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Measuring Sensory Memory. MEG Habituation and Psychologis
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Vision and audition each have several levels of sensory memory, and constructing experiments to selectively measure one or another of these memories has been an elusive goal. Here we consider one apparently successful example, Lu, Williamson, & kaufman (1992a) who measured the retention of the precise loudness of a tone in a very-short-term auditory memory. The psychophysically measured immediate memory for tonal loudness decayed in a period of a few seconds (depending on the observer) to the average loudness of recelty heard tones (which was maintained in a higher-level short-term auditory sensory memory). A critical component of this experiment was establishing a well-defined higher-level sensory-memory representation so that the decay of the very-short-term memory trace could be observed without contamination. In a habituation paradigm, the same tonal stimulus was repeatedly presented with a fixed interval between presentations, and the MEG response was recorded. The longer the interval between successive presentations is, the greater the response. The recovery of response amplitude from prior simulation reflects continuing activation, and therefore offers a physiological access to memory duration. MEG recordings of habituation for the stimuli in the loudness experiments revealed two sites in temporal cortex, a primary A 1 site that reflects the tonal memory studied psychophysically, and another auditory memory site in nearby auditory association cortex. By replicating the psychophysical conditions precisely in habituation, and by separating the two N1 MEG components, for each subject, both the psychophysically measured memory for loudness and the memory inferred from habituation of A1 were found to decay with an identical time constant. Between subjects, the lifetime (time constant of the decay) of memory for loudness varied from 0.8 to 3 sec. Additionally, an example of the decay of very-short-term visual memory (iconic memory) is given in which the psychophysically measured lifetime and the EEG lifetime determined in an habituation experiment seem to agree quite closely. MEG is preferred to fMRI because of its temporal resolution. Conclusion: MEG is an ideal tool for studying sensory memory.