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Studying the effects of repetitive transcranial magnetic stimulation for perceived cognitive changes in cerebral palsy patients

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Introduction: Cerebral palsy (CP) is a lifelong disability arising due to morbidity or lesion in the immature brain. In several cases, the cognitive ability is significantly affected and optimum task performance is quite difficult to achieve. To date researchers mainly focus on understanding physical improvement with aid of various therapies but studying improvement in the cognitive activity is usually neglected in CP children. Cognitive ability is a mental process of acquiring knowledge and its interpretation through experience. It encompasses different processes such as knowledge, attention, memory, judgment, evaluation, reasoning, decision making and problem solving.

Aim: To identify the perceived changes in VSMS scores and EEG signals employing repetitive transcranial magnetic stimulation (r-TMS) in CP child.

Research Methodology: In this study, total fifteen CP subjects (mean age, weight and height as 8.9+2.07 years, 20.8+4.87 Kgs and 110.56+18.06 cm respectively) were recruited into two groups namely the placebo group (PG) with five subjects and intervention group (IG) with ten subjects. In IG, participants were administered r-TMS for 20 minutes (2000 pulses repetitively with frequency of 10 Hz) every day for 20 sessions and in PG, no such treatment was provided to the selected subjects. However, both groups were administered standard therapy (ST) comprising special education, physical therapy and speech therapy regularly as mandated. VSMS and EEG signal from F3-F4 and C3-C4 were analyzed as an outcome measure before (pre) and after (post) the completion of r-TMS therapy treatment. Neuro-MS/D Variant-2 therapeutic (Neurosoft Russia) angulated coil in figure of eight (AFEC-02-100-C) was employed for providing repetitive transcranial magnetic stimulation and bi-channel Neuro-EMG-MS system for recording changes in neuro-muscular activity due to stimulation. The eight shaped magnetic coil generates the magnetic field of 4 Tesla that easily penetrates the cranium up to 6 cm stimulating the neurons of the underlying brain region. The white matter in the central zone region of the brain was considered as the stimulation site being responsible for human intelligence. Power spectrum analysis (PSA) using fast Fourier transform (FFT) of electroencephalography (EEG) signals was done and compared with Vineland Social Maturity Scale (VSMS) scores.

Results: Statistical analysis using MATLAB and SPSS 20 (IBM Inc. USA) found that IG show significant improvement with lower p-values ($p < 0.001$) in VSMS scoring in CP subjects and increased beta and gamma activity that are responsible for normal cognitive function in IG.

Conclusion: r-TMS therapy helps in enhancing cognitive ability in CP kids. In future r-TMS therapy can play an important role as a cognitive enhancement tool for CP children and possibly considered to improve their quality of life, thereby helping them come under normal schooling education.

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