



## **INVESTIGATING THE RELATIONSHIP BETWEEN INDIVIDUAL ALPHA FREQUENCY (IAF), ALPHA POWER, AND THE ALPHA SCALING EXPONENT IN EEG ALPHA WAVES**

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Electroencephalogram (EEG) waves exhibit oscillations that indicate the functional state and neuronal activity in the brain. These oscillations record the level of depolarization in the membrane potentials of a collective group of neurons, thereby providing information about the activation and inhibition of these neurons. An alpha wave is a characteristic of EEG data and consists of frequencies between 8 Hz and 13 Hz. The alpha wave is produced when the subject of the study is awake with their eyes closed, and is suppressed when the subject opens their eyes. Since the discovery of the alpha wave, numerous studies have attempted to understand its functional significance and how different characteristics of the alpha wave relate to cognitive functioning and general intelligence. Three alpha wave characteristics that merit further study are Individual Alpha Frequency (IAF), alpha power, and the alpha scaling exponent. Previous studies done to investigate the relationship between IAF and IQ as well as Alpha power and IQ resulted in conflicting findings. As a preliminary step before searching for a correlation between the alpha scaling exponent and IQ, this research project aimed at studying if there was a relationship between IAF, alpha power, and the alpha scaling exponent. In this study, EEG data was collected from 52 college students between the ages of 18 and 65 and was subsequently processed.

The percentage bend correlation between alpha power and alpha scaling exponent resulted in  $r=-0.10$  with 95% confidence interval (CI) of  $[-0.42, 0.18]$ . The percentage bend correlation between IAF and alpha power resulted in  $r=0.016$  with 95% CI of  $[0.23, 0.28]$ . The percentage bend correlation between IAF and the scaling exponent resulted in  $r=0.181$  with 95% CI of  $[-0.06, 0.43]$ . Results indicated that there was no statistically significant relationship between the three components. However, the correlation between the IAF and alpha scaling exponent had a confidence interval leaning towards the positive side and statistical analysis showed that to confidently establish a weak relationship of  $r=0.18$ , a minimum of 355 subjects would be required. Thus, EEG resting data is still being collected from more subjects.

