Control/Tracking Number: 2008-S-14183-SfN
Activity: Scientific Abstract
Current Date/Time: 5/15/2008 12:18:09 PM

Alpha desynchronization reflects prediction error in rewarded learning

AUTHOR BLOCK: *D. A. PETERSON[1], D. T. LOTZ[2], C. ELLIOTT[1], S. MAKEIG[3], T. J. SEJNOWSKI[4,1], H. POIZNER[1,2];
[1]Inst. for Neural Comput, UCSD, La Jolla, CA; [2]Dept. of Cognitive Science, UCSD, La Jolla, CA; [3]Swartz Ctr. for Computat. Neuroscience, UCSD, La Jolla, CA; [4]Computat. Neurobio. Laboratory, Salk Inst., La Jolla, CA

Abstract:
The objective of the present study was to investigate whether brain oscillations play a role in rewarded learning. Previous research has shown that alpha oscillations in ventromedial prefrontal cortex are correlated with the reward prediction error from a reinforcement learning model of a subject's choice behavior in the Iowa Gambling Task. However, the macroscopic extent of these oscillations, whether they are detectable with scalp EEG, and whether they generalize to other forms of rewarded implicit learning remains unclear. We measured 64-channel scalp EEG in seven healthy young adults while they performed a rewarded implicit learning task. On each trial, subjects were presented with a pair of abstract images associated with different probabilities of providing a fixed cash reward. Over the course of 256 trials, subjects learned to choose images that are more likely to payoff. In the subsequent phase of an additional and otherwise identical 256 trials, the reward probabilities of the images were reversed and subjects had to learn the new reward contingencies to maximize their winnings. We evaluated oscillatory dynamics in theta, alpha, and beta bands as the change in spectral power between the 500 ms before and after subjects were given each auditory reward signal. In the period immediately after the reward contingency reversal, when the prediction error from a reinforcement learning model of the behavior is strongest, the success with which subjects learned the new reward contingencies was correlated with the extent to which their alpha power decreased in frontal regions. This correlation did not exist in posterior scalp regions, consistent with an origin specific to prefrontal cortex. Furthermore, the effect was not present in theta and beta bands, suggesting that alpha oscillations in particular play a role in this form of learning. Collectively, the results suggest that alpha oscillations, including those measured at the scalp, play a role in rewarded learning.
:

Theme and Topic (Complete): F.01.b. Learning and long-term memory ; F.01.g. Decision making and reasoning
Keywords (Complete): REINFORCEMENT LEARNING ; OSCILLATION ; REWARD ; DECISION MAKING
Presentation Preference (Complete): Poster Preferred
Support (Complete):
Support: Yes
Grant/Other Support: : NIH 2 R01 NS036449
Grant/Other Support: : NSF SBE-0542013 Temporal Dynamics of Learning Center

Linking Group (Complete): None selected
Special Requests (Complete):
Religious Conflict?: Sunday AM
Additional Conflict?: No

Status: Complete