

AUDITORY EVOKED RESPONSES TO FREQUENCY AND AMPLITUDE MODULATED SOUND

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Auditory evoked responses to pure tone bursts have been described in a number of studies and have been characterized by their P_1 , N_1 and P_2 components. The presence of later components, namely N_2 , P_3 and the Contingent Negative Variation, depends largely on the cerebral processing of the stimulus. These evoked responses have been recorded using tone bursts. However, neurophysiological studies have shown that the cortex codes complex sounds. Therefore, we performed a set of acute experiments on the cat, using frequency and amplitude modulated sounds. This was reported in a previous study (Rickards and Clark, 1972) which showed that similar onset and later waves could be recorded from the cortex of the cat. In some areas of the cortex the later waves were in synchrony with the modulation envelope.

As an extension of this study, similar complex stimuli were presented to subjects and the responses were recorded from the scalp. Neuropsychological work has shown that the processing of speech is done in the dominant hemisphere. Consequently, multiple recordings were made from both hemispheres in right and left handed subjects. This study was carried out on 29 volunteers and they were presented with three series of sound stimuli. These were a 500 msec pure tone, a frequency and an amplitude modulated sound. The modulation envelope was five cycles of a 4 Hz sinusoidal wave. Eighty sounds were presented alternatively to each ear.

Inspection of the responses showed the following trends. The $P_1N_1P_2$ response was recorded in each series in all subjects, and usually had a maximum amplitude near the vertex. With all tones, stimulation of at least one ear evoked an N_2 response, followed by a negative shift which lasted until the end of the tone. These were often separated by a P_3 component. In 18 subjects, a frequency-modulated tone produced a periodic wave superimposed on the negative shift. This wave had the same period as the modulating waveform. In 16 subjects, an amplitude modulated tone produced a similar periodic response. Only three subjects failed to show periodicity to one of the two modulated tones. The late negative components were more negative on the dominant hemisphere in most cases. Only two subjects showed a larger negative shift on the non-dominant hemisphere. Periodic responses were usually largest over the frontal cortex, and the responses on the dominant hemisphere were always greater than or equal to those on the non-dominant hemisphere.

Rickards, F. W. and Clark, G. M. (1972). *Proceedings of the Australian Physiological and Pharmacological Society*, 3, No. 2, 201.



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