Brain magnetic stimulation for veterans with concussion: Need is high, but evidence is limited

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Studies using repetitive transcranial magnetic stimulation (rTMS), a noninvasive technique, to help veterans and active-duty service members

living with depression, post-traumatic stress disorder (PTSD), and other lasting consequences of concussion have shown promise. However, there's an urgent need for studies designed to address the unique patterns of post-concussion symptoms seen in military populations, concludes a review in the November/December issue of the *Journal of Head Trauma Rehabilitation* (*JHTR*).

"rTMS represents a novel innovative, and possibly transformative approach to the treatment of chronic neuropsychiatric and neurocognitive symptoms associated with military concussion," write David L. Brody, MD, Ph.D., of the Center for Neuroscience and Regenerative Medicine at the Uniformed Services University of the Health Sciences, Bethesda, Md., and colleagues. They highlight the need for higher-quality evidence to guide the use of rTMS for service members and veterans with post-concussion symptoms.

rTMS for post-concussive symptoms in veterans: 'Smarter trials' needed

More than 342,000 US service members have experienced concussion over the past two decades. Many of them are living with post-concussive symptoms—especially depression, PTSD, and cognitive issues, often in combination. Despite the high impact of these chronic neuropsychiatric and neurocognitive symptoms, there is a lack of effective, evidence-based treatments.

One potentially useful approach is rTMS, consisting of repeated sessions of noninvasive magnetic stimulation, targeted to specific areas of the brain. Specific rTMS protocols are approved for the treatment of selected patients with major depressive disorder. A growing body of evidence suggests that rTMS may be effective for PTSD and cognitive issues as well.

However, the effectiveness of rTMS for post-concussion symptoms remains unclear; many studies have specifically excluded patients with brain injury or head trauma. In addition, the nature of military concussions and post-concussion symptoms may be very different than in civilian populations.

To assess the current state of knowledge, Dr. Brody and colleagues reviewed the research literature on rTMS for post-concussion symptoms. They identified a total of nine clinical trials, mainly small-scale pilot studies. Evidence for the effectiveness of rTMS for specific types of symptoms was mixed, at best:

- *Depression.* Of six studies evaluating the effects of rTMS for depression, three reported positive results but three found no improvement. Three of the studies did not assess veterans or service members.
- *PTSD.* Three of the depression studies did include patients with military concussions, and all of them also included data on PTSD. However, just one study reported improvement in PTSD symptoms with rTMS.
- *Cognitive issues.* Five studies included data on cognitive outcomes of rTMS; none found significant improvement. One recent trial designed for veterans with mild to moderate traumatic brain injury reported no improvement in executive functioning: a key aspect of cognitive performance.

Based on the results, "there is simply insufficient data" to support the effectiveness of any specific rTMS protocol, Dr. Brody and coauthors write. They do note that rTMS appears safe, and that the negative results in preliminary trials don't necessarily mean that rTMS is ineffective. Key questions remain as to the best stimulation settings and number of sessions, as well as the optimal approach to military and other patients with multiple clinical issues.

"The importance of optimizing feasibility and efficacy of rTMS to treat service members and veterans with chronic neuropsychiatric and neurocognitive symptoms associated with concussion cannot be overstated," Dr. Brody and colleagues conclude. "We need to begin to design smarter trials that are powered to answer research questions to confidently assess and recommend rTMS as a treatment option for this population."

More information: Lindsay M. Oberman et al, Use of Repetitive Transcranial Magnetic Stimulation in the Treatment of Neuropsychiatric and Neurocognitive Symptoms Associated With Concussion in Military Populations, *Journal of Head Trauma Rehabilitation* (2020). DOI: 10.1097/HTR.0000000000000628