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Brain functional connectivity in Tourette syndrome

Exploring the circuitry of tic suppression in children

Philadelphia, July 7, 2021 – Tourette syndrome, a neurodevelopmental disorder, causes motor and phonic “tics,” or uncontrollable repeated behaviors and vocalizations. People affected by Tourette syndrome can often suppress these tics for some time before the urges become overwhelming, and researchers have long wondered at the neural underpinnings of the suppression effort.

Now, [in a new study](#) using a non-invasive technique to measure brain activity called high-density electroencephalography (hdEEG), researchers at Yale School of Medicine have assessed the impact of tic suppression on functional connectivity between brain regions.

The study appears in [Biological Psychiatry: Cognitive Neuroscience and Neuroimaging](#), published by Elsevier.

“Tic suppression is an important feature of Tourette syndrome. Understanding how someone may temporarily gain control over their tics may inform several research areas in Tourette syndrome. Yet, brain correlates of tic suppression have not been studied extensively, especially in children,” said Denis Sukhodolsky, PhD, senior author of the study, and Associate Professor at the Yale Child Study Center at the Yale School of Medicine, New Haven, CT, USA.

Cameron Carter, MD, Editor of *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, said of the study, “Understanding brain mechanisms associated with successful coping in disorders such as Tourette syndrome opens up opportunities for developing targeted treatments to enhance the innate self-control that normally emerges as the brain matures.”

The team led by Dr. Sukhodolsky recorded the brain activity of 72 children, aged 8 to 16 years old, with Tourette syndrome using hdEEG, while they were ticing freely and while they were suppressing their tics. The researchers then assessed connectivity between the different regions in the brain.

The authors found that connectivity between multiple brain regions was increased while children suppressed their tics. “Some of these regions are part of the default mode network, an array of brain regions engaged during internal thought processes such as daydreaming,” explained first author Simon Morand-Beaulieu, PhD.

Additionally, the researchers reported that functional brain connectivity during tic suppression was positively correlated with age, suggesting that the brain networks of tic suppression undergo developmental changes in response to the experience of tics. “This increase in functional connectivity as

children mature is consistent with increasing tic suppression capacities developing into adolescence as well as a better awareness of the sensory phenomena accompanying tics," said Dr. Morand-Beaulieu.

The study highlights the brain mechanism involved in a temporary decrease in tic frequency, which could have therapeutic implications. "It will be important to assess whether the same mechanism plays a role in a more structured intervention to decrease tic severity, such as behavioral therapy for Tourette syndrome," said Dr. Sukhodolsky.

Notes for editors

The article is "Increased alpha-band connectivity during tic suppression in children with Tourette syndrome revealed by source EEG analysis," by Simon Morand-Beaulieu, Jia Wu, Linda Mayes, Heidi Grantz, James Leckman, Michael Crowley, Denis Sukhodolsky (<https://doi.org/10.1016/j.bpsc.2021.05.001>). It appears as an Article in Press in *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, published by [Elsevier](#).

Copies of this paper are available to credentialed journalists upon request; please contact Rhiannon Bugno at BPCNNI@sobp.org or +1 254 522 9700. Journalists wishing to interview the authors may contact Simon Morand-Beaulieu at simon.morand-beaulieu@yale.edu or Denis Sukhodolsky at denis.sukhodolsky@yale.edu or +1 (203) 785-6446.

The authors' affiliations and disclosures of financial and conflicts of interests are available in the article.

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