

In few recent decades, the idea that thinking is systematically shaped not only by the brain but also by the whole body that interacts with the environment has been gaining more and more support. Such view is called the “embodied cognition,” and its popularity range from psychology through philosophy and linguistics to robotics. One of the most important theories developed within the “embodied” account is the Barsalou’s theory of perceptual symbols. According to this theory, thinking, specifically the processing of concepts, is based on partial reproduction of neural activations of sensorimotor structures occurring during actual interactions with relevant objects, dubbed “simulation.” Barsalou’s approach, which constitutes theoretical basis of the project, applies not only to the processing of concrete concepts (like a “hammer”) but also to the emotional ones (like “fear”). Importantly, proponents of the embodied cognition claim that understanding of such concepts is related to the activity of facial muscles involved in producing facial expressions of own emotions.

One of the arguments for the involvement of muscular activity in emotion recognition are the results of the study conducted by Oberman, Winkielman, and Ramachandran in 2007. In this study, like in many others, participants, in various conditions, were presented with the images of emotional faces. Their task was to recognize emotions expressed by those faces. It turned out that holding a pen with one’s teeth hinder recognition of emotions, but only those, whose expressions involve the lower part of the face. Namely, we better understand emotions while we can reproduce them with our own faces. Such “reproduction,” even when it is not visible for an observer, can be measured with electromyography (EMG), which is a method that enables recording of even the subtlest muscle activity.

The results of previous studies, however, do not allow to determine on which level the simulation occurs. On the one hand, it may work on the high, i.e. conceptual, level, regarding the understanding of emotions in general. On the other hand, it may refer to the lower, perceptual, level. The proposed project will address this issue. We can predict that blocking spontaneous facial expressions will disrupt emotion recognition irrespective of the stimulus type (images, words or sounds). Here, we will use sounds expressing emotions. If blocking facial expressions will hinder the recognition of emotional sounds, analogously to the recognition of emotional faces, it will be a significant premise for the claim that simulation is involved in emotion recognition in general.

Furthermore, the previous studies do not allow for determining how emotional concepts become rooted in embodied simulations, described by Barsalou. It has been suggested that sensorimotor activity links with emotional concepts thanks to our tendency to spontaneously imitate other people regarding e.g. their facial expressions, which has been observed in various studies. Thus, we can suppose that this aspect of simulation should not occur if there was no possibility of spontaneous imitation during one’s life, even with preserved possibility of facial expressions, as in the congenitally blind. In this case, interfering facial activity should have no impact on the recognition of emotions. If the same effect as expected in healthy people will appear, it is possible that there are other mechanisms of emotional concepts grounding and spontaneous imitation might not (always) be necessary.

Overall, the implementation of the proposed project will allow for a better understanding of sensorimotor simulation in the processing of emotional concepts induced by non-verbal sounds. In this project, using methods of experimental psychology and psychophysiology, we will test whether the possibility of reflecting the emotion with one’s own face disrupts the recognition of sounds expressing happiness, disgust, sadness, and fear. Electromyography will be used to measure the response of facial muscles to emotional sounds and facial activity manipulation. We will invite the sighted and congenitally blind people to participate in the experiments.

Given that the embodied simulation is considered to be a pivotal mechanism of cognition and that according to certain researchers the “embodiment” is an idea, which can unify psychology and even whole cognitive science, we may expect that the result of this project will be significant not only for cognitive psychology and social cognition but also for linguistics and computer modeling of cognitive processing. Better understanding the way human mind operate concepts will allow engineers to more effectively simulate analogical processes in artificial cognitive systems, with whom we meet in everyday life (e.g. translators).