodology aims to not only enable early diagnosis and prognosis but also provide effective treatment strategies for managing the pathology and symptoms associated with Dementia and AD. By targeting specific brain wave frequencies—alpha, beta, theta, delta, and gamma—Neuro-Acoustic loop methodology seeks to modulate neural activity, inducing desired changes in brain wave patterns.

The rationale behind Neuro-Acoustic loop methodology (NALM) lies in the understanding that brain wave patterns are closely linked to cognitive function and neurological disorders. By utilizing sound waves at specific frequencies, this approach aims to influence these brain wave patterns in a targeted manner, potentially mitigating the cognitive decline observed in Dementia and AD. Importantly, NALM is non-invasive and has the potential to be delivered in various settings, making it a promising candidate for widespread adoption in clinical practice.

CC License CC-BY-NC-SA 4.0	To evaluate the efficacy of NALM, this study employs advanced machine learning (ML) and deep learning (DL) algorithms. These algorithms are utilized to analyse the effects of NALM, on brain activity and correlate these effects with various biochemical parameters. By leveraging these computational techniques, aims to gain insights into the underlying mechanisms of action of NALM, and its potential impact on cognitive function.

INTRODUCTION

Dementia and Alzheimer's Disease (AD) represent significant global health challenges, with an increasing prevalence among aging populations worldwide. Early diagnosis and intervention are crucial for effectively managing these conditions and improving patient outcomes. Neuro-acoustic methodology offers a promising avenue for non-invasive, early detection and personalized treatment approaches. This proposal outlines a comprehensive research project aimed at utilizing observational analyses of brainwave spectrums to advance early diagnosis and treatment strategies for Dementia and AD and by employing advanced computational techniques, including machine learning (ML) and deep learning (DL), this study aims to evaluate the efficacy of Neuro-Acoustic loop Stimulation and elucidate its mechanisms of action.

LITERATURE REVIEW

A comprehensive review of existing literature highlights the role of neural oscillations in cognitive function and the pathophysiology of Dementia and AD. Studies suggest that abnormalities in brain wave patterns correlate with cognitive decline, indicating a potential target for therapeutic intervention. Additionally, emerging research supports the use of non-invasive brain stimulation techniques, such as transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS), in the treatment of neurodegenerative diseases, providing a foundation for exploring Neuro-Acoustic Stimulation.

OBJECTIVES

To explore the feasibility and effectiveness of neuro-acoustic methodology in detecting early signs of Dementia and AD.
To identify distinct brainwave patterns associated with different stages and subtypes of Dementia and AD.
To develop algorithms for the analysis and interpretation of brainwave spectrums to aid in early diagnosis.
To investigate the potential of neuro-acoustic interventions, such as auditory stimulation, in managing symptoms and slowing disease progression

DISCUSSION

The proposed neuroacoustic loop methodology NALM offers a non-invasive and potentially effective approach for early diagnosis and treatment of Dementia and Alzheimer's disease. By targeting specific brainwave patterns associated with memory and cognition, we aim to slow down cognitive decline and potentially modify the course of the disease.
However, it is essential to acknowledge potential limitations and challenges, such as the heterogeneity of patient responses, the need for individualized treatment plans, and the long-term sustainability of therapeutic effects. Further research and clinical trials are required to validate the efficacy and safety of this approach fully.

METHODOLOGY

The proposed methodology aims to investigate the potential use of Neuro Acoustic loop methodology (NALM) in the early treatment of Dementia and Alzheimer's disease (AD). The use of specific sound frequency spectrums identified as acoustic loops have been proposed to ameliorate the state of diseases with promising signs within the limited groups and specific range of identified disorders with regards to our study. NALM have shown promising results in previous research, particularly in the reduction of symptoms of anxiety, depression, and PTSD. Our study will utilize a mixed-methods approach to objectively measure the effects of NALM on brainwave patterns and subjective experiences. The novelty of identifying principal frequencies

regarding specificity of disease and the type of patient has been also supposed to be validated from other methods with the proposal of indirect scale which will be also verified by known medical and biochemical parameters. The biochemical profiling could also open new dimension in the prognosis and diagnosis of the Dementia and Alzheimer's disease (AD) besides adding to the potential of Neuro Acoustic Loop based diagnosis and treatment methodology. The variation of methods scale and scope of treatment may itself be part of any future study We plan to develop guidelines for the use of NALM in the treatment and as well as in early diagnosis of Dementia and Alzheimer's disease (AD) to improve the quality of care provided to individuals with these conditions. In addition of building a standard dataset, we also plan to develop a AI/Machine/Deep learning model for the early diagnosis and treatment of these disorders and exploring the potential use of NALM as a preventative intervention for individuals at risk of developing such disorders.

Data Collection: Collaborate with healthcare institutions to collect EEG (Electroencephalogram) data from individuals diagnosed with Dementia, AD, and age-matched healthy controls. Additional demographic and clinical information will be gathered for comprehensive analysis

Neuro Acoustic loop Methodology (NALM): will be administered using specialized audio equipment capable of delivering sound waves at specific frequencies corresponding to alpha, beta, theta, delta, and gamma brain waves. Participants will undergo regular sessions of NALM, over a predetermined period.

Data Analysis: Employ advanced signal processing techniques to analyze EEG recordings and extract relevant features indicative of Dementia and AD. Utilize machine learning algorithms for pattern recognition and classification of brainwave spectrums.

Interventional Studies: Conduct controlled trials to assess the efficacy of neuro-acoustic interventions in modulating brain activity and improving cognitive function in individuals with Dementia and AD.

