THE BRAIN DYNAMIC PROCESSES DURING METAPHORIC LANGUAGE PROCESSING

Y. Arzouan[1], S. Solomon[2], M. Faust[3], A. Goldstein[3]
[1]Dept. of Special Education, Levinsky College of Education, Tel Aviv;
[2]Racah Institute of Physics, Hebrew University of Jerusalem, Jerusalem;
[3]Gonda Brain Research Center, Bar-Ilan University, Ramat Gan, Israel

Language comprehension is a complex task that involves a wide network of brain regions. We used topological measures to qualify and quantify the functional connectivity of the networks used under various comprehension conditions. To that aim we developed a technique to represent functional networks based on EEG recordings, taking advantage of their excellent time resolution in order to capture the fast processes that occur during language comprehension. Networks were created by searching for a specific causal relation between areas, the negative feedback loop, which is ubiquitous in many systems. This method is a simple way to construct directed graphs using event-related activity, which can then be analyzed topologically. Brain activity was recorded while subjects read expressions of various types and indicated whether they found them meaningful. Slightly different functional networks were obtained for event-related activity evoked by each expression type. The differences reflect the special contribution of specific regions in each condition and the balance of hemispheric activity involved in comprehending different types of expressions and are consistent with the literature in the field. Our results indicate that representing event-related brain activity as a network using a simple temporal relation, such as the negative feedback loop, to indicate directional connectivity is a viable option for investigation which also derives new information about aspects not reflected in the classical methods for investigating brain activity.