

The Effects of High-frequency rTMS Targeting the Mirror Neurons on Improving Social Awareness in ASD, the Preliminary Analysis of a Pilot Study

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Abstract : Background: Autism Spectrum Disorder (ASD) is a common neurodevelopmental disorder with limited pharmacological interventions. Transcranial Magnetic Stimulation (rTMS) has produced promising results in ASD, although there is no consensus regarding optimal targets or stimulation paradigms. A prevailing theory in ASD attributes the core deficits to dysfunction of the mirror neurons located in the inferior parietal lobule (IPL) and inferior frontal gyrus (IFG). Methods: Thus far, 11 subjects with ASD, 10 boys and 1 girl with the mean age of 13.36 years have completed the study by receiving 10 sessions of high frequency rTMS to the IPL. The subjects were randomized to receive stimulation on the left or right IPL and sham stimulation to the opposite side. The outcome measures included the Social Responsiveness Scale - Second Edition (SRS-2) and Delis-Kaplan Executive Function System (D-KEFS) Verbal Fluency task. Results: None of the 11 subjects experienced any adverse effects. The rTMS did not produce any improvement in verbal fluency, nor there was any statistically significant difference between the right versus left sided stimulation. Analysis of social awareness on SRS-2 (SRS-AWR) indicated a close to significant effect of the treatment with a small to medium effect size. After removing a single subject with Level 3 ASD, we demonstrated a close to significant improvement on SRS-AWR with a large effect size. The analysis of the data 3-month post TMS demonstrated return of the SRS-AWR values to baseline. Conclusion: This preliminary analysis of the 11 subjects who have completed our study thus far shows a favorable response to high frequency rTMS stimulation of the mirror neurons/IPL on social awareness. While the decay of the response noted during the 3-month follow-up may be considered a limitation of rTMS, the presence of the improvement, especially the effect size despite the small sample size, is indicative of the efficacy of this technique.

Keywords : rTMS, autism, social cognition, mirror neurons

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