DOCUMENT SUMMARY

This document is a foundational scientific paper by Mottron et al. (2006) that proposes and updates the "**Enhanced Perceptual Functioning (EPF)**" model for understanding autism. As an alternative to the **Weak Central Coherence (WCC)** theory, the EPF model posits that autistic perception is not deficient but is characterized by a superior and more prominent role in cognition. The paper outlines eight principles of autistic perception, including a default local orientation, superior performance in low-level discrimination tasks, and an atypical reliance on posterior brain regions. It argues that this perceptual style can explain both the challenges and the unique strengths, including savant abilities, seen in the autistic population.

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METADATA

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- **Related Docs**: This paper provides a theoretical framework for the cognitive strengths and assessment approaches discussed in "Neurodivergent Cognitive Strengths and Dimensional Assessment" and "The Neuroscience of Autism."

FORMATTED CONTENT

Enhanced Perceptual Functioning in Autism: An Update, and Eight Principles of Autistic Perception

Laurent Mottron, Michelle Dawson, Isabelle Soulières, Benedicte Hubert, and Jake Burack

We propose an **"Enhanced Perceptual Functioning"** model encompassing the main differences between autistic and non-autistic social and non-social perceptual processing: locally oriented visual and auditory perception, enhanced low-level discrimination, use of a more posterior network in "complex" visual tasks, enhanced perception of first order static stimuli, diminished perception of complex movement, autonomy of low-level information processing toward higher-order operations, and differential relation between perception and general intelligence.

INTRODUCTION

The aim of this paper is to update the **Enhanced Perceptual Functioning (EPF)** model originally proposed (Mottron & Burack, 2001) as a framework within which the perceptual characteristics of autistic persons could be understood. This model was proposed in alternative to the prevailing model of perceptual functioning in autism at the time, the **Weak Central Coherence model (WCC)**.

According to the **EPF** model, superiority of perceptual flow of information in comparison to higher-order operations led to an atypical relationship between high and low order cognitive processes in autism, by making perceptual processes more difficult to control and more disruptive to the development of other behaviors and abilities.

Our contribution was to emphasize that perception was not intact, in the sense of "similar to that of non-autistics", but superior to that of non-autistics in absolute performance and relative involvement in laboratory and ecological settings.

The Updated EPF Model: Eight Principles of Autistic Perception

Principle 1: The Default Setting of Autistic Perception is more Locally Oriented than that of Non-autistics

Autistics display a constant pattern of enhanced performance in tasks like the **block design (BD)** task and the **Embedded Figures Task (EFT)**. When the processing of a global aspect conflicts with a local analysis among typically developing persons, autistics perform at a level superior to their comparison groups.

In sum, these findings... appear surprisingly consistent... The default setting of the autistic perceptual system toward local information contrasts with typical hierarchical processing that combines "**global advantage**", the superior relative speed and accuracy of global target detection, with "**global interference**", the asymmetric influence of global processing on the detection of the local stimuli.

Principle 2: Increased Gradient of Neural Complexity is Inversely Related to Level of Performance in Low-Level Perceptual Tasks

This pattern of findings displays a striking contrast with the evidence of superior performance by autistic persons on static, "simple" discrimination tasks. For example, Plaisted et al. (1998a) demonstrated enhanced discrimination of novel, highly similar stimuli. Bertone et al. (2005) studied orientation-identification thresholds and found that high-functioning autistics (HFA) were better able to identify the orientation of simple, first-order gratings, but less able to identify the orientation of complex, second-order gratings. This pattern is also seen in the auditory modality, with enhanced discrimination of pure tones.

This aligns with the **underconnectivity hypothesis (UCH)**, which suggests that long-range neural connections required for higher-level processes may be impaired in autism, while short-range, intraregional connections within low-level perceptual areas may be preserved or even superior (**local overconnectivity**).

