

Sometimes we see a glass half full and sometimes half empty. This happens because our interpretation of external world is usually biased. When you are perceiving the world, you like to think that you are objective, and self-independent. Unfortunately, your brain may sometimes trip you up and bias your perception of world around you. Some of these biases are related to perception of emotional material (so-called attentional bias), while other biases might be related to perception of rewards (so-called reward processing bias). To date, however, still little is known about an exact brain mechanisms that are responsible for producing and managing these two types of biases. Interestingly, our recent studies have shown that the ventro-medial part of the frontal lobe (vmPFC) might play a very important role in producing and managing of both attentional and reward processing biases. When this area of brain is active, people pay more attention to positive emotional stimuli and gains. However, when this area is inhibited, people are more focused on negative emotional stimuli and loses.

In the current project, we intend to better understand the neural mechanism of attentional and reward processing biases. Especially, we will focus on the vmPFC "at work" to directly trace its activation, and, additionally, pinpoint its functional relationships with other cortical areas. In our experiments, we will present participants with emotional and rewarding stimuli, after stimulating their vmPFC using non-invasive transcranial direct-current stimulation technique. At the same time, we will monitor activity of their whole brain to observe how their vmPFC communicate with other parts of the brain during biased processing. In the analyses, we will introduce an innovative approach to study brain communication – Directed Transfer Function (DTF). First, we will use the DTF method to analyse the data already collected (3 experiments on attentional bias) and then, we will use this method to analyse the data collected during the project (3 experiments on reward processing).

The choice of the research topic is motivated by insufficient knowledge regarding the role of vmPFC in attentional biases and biases in reward processing. We believe that our research program will advance current understanding of the mechanism by which our brains produce attentional and reward processing biases. Since such biases are considered as key symptoms of various psychiatric disorders including depression or addiction, we believe that the results of the proposed project will help to create modern and effective therapies for many mental disorders. The projects' objectives and related goals can only be achieved in close international collaboration between the German and Polish research groups. The German group will provide their expertise in implementation of brain stimulations and provide infrastructure necessary to conduct the experiments. The Polish group, in turn, will provide expertise in brain communication analyses.