

**Background:** Intrusive thoughts and compulsive behaviors that characterize obsessive compulsive disorder (OCD) are associated to aberrant resting state functional connectivity (rsFC) patterns within the cortico-striatal-thalamo-cortical (CSTC) circuits. A high percentage of OCD patients do not respond to conventional pharmacological treatments or psychotherapy. In these patients, inhibitory repetitive transcranial magnetic stimulation (rTMS) of the Supplementary Motor Area (SMA) resulted in a significant clinical benefit.

**Methods:** In the current pilot study, we applied a novel protocol of 1-week MRI-guided individualized double-daily sessions of rTMS treatment (1-Hz; 110% of resting Motor Threshold/7,200 pulses/day), to bilateral SMA in 9 OCD patients. We tested its (i) feasibility safety, (ii) clinical efficacy and (iii) rsFC related changes.

**Results:** Patients reported no side effects during and after rTMS. Personalized rTMS treatment led to a significant improvement of OCD symptoms (average 25%;  $p=.005$ ) and persistence of benefit up to 3-months follow-up. rsFC analysis revealed a significant reduction of connectivity

patterns between bilateral SMA and subcortical regions, specifically in the basal ganglia and thalamus. Additional analysis showed that OCD symptoms severity correlates with a higher connectivity pattern between bilateral SMA and subcortical regions.

**Conclusions:** rTMS double-daily sessions are safe, feasible and effective in OCD. The clinical outcomes, that are consistent with those found in our previous RCT, are linked to a decreased connectivity between SMA and subcortical brain areas implicated in control over obsessions and maladaptive compulsive behavior.