Stimulating Gamma Brain Waves via the Visual System Using Flashing LED Lights: Optimizing a Potential Treatment for Alzheimer's

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Recent studies with a mouse Alzheimer's disease model show that inducing gamma brain waves at 40 Hz causes microglia in the brain to remove plaque-forming proteins, actually treating the disease, not just the symptoms. In my study, an electroencephalogram (EEG) device and a flashing LED light circuit were designed and built in order to test how best to induce gamma waves in the human brain. Data were analyzed with a Fast Fourier Transform. Nine adults were tested, ranging in age from 18 to 90, including an Alzheimer's patient. 40 Hz brain waves were readily induced in every subject. At 30, 35, and 40 Hz there was a striking peak in the brain wave at the test frequency during stimulation. No response was detected in control trials with the lights on but blocked by cardboard, demonstrating that the effect was not due to electronic crosstalk artifact. The effect was weak at 45 and absent at 50 Hz. The response was strongest at a 50% duty cycle. Occasionally there was no response at 20% and 80%. Response increases with brightness. However, there was occasionally a strong response at low luminance, especially in the older subjects. Red and white worked better than green and much better than blue. One subject commonly had a response at exactly half the stimulation frequency, implying the neurons are responding to every other light stimulus. This study provides guidance on how best to induce 40 Hz gamma brain waves in humans to potentially treat Alzheimer's disease.

Awards Won:

Fourth Award of $500