Computational Analysis: ML and DL algorithms will be utilized to analyze neuroimaging data and identify patterns of brain activity associated with Neuro-Acoustic Stimulation. Feature extraction techniques will be employed to extract relevant biomarkers from imaging data, allowing for the quantification of treatment effects. Statistical analyses will be conducted to assess the significance of observed changes in brain activity and biochemical markers.

PROTOCOL

Participant Recruitment and Screening: Individuals diagnosed with Dementia or AD will be recruited from clinical settings after obtaining informed consent. Screening assessments will be conducted to ensure eligibility criteria are met.

Neuro-Acoustic loop Sessions: Participants will undergo regular sessions of Neuro-Acoustic Stimulation according to a predetermined protocol. Treatment duration and frequency will be standardized across participants.

Neuroimaging and Biomarker Assessment: Neuroimaging scans and biochemical tests will be performed before and after the intervention period to evaluate treatment effects on brain activity and biochemical markers associated with Dementia and AD.

EXPECTED OUTCOME

Identification of novel biomarkers and brainwave patterns associated with early stages of Dementia and AD.
Development of predictive models for early diagnosis and risk stratification.
Validation of neuro-acoustic loop methodology NALM as adjunctive therapies for managing symptoms and enhancing quality of life in affected individuals.
Generation of valuable insights into the underlying neurophysiological mechanisms of Dementia and AD progression.

IMPACT AND SIGNIFICANCE

The successful implementation of this project holds several potential implications:

Early detection of Dementia and AD can facilitate timely intervention strategies, potentially delaying disease progression and improving prognosis.
Personalized treatment approaches based on neuro-acoustic profiles can enhance therapeutic outcomes and optimize resource allocation in healthcare settings.
Advancements in neuro-acoustic loop methodology may have broader applications in neurology and psychiatry, paving the way for innovative diagnostic and therapeutic modalities.

CONCLUSION

This study aims to investigate the efficacy of Neuro-Acoustic loop Methodology as a therapeutic intervention for Dementia and AD using advanced computational techniques. By employing a rigorous methodology encompassing participant recruitment, intervention administration, data collection, and computational analysis, this research seeks to provide insights into the potential benefits of Neuro-Acoustic Stimulation and its mechanisms of action. Results from this study may contribute to the development of innovative treatments for neurodegenerative diseases and improve the quality of life for affected individuals.

ETHICAL CONSIDERATION

The project will adhere to established ethical guidelines for research involving human subjects, ensuring informed consent, privacy, and confidentiality. Measures will be implemented to safeguard the well-being and rights of participants throughout the study duration.

Conflict of Interest

The authors declare that there was no conflict of interest.

Competing interests

The authors declare that there were no competing interests.

References:

1. Garcia-Cossio, E., Severens, M., Nenadic, I., & Navarro, X. (2015). Acoustic stimulation as a tool for neural intervention in chronic neurological conditions and its potential for multimodal neuromodulation. Frontiers in Neurology, 6, 251. https://doi.org/10.3389/fneur.2015.00251
2. Leung, J., Alain, C., & Tays, W. (2019). Frequency-specific acoustic stimulation as non-invasive brain intervention for memory enhancement in Alzheimer's disease: A review. Aging and Disease, 10(1), 149–157. https://doi.org/10.14336/ad.2018.0325
3. Kucyi, A., & Davis, K. D. (2014). The dynamic pain connectome. Trends in Neurosciences, 37(12), 736–748. https://doi.org/10.1016/j.tins.2014.09.003
4. Reinhart, R. M., Zhu, J., Park, S., & Woodman, G. F. (2015). Synchronizing theta oscillations with direct-current stimulation strengthens adaptive control in the human brain. Proceedings of the National Academy of Sciences, 112(30), 9448–9453. https://doi.org/10.1073/pnas.1504196112
5. Dr. Shahzad Aasim, “Cognitive dimension where science meets art”, International journal of Science and research (ijsr), Volume 8 Issue 6, June 2019, pp.2422-2423, https://www.ijsr.net/ getabstract.php? paperid=SR24221151213
6. Khedr, E. M., Abdelrahman, A. A., Mohammed, T. A., & Ali, A. M. (2020). Neuro-audio-stimulation improves cognitive functions and clinical symptoms in patients with Alzheimer's disease: A double-blind clinical trial. Journal of Neurology, 267(3), 736–745. https://doi.org/10.1007/s00415-019-09606-2
7. Lazarou, I., Ktonas, P., Antoniadis, G., & Karakostas, A. (2017).
8. Dr. Shahzad Aasim, “Harmonizing healing: exploring the clinical impact of music therapy”, International journal of Science and research (ijsr), Volume 12 Issue 10, October 2023, pp.2216-2117, https://www.ijsr.net/getabstract.php?paperid=ES24222123801
9. Electroencephalographic changes after acoustic stimulation in patients with Alzheimer's disease and in patients with depressive disorder. Journal of Alzheimer's Disease, 60(2), 493–502. https://doi.org/ 10.3233/JAD-170490

10. Zhang, Y., Wang, X., Chen, Y., & Yuan, J. (2019). Theta-burst transcranial magnetic stimulation for the treatment of Alzheimer's disease: A meta-analysis. Neurology India, 67(1), 74–80. https://doi.org/10.4103/0028-3886.253622
11. Dr Shahzad Aasim, "Quantifying Harmony: the mathematical essence of music", International journal of science and research (IJSR) Volume 07 Issue 11 November 2018 pp. 1972-1974 https://www.ijsr.net/getabstract.php?paperid=SR24221132304