Resting state autocorrelation window modulates sensory-evoked response variability

Belén de Sancristóbal, IDIBAPS
E-mail address: belen.sancristobal@upf.edu.

We show that inter-individual variability of sensory-evoked responses elicited by long- lasting sounds ($\sim$ 3 s) can be explained by a homologous heterogeneity in the brain's intrinsic fluctuations. We combined electroencephalographic (EEG) recordings from human participants while they listened attentively to the stimuli with recordings while resting eyes-closed. Indeed, subjects with a similar temporal structure of the resting state, quantified by its autocorrelation window (ACW), exhibited comparable trial- averaged event-related spectral dynamics. Namely, slower spontaneous resting state fluctuations (i.e., with longer ACW) coincide with larger differences of a subject's response to distinct sounds and, in turn, better correlated with time-varying acoustic intensities. Our results are based on the first principal component extracted from all electrodes and were qualitatively well reproduced by a simple computational model of resting state fluctuations, that allowed us to confirm that changes in ACW alone can cause this variability. ACW's effects were also observed in single-trials in the form of a dynamic bias that forced the sound-triggered power fluctuations to relax back to the mean spontaneous activity. This temporal constrain, rather than time-averaged measures such as mean pre-stimulus activity, limited the amount of information about the nature of the stimulus. These results suggest that neuronal computations needed to extract stimulus-relevant information depend on the endogenous neuronal activity, i.e. the brain dynamics at rest, with inherent time-correlated dynamics.

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