

XVIII. NEUROPHYSIOLOGY*

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A. CORTICAL ACTIVITY PRECEDING SPEECH

In 1966, Gilden, Vaughan, and Costa¹ reported time-locked cortical activity preceding foot dorsiflexion and fist clenching. In 1967, Ertl and Schafer² corroborated these findings but also demonstrated nonrandom cerebral activity preceding speech. In

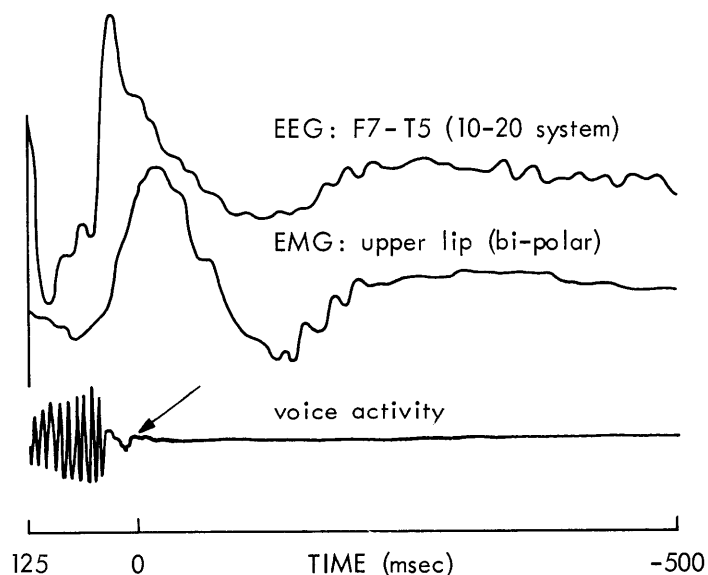


Fig. XVIII-1. Average of 100 EEG, EMG, and voice-activity samples preceding and 125 msec following spoken onset of letter "T". Similarity between summated EEG and EMG waveforms demonstrates low-frequency myogenic contamination of cortical activity preceding voice onset indicated by arrow.

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(XVIII. NEUROPHYSIOLOGY)

1968, the present writer criticized the study for adopting the criterion of phonation or vocalization as being the true initiation of speech because most speech sounds are, in fact, preceded by lip or labial preformation. In collaboration with Ertl and under the guidance of W. S. McCulloch, a series of experiments were performed, and it was demonstrated that potentials of myogenic origin invaded the EEG recordings. Consequently, an erratum has been submitted for publication by Ertl and Schafer.³ See also Fig. XVIII-1.

We do not feel that our study has disproved the existence of cerebral components prior to speech. As a matter of fact, it seems logical to assume that such phenomena must exist.

In view of the foregoing, it appears necessary to devise a new experimental design that would make it possible to eliminate such artefact problems because it is clear that the sequencing of neural events occurs at the same time as the muscle activity preceding the sound of human speech. Previous research by the writer^{4, 5} in the field of speech and language pathology seems to provide a methodology whereby EEG activity preceding language expression can be studied without contamination from the muscles of speech proximal to the scalp. Such investigations are now in progress and a report of findings will be submitted as soon as possible.

E. Douglass

References

1. L. Gilden, H. G. Vaughan, and L. B. Costa, "Summated Human EEG Potentials with Voluntary Movements," *EEG Clin. Neurophysiol.* 20, 433 (1966).
2. J. P. Ertl and E. W. P. Schafer, "Cortical Activity Preceding Speech," *Life Sci.* 6, 473-479 (1967).
3. J. P. Ertl and E. W. P. Schafer, "Cortical Activity Preceding Speech," in Erratum *Life Sci.*, Vol. 6, pp. 473-479, 1967 (submitted for publication). The text reads as follows:

In the course of continued research on cortical activity preceding speech it was noted that low frequency myogenic or movement artefacts originating from upper lip musculature contaminated the EEG preceding speech (Fig. 1). Our earlier findings in which time locked cortical activity preceding speech was identified are therefore equivocal. The prediction that specific changes in the electrical activity of the human brain must precede speech remains unchanged. We have continued to search for this phenomenon by examining the region preceding the earliest onset of EMG activity and by attempting to instrumentally remove the contributions of EMG from the EEG.
4. E. Douglass and J. C. Richardson, "Aphasia in a Congenital Deaf Mute," *Brain*, Vol. 82, Part 1, pp. 68-80, 1959.
5. E. Douglass, "The Development of Stuttering and Its Diagnosis," *Can. Med. J.* 71, 366-371 (1954).