

Each of us has to cope with everyday life challenges, which bring unpleasant, negative experiences. In a real life, there is no way to completely avoid them. However, due to our ability to partly control our emotions, we can decrease their impact on our feelings and health. Reappraisal is an emotion regulation strategy used to decrease the intensity of affective responses by conceptually changing the meaning of arousing stimuli, as well as modify our attitude towards them. This requires a cognitive effort to change one's perspective to a more neutral one, or imagine a positive or less serious outcome of a potentially negative situation (e.g. "Although this accident looks quite serious, all involved people were only slightly hurt").

Effects of reappraisal include improvement of mood, decrease of tension and arousal of autonomic nervous system (the one which controls our guts), which is associated with negative emotions. Despite recent interest in reappraisal, we still lack the knowledge on which particular mental processes are responsible for attenuating emotional arousal. On the other hand, we know that various engaging mental activities have the potential to decrease the level of negative emotions, however this effect is probably not so long-lasting, as in the case of reappraisal.

In our project we intend to identify a brain mechanism which is responsible for decrease in tension and improvement of mood during reappraisal. We want to get insight, how cognitive reinterpretation influences the way we perceive unpleasant stimuli, and how our attention selects and attenuates the impact of emotional content. What is important, we want to check, how change in our attitude to more positive, influences these brain regions, which are responsible for estimating the affective value of the things we perceive. They are important in regard to emotional arousal, as they constantly scan our visual field in order to identify potential threats and dangers. To achieve this, we need to trace, how the neural signal originating in visual areas just after noticing any emotional stimuli, propagate towards the regions responsible for recognition, understanding, context analysis of perceived scenes. It will be necessary to compare the patterns of cortical activations in different conditions: during reappraisal and during other strategy of emotional control, which do not include change of one's own perspective towards unpleasant content.

We predict, that initially, different engaging cognitive tasks will be equally sufficient to modulate emotional arousal, comparing to the conditions, where no control attempts are recruited. Improved mood will be accompanied with functional changes in visual, attentional brain regions, as well as in the prefrontal cortex, most frontally localized part of the brain cortex, which is responsible for monitoring and maintaining various mental activities. We also expect, that in the very late phase of emotional control, reappraisal will bring the most efficient and permanent modulatory effect, visible in brain regions which recognize the emotional value of stimulation

In our experiments, we will use electroencephalography (EEG) and magnetoencephalography (MEG) as main neuroimaging techniques. They allow for recording group activity of neurons located in various part of the cortex. These methods will be supplemented by advanced analytic techniques, which will provide reconstruction, with high temporal accuracy, activations and signal transmission between particular brain regions. Additionally, transcranial magnetic stimulation (TMS), which provides transient inhibition of selected brain region, will be used. By attenuating normal activity of the prefrontal cortex, we will determine which particular processes constituting reappraisal are mostly dependent on the prefrontal cortex. We expect, that our project will bring better understanding of emotional control phenomena. It will also allow for revealing determinants of its efficiency. These issues are of great importance for practical, therapeutic purposes.