The effect of emotional intensity on responses to joint attention in preschoolers with an autism spectrum disorder

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ABSTRACT

Background: Responding to joint attention (RJA) is reduced in young children with ASD despite being vital to the early development of social communication. For this reason, RJA is a frequent target in early intervention programs. Clinical guidelines suggest that exaggerating facial expressions or gestural pointing may improve RJA in children with autism by clarifying the meaning of the gaze or gesture. In the current study, we investigate the effect of intensity of emotional expression on RJA in preschoolers with ASD.

Method: Twenty-five preschoolers with ASD and 21 typically developing peers were administered a specifically designed eye-tracking task in which an actor directs attention to a moving object by looking at it with an expression that was either neutral, mildly surprised or intensely surprised. In a supplementary condition, gestural pointing was accompanied by a neutral gaze shift.

Results: Commensurate with previous studies, children with ASD oriented less to the face of the actor and were less responsive to RJA when compared to their typically developing peers. However, children with autism differed in their response to RJA according to the different task conditions. They demonstrated more frequent responses to RJA when the actor’s facial expression was either intense or supported by gestural pointing.

Conclusions: We report initial evidence for the importance of clarifying content cues in order to help preschoolers with autism adhere to receptive joint attention (RJA) opportunities. Our findings inform knowledge about early treatment and attention to emotional expressions in autism and improve our understanding of how early interventions may work to increase RJA in young children with ASD.

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1. Introduction

Joint attention (JA) represents the ability to share attention and refers to one of our earliest communication experiences as young children (Mundy, Sigman, & Kasari, 1990; Toth, Munson, Meltzoff, & Dawson, 2006). Young children with Autism Spectrum Disorders (ASD) demonstrate JA behaviors that are reduced both in quantity and quality compared to typically developing (TD) children (Mundy, Sigman, Ungerer, & Sherman, 1986; Navab, Gillespie Lynch, Johnson, Sigman, & Hutman,
Indeed, reduced JA is one of the most consistent features of ASD and even serves as a diagnostic criterion for the disorder (Lord et al., 2000). JA behaviors can be expressive (initiation of joint attention behaviors, IJA) or receptive (responding to joint attention behaviors, RJA) by nature. In this paper, we will mostly focus on RJA, which refers to “infants’ ability to follow the direction of the gaze and gestures of others to share a common point of reference” (Mundy et al., 2007; p. 269). RJA increases shared visual attention to objects (for a review see Frischen, Bayliss, & Tipper, 2007), which provides learning opportunities for communication (e.g. word designation) in both TD children (Brooks & Meltzoff, 2008) and children with ASD (Murray et al., 2008; Whalen & Schreibman, 2006; Jones, Carr, & Feeley, 2006b).

TD infants inherently direct their attention toward facial expressions, which represent socially salient cues for them (for a review see Frischen et al., 2007). This attention to faces in 2–3 month-old TD infants supports the development of JA skills through dyadic interactions between the child and his/her caretaker (Leekam & Ramsden, 2006; for a review see Aubineau, Le Driant, & Vandromme, 2015). Accordingly, when an infant orients himself to his socially relevant surrounding environment, he accesses opportunities to develop attention-sharing skills, such as JA. This prevalent early interest for the social world appears to be altered in autism (Chevallier, Kohls, Troiani, Brodkin, & Schultz, 2012; Dawson, Bernier, & Ring, 2012; Dawson et al., 2004). Infants at high risk for ASD demonstrated attention to the eyes at 2 months of age, but their attention had declined by 6 months of age (Jones & Klin, 2013). And there is evidence that it does not rebound; attention to eyes and faces in toddlers with ASD is reduced compared to their TD peers (Chawarska, Macari, & Shic, 2012; Osterling, Dawson, & Munson, 2002).

