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# ENHANCED PERCEPTUAL FUNCTIONING IN AUTISM

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## **W**HAT IS PERCEPTION?

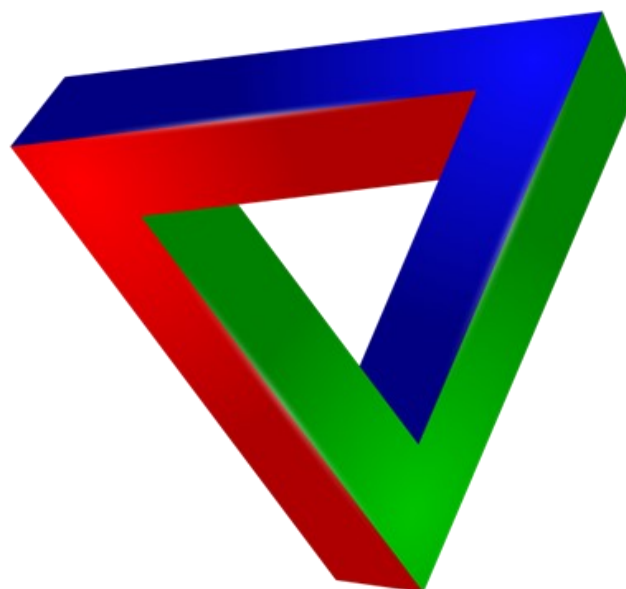
Our brain is arguably what makes us so different from other species. It allows us to read, think, plan ahead, make decisions and feel emotions. However, before doing these “higher-order” tasks it must decode signals sent by the sense organs (skin, eyes, ears, tongue, nose...). The task of receiving and decoding all these inputs is what is called “perception” and includes subtasks like stimuli selection, organisation and interpretation. Let's take vision as an example: light bounces off an object, enters the eye through the pupil, hits the retina, and activates specialized cells (cones and rods), which send chemical signals to a succession of neurons that finally relay the signal to the visual cortex. In this region, the signal is decoded and translated into an internal representation of the object. Other regions of the brain can then be

recruited to help identify and locate the object, as well as understand any possible emotional meaning linked to it.

## PERCEPTION IN AUTISM

Many studies have found that perception in autistic individuals is either equal to or even superior to perception in non-autistics. Some researchers have suggested that this superiority could explain why autistic people differ from non-autistics, and at the same time, why these individuals present with very different symptoms but still represent the same entity. Mottron, Dawson, Soulières, Hubert and Burack have thus created the “Enhanced Perceptual Functioning” (EPF) model, which outlines 8 prin-

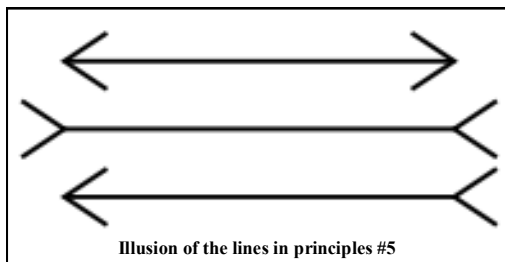
ciples (see next page). These 8 principles may be summarised in 3 overarching characteristics of autistic perception: 1) superiorities in low level tasks; 2) a greater independence from top-down processes (i.e., emotions, attention, expectations, etc.); 3) generally, a more central role in cognitive processes (e.g., intelligence and decoding of social situations).




