Syntax of EEG microstates in first episode, acute, medication-naïve schizophrenics

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Introduction. Psychophysiological building blocks of mentation ("atoms of thought") are identified by EEG microstate analysis. The concatenation rules of these microstates (their syntax) was investigated in schizophrenics and controls.

Method. Multichannel resting EEG (27 young, first-episode, medication-naive schizophrenics, 27 matched controls) was analyzed into microstates (mean duration below 100msec) using the global approach (modified k-means clustering), and assigning all microstates to four classes (EEG potential landscape maps, Figs. 1&2).

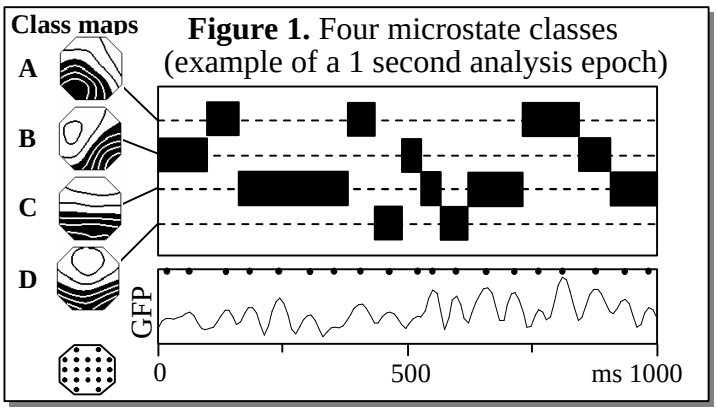

Figure 1. Four microstate classes (example of a 1 second analysis epoch)

The frequency with which the microstates of the four classes followed one another ("transitions") was assessed as percentage of all transitions in each subject. For the six possible pairings of transitions between the four classes, the preferred direction of each pair was compared between patients and controls (Fig. 3a).

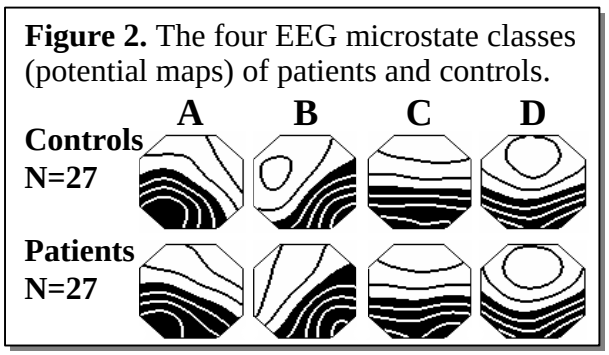

Figure 2. The four EEG microstate classes (potential maps) of patients and controls.

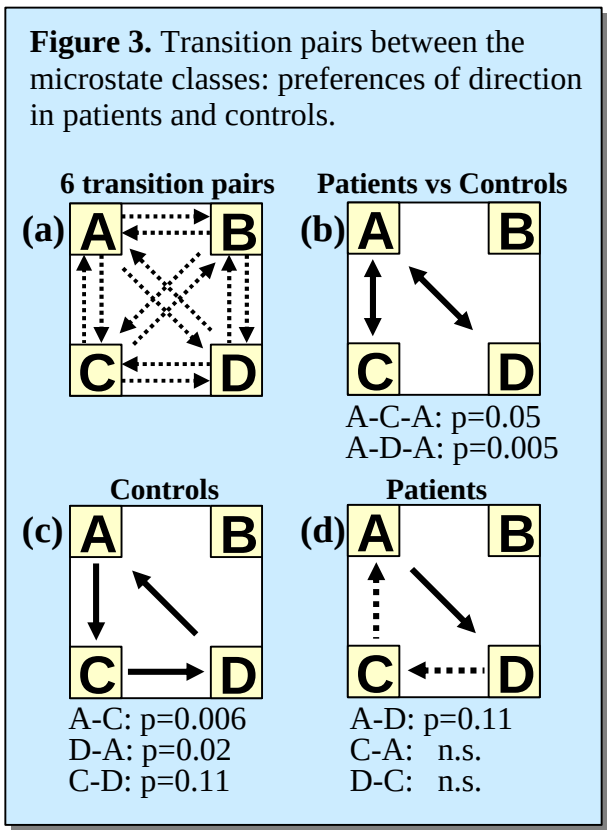

Figure 3. Transition pairs between the microstate classes: preferences of direction in patients and controls.

Results. There was a significant ANOVA group x pair interaction (2 subject groups x 6 transition pairs). The directions of transitions A->C/C->A and A->D/D->A differed significantly in controls from patients (Fig. 3b). In posthoc tests between the 3 involved microstate classes,controls clearly preferred the transitions A->C and D->A (Fig. 3c), whereas patients showed a tendency for generally reversed sequencing (Fig. 3d).

Conclusion. The syntax of transitions between brain electric microstates ("atoms of thought") opens a novel view on mechanisms of mentation. Different microstate classes have been reported to incorporate different mentation modes. The disturbed syntax of these building blocks of mentation might incorporate the generation of schizophrenic symptomatology.

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Reference.

Koenig T, Lehmann D, Merlo M, Kochi K, Hell D & Koukkou M (1999): A deviant EEG brain microstate in acute, neuroleptic-naïve schizophrenics at rest. Eur. Arch. Psychiatry Clin. Neurosci. 249: 205-211