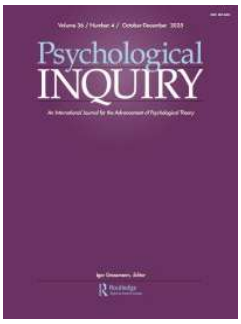

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COMMENTARIES

Do Autistic People Have Degrees of Disability in Theory of Mind? The Importance of Meta-Analytic Convergence

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We are pleased to be invited to comment on the article by Travis LaCroix regarding theory of mind (ToM) in autism. We make one key point: LaCroix's claim that the hypothesis of ToM disability in autism should be rejected ignores converging evidence from a staggering number of meta-analyses. We argue that an impartial reading of the meta-analytic literature, covering empirical evidence from 40 years of painstaking research, leads to the following conclusion: on average, autistic people compared to the general population have degrees of disability in ToM.

For the sake of clarity, we use the term "disability" not just in the statistical sense of scoring *on average* lower than people in the general population but also to highlight that this cognitive difference may cause difficulties in autistic people's lives. As for ToM itself, we define it as the ability to attribute mental states to others, and to explain and predict others' behavior based on their mental states[1]. Mental states might be epistemic (e.g., thoughts, beliefs, knowledge), volitional (e.g., desires, intentions, motives), perceptual (e.g., attention), or affective (e.g., emotions). We use the term "ToM" as synonymous with "cognitive empathy," "mentalising," or "mindreading." We thus view ToM as a crucial part of social cognition that includes emotion recognition but is distinct from "affective empathy" (defined as responding with an appropriate emotion to others' mental states) (Baron-Cohen & Wheelwright, 2004). We are well-aware that terminology is debated (Quesque et al., 2024) but take a broad perspective to conceptually capture most of the variance in mental-state attribution toward others.

The core idea of ToM is that it is our navigation system for making sense of human behavior, especially during complex social interaction. This system enables us to respond in real time in a dynamic and socially appropriate way (Baron-Cohen, 1995; Dennett, 1978; Frith & Frith, 2006; Wimmer & Perner, 1983); it is under both genetic and environmental influences (Abramson et al., 2020; Warrier et al., 2018), and is partly contextual (Milton, 2012).

Whilst we certainly do not think degrees of disability in ToM can explain all the behavioral differences in autism, we do think they can explain, to some extent, the social difficulties that are part of the diagnosis in psychiatric classification systems such as the Diagnostic and Statistical Manual of Mental Disorders (DSM) or the International Statistical Classification of Diseases and Related Health Problems (ICD). Degrees of disability in ToM have never been proposed to explain the non-social differences in autism, such as in attention to detail, pattern recognition, monotropism, preference for routines, the breadth and depth of interests, repetitive behaviors, sensory responsivity, or executive functions—these differences might require reference to alternative cognitive mechanisms (Baron-Cohen, 2020; Fletcher-Watson & Happé, 2019; Frith, 2003). It is thus long overdue to give up on the idea of a *single* cognitive mechanism driving all the behavioral differences in autism, or even all the social differences (Happé et al., 2006).

Turning to the target article, LaCroix states that there are at least two versions of the "ToM-deficit model of autism" (p. 229): (1) that autistic people "(…) often or typically experience difficulties with theory-of-mind abilities (…)"

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[1]Note that "ToM" was originally coined to apply to both our *own* mind and others' minds (Premack & Woodruff, 1978). Also note that alexithymia, which can be viewed as difficulties in self-oriented ToM, is much more prevalent in autistic people than non-autistic people (Kinnaird et al., 2019).

(the "weak" version), and (2) that autistic people have "(…) a theory-of-mind deficit—up to and including a complete *lack* of theory of mind (…)" (the "strong" version; LaCroix's emphasis). However, characterizing the field this way risks erecting a straw man because, for at least 30 years (Baron-Cohen, 1995), no one has claimed that autistic people lack ToM completely. Rather, the field suggests *degrees* of ToM disability in autism, and these are observed *on average* (we cannot stress this enough), when comparing autistic people as a group to non-autistic people as a group (i.e., a non-clinical group), and/or when comparing autistic people to those with other psychiatric diagnoses characterized by degrees of disability in ToM. Another way to put this is that, like most human traits, ToM is *dimensional* (there are individual differences in this ability) rather than binary (one either has it or lack it)—and this is evident in autism (Lombardo et al., 2016).

