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COMMENTARY

Interpreting and analysing measures of motor inhibition in Tourette research and beyond

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Tourette syndrome is a neurodevelopmental disorder characterized by repetitive, patterned movements and/or vocalizations known as tics, which are often preceded by sensory phenomena known as premonitory urges. Tics typically wax and wane throughout the day and may change throughout an individual's lifetime. Many find their tics substantially reduce in later adolescence;[1] and the majority of individuals with Tourette syndrome have one or more comorbidity, most commonly attention-deficit/hyperactivity disorder (ADHD) and/or obsessive–compulsive disorder.[1] These factors, paired with confounds due to medication use and difficulty in obtaining brain imaging data due to motion, pose challenges for understanding the neural causes and consequences of Tourette syndrome. These challenges are further compounded by a lack of longitudinal work, small studies with unrepresentative samples, and a research culture which historically limited data sharing and transparency. Consequently, it is not uncommon to see conflicting findings when assessing the Tourette syndrome literature.

Numerous lines of converging evidence suggest that Tourette syndrome involves cortical, striatal, and thalamic brain regions, and it is highly likely that imbalances in inhibition and disinhibition within these circuits are core to the condition.[2] Much of the early evidence of altered inhibition within cortical motor regions comes from research using transcranial magnetic stimulation (TMS). This includes a measure known as short-interval intracortical inhibition (SICI) which is underpinned by interneuron activity relating to the inhibitory neurotransmitter gamma-aminobutyric acid (GABA). Several small-scale studies in adults and adolescents have reported a reduction in SICI;[3] however, this has been less well explored in younger children. Batschelett et al.[4] collected several TMS measures (including SICI) from a sample of 30 Tourette syndrome and 30 control participants aged 8 to 12 years. Interestingly, after accounting for ADHD – 15 of the 30 with Tourette syndrome also had ADHD – SICI was not found to be significantly reduced in comparison to controls. This contrasts with findings in adults and poses interesting questions about the impact of age/time since initial tic onset and adaptations occurring within motor cortex. Although group differences were not found, several relationships between SICI and tic symptoms were reported.

In a very welcome move, the authors publicly archived their data, which allows for additional exploration and analysis. As an exercise in reproducibility, we independently analysed this data using the information available in the methods. We were able to find robust support for the TMS protocols used and calculated similar levels of inhibition and disinhibition. This is valuable information for those wanting to choose parameters for measuring such protocols in paediatric populations, or to extend this by including older participants. However, using only the summary data and simple analyses of means, we did not find clear support for correlations between SICI and the measures of tic severity illustrated in their Figure 2. Rather than using subject means, the authors used a multilevel mixed effects modelling approach and included several covariates in their model. Since we are not expert in linear mixed models, we were unable to reproduce these analyses. We would therefore encourage interested researchers to download the data and investigate for themselves.

In Tourette syndrome research (as in many other areas), openness and data sharing are great opportunities for resolving some of the discrepancies within the field and exploring nuances within findings. These approaches have the potential to be excellent ways of improving scientific transparency, generating collaboration, and maximizing impact. However, for this to reach its full potential we need to go a step further to develop unified approaches to data reporting, analysis, and archiving that allow for detailed replication and subsequent extension of findings.

This commentary is on the original article by Batschelett et al. To view this paper visit https://doi.org/10.1111/dmcn.15578

DATA AVAILABILITY STATEMENT

Not required.

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