

# Attentional Behaviors During Social Interaction in Children with Autism

Urvi Sakhuja and Hanako Yoshida, Ph.D Department of Psychology

## Background

Autism Spectrum Disorder (ASD) is characterized by “disturbances in social interaction and communication.”<sup>[1]</sup> Attention development differs between typically developing (TD) children and children with ASD, yet actual gaze behaviors have not been systematically explored. The present study aims to document the potential impact on looking behaviors by directly measuring children’s moment-to-moment gaze with a head-mounted eye tracker during a parent-child naturalistic object play session.

### Variables

- Saccades (rapid eye movement): <200 milliseconds (ms)<sup>[2]</sup> in duration, representative of hyperactive and impulsive behavior<sup>[3]</sup>
- Fixation: 200-2000 ms
- Sustained attention (SA): >2000 ms<sup>[4]</sup>
- Social stimulus: face (split into upper and lower regions), parent hands
- Nonsocial stimulus: objects, toys, background objects/scenery

### Impact of ASD on looking behaviors

Prior literature has observed group differences between the looking behaviors of ASD and TD children; however, results are inconsistent and there have been no simple, concrete definitions of the duration variables. Studying the duration (saccades, fixation, SA) and the target of gaze (social and nonsocial) will give us insight into the social and cognitive development of these groups, and how they process the environment.

## Methods

### Participants

- 15 ASD children, ages 3-9, mean age: 68.9 months, 12 male, 3 female
- 15 TD children, ages 3-9, mean age: 55.2 months, 7 male, 8 female



Figure 1

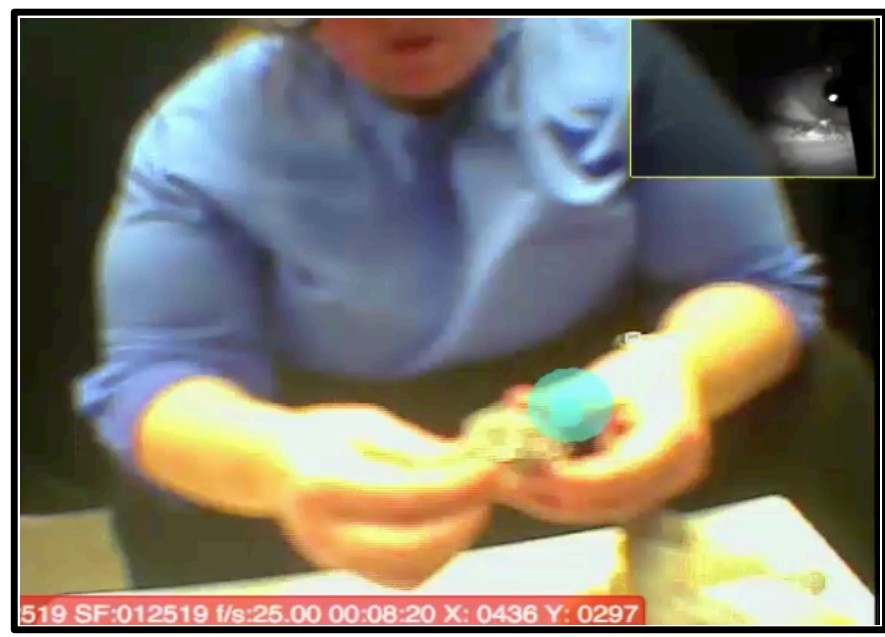


Figure 2

### Procedure

Each participant engages in a 5-10-minute naturalistic parent-child play session in which the child and parent interact with 8-16 toys (**Figure 1 for sample set**) while wearing an eye tracking device (**Figure 2**). Looking behavior data will be manually coded for the target and duration of gaze according to the variables listed.

## Acknowledgements

We would like to thank the members of the Cognitive Development Lab for research support, the parents and children for participating in the project, and the Office of Undergraduate Research for providing us with this opportunity and funding.

## Research Questions

- How does ASD influence early looking behaviors in a naturalistic interactive context?
  - Are there group differences in saccades, fixation and SA?
- Is there a significant group difference in regards to nonsocial stimuli, such as toys, and social stimuli, such as faces?
  - How do saccades, fixation, and SA reflect preferences to social and non-social stimuli?

## Expected Results

- We expect to observe significant group differences in their play experiences: children with Autism will be shown to have less SA and more looking behaviors indicative of hyperactivity and impulsiveness during object exploration<sup>[3]</sup> (**Figure 3**).
- We expect to see that the ASD group will spend equal time looking at social (e.g., face, hands) or nonsocial items (e.g., table, object), whereas the TD group will spend more time looking at social items (**Figure 4**). More specific to the elements of social items, we expect to see that the ASD group will spend more time looking at the body and less time looking at the mouth and eyes<sup>[5]</sup>.
- In the ASD group, we expect to see a greater duration of saccades when gaze is directed at social stimuli.

