[1] MIND & AI Lab, Department of Psychology, University of Hong Kong, Hong Kong, China

[2] SRT AI, Society & Social Dynamics, Faculty of Social Sciences, University of Hong Kong, Hong Kong, China

Correspondence to: B Becker
ben_becker@gmx.de
https://orcid.org/0000-0002-9014-9671

Cite this as: *BMJ* 2026;393:s783
http://doi.org/10.1136/bmj.s783

Accelerated non-invasive brain stimulation in childhood autism

Shows promise for social communication difficulties

Benjamin Becker *full professor*[1, 2]

Autism spectrum disorder (ASD) is among the leading causes of health burden in children and adolescents worldwide and remains a major challenge for health and education systems.[1] Social communication difficulties are central to ASD, yet beyond behavioural programmes that are time consuming, often inaccessible, or only partially effective, families and clinicians have few evidence based options. The linked multicentre, randomised sham controlled trial by Tan and colleagues (doi:10.1136/bmj-2025-086295), testing accelerated non-invasive brain stimulation to the left primary motor cortex in 200 children aged 4-10 years with ASD, represents a promising advance that balances progress in neuroscience with inclusivity and feasibility.[2]

The investigators conducted a multicentre randomised controlled trial to test whether an intensive five day course of non-invasive magnetic brain stimulation (accelerated continuous theta burst stimulation) could improve social communication from baseline to immediate post-treatment and one month follow-up. Children were randomly assigned to active or sham stimulation, stratified by site and intellectual disability status, and stimulation was delivered in 10 brief sessions per day for five consecutive days, targeting the left primary motor cortex. Of 200 randomised participants, 193 completed the full intervention, indicating feasibility and acceptability despite the demanding schedule. Compared with the sham group, the active group showed greater improvements in social communication, with significant reductions in Social Responsiveness Scale (second edition) scores post-treatment (−6.25, 95% confidence interval −8.69 to −3.81, Cohen's d −0.92, P <0.001) and at one month follow-up (−6.17, −8.65 to −3.70, −0.90, P<0.001). Convergent positive effects were observed on secondary outcomes, including gains on language measures. Adverse events, in particular restlessness and scalp discomfort, were more frequent in the active group than the sham group (54.5% *v* 29.3%), but were mostly mild to moderate and resolved without medical intervention.

A strength of this trial is its inclusivity. Previous trials have started to explore the therapeutic potential of non-invasive magnetic brain stimulation in older children and adolescents with high functioning ASD. Tan and colleagues included younger children and those with co-occurring intellectual disability, a group that represents a substantial proportion of the autistic population and has high unmet clinical need. The age range of 4-10 years capitalises on a developmental window of heightened neuroplasticity, when social and language circuits may be particularly amenable to change and early gains can critically shape later trajectories. Even modest improvements in social communication at this stage may increase opportunities for participation in play, family life, and education, with potential downstream benefits over time.

The stimulation target and protocol were also designed with real world services in mind. The left primary motor cortex can be localised using simple motor evoked potentials, a standardised physiological measure that typically takes only a few minutes and removes the need for costly neuronavigation or brain imaging. Each therapeutic stimulation session is brief, allowing the entire treatment course to be completed within one week. For families who struggle with access or commitment to months-long behavioural programmes, such a protocol is attractive, particularly in low resource settings where specialist services are scarce. To facilitate future clinical translation, it will be essential to carefully characterise longer term outcomes, including durability of benefit and neurodevelopmental safety in young children with ASD. Moreover, the implementation will require debating and establishing clear risk-benefit guidelines alongside conservative exclusion criteria for participants at higher risk of adverse events as well as considerations about assent.

From a human neuroscience perspective, the study provides a bridge between pragmatic clinical design and contemporary neuroscience models of autism.[3] The motor cortex is increasingly recognised as part of wider sensorimotor networks involved in action understanding, speech articulation, and social-emotional processing[4]—domains frequently disrupted in ASD. By delivering an accelerated continuous theta burst stimulation protocol, which is thought to induce neuroplasticity, to this region, the authors may be retuning aberrant sensorimotor networks and, through their connections with frontal and temporal regions, reshaping circuits critical for social interaction and language. The observed improvements in social behaviour and language are consistent with this network level account and raise the possibility that early neuromodulation could enhance opportunities to benefit from ongoing social experiences in these children.

These characteristics make the protocol a candidate for integration with established behavioural interventions that directly train social communication and language. Evidence based early programmes—including naturalistic, play based, and parent mediated approaches—aim to build joint attention, vocabulary, and reciprocal interaction through structured practice with care givers. Exploring the combination of these interventions with neuromodulation in future experimental trials

could harness stimulation induced plasticity to acquire and consolidate new skills and further extend benefits into everyday life, potentially supported by digitally delivered or AI assisted training tools that can further engage and shape social brain circuits.[5] At the same time, mild to moderate adverse events (mostly restlessness, scalp discomfort) were more frequent in the active treatment than in the sham group, highlighting the importance of further technical optimisation of stimulation parameters and coil design to maximise comfort, particularly for younger children.

For now, Tan and colleagues provide evidence that non-invasive brain stimulation can be safely delivered to young children with ASD, including those with intellectual disability, in a way that is acceptable to families and services, and associated with clinically important improvements in social communication over at least one month. The message is one of cautious optimism: accelerated continuous theta burst stimulation to the left primary motor cortex should not replace psychosocial support or educational adaptation, but, if further replicated and integrated thoughtfully with behavioural care, it may become an important component of a multimodal pathway for children with autism and major social communication difficulties.

Competing interests: The BMJ has judged that there are no disqualifying financial ties to commercial companies. The authors declare the following other interests: none

Provenance and peer review: Commissioned; not externally peer reviewed.

1 Lord C, Charman T, Havdahl A, etal. The Lancet Commission on the future of care and clinical research in autism. *Lancet* 2022;399:-334. doi: 10.1016/S0140-6736(21)01541-5. pmid: 34883054

2 Tan H, Ren T, Cao A, etal. Accelerated continuous theta burst stimulation targeting left primary motor cortex for children with autism spectrum disorder: multicentre randomised sham controlled trial. *BMJ* 2026;393:e086295.

3 Lord C, Elsabbagh M, Baird G, Veenstra-Vanderweele J. Autism spectrum disorder. *Lancet* 2018;392:-20. doi: 10.1016/S0140-6736(18)31129-2. pmid: 30078460

4 Tomasino B, Gremese M. The cognitive side of M1. *Front Hum Neurosci* 2016;10:. doi: 10.3389/fnhum.2016.00298. pmid: 27378891

5 Becker B. Will our social brain inherently shape and be shaped by interactions with AI?*Neuron* 2025;113:-41. doi: 10.1016/j.neuron.2025.04.034. pmid: 40505654