Given the key role of JA in the development of communication skills in children with ASD (Jones et al., 2006b; Murray et al., 2008; Whalen & Schreibman, 2006), attention sharing behaviors represent a critical target for early intervention programs designed for young children with autism (Charman et al., 2003; Jones & Carr, 2004; Jones, Carr, & Feeley, 2006c; Rogers et al., 2012). Practice coordinating gazes and pointing when initiating JA with ASD children can improve their ability to respond to JA overtures (Carpenter, Pennington, & Rogers, 2002; Hofsten, Dahlström, & Fredriksson, 2005). Exaggerating facial expressions and gestures, another early intervention technique, can make the behavioral content of the gaze and/or gesture clearer, thus helping RJA (Ingersoll & Dvortcsak, 2006; Mead & Mataric, 2010; Rogers & Dawson, 2010; Taylor & Hoch, 2008). Finally, several theoretical papers and books on ASD interventions suggest that expressing surprise in naturalistic situations may cue RJA behaviors (LeComer, 2009; Mastrangelo, 2009).

Several studies show the importance of emotional facial expressions to gaze shift in RJA. For example, work on primates suggests that detection of facial expressions contributes to the development of RJA by facilitating early gaze-following (Teufel, Gutmann, Pirow, & Fischer, 2010). Growing evidence from adult human studies also suggests that attention and correct detection of emotional facial expressions may play a role in accurately responding to other people’s gaze shifting (Bayliss, Frischen, Fenske, & Tipper, 2007; Bayliss, Paul, Cannon, & Tipper, 2006; Itier and Batty, 2009; Soussignan, Schaal, Boulanger, Garcia, & Jiang, 2015). Studies on TD children similarly suggest that toward the end of the first year of life, negative facial expressions (e.g. angry faces) already attract eye gaze (Niedzwiecka & Tomalski 2015; Hoehl, Wiese, & Striano, 2008). Furthermore, social appraisal studies (e.g. Mumenthaler & Sander, 2012) suggest that other people’s emotional reactions influence the way individuals appraise the same event. In a study using subliminal emotional faces looking at a second emotional face, the authors demonstrate that socio-affective inference can have a major influence on the way that we perceive emotions (Mumenthaler & Sander, 2015). Given the importance of emotional expression in events of social reference, as well as the aforementioned clinical observations that support the importance of emotional expressions to RJA, we postulate that intense expressions could enhance attention to faces in young children with or without ASD and help them to better recognize and respond to a JA behavior initiated by another person. To the best of our knowledge, previous studies have not investigated the effect of emotional intensity on attention to faces or RJA in young children with ASD.

Eye-tracking provides a unique opportunity to quantify RJA in a precise and standardized way (Chawarska et al., 2012; Chawarska, Klin, & Volkmar, 2003; Falck-Ytter, Fernell, Hedvall, Hofsten von, & Gillberg, 2012; Navab et al., 2012). Measuring gaze patterns while watching video clips containing examples of joint attention behavior makes it possible to quantify time spent on a face (Chawarska et al., 2003; Chawarska et al., 2012) or the number of gaze shift between a face and a referenced object during a JA behavior exchange (Falck-Ytter et al., 2012; Navab et al., 2012). For that purpose, we created an eye-tracking task to measure RJA in response to a gaze shift with different emotional intensity in ASD and TD preschoolers. In each condition, an actor shifted her gaze through a referenced object with a neutral, mild or strong expression of surprise on her face. A pointing condition also was added, in which the actor indicated the referenced object with her index and a neutral reference, as well as the aforementioned clinical observations that support the importance of emotional expressions to RJA, and a decrease in RJA in the ASD group compared to their TD peers. Second, we hypothesized that the intensity of the emotion expressed by the actor would enhance attention to faces within both the ASD and TD groups, and increase RJA in the ASD group. Third, we predicted that these eye-tracking variables would correlate with adaptive behavior, especially in the Communication domain, as measured by the Vineland Adaptive Behavioral Scale, 2nd Edition (Sparrow, Cicchetti, & Balla, 2005).
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