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Reading faces for information about words and emotions in adolescents with autism

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ABSTRACT

Studies of explicit processing of facial expressions by individuals with autism spectrum disorder (ASD) have found a variety of deficits and preserved abilities compared to their typically developing (TD) peers. However, little attention has been paid to their implicit processing abilities for emotional facial expressions. The question has also been raised whether preferential attention to the mouth region of a speaker's face by ASD individuals has resulted in a relative lipreading expertise. We present data on implicit processing of pseudo-dynamic facial emotions and visual speech in adolescents with autism. We compared 25 ASD and 25 TD participants on their ability to recreate the sequences of four dynamic emotional facial expressions (happy, sad, disgust, and fear) as well as four spoken words (with, bath, thumb, and watch) using six still images taken from a video sequence. Typical adolescents were significantly better at recreating the dynamic properties of emotional expressions than those of facial speech, while the autism group showed the reverse accuracy pattern. For Experiment 2 we obscured the eye region of the stimuli and found no significant difference between the 22 adolescents with ASD and 22 TD controls. Fearful faces achieved the highest accuracy results among the emotions in both groups.

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Autism is a complex developmental disorder that includes social, pragmatic, and language deficits, which can have a devastating, impact on a person's ability to conduct daily face-to-face conversation. The capacity to recognize and respond to nonverbal conversational cues, including facial expressions, is central to effective human communication. Typically developing (TD) infants develop the capacity to recognize faces and facial expressions very early. They preferentially attend to faces within a few hours of birth (Goren, Sarty, & Wu, 1975; Johnson & Morton, 1991); at 4 months they can already discern emotional facial expressions (Montague & Walker-Andrews, 2001). Although there is evidence that the ability to process facial expressions of emotions (FEEs) continues to improve throughout childhood (Egan, Brown, Goonan, Goonan, & Celano, 1998), adult competence is reached by early adolescence (Batty & Taylor, 2006; Custrini & Feldman, 1989). In contrast, individuals with autism spectrum disorders (ASD), including autism, Asperger syndrome, and pervasive developmental disorder-not otherwise specified (PPD-NOS), experience a variety of difficulties and use atypical strategies in both face recognition and the identification of emotional facial expressions that persist through adulthood (Schultz, 2005, for review).

A rapidly growing literature exists on the recognition of FEEs by children and adults with ASD. Some studies found that individuals with ASD are able to match emotions during slowed (Tardif, Lainé, Rodriguez, & Gepner, 2007), or even strobe-like presentations (Gepner, Deruelle, & Grynfelt, 2001) and to recognize basic emotions, although not complex ones (Castelli, 2005). Other studies, however, indicate that children with ASD show a deficit in labeling, categorizing, matching, or identifying static facial emotions (Celani, Battacchi, & Arcidiacono, 1999; Gepner, de Gelder, & de Schonen, 1996; Gross, 2004; see Jemel, Mottron, & Dawson, 2006, for review; Tantam, Monaghan, Nicholson, & Stirling, 1989), dynamic expressions (Lindner & Rosén, 2006), and for categorical perception of emotional expressions (Teunisse & de Gelder, 2001).

When trying to interpret an emotional facial expression, typical adults initially focus their gaze on the eye region of a face. However, when they are attending to a spoken word, their gaze focuses more directly on the lower half of the face since the mouth is more relevant for processing facial speech (Buchan, Paré, & Munhall, 2007). In contrast, several studies of face processing in individuals with ASD suggest that they focus on the lower half of the face, particularly the mouth, in a variety of social or emotional contexts (Dawson, Webb, Carver, Panagiotides, & McPartland, 2004; Joseph & Tanaka, 2003; Klin, Jones, Schultz, Volkmar, & Cohen, 2002; Pelphrey et al., 2002). The lack of attention toward the eye region of the face by individuals with ASD may account for some of their deficits identified in studies of face and emotion recognition.

In a classic study, Langdell (1978) found that children with ASD were better than their age-matched peers in face identification when only the lower part of the face was shown. Gross (2004) found that very young children with ASD were relatively less able than a TD cohort to match emotions of humans, dogs, and apes based on the upper face alone, and their error patterns suggested that primary attention was focused on the lower portion of the face. Baron-Cohen, Wheelwright, and Jolliffe, 1997; Baron-Cohen, Wheelwright, Hill, Raste, and Plumb, 2001 found that typical adults were able to rely exclusively on the eye region of a face to extract information about an expressed complex emotion or mental state, whereas individuals with ASD were significantly impaired on such tasks. Spezio, Adolphs, Hurley, and Piven (2007), demonstrated not only that TD individuals visually attend to the eye region of a face, but that the eyes are crucial to their successful identification of emotional expressions. In contrast, participants with ASD used mostly information from the mouth to try and determine facial emotion. Some studies, however, indicate that individuals with ASD are able to attend to the eye region of faces (Bar-Haim, Shulman, Lamy, & Reuveni, 2006; Lahaie et al., 2006; van der Geest, Kemner, Verbaten, & van Engeland, 2002). Using a task similar to Baron-Cohen et al. (1997, 2001); Ponnet, Roeyers, Buysse, De Clercq, and van der Heyden (2004) and Roeyers, Buysse, Ponnet, and Pichal (2001) found that high functioning adults with ASD can identify emotions based on photographs of eyes alone. The difference between these results and those obtained by Baron-Cohen et al., may be explained by the fact that Roeyers et al., used posed expressions and a slightly different task design, as well as differences in autism symptomology among their respective ASD populations. The differences in these data raise the question whether individuals with ASD do in fact use information from a speaker's eye region without being specifically prompted to do so, especially when the eyes are presented within the context of an entire, natural face.