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SPATIAL DISTRIBUTION OF TEMPORALLY INDEPENDENT COMPONENTS OF SLEEP SPINDLES IN ELECTROENCEPHALOGRAPHIC (EEG) POTENTIALS. C. Humphries†, M.J. McKeown†*, P. Achermann‡, A.A. Borbély‡, and T.J. Sejnowski†. †Salk Institute for Biological Studies, La Jolla CA 92037.‡Institute of Pharmacology, University of Zurich, Switzerland.

Sleep spindles, which are a feature of stage 2 sleep, reflect oscillations in a reciprocal thalamocortical network. Spindles are commonly classified based on frequency and topographical distribution into two broad categories: anterior (12 Hz) and posterior (14 Hz) (Gibbs and Gibbs 1950). We analyzed sections of 29-channel EEG containing spindle activity recorded from a healthy male during stage 2 sleep. Independent Component Analysis (ICA) was used to separate the composite EEG data into varying numbers of temporally independent components, each with a unique topographical distribution. Band-passed filtered (11-15Hz), rectified EEG above a threshold was used to detect spindle activity in both the raw EEG and the derived components. The threshold was determined so that spindle detection in the raw EEG corresponded to visual detection by an expert. When ICA was used to separate the EEG into only two components, the topographical distribution and frequency of the temporally independent spindle-like wave forms corresponded to the standard classification and distribution. As increasing numbers of independent components were derived, at least 7 contained significant spindle activity and were distributed in left frontal, right frontal, left temporal, right temporal, the vertex, and posterior-medial regions. Components with predominantly anterior topographical distributions had prominent 12 Hz activity and components with posterior distributions had prominent 14 Hz activity. Numerous temporally independent components contribute to sleep spindle activity in the scalp EEG. This may reflect multiple independent spindle generators and/or the spatial propagation of the spindle oscillations across cortical areas.

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