

397 W-AM Increased Auditory Beta Oscillations in Schizophrenia

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PURPOSE: The most frequent positive symptom in schizophrenia is auditory hallucinations. Whether these relate to intrinsic defects in the auditory cortex or higher cognitive areas remains controversial. Previous reports [1] suggest a decrease in the sustained auditory gamma band response in schizophrenia. There has also been an indication of a trend towards increased beta activity (20Hz or lower beta) in schizophrenia yet no difference in the 30Hz (upper beta) response compared to normal controls. There are several reports of cortical thinning in a variety of areas of the brain of schizophrenia patients, most commonly in the cortex of the superior temporal gyrus (STG), where the 40Hz sustained field is thought to originate. This study aims to quantify and lateralize the auditory neuromagnetic sustained response of the gamma and beta bands in schizophrenia and correlate the spectral power to cortical thickness maps.

METHODS: Subjects: 12 medicated chronic schizophrenic subjects and 12 age matched control subjects were studied. Stimuli: Blocks of 500ms trains were presented at 75dB SL, bilateral. (lower-beta), 30Hz (upper beta), and 40Hz click trains were presented to all subjects. MEG: channel VectorView; MRI: 3T MRI with whole-head MPRAGE volumes. For defining the inner and outer skull, a FLASH scan with a 5 degree flip angle was used. Cortical thickness maps and boundary element models (BEM) were created with FreeSurfer [2]. Analysis: Multi-taper power spectrum from a 2-dipole ECD, which localized in or near Heschl's gyrus bilaterally, using a BEM. Using a general linear model, the maximal power from each of the spectral bands was correlated with the cortical thickness maps in each hemisphere.

RESULTS: The 40Hz response was significantly reduced in the SZ subjects in the right hemisphere ($P < 0.05$), consistent with previous reports. There was also a statically significant increase in 20Hz activity (lower beta), bilaterally ($P < 0.05$), but no difference in the 30Hz activity. The significant correlation of the 40Hz response to the lateral right Heschl's gyrus cortical thickness (Figure 1) and a trend towards a correlation between the cortical thinning in the left posterior and the power reduction in the left 40Hz power.



CONCLUSION: An increase in the 20Hz sustained neuromagnetic response power in schizophrenia patients originates in Heschl's gyrus, bilaterally. A 40Hz power reduction was most prominent in the right hemisphere which was highly correlated with thinning of the cortex in the right hemisphere. Gamma band processing may represent local processing, and lower beta band activity may indicate long-distant communication across the cortex [3]. This suggests abnormal local processing in the auditory cortex in schizophrenia and perhaps increased long-range communication. These findings relate to patient's auditory hallucinations and other auditory dysfunctions.

[1] Kwon et al. Gamma frequency-range abnormalities to auditory stimulation in schizophrenia. *Arch Gen Psychiatry*. 1999;56:1001-5.

[2] Dale, A.M., B. Fischl, and M.I. Sereno, Cortical surface-based analysis. I. Segmentation and surface reconstruction. *Neuroimage* 9:79-94.

[3] N. Kopell, G.B. Ermentrout, M. Whittington, R.D. Traub "Gamma rhythms and beta rhythms have different synchronization properties", *Proc. Nat. Acad. Sci. USA* 97:1867-1872.