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Wavelet Analysis of Behavior Inhibition

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Wavelet Analysis of Behavior Inhibition

Poor impulse control is a sign of numerous psychological disorders such as attention-deficit/hyperactivity syndrome (ADHD), obsessive-compulsive disorder (OCD), and borderline personality disorder (BPD). In contrast, high levels of impulse control are correlated with academic achievement and other positive life outcomes. Because of this, it is important to understand how the brain functions when it is attempting to inhibit behaviors. This study examined impulse control using the stop-signal task while measuring brain activity with EEG. The sample consists of Kennesaw State University undergraduate students ($n = 25$). The stop-signal task requires the participant to respond to a particular stimulus as fast as possible unless a stop signal is presented afterwards. This measures the ability of an individual to inhibit their response to stimuli after the response has begun. How the brain enacts this inhibition is not fully understood. We used wavelet analysis of evoked response potentials to explore whether there were differences in brain wave synchrony between the stop and go conditions. When looking at the electrodes on the midline of the head, there was a noticeable difference in beta waves. In the stop condition, there was a desynchronization of beta waves that occurred around 400 milliseconds. The desynchronization was strongest towards the back of the head and weaker towards the front of the head. In addition, the evoked sensory response to the stimulus was inhibited in the stop condition. This implies that the inhibition of a behavior is related to inhibiting the evoked sensory response that causes the behavior, and to the desynchronization of beta brain waves.

Keywords: Impulse control, EEG, stop signal task, response inhibition, beta brain waves