

Recent Neural Advances in Studies on Theory of Mind and Autism

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Almost forty years after the seminal study by Baron-Cohen and colleagues (1985), the Theory of Mind (ToM) theory is still one of the most prominent and most-studied cognitive theories attempting to explain the social difficulties characteristic of autism¹. Its premise is that the ToM ability, i.e. the ability to attribute mental states to oneself and others, or ‘mentalize’, is diminished in individuals with autism. Despite initial evidence in favor of the theory, results in later years, particularly in adult samples and those with above-average intelligence, have been mixed. This can be explained by the literature on ToM in autism being highly heterogeneous: it covers a wide variety of paradigms, measuring both cognitive and affective mental state processing in samples with varying characteristics. In addition, there are few longitudinal studies, leaving many questions about development unanswered.

Around the 2000s, as neuroimaging techniques such as fMRI advanced, it became apparent that a designated set of brain regions, ‘the social brain’, subserves mental state reasoning (Frith, 2007), with the medial prefrontal cortex and temporoparietal junctions/posterior superior temporal sulci as key regions. This caused many researchers to use neuroimaging as a tool to provide additional insights regarding ToM differences in autism. Specifically, in the past decade, many have attempted to fill important gaps in the literature that may account for the existing inconclusive findings.

A main critique of most research on mental state processing in autism is the lack of ecological validity. Firstly, most tasks used for ToM research require a participant to reflect on another’s mental states such as beliefs or intentions through explicit instruction. Instead, in everyday social situations, most individuals presumably do so spontaneously. Therefore, researchers have recently focused increasingly on potential behavioral and neural differences in autism in the spontaneous inclination to mentalize, rather than on their ability to do so when explicitly asked. Initial evidence supports such differences in spontaneous mentalizing, further suggesting that spontaneous and explicit mentalizing are in large part subserved by overlapping brain regions, particularly the temporoparietal junction (Nijhof et al., 2018).

A second criticism is that when differences in brain activity between individuals with and without autism on traditional ToM tasks are found, these are claimed to reflect social interaction difficulties. However, such tasks hardly ever measure participants partaking in interaction: most studies entail them passively watching images or videos of *others* in social situations. Here, recent advances in hyperscanning as well as new techniques such as wearable EEG or fNIRS, open up a host of possibilities to study the neural responses to live social interaction. Such studies may also help substantiate the idea that those with autism experience less difficulties when interacting with others with autism (the ‘double empathy’ theory; Milton et al., 2022).

Finally, it has been pointed out that even though the ToM ability covers not only the attribution of others’, but also of one’s own mental states, autism studies focused almost exclusively on reasoning about others (Nijhof & Bird, 2019; Perrykkad & Hohwy, 2019). It has been hypothesized that there may also be difficulties with ‘Theory of Own Mind’ in autism, as thinking about one’s own and others’ mental states is thought to rely on similar neural processes, providing another promising research avenue.

¹ I use an abbreviated version of the diagnostic term, and refer to a person with a diagnosis of autism spectrum disorder, as a person with (a diagnosis of) autism. With this, I do not intend to take a stance in the ongoing person-first versus identity-first debate, in which there is currently no consensus. I acknowledge and respect different language preferences to refer to a person with a diagnosis of autism spectrum disorder.

Going forward, there are many other important aspects of neuroimaging studies of ToM in autism to consider that may have caused the inconclusive findings. For example, women and minimally or non-verbal individuals with autism have been underrepresented, and sample sizes, especially of neuroimaging studies, have generally been small – this last issue can be circumvented by the increasing number of international neuroimaging consortia.

In conclusion, there is growing awareness of both theoretical and methodological issues of past ToM research in autism, which inspires many new research lines that will expectedly further insights into the outstanding questions in this field in the upcoming years.

Declarations of interest

The author reports there are no competing interests to declare.

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