

Presenter Disclosures

Glen T. Steele, O.D. FCOVD FAAO

- (1) The following personal financial relationships with commercial interests relevant to this presentation existed during the past 12 months:

No Relationships to Disclose

The Vision Assessment An Early Peek Into Autism

Glen T. Steele, OD, FCOVD FAAO
Professor of Pediatric Optometry
Southern College of Optometry

Optometric Publications

- ▶ Appreciable numbers of infants exhibit visual problems that escape detection
- ▶ Press LJ. InfantSEE as a portal to early intervention for autism spectrum disorders. *Optometry* 2008;79:627-630.
- ▶ The absence of eye contact, unresponsiveness to facial gestures, and/or difficulty in sharing joint visual attention are signs of abnormal or atypical visual development
- ▶ Press LJ, Richman J. The role of the optometrist in early detection of autism spectrum disorders. *Optom Vis Devel* 2009;40(3):141-149.

Looking to the Eyes

- ▶ Looking at the eyes of others is important in early social development and in social adaptation throughout one's life span.
- ▶ Our results indicate that in 2-year-old children with autism, this behavior is **already derailed**, suggesting critical consequences for development but also offering a potential biomarker for quantifying syndrome manifestation at this early age.
- ▶ Absence of preferential looking to the eyes of approaching adults predicts level of social disability in 2-year-old toddlers with autism spectrum disorder. Jones W, Carr K, Klin A. Yale Child Study Center, Yale University School of Medicine, Arch Gen Psychiatry. 2008 Aug;65(8):946-54.

Psychiatric Articles

- ▶ Autism is a common developmental disorder.
- ▶ Once children could be diagnosed only after the age of 3.
- ▶ New research suggests the disorder can be recognized as early as 14 months.
- ▶ Early diagnosis allows treatment as soon as possible, when it is most effective.
- ▶ The American Academy of Pediatrics recommends all children under 2 be screened for autism.

- ▶ Sources: *Archives of General Psychiatry* 64 (2007): 853-64; *AAP, Pediatrics*, published online October 29, 2007, doi:10.1542/peds.2007-2361.

Making eye contact is a baby's first amazing skill

- ▶ Just minutes old, the baby finds his mother's face and looks into her eyes—and looks, and looks, and looks. Newborns' instant ability to make steady, extended eye contact is their first, most powerful effort to communicate with other humans.

Making eye contact is a baby's first amazing skill

- ▶ Two experiments to demonstrate how skilled babies are at making eye contact.
 - In the first – paired photographs of faces were shown to infants between 2 and 5 days old. In one photograph, the eyes were averted. In the other, the eyes looked directly forward. ... babies looked longer at the faces in which the eyes were forward – those with which they could make eye contact.
 - In the second, four month old babies showed increased brain activity when looking at photographs of faces with a direct gaze.

Autism Warning Signs – BabyTalk

- ▶ By 2 to 3 months, your baby isn't making frequent eye contact.
- ▶ By 3 months, he isn't smiling at you and the sound of your voice.
- ▶ By 6 months, he doesn't laugh or make other joyful expressions.
- ▶ Around 8 months, he isn't following your gaze when you look away from him towards something else.
- ▶ By 9 months, he hasn't begun to babble.
- ▶ By 1 year, he isn't consistently turning to you when you call his name
- ▶ By 1 year, he shows a general disregard for vocalizations (ie, lack of response to his name), but has a keen awareness of environmental sounds.
- ▶ By 1 year, he isn't engaging in back-and-forth vocalizations with you.
- ▶ By 1 year, he hasn't begun to wave bye-bye.
- ▶ By 1 year, he isn't "following a point" (looking towards something you point at).

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Early Indicators of Risk related to Vision

- ▶ Pupillary Reflex
- ▶ Blink Reflex
- ▶ Gaze Following
- ▶ Oculomotor Function
- ▶ Choice of fixation object
- ▶ These are all tests optometrists do every day in practice

Pupil Response

Pupil Size

- ▶ Seeing what babies are interested in can give clues to what they're able to recognize -- different shapes or sounds, for example. A researcher might show a child two images side by side and see which one they look at for longer. Measuring the size of a baby's pupils could do the same without needing a comparison.

• Perspectives on Psychological Science - Jan 2012

- ▶ Abstract: ... We found that participants with ASDs showed significantly longer PLR latency, smaller constriction amplitude and lower constriction velocity than children with typical development.

• Abnormal Transient Pupillary Light Reflex In Individuals with Autism Spectrum Disorders Xiaofei Fan, Judith H. Miles, Nicole Takahashi, Gang Yao, J. Autism Dev Disord (2009) 39:1499-1508

Blink Reflex

- ▶ Moreover, typical toddlers inhibited their blinking earlier than toddlers with ASD, indicating active anticipation of the unfolding of those events. These findings indicate that measures of blink inhibition are useful quantifiers of atypical processing of social affective signals in toddlers with ASD.

• **Inhibition of eye blinking reveals subjective perceptions of stimulus salience** Sarah Shultz, Ami Klin, and Warren Jones. Edited by Riitta Hari. Aalto University School of Science and Technology, Espoo, Finland, and approved November 1, 2011 www.pnas.org/cgi/doi/10.1073/pnas.1109304108



Atypical Response to Direct Gaze

- ▶ **Conclusion:** This study suggests that a broader autism phenotype, which includes an atypical response to direct gaze, is manifest early in infancy.

• **Neural Correlates of Eye Gaze Processing in the Infant Broader Autism Phenotype** Mayada Elshabbagh, Agnes Volein, Gergely Csibra, Karla Holmboe, Holly Carwood, Leslie Tucker, Sanya Krijes, Simon Baron-Cohen, Patrick Bolton, Tony Charman, Gillian Baird, and Mark H. Johnson *BIOL PSYCHIATRY* 2009;65:31-38

Gaze Development



Gaze Behavior

- ▶ These findings suggest that although gaze behavior at 6 months may not provide early markers for autism as initially conceived, gaze to the mouth in particular may be useful in predicting individual differences in language development.

