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Autism

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The concept of autism has undergone a huge transformation since the 1940s when it was first given a name. Originally, it referred to a rare neurodevelopmental disorder characterized by severe impairment in social communication and restricted repetitive behaviors. Over time, autism was recognized as a heterogeneous spectrum, with milder forms being far from rare. Now, the term autism also captures a difference in personality traits such as social awkwardness, attachment to routines, and hypersensitivity. Today, everyone knows somebody who is "on the spectrum" and can use websites to explore whether they might be "a little bit autistic."

History

In 1943, Leo Kanner, a Baltimore child psychiatrist, memorably described eight boys and three girls who stood out by their *autistic aloneness*, *insistence on sameness*, and *islets of ability*. At the same time, Hans Asperger, a Viennese pediatrician, used the term autistic in his vivid description of four boys who all demonstrated these features. The new label enabled other clinicians to identify similar cases among children with learning disabilities.

The syndrome was only slowly recognized, first in European and American clinics, then worldwide. In the absence of knowledge of brain pathology, psychological causes were assumed, particularly cold and distant parenting. Biological causes began to be taken seriously from the 1980s, after a genetic basis was revealed via twin studies, with the first of these carried out by Folstein and Rutter in 1977. However, despite steady progress in elucidating genetic risk factors, the causes of autism spectrum disorder (ASD) have remained elusive (Havdahl et al., 2021). In the absence of any biomarkers, the diagnosis is based on behavior, as assessed by clinical observation and parental reports or questionnaires. Some of these are standardized, but clinical judgment remains indispensable (Bishop & Lord, 2023).

The prevalence of autism has increased dramatically from the first epidemiological study in 1966, which produced an estimate of 4.5 in 10,000 (0.05%) children (Lotter, 1966). In 2023, the CDC monitoring network of the United States reported an incidence of 1 in 36 (2.8%) children aged 8 years, which is up from 1 in 150 (1.5%) in 2000 (Centers for Disease Control and Prevention, 2023). Global prevalence has been estimated at around 1%. It is unlikely that the number of children born with autism has increased. Instead, the diagnostic criteria have been widened, and a diagnosis can now be made at any age and any level of intellectual ability. Today, we have a whole spectrum of autistic conditions (ASC). Autism has captured the imagination, and while awareness of the condition is now very high, it has been molded more by popular books and films than by scientific data.

Core concepts

ASD remains elusive in terms of cause, developmental course, and treatment. Even the core behavioral symptoms remain controversial. However, there is agreement about both social and nonsocial symptoms that stand out. The impairments in social interaction and communication include reduced affective

contact and responsiveness to others, language delay, reduced use of nonverbal gestures, and a lack of spontaneous pretend play. The nonsocial features are often referred to as restricted and repetitive behavior (RRB) and include sensory processing difficulties, resistance to change, presence of elaborate ritualistic behavior, and intense interests. Twin studies indicate that social and nonsocial traits are associated with separable genetic contributions (Happé, Ronald, & Plomin, 2006). Cognitive neuroscience has offered some tentative proposals for proximal causes of these two types of traits.

Explaining the social features

A still widely accepted explanation of the social impairments unique to autism is a deficit in *Theory of Mind* [see Theory of Mind] (originally proposed by Baron-Cohen, Leslie, & Frith, 1985; see Voyles Askam, 2023, for a recent appraisal). Theory of Mind (also known as *mentalizing*) refers to the spontaneous attribution of intentions and beliefs to self and others to explain and predict behavior. A fault in mentalizing can explain why some, but not all, autistic individuals find other people unpredictable, why they have difficulties in acquiring the pragmatics of language and in detecting deception, and why they show poor reciprocal engagement in social interactions. The brain system that supports mentalizing shows weaker connectivity between the hubs of the network (Frith & Frith, 2023, chapter 10). Brain structures involved in empathy are largely separate from those involved in mentalizing (Schurz et al., 2021). This fits with the notion that autistic individuals can experience emotional empathy (Fletcher-Watson & Bird, 2020).

Social behavior is complex, and deficits in other cognitive mechanisms are also contributing to the emerging picture of social difficulties in ASD. These include subtle problems with biological motion perception, understanding and expressing emotions, poor sensitivity to social rewards, anxiety, and reduced emotional contagion (Alkire et al., 2020). Alexithymia, the inability to accurately identify one's own emotions, likely due to a disruption in how physiological arousal translates into the subjective experience of feelings, often but not always co-occurs with autism (Gaigg, Cornell, & Bird, 2020).

Explaining the nonsocial features

RRB occur in a range of neurological conditions and seem less specific to ASD than the social features. One theory, built on the strengths and weaknesses of the profile of cognitive abilities in autism, proposes that autistic individuals use an information processing style that favors focus on detail at the expense of the whole and may be linked to rare savant skills (Happé & Frith, 2006). This theory might, for example, explain the strength in verbatim recall, jigsaw-type tests, and ability to draw detailed images from memory. It might also explain difficulties in comprehending the overall meaning of an event or a story.

Sensory anomalies remain puzzling as they include both hypo- and hypersensitivity and may be associated with a range of perceptual and motor planning difficulties (Hamilton & Pelphrey, 2018). A Bayesian framework of information processing suggests that prior expectations are rigid and not easily updated by experiences. This might relate to the often-reported lack of habituation to sounds and

aversion to gaze. Problems in executive function, such as lack of impulse control, hyperactivity, and planning inflexibility, have long attracted autism researchers' attention (Demetriou et al., 2018). They are also found in other developmental disorders, such as ADHD, and in patients with acquired prefrontal cortex damage. These problems are detrimental to sensible decision-making in everyday life.

Questions, controversies, and new developments

Is autism a biological entity? This question arises from the extreme heterogeneity of the cases now diagnosed with ASD, and it has not yet been resolved. The interpretation of the behavioral traits and their putative causes is hindered by the heterogeneity of cases. This is a huge problem for autism research, precluding replication and generalization of findings. Different cognitive phenotypes might be identified in the future and are likely to relate to different etiologies.

Why are fewer girls diagnosed as autistic? Research on causes that might be responsible for the excess of males (3:1 ratio) has targeted the role of genes, hormones, and complex interactions with the developing nervous system (Lai et al., 2015). But perhaps the excess is less than hitherto thought because females may tend to camouflage autistic traits and compensate for social difficulties (Livingston & Happé, 2017).

Is autism a clinical category or a dimension? Diagnostic categories are useful, and many autistic people feel a label is important to their identity. At the behavioral or genetic level, there is no clear cutoff point between diagnosed ASD or ASC and people with high autistic traits. Yet, at the cognitive level, there is an assumption of discrete categories or phenotypes.

Is autism a disorder or a difference? Advocates of neurodiversity challenge the notion that brains/minds that diverge from the average are deficient. They suggest that the mind/brain in autism is part of natural variation and is different but not deficient. This clashes with the original proposal that autism is a neurodevelopmental disorder, as expressed in the term ASD, for which "impairment" is part of the diagnostic criteria.

Broader connections

Cognitive scientists and cognitive neuroscientists have gained insights into our complex social brains and minds through the study of autism. Autism research has inspired investigations in general cognitive processes in unexpected ways. For example, the originally vague impressions of difficulties in social interaction have been shown to be amenable to dissection into distinct processes, in turn related to distinct brain systems. In this way, they have become amenable to analysis in terms of both biological evolution and culture (Henrich & Muthukrishna, 2021).

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