Do we see what we expect or what we want to see? Mutual impact of expectations and endogenous attention on visual awareness.
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How do we become conscious of the surrounding world? How do our current goals and prior knowledge about the environment shape what we subjectively perceive? Perceptual information collected by our senses is fragmented, highly variable, and inherently ambiguous. However, our subjective experience of the surrounding environment is rather holistic, integrated, and filled with meaningful representations. This is possible because the processing of perceptual signals in the brain relies on active filtering and integration, and is assisted by attentional selection and predictions about upcoming contents. However, little is known about the mechanism by which attention and expectations interact, and how those two factors mutually influence subjective awareness.

In this project, I will disentangle the mechanisms of awareness, attention, and expectations, look into each of those processes separately, and inspect how they relate to each other. First, I will investigate how different aspects of attention and different ways of creating expectations influence the subjective visibility of the presented stimulus. Second, I will test to what extent attention and expectations can operate outside consciousness. Third, I will study neural activity that accompanies visual perception in different conditions in order to identify mechanisms related to attention and expectations. Finally, I will attempt to distill the pattern of neural activity associated specifically with conscious experience.

To this end, I will conduct a series of studies in which participants will be asked to rate the subjective visibility of naturalistic stimuli such as images of scenes, animals, and objects. At the same time, I will manipulate participants' attention by asking them to focus on a particular location of the screen and detect a specific category of stimuli. In each of the experiments, I will also build participants' expectations of the upcoming stimulus in one of the following ways: by increasing the frequency particular stimulus category, preceding the stimulus with a cue that indicates which stimulus will be presented, or preceding the stimulus with a photo of natural context in which stimulus often occurs. I will analyze how subjective visibility depends on what participants attend to, and what they expect. Furthermore, by recording brain activity using electroencephalography (EEG) I will reveal neural mechanisms responsible for attention, predictions, and visual awareness.

This project is among the first to investigate the relationship between expectations, attention, and awareness. The planned research will bring novel insights into the mechanisms by which attention and expectations interact together, and how they mutually shape visual perception. Importantly, proposed studies will also address the question regarding the neural underpinnings of conscious experience.