• **Gaze behavior and affect at 6 months: predicting clinical outcomes and language development in typically developing infants and infants at risk for autism** Gregory S. Young, Noah Merin, Sally J. Rogers and Sally Ozonoff *Developmental Science* 12:5 (2009), pp 798-814



Gaze Behavior

- ▶ Eye contact is crucial in achieving social communication. Deviant patterns of eye contact behavior are found in individuals with autism, who suffer from severe social and communicative deficits. ...
- ▶ This suggests that whereas typically developing children have the ability to detect direct gaze, children with autism do not. This might result in altered eye-contact behavior, which hampers subsequent development of social and communicative skills.

• **Eye contact does not facilitate detection in children with autism** Atsushi Senju,*, Kiyoshi Yaguchi, Yoshikuni Tojoc, Toshikazu Hasegawa *Cognition* 89 (2003) B43-B51



Gaze Following

- ▶ Active gaze following by 12 months
 - 335 words known by 18 months
- ▶ Babies without Active gaze following or other patterns
 - 195 words known by 18 months

• **The development of gaze following and its relation to language** *Developmental Science* 8:6 (2005), pp 535-543

Self-directed Gaze

- ▶ Conclusions:
 - ▶ Low-risk group were more likely to have normal social gazing
 - ▶ Infrequent self-initiated socially directed gaze may be an early marker of later social and communication delays

• **Social and non-social visual attention patterns and associative learning in Infants at risk for autism** - A.N. Bhat, J.C. Galloway, and R.J. Landa *Journal of Child Psychology and Psychiatry* (2010)

Oculomotor Function

Eye Movements

- ▶ Oculomotor abnormalities may play a role as a sensorimotor defect at the root of impairments in later developing functional systems, ultimately resulting in socio-communicative deficits.

Eye Movement and Abnormalities in Autism Laurie A. Brenner, Katherine C. Turner, Axel Müller *J Autism Dev Disord* (2007) 37:1289-1309

- ▶ Most authorities now believe that subtle signs of ASD are present under 12 months of age, and eye tracking technology has been used experimentally to detect gaze patterns at progressively younger ages

• Pelphrey KA, Sasson NJ, Reznick JS, et al. Visual scanning of faces in autism. *J Autism Dev Disord.* 2002;32:249-261

Eye Tracking

- ▶ This study used eye-tracking to examine how 20-month-old toddlers ...monitored the activities occurring in a context of an adult-child play interaction.
- ▶ Toddlers with ASD, in comparison to control groups, showed less attention to the activities of others and focused more on background objects (e.g., toys).

Eye Tracking

- ▶ In addition, while all groups spent the same time overall looking at people, toddlers with ASD looked less at people's heads and more at their bodies.
- ▶ In ASD, these patterns were associated with cognitive deficits and greater autism severity.
- ▶ These results suggest that the monitoring of the social activities of others is disrupted early in the developmental progression of autism, limiting future avenues for observational learning.

• **Limited activity monitoring in toddlers with autism spectrum disorder**, Shic F, Bradshaw J, Klin A, Scassellati B, Chawarska K. *Brain Res.* 2011 Mar 22;1380:246-54. Epub 2010 Dec 1.

Fixation

Fixation on Faces

- ▶ Fixation times on mouths and objects but not on eyes are strong predictors of degree of social competence.

Visual Fixation Patterns During Viewing of Naturalistic Social Situations as Predictors of Social Competence in Individuals With Autism [Amit Klin, PhD](#), [Warren Jones, BA](#), [Robert Schultz, PhD](#), [Fred Volkmar, MD](#), [Donald Cohen, MD](#) *Arch Gen Psychiatry*. 2002;59:809-816.

- ▶however, the team found that when the babies were not being engaged, those in the high risk group spent far more time gazing at the toy than the caregiver.

• Where an infant fixes their gaze could be an early indicator of autism - Kennedy Krieger Institute 2010

Disengagement from Faces

- ▶ Developmentally delayed and typically developing toddlers had more difficulties disengaging visual attention from faces than toddlers with ASD. This effect was not present in response to non-facial stimuli
- ▶ These results suggest that toddlers with ASD are not captivated by faces to the same extent as toddlers without ASD and that this effect is not driven by a generalized impairment in disengagement of attention.

• Limited attentional bias for faces in toddlers with autism spectrum disorders. [Chawarska K, Volkmar F, Klin A.](#) *Arch Gen Psychiatry*. 2010 Feb;67(2):178-85.

Call to Action

- ▶ Routine Eye and vision exams with careful attention to entities not often addressed
 - History
 - Ocular Motility – special attention here – fixation – attention – eye tracking –
 - Eye Health – include careful evaluation of pupillary responses
- ▶ Special emphasis should be placed on ocular motility

Call to Action

- ▶ If you suspect something is amiss:
 - Initiate activities to stimulate looking patterns whether diagnosed with autism or not
 - Look early – look often
 - Work with community resources – develop a resource list
 - Monitor without alarming parent – Not necessary to begin intervention until it is determined that specific prescribed eye movement activities do not change the looking behaviors
 - Short leash for follow-up

Call to Action

- ▶ Activities for parents
 - Get babies down on their tummy – tummy time. They won't always like it but it is necessary
 - Look at your baby especially when feeding, changing, play time and at other times when the baby is awake and alert – don't leave eye contact to chance
 - This is NOT effective tummy time



Contact Information

Feel free to contact me

Glen T. Steele - gsteale@sco.edu

901-722-3284