

The limits of unconscious processing. Is unconscious perceptual integration possible.

We typically think that our conscious experience faithfully represents everything that happens in our environment. Yet, multiple psychological studies have shown that we are aware only of a fraction of information reaching us, and that external stimuli processed unconsciously influence our behaviour. This raises important questions regarding the role of consciousness. What is the function of consciousness? Which mental processes can, and which cannot be performed without consciousness? Is unconscious processing fundamentally different from conscious processing?

One of the most influential hypothesis regarding the function of consciousness is that consciousness is necessary to integrate information - across space, time, and senses - to create a coherent subjective view of the world. What follows, is that such perceptual integration should not be observed without consciousness. Indeed, there are studies showing that without consciousness our brain is able to process relatively simple stimuli, but few studies investigated whether it can efficiently process and integrate complex stimuli (e.g. understand a whole sentence, recognize a face, or grasp a meaning of a visual scene).

In the proposed project we will investigate whether complex stimuli, like pictures of faces and natural scenes, can be processed and affect our behaviour when presented unconsciously. What these stimuli have in common is that the meaning of a whole is defined by multiple simpler elements and by relations among them. We will conduct a series of experiments in which pictures of faces and scenes will be presented consciously and unconsciously. To render stimuli unconscious we will use a technique known as backwards masking, in which a picture is presented on the computer screen very briefly (for 16 ms) and immediately followed by a “backward mask” – a nonsense pattern interfering with processing of a picture in the brain and consequently making it subjectively invisible. To investigate whether pictures are indeed processed outside of awareness we will use pictures known to automatically attract attention. For instance, presenting a picture of our own face attracts our attention automatically and very rapidly. The same is true for natural scenes, which are modified to comprise an incongruent (unexpected) object (i.e. an object which is very unlikely to appear in a given context). Thus, in the present project we will test whether a self-face and incongruent scenes can attract attention even when presented and processed outside of awareness. If we confirm this hypothesis, this will mean that faces and scenes can be integrated and analysed by the brain without consciousness.

Demonstrating that high-level perceptual integration can be performed unconsciously will challenge the most influential theories of consciousness, which assume that such a process is the function of consciousness. Therefore, our studies will allow more precise definition of functions of consciousness and guide our search for more accurate theories.