

Extended Abstract

An innovative treatment
approach for mild traumatic
brain injury: Concussion

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Abstract

According to the WHO and the CDC, Traumatic Brain Injury is one of the major causes of death and disability around the world. In the United States over 50,000 lives are lost every year, with hundreds of thousands afflicted with lasting disabilities. Many practitioners lack familiarity with concussion, and have limited access to resources. The Schurig Center for Brain Injury Recovery, a non-profit center near San Francisco, California, has created an innovative range of services to address the needs of adults who have sustained Traumatic Brain Injury (TBI) and Mild Traumatic Brain Injury (mTBI or Concussion). The Center's mTBI treatment program consists of several components: 1) The Re-source Center, 2) The Post-Concussion Education and Support Group, 3) The Individualized Com-puter Treatment Program (ICTP), and 4) "Cog- Smart" - a compensatory skills training class. The Center also provides a separate full-day Therapeutic Program for moderate to severe brain injury. The aim of the Post-Concussion Education and Support Group is to improve knowledge about mTBI, provide resources of support or care in the community, and address the altered sense of self. The efficacy of this group treatment method for post-concussion syndrome was determined through pre- and post-treatment assessment data collected over two years, from 32 patients who participated in successive treatment groups of 7-8 patients each, facilitated by a neuropsychologist and meeting once monthly over four months. Participants responded to questions about their concussion knowledge, level of perceived psychological support, "brain health habits," feelings of isolation, and overall coping ability. Wilcoxon Signed-Rank Tests conducted on this data, showed significant improvement pre-treatment to post-treatment (at the 0.05 level) in all areas (z values ranging from -3.9235 to -4.1399) except for the isolation question (z = -1.5533). Treatment implications of these findings are explored. Awareness of mild traumatic brain injury (mTBI) and persisting post-concussive syndrome (PCS) has increased substantially in the past few decades, with a corresponding increase in research on diagnosis, management, and treatment of patients with mTBI. The purpose of this article is to provide a narrative review of the current literature on behavioral assessment and management of patients presenting with mTBI/PCS, and to detail the potential role of neuropsychologists and rehabilitation psychologists in interdisciplinary care for this population during the acute, subacute, and chronic phases of recovery.

Mild traumatic brain injury (mTBI) results from an external force to the head or body causing neurophysiological changes within the brain. The number and severity of symptoms can vary, with some individuals experiencing rapid recovery, and others having persistent symptoms for months to years, of quality life.

Current rehabilitation is limited in its ability to treat persistent symptoms and novel approaches are being sought to improve outcomes following mTBI. Neuromodulation is one technique used to encourage adaptive neuroplasticity within the brain.

To systematically review the literature on the efficacy of neuromodulation in the mTBI population.

A systematic review was conducted using Medline, Embase, PsycINFO, PsycARTICLES and EBM Review. Preferred Reporting Items for Systematic Reviews and the Synthesis Without Meta-analysis reporting guidelines were used and a narrative review of the selected studies was completed. Fourteen articles fulfilled the inclusion criteria which were published in English, investigating an adult sample and using a pre- and post-intervention design. Studies were excluded if they included non-mild TBI severities, pediatric or older adult populations thirteen of fourteen studies reported positive reductions in mTBI symptomatology following neuromodulation. Specifically, improvements were reported in post-concussion symptom ratings, headaches, dizziness, depression, anxiety, sleep disturbance, general disability, cognition, return to work and quality of life. Normalization of working memory activation patterns, vestibular field potentials, hemodynamics of the dorsolateral prefrontal cortex and excessive delta wave activity were also seen. The studies reviewed had several methodological limitations including small, heterogenous samples and varied intervention protocols, limiting generalisability. Further research is required to understand the context in which neuromodulation may be beneficial.

While these positive effects are observed, limitations included unequal representation of neuromodulation modalities in the literature, and lack of literature describing the efficacy of neuromodulation on the development or duration of persistent mTBI symptoms. Better clarity regarding neuromodulation efficacy could have a significant impact on mTBI patients, researchers, clinicians, and policy makers, facilitating a more productive post-mTBI population. Despite the limitations, the literature indicates that neuromodulation warrants further investigation. PROSPERO registration number: CRD42020161279.

TBI (traumatic brain injury) is a major cause of death among youth in industrialized societies. Brain damage following traumatic injury is a result of direct and indirect mechanisms; indirect or secondary injury involves the initiation of an acute inflammatory response, including the breakdown of the blood-brain barrier (BBB), brain edema, infiltration of peripheral blood cells, and activation of resident immunocompetent cells, as well as the release of numerous immune mediators such as interleukins and chemotactic factors. TBI can cause changes in molecular signaling and cellular functions and structures, in addition to tissue damage, such as hemorrhage, diffuse axonal damages, and contusions. TBI typically disturbs brain functions such as executive actions, cognitive grade, attention, memory data processing, and language abilities.