In sum, ToM is not a pass or fail on a test. For example, an autistic person might be able to maintain a conversation in a one-to-one setting that involves staying on topic and building on what the other person says, but that is very different to being able to keep track of the fluctuating mental states in a social group, chatting, joking, and reacting timely. The former tends to be linear and is thus more achievable through logic, one step at a time; the latter involves the dynamic switching between other people's mental states, including their different informational needs.

Although psychiatric classification systems such as the DSM or the ICD do define autism as binary (one is either autistic or not), since Lorna Wing introduced the revolutionary concept of the autistic *continuum* or *spectrum* (Wing, 1988), we have recognized that autism itself comes by degrees. In a similar vein, disabilities in autism also need to be viewed not as binary but as dimensional, to recognize individual differences both in autistic people and non-autistic people. And since at least 2001, we have had ways of quantifying autistic traits in the general population, using instruments such as the Autism-Spectrum Quotient (Baron-Cohen et al., 2001b), which reveals the distribution of individual differences in autistic traits regardless of diagnosis (Greenberg et al., 2018). Related instruments, such as the Social Responsiveness Scale (Constantino et al., 2003) or the Comprehensive Autistic Trait Inventory (English et al., 2021), further corroborate this autism-related dimensionality.

Throughout their article, LaCroix claims that ToM research in autism is "bad science" or even "pseudoscience"; they claim that "(…) the theory-of-mind-deficit explanation leads to degenerating research programme and should be rejected" (p. 252). This reads to us more like sensationalist activism rather than a serious engagement with the scientific literature. Critically, we argue that LaCroix has a responsibility not to ignore the staggering number of relevant meta-analyses, the robustness of this methodology, and the weight of the derived evidence. Although LaCroix cites a few of these meta-analyses, they are ultimately explained away (p. 248): "If the hypothesis in question—i.e., the theory-of-mind-deficit explanation of autism—is false, then a meta-analysis of this sort cannot be meaningful."

To make these claims, LaCroix relies on a philosophical frameworks, which has an undeniable value in clarifying concepts, at the very least. However, doing so effectively dismisses the hundreds or even thousands of peer reviewers who have required researchers to address key questions of scientific rigor; to ensure that conclusions are drawn only based on the data; and to discuss any limitations carefully and in a balanced way. Taken together, LaCroix's article reveals biases that may succeed in sloganising but do not enhance the process of empirical science; it resorts to headline-grabbing statements that overlook the painstaking research undertaken in hundreds of independent studies across different samples, cultures, methods, and laboratories over decades.

According to LaCroix, "(…) the theory-of-mind-deficit explanation of autism does not have solid empirical grounding insofar as experiments that purport to measure theory-of-mind differences between autistics and neurotypicals have *failed to replicate* (…)" (p. 229; our emphasis). If this were the case, then the meta-analyses would be unlikely to converge. Yet, this body of literature offers a clear consensus that autistic people, on average, score lower than non-autistic people on a range of ToM tasks—and that autistic people, on average, score similarly to people with some other psychiatric diagnoses. What is the "empirical grounding," then?

A non-systematic though wide-ranging review of the meta-analytic literature on ToM in autism identified as many as 23 comparative reports[2]. These meta-analyses investigated various aspects of ToM in autism as the only or primary psychiatric condition of interest (Cusson et al., 2025; Fatima & Babu, 2024; Gao et al., 2023; Jinhe et al., 2025; Leung et al., 2022; Lozier et al., 2014; Luo et al., 2025; Masoomi et al., 2025; Peñuelas-Calvo et al., 2019; Song et al., 2019; Uljarevic & Hamilton, 2013; Velikonja et al., 2019; Yeung, 2022; Zhang et al., 2022), or in autism alongside other psychiatric conditions, most often schizophrenia (Bliksted et al., 2016; Bora & Pantelis, 2016; Chung et al.,

