Evaluating eye gaze perception deficits in autism spectrum disorder using a computational modeling approach

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The broad ability to perceive, interpret, and understand information about people
Individuals on the autism spectrum struggle to interpret eye gaze

Atypical in Autism

- → Emotion
- → Intention
- → Communication

Chevallier et al., 2012; Jones & Klin, 2013; Riby et al., 2008; Frischen et al., 2007; Nation & Penny, 2008
People with autism look less at faces

Frazier et al., 2017; Chita-Tegmark, 2016; Chawarska et al., 2003; Guillon et al., 2014; Klin et al., 2002
Reduced looking at faces does not predict difficulty interpreting social cues.

Griffin & Scherf, 2020; Riby et al., 2009
Shifting from where autistic adolescents look to **how** they look
Primary Research Aims

Aim 1
1. Atypical visual processing strategies?
2. Influence behavior?

Aim 2
1. Plasticity of visual processing strategies?
2. Influence behavior?
Eye Gaze Perception Task

Participants:
41 ASD adolescents
49 TD adolescents

Data collected:
Eye-tracking
Behavioral accuracy

Penn State | Graduate Exhibition March 2022
Eye movements are characterized by sequential fixations connected by saccades.

Noton & Stark, 1979
Modeling Approach

Discover similar eye movement patterns through clustering

Chuk et al., 2014; Hsiao et al., 2021
## Results

The two representative models reflected a **focused** and **explorative** eye movement patterns.

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<th>Focused</th>
<th></th>
<th>Explorative</th>
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<tr>
<td></td>
<td>prior</td>
<td>to 1</td>
<td>to 2</td>
</tr>
<tr>
<td></td>
<td>.74</td>
<td>.52</td>
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Results

Autistic adolescents tend to have a more explorative eye movement pattern.
Computer game intervention

Evaluating psychosocial intervention at altering visual processing strategy in autism
Aim 2: Evaluating plasticity of visual processing strategy
Results

Treatment group’s visual processing strategy became more focused across time.
Results

Change from explorative to more focused visual processing strategies associated with behavioral improvement.
Autistic adolescents may use different visual processing strategies during eye gaze perception.

Visual processing strategies can be altered by intervention, which generally is associated with behavioral improvements.

This eye movement measure could be used as a potential biomarker.
# Acknowledgements

**Investigators**

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