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Title: Quantitative Electroencephalographic Evaluations Of Electrophysiological Biomarkers And Impaired Functional Networks Of Older Adults Diagnosed With Dementia

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Abstract

Quietmind Foundation Alzheimer's disease (AD) is a neurodegenerative disorder associated with affective dysregulation, cognitive impairment, psychosis, and delusion. While the clinicopathogenesis of this disorder is not well understood, factors related to immunology, genetics, amyloid precursor proteins, neurotransmitter deficiencies, and neurofibrillary tangles are thought to induce the neurodegenerative processes associated with this disorder. Because the neurodegenerative processes of AD vary according to the severity and progression of this disorder, divergent neurophysiological profiles may be present across this clinical disorder. Considerations of quantitative electroencephalographic (qEEG) biomarkers across the delta, theta, alpha, and beta bands were examined to determine whether exposure to photobiomodulation (PBM) induced significant alterations across divergent Brodmann areas and functional connectivity networks compared to sham intervention. PBM is the application of light therapy that allows photons to alter the activity of molecular and cellular processes in the tissue where the stimulation is applied. Because the photons associated with the therapeutic mechanisms of PBM affect processes associated with the mitochondria, it is hypothesized that PBM increases ATP synthesis, which thereby induces healing to damaged tissues via regeneration. Examination of electrophysiological alterations were evaluated utilizing 1 Hz resolution bins and across the delta, theta, alpha, and beta frequency bands using standardized weighted low resolution topographic (swLORETA) analyses. Current source density and surface topographical analyses were utilized to determine alterations across eyes-open and eyes-closed conditions across the experimental and control groups. Furthermore, specific functional networks examined include the salience, default mode, executive, working memory, and face/object recognition networks. Results of the study indicate that only the eyes-closed condition for the PBM group reached statistical significance. Significance was observed across the salience, default mode, and working memory networks. However, statistical significance was not approached within the executive network irrespective of group assignment or EEG assessment condition.

Biography

Kristin Williams is a PhD (cand), BCN, Lead Neurophysiology Research Scientist & Home Neurofeedback Training Consultant. Kris has joined Quietmind Foundation as a research neuroscientist and be manages Quietmind Foundation clinical trial programs and neurofeedback training session data analysis program. Her background in QEEG signal processing and analysis added a needed level of technical expertise to the team and help Quietmind Foundation grow their efforts to integrate neurofeedback and photobiomodulation