[2]On 6 December 2025, using the PubMed (http://pubmed.ncbi.nlm.nih.gov) and APA PsycInfo (https://www.apa.org/pubs/databases/psycinfo; via EBSCO: https://research.ebsco.com) databases, we searched for the following terms in article titles: "meta-analyses" OR "meta-analysis" OR "meta-analytic" AND "affect identification" OR "affect recognition" OR "affective prosody" OR "belief reasoning" OR "emotion identification" OR "emotion recognition" OR "emotional prosody" OR "empathetic" OR "empathic" OR "empathy" OR "false belief" OR "false beliefs" OR "false-belief" OR "faux pas" OR "faux-pas" OR "identification of affect" OR "identification of emotion" OR "identification of emotions" OR "mental state" OR "mental states" OR "mental-state" OR "mentalising" OR "mentalizing" OR "mind" OR "mind-reading" OR "mindreading" OR "minds" OR "perspective taking" OR "perspective-taking" OR "recognition of affect" OR "recognition of emotion" OR "recognition of emotions" OR "social attribution" OR "social cognition" OR "social cognitive" OR "social-cognitive" OR "social inference" OR "social intelligence" OR "social reasoning" OR "social understanding" OR "theory-of-mind" OR "understanding affect" OR "understanding emotion" OR "understanding emotions" AND "ASC" OR "ASCs" OR "ASD" OR "ASDs" OR "autism" OR "autism-spectrum" OR "autistic" OR "neurodevelopment" OR "neurodevelopmental" OR "neuropsychiatric." This search yielded $N = 27$ (PubMed) and $N = 30$ (APA PsycInfo) reports, of which $N = 23$ were deemed unique (i.e., non-overlapping) comparative meta-analyses on ToM, with comparisons of autistic groups versus non-clinical groups and/or autistic groups versus other psychiatric groups. Note that this search may not have been exhaustive; we look forward to learning about other potentially existing as well as future meta-analyses on ToM in autism.

2014; Fernandes et al., 2018; Leppanen et al., 2018; Oliver et al., 2021; Ozbek et al., 2023; Veddum & Bliksted, 2022; Yirmiya et al., 1998; see also Cotter et al., 2018 for a comprehensive cross-diagnostic review).

The convergence across these meta-analyses leads us to the conclusion that the evidence could hardly be more robust that autistic people compared to the general population score on average lower on ToM tasks—whether they are being assessed using performance tasks or asked about their own ability via self-report instruments. Notably, not one of the meta-analyses suggested an autistic advantage in ToM; all but one suggested a *disadvantage* and/or similar degrees of disability seen in other psychiatric conditions. In fact, even the one outstanding meta-analysis—on the recognition of affective prosody rather than higher-order ToM (Zhang et al., 2022)—observed a baseline autistic disadvantage (Hedges' $g = -0.63$ [95% CI: −0.86, −0.39]), whose statistical significance did not survive correction for publication bias. However, even this correction did not reverse the effect direction: descriptively lower average in autism at Hedges' $g = -0.26$ [95% CI: −0.54, 0.01], in line with two other meta-analyses on the topic (Jinhe et al., 2025; Luo et al., 2025). We note that LaCroix cites only 5 of these 23 meta-analyses (Chung et al., 2014; Fatima & Babu, 2024; Gao et al., 2023; Leppanen et al., 2018; Song et al., 2019) while incorrectly labeling one study (Lee et al., 2024) as one of them.

More specifically, grounded in this meta-analytic convergence, our conclusion is that autistic people compared to the general population score on average lower *across* ToM tasks, not necessarily on each of them when considered alone. The effect size is expected to vary as a function of the task, reflecting both theoretical and methodological heterogeneity. However, as far as behavioral performance is concerned, it is noteworthy that the meta-analyses include tasks as varied in their content and form as the "Reading the Mind in the Eyes" task (Baron-Cohen et al., 2001a), the Faux Pas Recognition task (Baron-Cohen et al., 1999), the Strange Stories task (Happé, 1994), the Triangles task (Abell et al., 2000), or the Hinting task (Corcoran et al., 1995), to name a few of the traditional ones. This suggests that there is a consistent cognitive construct—which we can keep calling "ToM"—that is being tapped across different testing paradigms. It is also true that these performance tasks are rarely accompanied by the measurement of context or interaction partners' "neurotypes." Therefore, the situational sources of the observed degrees of disability in ToM cannot yet be fully disentangled, similarly to the underlying cognitive mechanisms (e.g., less spontaneous ToM in autism; Senju et al., 2009).

LaCroix is right that the convergent validity among ToM tasks in the general population is low (e.g., Yeung et al., 2024), but this is not a problem of autism research in particular. Interestingly, some ToM tasks may exhibit *higher* internal consistency in the autistic population than the general population (Tsui et al., 2025). LaCroix also misses an important point about *external* validity: meta-analyses in the autistic population document positive relationships between ToM and social functioning (Bottema-Beutel et al., 2019; Trevisan & Birmingham, 2016), and negative relationships between ToM and clinical scores (Johnson et al., 2022). In other words, not only are autistic differences evident in the convergence of meta-analyses on ToM but, crucially, these differences also meta-analytically map onto social and clinical outcomes. Of course, these relationships are purely correlational rather than causal, but they are consistent with the hypothesis that degrees of ToM disability in autistic people play a role in the real-world (social) difficulties they tend to experience.

