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Right Prefrontal Deep Tms Effects On Attention Symptoms: Behavioral Outcomes and Electrophysiological Correlates

H. Shahar¹, U. Alyagon¹, A. Lazarovits¹, A. Hadar¹, D. Cohen¹, H. Shalev², A. Zangen¹

¹Life sciences, Ben-Gurion University of the Negev, Beer-Sheva, Israel ; ²Psychiatry, Soroka Medical Center, Beer-Sheva, Israel

Introduction: Despite its high prevalence, the validated treatment for ADHD is chronic administration of psychostimulants, which is associated with side effects and occasionally not tolerated. Deep TMS using special coil designs for targeting neural networks linked with neuropsychiatric disorders, may become a viable alternative.

Objectives: Comparison of rTMS treatment using deep, figure-8 and sham coils on ADHD symptoms.

Methods: In the current randomized, sham-controlled study, adult ADHD patients received 15 daily sessions of high-frequency rTMS directed to the right prefrontal cortex (rPFC), using either deep, figure-8, or a sham coil. ADHD symptoms and cognitive alterations were assessed using the CAARS-INV, self-report questionnaires and performance tests. Additionally, the stop signal task (SST) combined with EEG measures was used to assess behavioural inhibition and ERPs. EEG responses to an inhibitory protocol of paired TMS pulses over the rPFC were measured before and after treatments. A healthy control group was evaluated at baseline for comparison.

Results: Several ADHD symptoms were improved in patients that received dTMS but not standard figure-8 or sham treatment ($p=0.007$, CAARS; $p=0.014$, SST). Differences between ADHD patients and healthy controls were demonstrated in ERPs during the SST, and in response to single and paired TMS pulses. The lower amplitudes of ERPs in patients correlated with ADHD symptoms and behavioural inhibition measures.

Conclusions: Repeated stimulation of deep areas in the rPFC has therapeutic potential, where rPFC excitability is impaired in ADHD patients. Ongoing analysis attempts to establish the neurophysiological measures as predictors and biomarkers for effectiveness of dTMS treatment.