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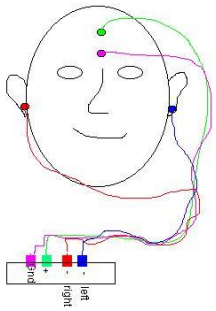
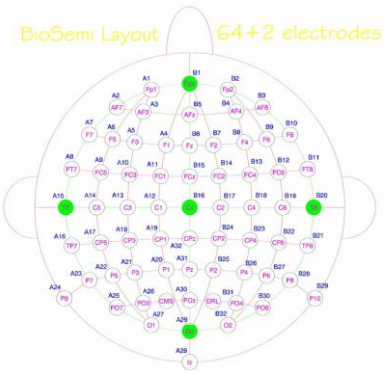
Auditory Evoked Potentials (AEPs)

Auditory EEG for hearing diagnostics



Diagnostic EEG is often collected at high sampling frequencies (because we are targeting sub-cortical source generators) and with few recording electrodes. Often, the following setup is used (not my own drawing), with recording electrodes placed near the forehead, a ground electrode near the forehead, and two reference electrodes on the earlobes. Using this setup, it is convenient to catch dipoles projecting upward from the auditory brainstem region. Conventional auditory EEG methods have been used to assess either hearing sensitivity loss or brainstem lesions in an objective way (i.e., no participation of the participant is necessary e.g. newborns). Newer approaches also use this technique to study auditory-nerve deficits and supra-threshold hearing deficits. For these applications, either higher stimulus levels are adopted for the click-evoked auditory-brainstem response, or, sustained stimuli with fluctuating low-frequency envelopes are used to evaluate the envelope-following response.

Recording and analysing AEPs



In the first part of this exercise you will analyse auditory evoked potentials to click stimuli (ABRs) and in the second part EFRs to tonal and speech stimuli. The auditory evoked potentials were recorded using a multi-channel EEG-setup by presenting the different stimuli repeatedly to the listener. The 64-channel Biosemi electrode montage we used and the corresponding EEG channel numbers are depicted on the right. For our analysis, we only focus on the data recorded by a single channel on top of the head (B16), refenced to the mean signal of two earlobe-placed electrodes. The information about each part of the exercise is provided in the provided Jupyter Notebook.

References:

[1] Aiken, Steven J., and Terence W. Picton. "Human cortical responses to the speech envelope." *Ear and hearing* 29.2 (2008): 139-157.

[2] Burkard, Robert F., Jos J. Eggermont, and Manuel Don, eds. *Auditory evoked potentials: basic principles and clinical application*. Lippincott Williams & Wilkins, 2007.