

If we search for a particular phrase in an article we have to thoroughly scan the text lines until we notice the sought after words. Conversely, if the searched phrase is the only one highlighted in bright yellow, we will find it immediately, at first glance. Attention can be evoked and directed by endogenous factors that primarily relate to the subject's internal goals and intentions. On the other hand, it can be enchainned by the salient features of external stimuli. Traditionally, attention research has distinguished these two types of selection mechanisms and ascribed them to separate attentional mechanisms: endogenous factors are associated with top-down voluntary control, while exogenous factors are associated with bottom-up signaling that is thought to take place automatically. Moreover, the two mechanisms are believed to be realized by separate functional brain networks.

According to the current model the dorsal attentional network (DAN) is responsible for maintaining the focus of attention and the ventral attentional network (VAN) is described as a "circuit breaker" to voluntarily controlled DAN operations. VAN is recognizing new salient stimuli in the environment and reorienting attention towards them. However, some newer studies suggest that the two networks contribute to both types of attention allocation in more complicated manner.

We propose a study that attempts to define the function of ventral attentional network and in particular its primary node (temporoparietal junction, TPJ). We advocate the hypothesis that its main function consists in processing congruence between expected and incoming stimuli. In order to test our hypothesis we will record the behavioral and neurophysiological data in a novel attentional paradigm. Our task is to quickly detect presented stimuli; it contains standard manipulations changing the extent to which one can prepare for target stimuli. At variance with previous studies, the to-be-detected target is presented centrally, and the cue represents its category instead of location. If the role of TPJ is to compute the congruency of bottom-up signals with those expected by top-down systems, its pattern of activation should differ between predicted and unpredicted stimuli, resembling activation observed in spatial cueing paradigms.

The main results on the study will be obtained from comparisons of brain responses to particular types of trials (with standard procedures applied to event-related designs in fMRI studies, i.e. with general linear model, GLM) and at the behavioral level, from the analysis of benefits and costs in reaction times. Furthermore we are planning to apply advanced methods of data analysis (i.e. multivariate pattern analysis, MVPA) to conclude upon the proposed hypothesis by resolving two separate research questions: (1) whether our regions of interest contain spatially overlapping but distinct subunits devoted to signaling of match and mismatch between incoming and expected stimuli; (2) if the behavioral benefits and costs are correlated with the level of active processing (maintenance) of the representations corresponding to cued and uncued categories. Finally, we want to complete the characteristic of TPJ function by addressing the asymmetry associated to the neural mechanisms of the neglect syndrome.