It is important to keep in mind that the boundary of autism has changed substantially since the first paper on ToM in autism was published in 1985 (Baron-Cohen et al., 1985). For example, in 1966, autism was reported to be rare (4.5 in 10,000 children; Lotter, 1966), whereas now, it is common (1 in 31 children; Shaw et al., 2025). Back then, the majority of autistic people had a learning or intellectual disability, whereas now, it is the opposite (the majority of autistic people do not have such a disability). This is largely a reflection that in the 1990s, the DSM-IV and ICD-10 created a subgroup of autism called "Asperger's Disorder" or "Asperger's syndrome," respectively, thus opening up diagnosis to the wider population, including those without a learning (or intellectual) disability and those without a language delay.

Even though the DSM-5 (in 2013) and ICD-11 (in 2019) removed this subgroup, it remains the case today that autism can be diagnosed with the qualifier of "with or without accompanying intellectual impairment" and "with or without accompanying language impairment." The rise in the prevalence of autism is thought to be not due to the changing definitions alone (e.g., from the DSM-III to the DSM-5) but also due to socio-cultural factors such as increased awareness, increased recognition, increased availability of clinical resources for the diagnosis, as well as social media (Charman, 2025). The relevance of these changes to ToM research in autism is that it is inevitable that results from autistic people will have changed over this 40-year period as well. Yet, even the most recent meta-analyses draw the same conclusion: on average, autistic people score lower than the general population on ToM tasks (e.g., Cusson et al., 2025)—although, as LaCroix correctly points out, these differences decrease over time (Rødgaard et al., 2019).

Finally, LaCroix discusses children who are tested with the false-belief task, which was originally designed by Wimmer and Perner (1983) as a change-of-location task in typically developing 3-to-9-year-olds. While LaCroix recognizes an autistic delay in ToM development as another "weak" version of the "ToM-deficit model" (e.g., p. 229), we wish that the developmental literature had been discussed in more detail. For instance, some autistic children that fail this test at the age when they would be expected to pass it (e.g., at 4 years old) might go on to pass it after a considerable delay (e.g., by 9 years old) (Happé 1995); identifying an autistic adult who passes this test does not necessarily mean there has been no degree of disability at a developmentally relevant point. Our understanding of how typically developing children solve the Sally-Anne task—an adaptation of the Wimmer and Perner's (1983) task for the first study on

ToM in autism (Baron-Cohen et al. (1985)—has also been evolving. In particular, subsequent analytic methods suggested why 3-year-olds might fail and what developmental transitions to passing might look like (Baker et al., 2016). Further, the *early*-developmental literature shows how ToM in the typical case emerges from precursors in late infancy or toddlerhood, including joint attention, pretend play, and intentionality detection, among others (Baron-Cohen, 1995; Leslie, 1987; Rakoczy, 2022). This contextualization is important because delays in reaching social milestones within the first 2 years of life (e.g., as measured by the Quantitative Checklist for Autism in Toddlers; Allison et al., 2008) are associated with a later diagnosis of autism (Lai et al., 2014).

In conclusion, we are grateful for the opportunity to comment on LaCroix's philosophical article regarding ToM in autism. The take-home message is that degrees of ToM disability in autism are evident in the convergence of 22 out of 23 meta-analyses. Ignoring or dismissing such a robust evidence base confers no benefits to either science or autistic people. Indeed, we worry that the degrees of disability in ToM are in part what renders autistic people a vulnerable group, as they are at an elevated risk of multiple forms of victimization (Trundle et al., 2023). Recognizing the degrees of disability in ToM means appropriate safeguarding can be put in place. Perhaps even more importantly, ToM can improve with practice (Wu et al., 2024), and if we do not legitimize degrees of ToM disability in autism, we miss the opportunity for parents, educators, clinicians, and autistic people themselves to find the support they may wish to receive (for meta-analyses of practice effects in autism, see Farashi et al., 2024; Fletcher-Watson et al., 2014; Zhi et al., 2021). We therefore urge readers and researchers to reflect on the importance of meta-analytic convergence.

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