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# THETA RESET AND WORKING MEMORY IN HUMANS: AN EEG STUDY

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The purpose of this study is to determine the nature of frontal lobe activity, specifically theta EEG activity, while performing a working memory task. Theta activity, which is evident in cortical areas such as the entorhinal cortex, the hippocampus, and the anterior cingulate plays an important role in information processing (Bland, 1986; Chrobak and Buzsaki, 1998b; Dickson et al. 1994, Givens and Olton, 1994, 1995; Mizumori et al., 1990; Sarnthein et al., 1998; Sato and Sakata, 1999; Winson, 1978). One way the theta rhythm may influence cognitive processing is by theta resetting in which the ongoing theta rhythm becomes phase-locked to the onset of a sensory stimulus (Givens, 1996). Theta reset follows stimuli across a number of sensory modalities in a variety of cognitive tasks, indicating that theta reset may be a general neural mechanism to enhance learning and memory.

Previous research by Williams, Johnson, and Givens (submitted to Journal of Neuroscience, 2002) recorded theta activity of rats while performing a working memory task. This study investigated whether theta reset in the frontal area of the brain can also be detected in humans during a working memory task. The memory task proposed for this study is similar to Williams' delay non-match to position task used in rats in that both tasks contain an encoding and retrieval phase in which the subject must recall, after a delay period, the initial sample in order to make a correct choice. Therefore it is predicted that the proposed study should yield similar patterns to those discovered in rats.

Thirty male and female student volunteers from the General Psychology courses at Illinois Wesleyan University will serve as the participants in this study. Each participant was asked to complete a series of computer-based working memory tasks created by the program "Superlab" of Cedrus Corporation (Phoenix, AZ). At the same time that these students performed the computer tasks, EEG data was collected from two frontal brain areas (midline and either left or right) via an electrode cap to monitor changes in theta activity. Differences in theta activity of each area before and after encoding and retrieval phases of the task will be noted. Currently data is being analyzed and results will follow.