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MULTIPLE COHERENT OSCILLATORY COMPONENTS OF THE HUMAN ELECTROENCEPHALOGRAM (EEG) DIFFERENTIALLY MODULATED BY COGNITIVE EVENTS

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Single-trial multi-channel EEG epochs were analyzed using Independent Component Analysis (ICA), which decomposed data into a sum of temporally independent components projecting to spatially fixed scalp maps (Makeig et al., Proc Nat Acad Sci USA 94:10979-10984, 1997). ICA uses higher-order statistics to identify spatially coherent patterns of activation in the input data. Decomposing single-trial ERP epochs from a visual selective attention task with ICA revealed the scalp patterns and time courses of activation of multiple alpha, beta, and gamma band oscillatory EEG components which were consistently but differentially affected by cognitive task events. Event-related modulations included amplitude blocking or augmentation and slow or fast phase resetting time locked to target-stimulus onsets or motor responses. At alpha band frequencies (8-12 Hz), multiple components with differing scalp distributions were found in single subjects. Some beta band (16-24 Hz) components were also active in the alpha band, while others were not. These oscillatory ICA components may be major sources of inter-channel coherences measured in EEG coherence studies. Research supported by the Office of Naval Research and the Howard Hughes Medical Institute.