Orientation threshold profiles identify distinct subgroups within autism spectrum disorder

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Introduction

Changes in diagnostic criteria for Autism Spectrum Disorder (ASD) in the latest Diagnostic and Statistical Manual for Mental Health (DSM-V) combined previously distinct disorders (e.g. Asperger’s Syndrome, Autistic Disorder) into one (Autism Spectrum Disorder)

However, there is consensus that this is a very heterogeneous group — just no scientific evidence to base categories on. Subgroups would help to develop treatments and intervention specificity.

Vision is one sensory area displaying heterogeneity amongst individuals with ASD³

It has been previously shown that some individuals with ASD may outperform controls with detailed orientated visual tasks.

Main Goal: to determine if visual processing can be used to characterize subgroups

Methods

Participants: N=26 (7 female) individuals with ASD, N=19 (6 female) controls. Ages 16-38 with full IQ >75. All received a complete eye exam by a qualified optometrist to confirm 20/20 or corrected to 20/20 visual acuity and to check for refractive errors such as astigmatism.

Administered a psychophysical task aimed at measuring orientation discrimination across a range of base orientations between 150 and 157.5 degrees.

Thresholds estimated in a staircase protocol to determine each individual’s minimum amount of angle required to complete the task at 82% accuracy.

Neuropsychological and clinical evaluations to reconfirm diagnosis and characterize social competence, along with full scale IQ

Orientation Discrimination

Orientation threshold profiles for eight possible reference angles were plotted on the x-axis. One ASD group had comparable response patterns (oblique effect) to controls. A different cluster of ASD participants have impaired discrimination of orientations and are completely lacking the typical curve, indicating arrested early visual development.

Classification Results

Orientation Discrimination: (Graph showing orientation threshold profiles across different groups)

Classifiers for WASI-II & Gender:

WASI-II

Predictor

Corrected R²

Gender

C

0.43

MR

−0.02

BD

−0.09

W/ Gender

0.17

W/o Gender

0.15

WASIQ

Specificity

Sensitivity

Conclusions

Orientation discrimination task reveals arrested early visual development in a subgroup with ASD.

Multivariate pattern classification analysis indicates this subgroup can be classified with high accuracy based on:

(1) gender and block-design WASI-II measure OR
(2) matrix-reasoning WASI-II measure

ADOS, AQ, and MSCS do not predict the subgroups.

Taken together, the visual performance and classification results suggest the presence of two etiological subgroups within ASD.

Multidimensional Social Competence Scale (MSCS)

-Assessing empathy, deficits in theory of mind, and social knowledge

References


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