Example of impossible figure

## ***THE 8 PRINCIPLES OF THE EPF MODEL***

- #1** Perception is oriented more towards local elements in autistic than in typical individuals. For example, autistic individuals are better at copying impossible images (see figure 1) because they are better able to concentrate on local elements without being distracted by the overall “impossible” image.
- #2** Perception in autism is superior for simple but not complex information. That is, perception of static stimuli (which are not very complex) is superior in autism, but perception of movements (which are more complex) is not superior.
- #3** Some atypical behaviours in autistics could help filter stimuli that the senses receive and then send to the brain. For example, lateral gazes (which are frequently observed in young autistics) diminish the quantity of visual details received by the eye and enhance the perception of movements.
- #4** Autistic individuals demonstrate a different pattern of brain activation in social and non-social tasks than typical individuals. For example, autistic individuals show a greater activation in visual and perceptive than frontal areas, but no differences in behavioural performances relative to typical individuals.
- #5** The influence of “top-down” processing (for example: expectations, prior knowledge and conscious reasoning) is mandatory in typical individuals, but optional in autistic individuals. For example, an optical illusion happens when the brain builds an internal image that is different from reality because of an interference with how visual information is integrated (which uses top-down influences). In an experiment, autistic individuals were as sensitive to an illusion when they were asked “which line LOOKS longer” (which is influenced by higher-order psychological factors), but were more likely than non-autistics to give the correct answer when they were asked “which line IS longer” (which is a factual question less influenced by higher-order processes). This demonstrates that autistic individuals are able to ignore the distorting effect of higher-order processes in certain circumstances, contrary to non-autistics.
- #6** The superiority of autistic perception relates to some of the special abilities seen in Savant Syndrome. A special ability in an autistic individual can emerge from a preference for certain perceptual stimuli. For example, an early interest in numbers and letters can lead to a special ability in calendar computation later in life. Stephen Wiltshire, an artist and autistic individual without intellectual disability, is an example of someone with incredible abilities: he can draw exquisitely precise city landscapes (e.g., Rome, London, New York City, Tokyo...) from memory after flying over in helicopter only once!
- #7** Savant Syndrome could be a model to further classify the autism spectrum, especially in the absence of clear genetic subtypes. Indeed, differences in autism symptomatology could be due to an early overspecialization of perception, which would later transform into special abilities (peak in language ability, peak in visuo-spatial abilities, specific interests, etc.). This specialization could happen at the expense of other important functions. For example, autistic individuals who present with early language abilities (i.e. with Asperger’s syndrome) do not exhibit strengths in visuo-spatial tasks and, conversely, those with an early peak in visuo-spatial tasks tend to do poorly in language.
- #8** Enhanced perceptual functioning explains the 7 aforementioned principles of autistic perception.



fundamentally flawed. On the contrary, it makes the assumption that it is superior to the non-autistic brain in terms of perception. This implies that interventions should focus not on repairing something broken, nor on alleviating fundamental flaws. Instead, they should target the specific strengths of an individual and use them to improve upon weaknesses in less functional domains. Eventually, these kinds of interventions could complement current interventions, which are far from perfect. 

**Original study:** Mottron, L., Dawson, M., Soulières, I., Hubert, B., & Burack, J. (2006). Enhanced Perceptual Functioning in Autism: An Update, and Eight Principles of Autistic Perception. *Journal of Autism and Developmental Disorders*, 36(1), 27–43. doi: 10.1007/s10803-005-0040-7

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## WHY IS IT IMPORTANT?

The EPF model is able to explain why symptoms that are vastly different (for example, calendar computation and communication difficulties) could result from a single process: specialization in one domain but not in others due to inborn differences in the perceptual process. Another important contribution is that the EPF model does not imply that the autistic brain is

# THE RAVEN’S GENIUS

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*“Autistic intelligence is underestimated by conventional IQ tests”.*

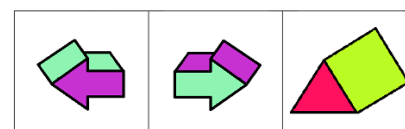
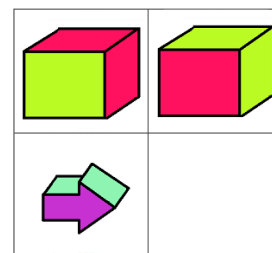
This has been observed in a study conducted by the Montreal Cognitive Neuroscience Autism Research Group.

The idea that cognitive functioning is impaired in autism is largely assumed among the general and scientific communities. Even if some autistics present with strong or savant skills, abnormal neural functioning has been the leading argument to account for these exceptional abilities rather than being considered a true form

of intelligence. To improve our understanding of the level and nature of autistic intelligence, a group of researchers has empirically explored these pervasive beliefs.

## INTELLECTUAL PROFILE IN AUTISM

Wechsler intelligence scales are commonly used to assess cognitive potential in clinical and scientific practice. These scales comprise approximately ten verbal and nonverbal subtests soliciting verbal comprehension, perceptual reasoning, working memory and processing speed



skills. Prominent peaks and troughs are commonly observed among autistics on this standard IQ test.

For example, selective impairments are often found in autistics on one of the verbal subtests, Comprehension. In contrast, they typically demonstrate marked strengths on perceptual reasoning subtests (e.g., Block Design). This spiky IQ profile in autism