Acute Functional Connectivity Changes Induced by Repetitive Transcranial Magnetic Stimulation Predict Therapeutic Response in Treatment-Resistant Depression

Ruiyang Ge¹, Afifa Humaira¹, Elizabeth Gregory¹, Rebecca Todd², Sean Nestor³, Sophia Frangou¹,², Fidel Vila-Rodriguez¹

¹ Department of Psychiatry, University of British Columbia; ² Department of Psychology, University of British Columbia; ³ Department of Psychiatry, University of Toronto; ⁴ Department of Psychiatry, Icahn School of Medicine at Mount Sinai, New York City, NY, USA

Approximately, 50-60% of patients with major depression may have treatment resistant depression (TRD).

The mechanisms underpinning therapeutic response to rTMS remain poorly understood.

Concurrent rTMS-fMRI permits quantification of acute rTMS-induced changes in the fMRI signal at the target site and across the whole brain.

Participants

38 TRD patients
26F/12M

Pre-treatment Assessment

demographic/clinical data

age
sex

resting-state fMRI (rsfMRI₀)

resting-state fMRI (rsfMRI₁)

concurrent rTMS-fMRI (1Hz)

3 fMRI scans

Treatment

4-week 1-Hz rTMS over right DLPFC

Data Analysis

• functional connectivity (FC)

• connectome-based predictive modeling (CPM)

Results

• 4-week rTMS alleviate MADRS scores (pre-treatment: 29.50 [6.84]; end-point: 18.63 [9.62]).

• Significant functional connectivity (FC) changes between the rsfMRI₀ and rTMS-fMRI scans implicated 50 regions and 43 connections.

• These changes did not persist after the conclusion of the rTMS administration.

Conclusion

Pre-treatment, single rTMS-induced connectivity changes in the resting-state functional architecture of TRD patients may index macro-level neuroplasticity, relevant to inter-individual variability in rTMS treatment response.

FC changes induced by a single concurrent rTMS-fMRI session to the right DLPFC at baseline predicted 52% of the variance in depressive symptom change following a subsequent 4-week course of rTMS.