

# COGNITIVE REHABILITATION IN DISORDERS OF CONSCIOUSNESS WITH TRANSCRANIAL DIRECT CURRENT STIMULATION

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## Abstract

**INTRODUCTION:** Disorders of consciousness (DOC) range from Unresponsive Wakefulness Syndrome (UWS, formerly known as Vegetative State) where patients show no signs of conscious/purposeful interaction with the environment, to Minimally Conscious State (MCS) where reproducible but not consistent interaction is apparent, and may last for months, years, or even a lifetime. To date, there is no therapeutic intervention for these patients who are expected to either recover spontaneously or not recover at all. Transcranial Direct Current Stimulation (tDCS) is a non-invasive technique that applies small electrical currents through the brain that depolarize or hyperpolarize the underlying neural cell membrane depending on its polarity. Effects of tDCS include cognitive improvement in healthy volunteers as well as clinical improvement in several neurological disorders, like stroke-induced aphasia, motor and visual deficits, cognitive deficits due to TBI or Parkinson's Disease. Multiple sessions of tDCS are considered to affect LTP and LTD mechanisms.

**MATERIAL - METHOD:** Patients with DOC were treated with anodal tDCS (25 cm<sup>2</sup> sponge electrode, 2 mA) over the left primary motor area of the hand while they received verbal movement commands. tDCS was applied for 30 minutes daily with a mean number of 33 sessions totally (range: 14-59). Patients were assessed with the JFK Coma Recovery Scale – Revised (CRS-R). All patients had been stable with no signs of clinical improvement at least for the last 2 months before participation.

**RESULTS:** At the end of participation some patients improved their cognitive status, some showing signs of consciousness that were not present before treatment, while others regained full consciousness.

**CONCLUSIONS:** A significant number of patients that were not improving clinically for at least two months prior to tDCS showed clinical improvement after 10-20 sessions. This case series study shows that tDCS holds promise in the rehabilitation of DOC. Its non-invasive and side-effect-free nature, together with the portable and inexpensive equipment makes tDCS an excellent candidate for large longitudinal controlled studies for the rehabilitation of DOC.