

LINKING CEREBRAL GREY MATTER AND MISMATCH NEGATIVITY (MMN) IN SCHIZOPHRENIA

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Well established in schizophrenia research is the reduction in amplitude of an auditory event-related potential (ERP) termed ‘mismatch negativity’ (MMN) (Umbricht & Krljes, 2005). MMN occurs in response to an infrequent discriminable change in repetitive background sounds and is derived by subtracting the ERP to a frequent, standard, stimulus, from the ERP to an infrequent deviant stimulus. MMN is considered a psychophysiological measure of auditory sensory memory function and reflects the auditory system’s capacity to discriminate representations of sound properties (Näätänen, 2003). To investigate the relationship in schizophrenia of MMN and cortical grey matter, ERPs and structural magnetic resonance images (sMRI) were collected from 18 schizophrenia subjects (13 males and 5 females; age range 16–67 years; mean age 33; S.D. \pm 12) and 18 pair-wise age- and gender-matched healthy control subjects. MMN was derived from three types of deviant stimulus that differed from the standard in duration (ms), frequency (Hz) and intensity (dB).

Peak amplitudes were determined for each MMN waveform within 100 to 300 ms post-stimulus intervals. For the structural analysis, models were extracted from the sMRI of all subjects followed by the identification and tracing of sulcal landmarks. Average models of the cerebral cortex were generated using cortical pattern matching (Thompson et al., 1997), a technique that maintains the relationship with the individual’s scan while allowing the accurate averaging of gyral structures across subjects. Correlation maps ($P < 0.05$) of cerebral grey matter with peak amplitudes for each MMN type were calculated and tested by permutation analysis.

Grey matter reduction in cortical areas subserving auditory processing, motor organization and executive function correlated with reduced MMN amplitude in patients to frequency deviants only. No correlations were observed in healthy controls. These results suggest that frequency MMN amplitude reduction in schizophrenia reflects progressive loss of grey matter volume whereas duration and intensity MMN amplitude reductions, that are evident early in the illness (Todd et al., 2008) may precede cell loss.

Umbricht, D. & Krljes, S. (2005) *Schizophrenia Research* 76:1-23.

Näätänen, R. (2003) *International Journal of Psychophysiology* 48:25-32.

Thompson, P.M., et al. (1997) *Journal of Computer Assisted Tomography* 21:567-581.

Todd, J., et al. (2008) *Biological Psychiatry*, 63:58-64.