Principle 3: Early Atypical Behaviors have a Regulatory Function Toward Perceptual Input

Atypical visual exploratory behaviors for inanimate objects date to the first description of autism. We found that the most frequent atypical visual behaviors among 15 autistic toddlers were **lateral glances**, mostly oriented toward moving stimuli. Detail perception being enhanced (principle 1) and movement perception being diminished (principle 2) in autistic adults, we interpreted the high prevalence of lateral glances among autistic toddlers as an early attempt to limit otherwise excessive amounts of information and/or to focus on optimal information for a given task.

Principle 4: Perceptual Primary and Associative Brain Regions are Atypically Activated During Social and Non-Social Tasks

Findings from functional imaging studies consistently indicate that, despite typical levels of performance, autistics display an enhanced activation of visuo-perceptual regions (occipital or occipito-temporal) in association with a diminished activation in regions that are devoted to “higher order" (frontal) or "socially relevant" (e.g.: **fusiform face area or FFA**) tasks among non-autistics. This pattern is observed in both perceptual and non-perceptual tasks and for both social and non-social stimuli.

Principle 5: Higher-order Processing is Optional in Autism and Mandatory in Non-Autistics

The versatility of the influence that high level perception exercises on low-level perception in autism contrasts with the mandatory laws of global precedence, gestalt laws, or categorization effects observed among typical individuals. Autistics have access to physically accurate or psychologically distorted representations dependent upon the cue in the question. This indicates that autistics had a superior access to the “perceptual reality” of stimuli, without being influenced by their previous knowledge.

Principle 6: Perceptual Expertise Underlies Savant Syndrome

A remarkable aspect of “**savant**” performances is that domains of information (e.g., calendar) and types of cognitive operations performed on this material (e.g., list memory) are restricted, and highly similar among observers. We hypothesize that the development of savant ability requires five distinct components, including an encounter with a perceptually defined class of units, a brain-behavior cycle, expertise effects, implicit learning, and generalization to new material.

> According to the autistic member of our team, M. Dawson, "We do what we can with what's around."

The encounter of a phenomenal regularity forms the "perceptual root" of the savant ability. This would be responsible for the apparent "material specificity" of autistic peaks of ability.

Principle 7: Savant Syndrome is an Autistic Model for Subtyping PDDs

The heterogeneity of the autistic phenotype at older ages would result from an overspecialization to a certain perceptual material inherent to the developmental course of autism. Autistic subtypes with and without a visuo-spatial peak, autism with or without overt speech, and even the **autism vs. Asperger** distinction may be at least partially produced by differences in objects of expertise, in opportunity or lack thereof to enact perceptual specialization and expertise.

Principle 8: Enhanced Functioning of Primary Perceptual Brain Regions may Account for Autistic Perceptual Atypicalities

The organization of visual cortex suggests that the characteristics that differentiate autistic from non-autistic perception plausibly correspond to an overall superior functioning, involvement, and autonomy of posterior regions of the perceptual visual cortex. Locally oriented processing (Pr. 1), superior involvement of posterior regions in multiple tasks (Pr. 4), and enhanced autonomy toward higher-order influences (Pr. 5), would therefore correspond to a skewing of the “hierarchical axis" toward more posterior regions.

CONCLUSION

Five years of research have strengthened the notion, stated in the original **EPF** model, that perception plays a different and superior role in autistic cognition. Recent studies in the visual and auditory modalities indicate a skewing of brain activation toward primary and early associative areas in autistics in most tasks involving higher-order or socially relevant information in non-autistics.

> Therefore, it becomes increasingly difficult for "social-first" models to explain why most of the cognitive operations performed by autistics differ from their equivalent in non-autistics.

A new version of the **EPF** re-asserts, with a larger empirical basis, the principle of locally oriented and enhanced perceptual functioning. We propose to attribute both the choice of domain of special ability and some aspects of the phenotypic variability characterizing autistic subtypes to a brain-behavior cycle rooted in perceptual expertise effects.