Pupillary Light Reflex and Social-Communicative Behavior in Infants With and Without Family History of Autism

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BACKGROUND

- Autism spectrum disorder (ASD) is a neurodevelopmental disorder that affects social behavior and other developmental aspects at a wide range; these behaviors are usually identified around 3 to 4 years old (e.g., Lai, Lombardo, & Baron-Cohen, 2014).
- Researchers have uncovered physiological differences in pupil responses between those with ASD and those of typical development.
  - Children with ASD demonstrated larger baseline pupil size than mental and chronological age matched groups when viewing face and non-face stimuli (Anderson & Colombo, 2009).
  - Children with ASD have an atypical pupillary light reflex (PLR), with longer latencies, lower constriction velocities, and smaller constriction than neurotypical children (e.g., Fan et al., 2009).
- Retrospective studies that looked for early markers of ASD in infancy found that infants with a later ASD diagnosis displayed less social attention, less joint attention, more autistic behaviors, and they didn’t look at other people’s faces as much as neurotypical children did at 1 year old (e.g., Osterling & Dawson, 1994).
- Recent work looking prospectively at infants whose older siblings had ASD (a group with a higher risk of developing ASD) has identified pupil responses as early markers of developmental difficulties.
  - Greater arousal (i.e. larger pupil response) to emotional faces in high-risk infants at 9 months predicted worse social functioning at 18 months (Wagner et al., 2016).
  - High-risk infants demonstrated hypersensitive PLR at 10 months (larger constriction, faster latency; Nyström et al., 2015), and the magnitude of this response was predictive of later ASD outcome and symptom severity at 3 years old (Nyström et al., 2018).

The current study will extend this research using a sample of infants with and without an older sibling with ASD; we will examine differences in PLR across age and between risk groups, as well as concurrent associations between PLR and cognitive ability, autistic traits, and social-communication.

METHOD

Participants

- Infants between 6 and 18 months old with and without an older sibling with ASD.

Procedure

- Infants were seated on their care-giver’s lap in front of an eye tracking monitor in a dark room and a calibration procedure took place to ensure proper positioning.

Procedure, continued

- Based on Nyström et al. (2015), infants saw 9 PLR trials.
  - Trials included 6-second videos that began with a black screen with a central fixation point shown for 1.5 to 2.5 seconds (varying to prevent anticipation), followed by a white screen that flashed for 120ms, followed by another black screen for 3.5 to 4.5 seconds (see Figure 1).
  - Interstimulus intervals included short videos of a moving shape.
- After testing, infants completed the Autism Observation Scale for Infants (AOSI; Bryson et al., 2008) to assess autistic traits and the Mullen Scales of Early Learning (MSEL; Mullen, 1995) to measure cognitive ability.
- Parents also completed the Communication and Symbolic Behavior Scales Developmental Profile (CSBS-DP; Wetherby et al., 2002) to measure social communication.

Figure 1. Sample stimulus presentation (adapted from Nyström et al., 2015)

Data Analysis

- PLR: Based on the data processing used in Nyström et al. (2015), we will use custom scripts to extract pupil dilation times per trial.
  - Relative pupil constriction will be calculated from baseline pupil diameter and minimum diameter post stimulus onset, reflecting PLR.
- AOSI: Total score will be calculated, with higher scores reflecting more autistic traits.
- MSEL: Early Learning Composite (ELC) will be calculated from the fine motor, visual reception, receptive language, and expressive language domains of the MSEL to assess cognitive ability.
- CSBS-DP: Total score will be calculated, with higher scores relating to better social communication.

REFERENCES


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