

Lingli, Hu “Quantifying single trial auditory evoked potentials and sensory gating variability”

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Sensory gating is the ability of the brain to modulate its sensitivity to incoming sensory stimuli. For example, when pairs of identical auditory stimuli are presented, the second stimulus in each pair produces a smaller response than the first in normal adult subjects. In contrast, patients with schizophrenia show less reduction to the second click. In this study, we explored the relation between response variability and the degree of sensory gating.

We developed a method to assess on a trial-by-trial basis the completeness of the evoked brain responses. The method employs an unsupervised correlation-based clustering technique for selective averaging of single trials. We were able to verify that this technique produced homogeneous and well-separated clusters.

Data from 25 normal and 25 schizophrenia subjects were analyzed. It was found that only 30% of responses of the normal subjects were complete in the sense that all three major EP components (i.e., P50, N100, and P200) were present. Schizophrenia patients produced significantly fewer “complete” responses than normal subjects, and with smaller amplitude. Also, the schizophrenia patients had basically an equal number of “responsive” and “non-responsive” trials for S1 and S2, while normal controls had significantly more “responsive” trials (and fewer “non-responsive” trials) for S1 than S2.

We also studied ensemble averaged EP data to assess the differences in response variability for the normal and schizophrenia populations, and the influence of the pre-stimulus EEG characteristics on EP morphology. We found that healthy subjects display more inter-session and inter-subject variability than schizophrenia patients with regard to N100 and P200 amplitudes of the S1 and S2 responses. The results of pre-stimulus effect study showed that the phase of specific frequency bands at stimulus onset affects different EP components.

Our findings suggest that the smaller ensemble average amplitudes and the gating deficit observed in schizophrenia patients are due to the failure to adequately respond to the first of a pair of stimuli, rather than a failure to gate.