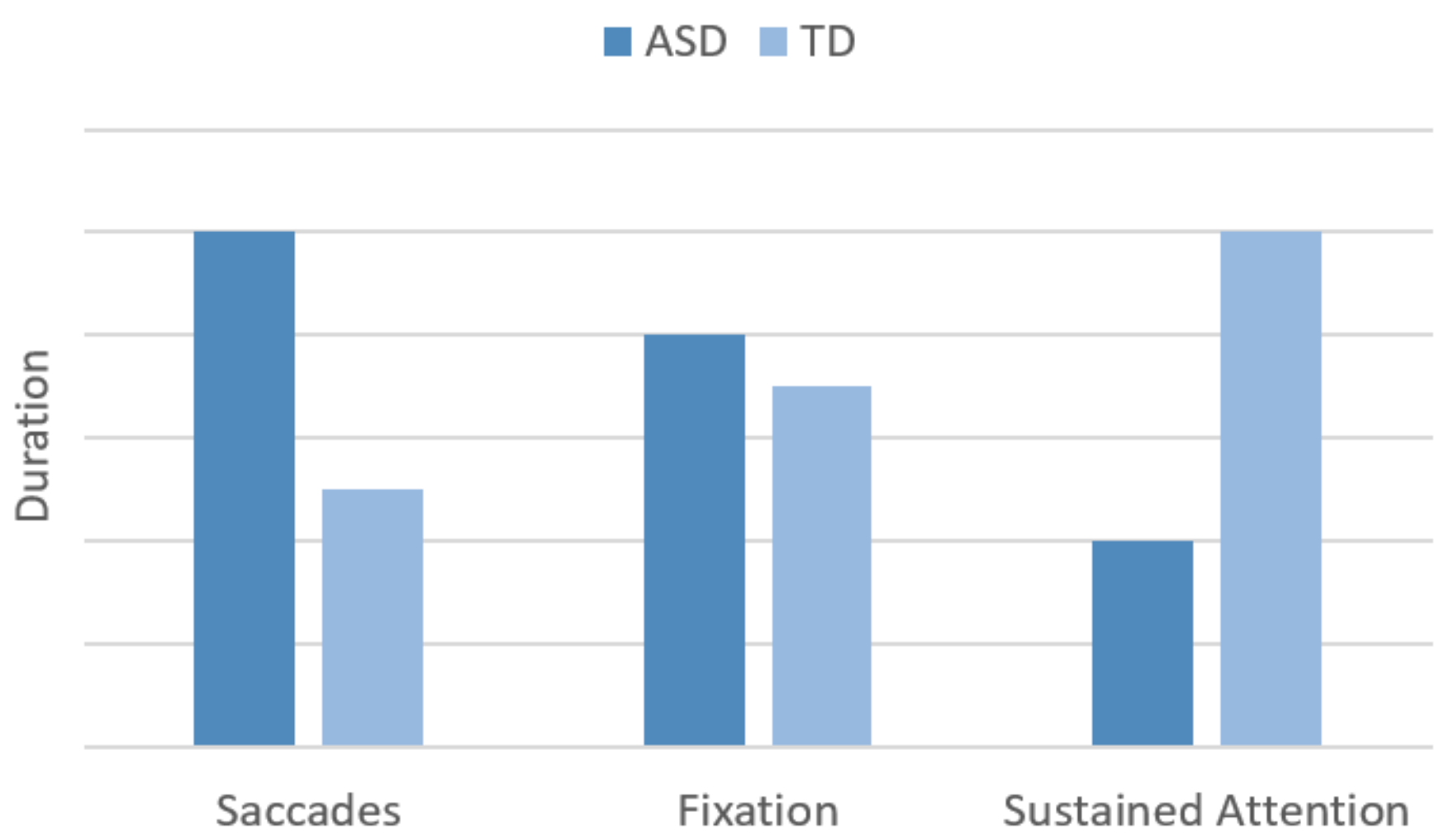


Figure 3

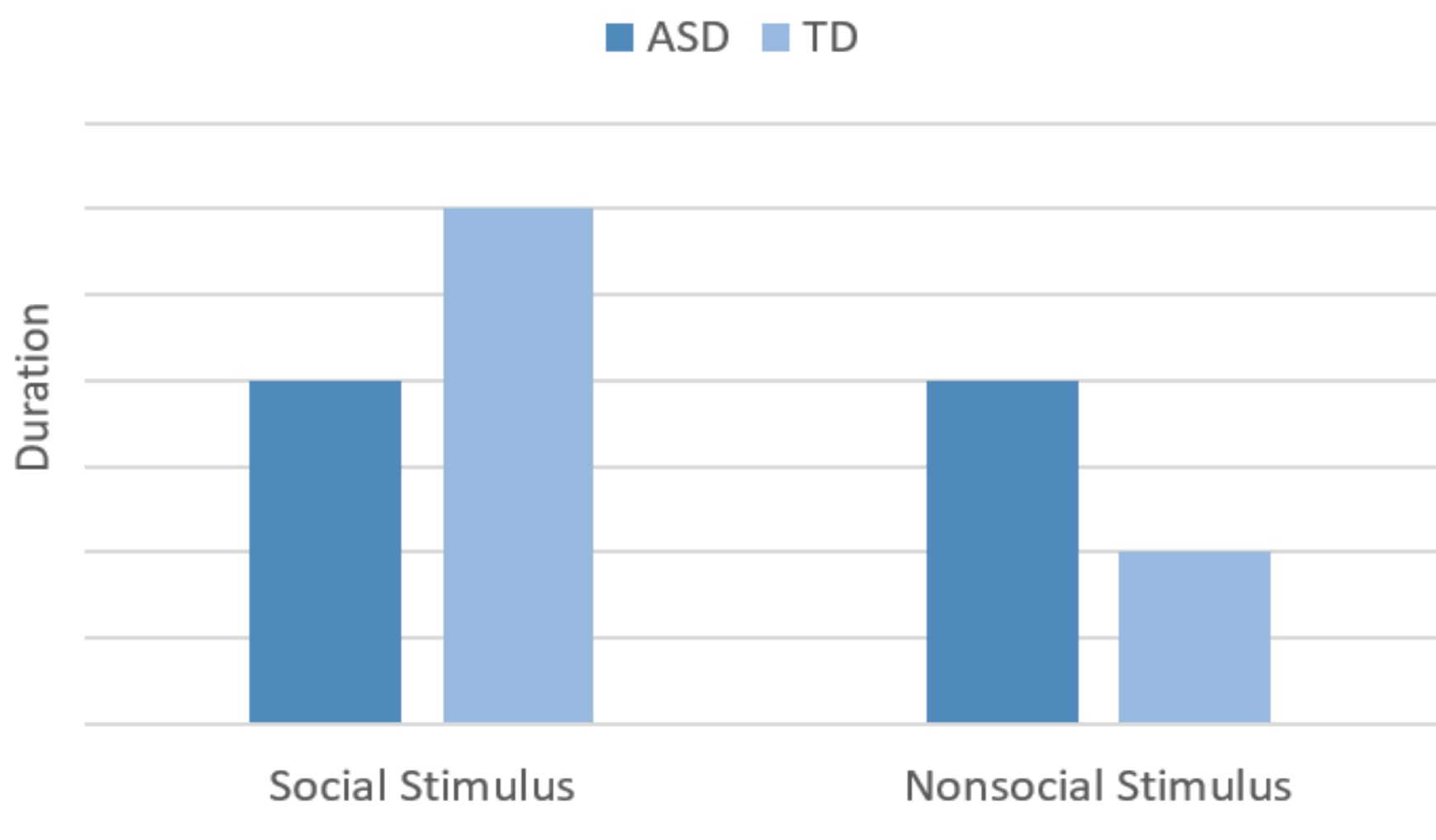


Figure 4

## Conclusion and Implications

The objective of this study is to 1) simplify and streamline the way saccades, fixation, and SA have been defined, 2) compare these behaviors in TD versus ASD children, and 3) determine if there are differences in the focus and type of gaze behaviors directed towards social vs. nonsocial stimuli. In answering these questions, proper measures can be taken to optimize the child’s learning, development, and attention in schools and at home.

If the expected results hold true, it may be assumed that compared to TD children, children with ASD...

- Are more hyperactive in exploring their environment because saccades are the most prevalent gaze behavior
- Struggle with focusing on a single object or task because SA is the least prevalent gaze behavior
- Have potentially reduced depth of processing, understanding, or learning because they do not distinguish between different kinds of stimuli, or because they do not spend sufficient time looking at a stimulus

## References

- <sup>[1]</sup> Johnson, B. P. et al (2012). A closer look at visually guided saccades in autism and Asperger’s disorder.
- <sup>[2]</sup> Fischer, B. et al (1983). Saccadic eye movements after extremely short reaction times in the monkey.
- <sup>[3]</sup> Chien, Y. et al (2014). Impaired sustained attention, focused attention, and vigilance in youths with autistic disorder and Asperger’s disorder.
- <sup>[4]</sup> Mosconi, M. W. et al (2013). Saccade Adaptation Abnormalities Implicate Dysfunction of Cerebellar-Dependent Learning Mechanisms in Autism Spectrum Disorders (ASD).
- <sup>[5]</sup> Chita-Tegmark, M. (2016). Social attention in ASD: A review and meta-analysis of eye-tracking studies.

## Contact Information

Email:  
urvi.sakhuja.uh@gmail.com  
Phone number:  
713-550-4440