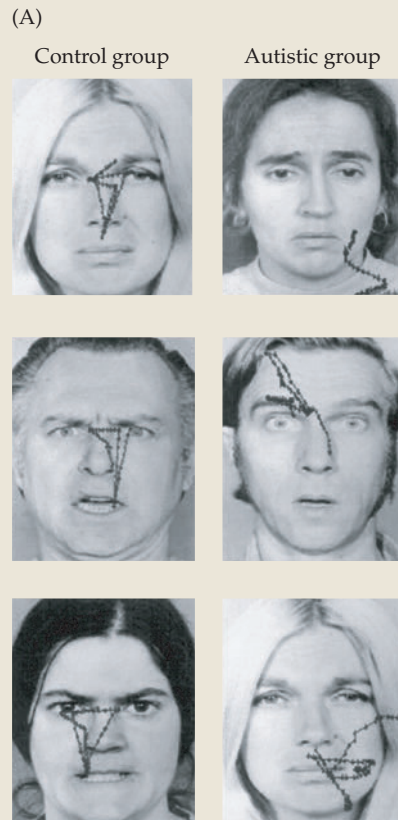


■ INTRODUCTORY BOX AUTISM

The term **autism spectrum disorder** refers to any of a range of neurodevelopmental problems characterized by functional deficits in communication and social interactions, and by repetitive, stereotyped behaviors. Epidemiological research suggests that some form of autism affects up to one in every 100 children. The severe form is highly heritable, with monozygotic twin studies indicating concordance rates from 60 to 90 percent.

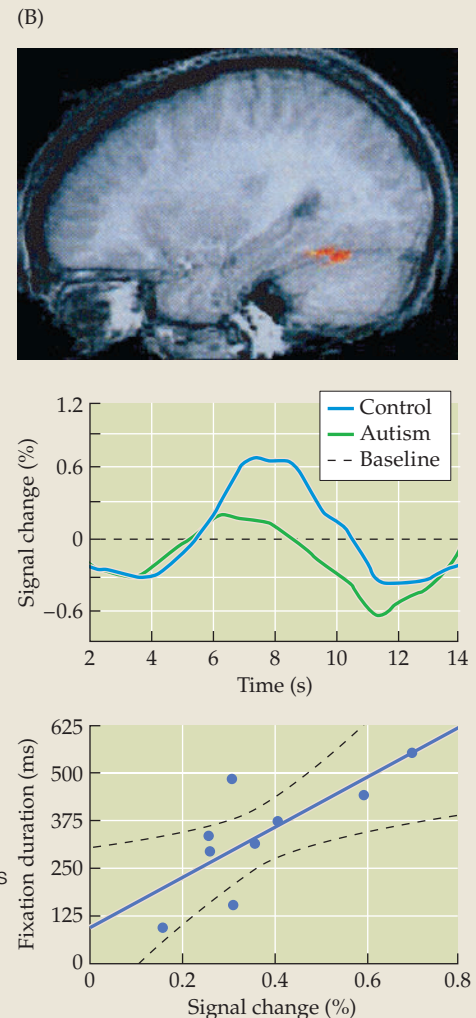
Originally described by psychiatrist Leo Kanner in 1943, autism (from the Greek word *autos*, meaning “self, same, spontaneous; directed from within”) is distinguished from other disorders by having social deficits as a core symptom. According to the American Psychiatric Association’s *Diagnostic and Statistical Manual (DSM-IV)*, the key criteria that define social deficits in autism include: (1) impairment in using nonverbal behaviors in social interactions such as eye-to-eye gaze, facial expression, and body posture/gestures; (2) failure to develop peer relationships appropriate for the individual’s age level; (3) failure to spontaneously seek to share enjoyment, interests, or achievements with other people; and (4) lack of social or emotional reciprocity. For these reasons, researchers have been greatly interested in autistic individuals to gain insight into the brain regions specialized for social cognitive functions. Autism is often accompanied by mental retardation, and studies have tended to focus on high-functioning autistic individuals, defined as those with an IQ of 70 or higher.

Social perception deficits in autism include difficulty processing faces, emotional expressions, and biological motion. Studies using eye-tracking techniques show that people with autism allocate their attention to noncanonical facial features, such as the forehead, cheeks, or other features located near the face (e.g., earrings). By contrast, most people scan faces in a characteristic triangular pattern, looking back and forth between the two eyes and the mouth—the regions that convey the dynamic information used in social and emotional communication (Figure A). When making social judgments about others from facial features alone, individuals with autism tend to overestimate how trustworthy people appear. Such challenges in discriminating emotions and personal characteristics conveyed in facial displays, in turn, affect how these individuals relate to other people.



When viewing faces, autistic individuals show reduced activation in the fusiform gyrus, inferior temporal gyrus, superior temporal sulcus, and amygdala. The activation decrements in the fusiform gyrus and amygdala correspond to a reduction in attentional allocation to the faces as measured by eye fixations (Figure B). Individuals with autism usually do not exhibit enhanced activity in these brain regions when the faces that they are viewing express emotions. Finally, unlike controls, autistic individuals do not exhibit activity increases in the superior temporal sulcus when goal-directed biological motion sequences are violated, as when viewing animated characters whose reaching actions miss their intended targets.

Social impairments in autism extend beyond perceptual processes to include difficulties in extracting meaning from interpersonal interactions. The inability to follow the gaze of other individuals, which emerges early in development, contributes to later impairments in using gaze to understand other people’s intentions and desires and in developing vocabulary skills, which are socially learned by using gaze, head, and pointing gestures to as-



Face-processing deficits in autism. (A) In contrast to control subjects (left), individuals with autism (right) tend to focus on features of faces that are not critical for socioemotional communication, as the lines tracing eye movement in these photos indicate. (B) Faces elicit greater fMRI activity in the fusiform gyrus (indicated in the scan and the upper graph) in controls than in individuals with autism. The bottom plot shows that, in autistic individuals, fusiform activity is positively correlated with the duration of eye fixations on the face. (A from Pelphrey et al. 2002; B after Dalton et al. 2005.)

sociate objects in the environment with their names. Individuals with autism often fail theory-of-mind tasks (described later in the chapter), which require participants to distinguish their own views and beliefs from those of others.