Counting changes in complex acoustic environments.

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Abstract

Natural auditory textures, e.g. wind or rain, could be only characterized on statistical level and despite the highly variable spectrotemporal profile, easily classified by human. Our previous studies demonstrated that the classification of a texture improves with the time the texture can be sampled and this to be mirrored by the magnitude of the parieto-occipital potential at the scalp.

In this study, we recorded EEG from 12 subjects, listening to natural auditory textures. The half of stimuli (i.e. 120/240) changed their statistics at the random time (0.75s, 1.6s or 3.0s). All stimuli were randomly presented in 4 equinumerous blocks. Participants were asked to count the number of changes and report it to the experimentator after each block. For further analysis, we subselect the blocks containing only correct responses.

We observed that the integration of statistical information is followed by the formation of parieto-occipital potential and interestingly, the amplitude of this potential reversely scales with the time the texture was sampled. We suggest the increase in cognitive load and the time of rote rehearsal could cause the attenuation of the response for the longest change times. Moreover, subject could form expectation of maximal sound duration and consequently expect more the change that occur later than sooner.

Summing up, variations in the parameters of the change detection signal formed for different change times, indicates its possible dependence of the current cognitive load and expectations that modify the observed process of evidence integration.

Keywords— evidence integration, acoustic textures, cognitive load

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