PERSPECTIVE

Impaired Face Perception in Individuals with Autism Spectrum Disorder: Insights on Diagnosis and Treatment

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Autism spectrum disorder (ASD) is a neurodevelopment disorder characterized by impaired social interaction and communication along with restricted and repetitive behavior. For a long period of time, ASD was considered to be a rare mental disorder, with a prevalence of less than 1/100,000. However, the prevalence of diagnosed ASD has increased rapidly in recent years to approximately 1/100 in the USA. Relative epidemiological investigations have not yet been performed across China because of the complex public health situation and insufficient public awareness. ASD children are usually considered peculiar and suffer prejudice. Unfortunately, this disorder is very hard to cure and continues to develop during adolescence and adulthood [1]. As a result, ASD has become a serious public issue in our society and deserves much more attention from scientists in revealing the mechanisms underlying the disorder and developing effective treatments.

Hereditary factors have been shown to be important in the pathogenesis of ASD [2]. Evidence from twin studies has shown that the risk of an individual having ASD is $> 90\%$ if the monozygotic twin is also diagnosed as having ASD [3]. Biologists and geneticists have worked tirelessly to reveal the underlying genetic mechanism of ASD, and achieved many significant findings. For example, Amb-a1 deficiency has been shown to result in autism-like phenotypes in female mice, and suggests a role of autophagy deregulation in the pathology of autism [4]. However, this work remains far from fully elucidating the heritable causes of ASD. To our knowledge, ASD is a complex genetic disorder with abnormalities in thousands of genes, copy number variants, and linkage regions [5]. As such, a tremendous amount of research is needed to find the determinant gene changes and develop an effective method of diagnosis and treatment based on these findings. Psychologists and psychiatrists address the issue from another perspective. It should be noted that ASD individuals usually have multiple cognitive and behavioral deficits. For example, restricted and repetitive behaviors are typical indicators of ASD. In particular, the "twin" nonapeptides oxytocin and arginine-vasopressin, which play regulatory roles in social behaviors, have been associated with specific autistic symptoms [6]. Accordingly, sensorimotor systems were found to be abnormal in individuals with ASD [7]. Similar dysfunctions have also been found in the language system [8]. Given these findings of specific impairments in ASD, we may expect to establish an effective and efficient screening system for ASD. Furthermore, relevant training programs may also be developed to improve these functions.

Most individuals with ASD have problems in social interaction and social communication. One of the reasons for this difficulty might be the impaired face perception that usually accompanies ASD. Human faces contain information critical to interpersonal interaction, such as face identity, facial expression, and gaze direction. Numerous studies have revealed that perceptions of the face and facial affect, as well as their neural processing, are largely impaired in ASD individuals [9]. A typical task to test face perception is the face recognition task. In such a task, one or more face stimuli are first presented to the observer. Seconds or minutes later, another face stimulus is

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presented. Observers are then instructed to indicate whether the face stimulus is novel or not. This task has been shown to be very reliable and sensitive in identifying individuals with selective impairments in face processing and thus might be a promising test in ASD diagnosis [10].

Our neural system has specific circuitries to process face

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