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**Fronto-posterior connectivity during cognitive control in schizophrenia: time-frequency dynamics and relation to local evoked activity**

Promotionsfach: Psychiatrie

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The main aim of the study was to investigate the time and frequency dynamics of connectivity within the fronto-posterior brain network in schizophrenia and its relationship with local evoked activity in the frontal and posterior brain areas. The central question was whether fronto-posterior connectivity (measured by coherence) shows a differential impairment in schizophrenia patients during time intervals of the task that maybe related to different cognitive processes and task demands. We furthermore examined impairments in local evoked activity (measured by event-related potentials/ERPs) over frontal and posterior areas in schizophrenia patients and its relationship to impairments in long-range connectivity within the fronto-posterior network.

High resolution electroencephalography (EEG) signal was analyzed from frontal and posterior scalp sites in a group of healthy subjects and schizophrenia/schizoaffective patients, as they performed a choice reaction task. Fronto-posterior coherence was analyzed for event-related increases with respect to the inter-trial interval. The two groups were compared for event-related coherence during the task-related time intervals which showed a significant coherence increase with respect to the inter-trial interval (0-250 ms post-stimulus), as well as for

absolute coherence during the inter-trial interval. In addition, the two groups were compared on frontal and posterior ERPs peaking between 100-250 ms post-stimulus and the correlation between these ERPs and simultaneous fronto-posterior coherence was examined in the two groups.

Event-related coherence was significantly reduced in patients during task-related time intervals (0-250 ms) when controls showed significant event-related coherence increases. On the other hand, absolute coherence during the inter-trial interval was significantly increased in patients as compared to healthy controls. These results pointed to differentially impaired front-posterior connectivity during different time intervals (related to different task demands) and to resource allocation deficits in schizophrenia.

Although the early (100-200 ms) ERPs over frontal and posterior sites were normal in schizophrenia patients and only the later (200-250 ms) ERPs were found to be reduced, event-related connectivity between frontal and posterior areas was reduced in schizophrenia patients also during the 100-200 ms time interval, indicating that connectivity disturbances may be a more fundamental deficit in schizophrenia as compared to local brain activity disturbances. Furthermore, limited linear correlation between local ERPs and long-range coherence showed that long-range synchronization measures add important new information to traditional ERP measures.

This study adds support to the previously implicated role of disturbed fronto-posterior brain connectivity in impaired cognition in schizophrenia and highlights the importance of taking the time course of this connectivity into account. Future studies should address more detailed aspects of network communication in order to enhance our understanding of neurophysiological mechanisms underlying cognitive impairments in schizophrenia.