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CHANGES IN AUDITORY STEADY-STATE RESPONSES DURING NEUROLEPTIC TREATMENT

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A 28-year old male was admitted to the La Jolla VAMC suffering from auditory hallucinations and delusions of persecution. Prior to beginning neuroleptic treatment, he participated in an auditory evoked response experiment in which clicks were presented to the subject's right ear through headphones at a rate of 39/s. At intervals near 4 s, a single click was omitted from the steady-state stimulus train, followed by a second such omission 500 msec later. Responses were recorded through 16 scalp electrodes refered to a balanced non-cerebral reference. This experiment has since been repeated several times at near 6 week intervals following commencement of neuroleptic treatment (Haldol, Serentil). Two progressive changes have been observed. First, baseline steady-state response (SSR) amplitude distribution shifted frontally over 3 months of neuroleptic treatment, due to a marked bilateral increase in frontal SSR amplitude. This contrasts with an abnormally posterior distribution we have observed in a small sample of chronic schizophrenics. Second, during treatment the characteristic augmentation in steady-state response amplitude near 250 msec following the first omitted-clicks declined in size dramatically. This paradoxical augmentation following a perturbation in a steady-state stimulus, together with other amplitude and phase perturbations collectively form the complex event-related response (CERP). The CERP is a continuous measure of time-locked modulations of the steady-state response following some perturbing event (Makeig & Galambos, in press) and is presumed to record the effects of central modulatory processes on the SSR. Together with the recent results of Weinberg et al. (Neurosci. Abst. 1:339, 1988) on changes in the SSR in depression, our observations suggest that steady-state responses may in future prove useful in the understanding and treatment of psychiatric illness including schizophrenia. The SSR and CERP provide new windows into early brain modulatory processing of sensory information. The SSR, in particular, may have potential for routine clinical use, since it can be recorded fairly quickly in nearly all adult subjects (Stapells et al., EEG 67: 260, 1987). Similarities and differences between auditory SSR and P50 measures will also be discussed based on new information gained in multi-channel experiments designed to explore the observations on the auditory P50 response of Freedman et al. (Schiz. Bull. 13:669, 1987). These experiments demonstrate the existence of at least three positive auditory response peaks near 50 msec, with three different scalp distributions. The SSR most probably indexes the amplitude of only one of these (the MLR Pb), while the P50 click-pair paradigm indexes another (a long-ISI P50 possibly part of a long-ISI P50/N100 complex). All the experiments demonstrate the usefulness of mapping the spatial distribution of evoked responses obtained in multi-channel recordings.