

Lay abstract

People with autism are commonly perceived in the light of their social and communication problems. However, research shows that autistic people differ also in terms of how they perceive the world. For example, they are better at visual search tasks and visual discrimination, they are also less susceptible to visual illusions. There are many theories aiming to explain the atypical perceptual profile in autism, but it is still unclear which theory is the one that is most consistent with the empirical data.

The aim of this project is to compare two of those theories through a series of eye-tracking experiments. An eye-tracker is a device that measures and records gaze position and movement. The first one of the two theories in question postulates that people with autism do not use their previous experience in perception to the same extent as typically developing people. According to the second theory, autistic people have an enhanced perceptual sensitivity, that is they are better at discriminating visual stimuli. I would like to find out which of these two theories better explains autistic perception. Perhaps both of them are necessary to fully understand how people with autism perceive the world?

The first series of experiments concerns an effect called visual hysteresis, i.e. the influence of what we have just seen on what we see now. Let's imagine a photograph of a cat that gradually transforms into a photograph of a dog, or vice versa. Our perception of intermediate stimuli, which look like a mix of a dog and a cat, depends on whether the sequence started with a cat or with a dog. For instance, the representation of the cat in our mind activated by an initial photograph influences the way we interpret subsequent stimuli, even if the cat is less and less visible and the dog becomes prominent. I predict that this kind of visual hysteresis will be present to a smaller extent in the perception of people with autism spectrum conditions (ASC), compared to the typically developing group (TD). But is it because previous experience has a smaller impact on their perception, or is it because they detect the emerging alternative stimulus sooner thanks to their enhanced visual sensitivity? To answer this question, I will conduct another experiment, where the object (for example, a cat) will gradually transform into noise, or vice versa. An earlier detection of the cat in a sequence starting with noise would provide support for the enhanced perceptual sensitivity theory, while an earlier switch to noise perception in a sequence starting with the cat would provide support for the weaker influence of previous experience theory.

In another series of experiments, I will study the influence of cues on perception in the ASC and TD group. 'High level' cues require a certain amount of knowledge in order to be useful. For example, if we receive information that the picture will represent 'a cat', we need to know what that word means in order to use this information. In contrast, low level cues require very little existing knowledge. For example, if the cat is always on the left side in a series of pictures, we can learn this regularity and use it to quickly find the cat in another picture, without having any other information about it.

I predict that people with autism will be able to utilise low level cues much more effectively than high level cues. More effective utilisation of low level cues would point to the enhanced perceptual sensitivity theory (better visual discrimination skills), while less effective utilisation of high level cues would point to the weaker utilisation of previous knowledge in perception.

In the last series of experiments, I will simultaneously investigate the effect of target detection and expectation on perception in the ASC and TD groups. Participants will be requested to detect a specific letter (for example, sometimes letter 'A' and sometimes 'B') among other letters. Each letter will appear either in an expected or unexpected place, with regard to where it appeared earlier. I hypothesise that people with autism will detect target letters sooner (due to enhanced perceptual sensitivity), but they will not differentiate their looking behaviour based on stimulus predictability (due to weaker use of previous experience).

To summarise, the experiments outlined above will allow me to determine which of the two prominent theories described here better explains atypical perception in autism. This is important, because studying how autistic people perceive the world may be a key to understanding and supporting them better.