Microcurrent Neurofeedback vs Traditional Neurofeedback in the Reduction of Post TBI Cognitive Symptoms

Lauren Kolbert, BSN Student; Faculty Mentor: Gloria Duke, PhD, RN
Contributors: Bailey Rogers, BSN Student; Emily Howard, BSN Student; Sophia Heard, BSN Student.

Problem Identification

Traumatic brain injury (TBI) often has serious consequences over the long term (Reddy et al., 2014) and is typically a result of acceleration-deceleration accidents, athletic trauma or blasts (Kerson, 2014). Consequences of TBI often profoundly impact daily quality of life, especially in first responders and veterans and are manifested as sustained physical, cognitive, emotional and behavioral problems (Lafee, 2017). While therapies have been in existence for decades, evidence is inconsistent and lacking regarding alternative modalities, such as neurofeedback training (NFT). IASIS microcurrent neurofeedback (MCN) is a more recently developed contemporary technology as compared to traditional NFT that has been used for the past several decades. A wide body of anecdotal evidence supports the effectiveness of MCN for treating TBI (Shallenberger, 2018). Advantages of MCN over traditional neurofeedback include (a) it is the first technology demonstrating effectiveness using image-based evidence, (b) sessions are shorter in duration, and (c) sustainability of positive outcomes occur sooner (IASIS, 2018). However, NFT has been around for decades and has also demonstrated effectiveness. This led to a spirit of inquiry by a group undergraduate nursing research students to compare TBI outcomes using the newer MCN therapy with the more traditional NFT in persons with mild TBI (mTBI).

The Clinical Question: PICOT

The literature search was guided by the following PICOT question: In patients with mTBI (***P***), how does MCN therapy (***I***) compared to NFT therapy (***C***) affect the reduction of TBI cognitive symptoms (***O***) within the therapy's duration (***T***)? For the intervention style question, the hierarchy evidence is rated from Level I to Level VII. The literature review culminated in evidence located that reflected Levels 1, 2, 3 and 7.

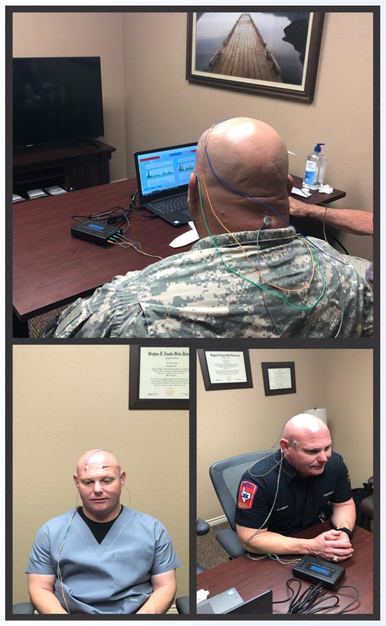
Critical Appraisal of the Evidence

Level 1: NFT A systematic study (May et al., 2013) reviewed 23 studies that explored effects of NFT on TBI. All reviewed reports showed improvements in mild-moderate TBI with both subjective and objective data.
Level 2: NFT Rostani et al. (2017) studied effects of NFT with mild TBI in 17 patients, 8 in intervention and 5 in control groups. No significant effects on memory and concentration.
Level 3: NFT Munivenkatappa et al. (2014) tested EEG—NFB on 2 subjects, aged 12 and 20 to see effects on white and grey brain matter; 20 sessions, 3/week; . Both were significantly enlarged post NFT, indicating improved cognitive functioning.
Level 3: NFT Reddy et al. (2014) studied NFT on QOL on 60 subjects; QOL significantly improved after 20 sessions 95-6/week).
Level 3: MCN Huang et al. (2017): first and only MCN due to newness; low intensity pulse transcranial electrical stimulation (LIP-tES) treatment that monitors brain waves, utilizing magnetoencephalography (MEG) exams for neuroimaging; Six with 1 drop out; all except drop out showed significant improvement in TBI-related post concussive symptoms.
Level 7: NFT Reid-Chung et al. (2015) demonstrated through three clinical case studies that a combination of biofeedback and NFT "can" improve heart rate variability with those who have TBI. Kerson, 2014) discussed an interview with the President of International Society for Neurofeedback and Research who stated too few academics are interested in research and research that has been done lacks rigor due to lack of collaboration with those knowledgeable about and skilled in NFT. Gray (2017) discusses a newer generation of NFT, quantitative EEG (qEEG) that helps to improve clinical sensitivity; current evidence flawed and lacks rigor.

The Evidence: MCN or NFT?

The one MCN study and three research articles located within the past six years lacked significant rigor and consequently led the reviewers to question results. Small sample sizes, lack of sham for control, lack of control group, lack of randomization, lack of transparency regarding other methodological issues (protocols, length of treatment, inclusion criteria), sample heterogeneity, and variability in length of time post TBI all contributed to weak internal and external validity. According to Shallenberger (2018), MCN does more than treat the symptoms….MCN repairs the underlying neurological mechanisms contributing to the devastating symptoms of PTSD and TBI. There is a critical lack of science to validate the scientific effectiveness to be able to promote MCN as something to once again give hope and meaning to the lives of thousands of veterans suffering from TBI and PTSD. With the one study at UC San Diego in progress with the veteran population, and two additional ones planned to be implemented in late May 2019 in East Texas, efforts will be maximized to ensure these studies reflect optimal internal and external validity. NFT research has been in progress for decades, but the research on TBI in the past six years is extremely limited and significantly lacks rigor.

Due to the lack of evidence and lack of rigor in existing research, no decision can be made as to whether or not IASIS MCN or NFT is more effective. In order to establish evidence sound enough for practice, the following must be incorporated into future studies**:** a) larger and more homogenous samples, b) Double blind studies with a sham treatment therapy using subjects with a variety of age groups and genders, c) outcomes that combine the use of imaging e.g. the MEG (Huang, 2017) along with appropriate psycho-social and cognitive functioning tools, d) longitudinal studies to explore sustainability of interventions post treatment, e) transparency of protocols and equipment used and consistency of their use within studies.



IASIS MCN

TRADITIONAL NFT

Evidence Integrated with Clinical Expertise and Patient Preferences to Inform a Practice Change Decision

Due to very limited evidence for both MCN and traditional NFB, and lack of study rigor in those that are published, no practice decision can be made at this time. This leads to the conclusion that more Level 2 research is needed and must be conducted to meet criteria for internal and external validity. A VA-funded, double-blinded, 4 year RCT is entering its 2nd year at University of CA, San Diego to determine the effects of MCN on TBI and PTSD in combat veterans.

Implications for East Texas

This evidence-based practice project is extremely relevant to East Texas due to the large numbers of combat veterans in this area. Percentages of veterans battling PTSD are as follows: Vietnam War 31%, Gulf War 12-24%, Iraq War 11-30% and Afghan War 14%. The suicide rate for veterans is 1 in 20 and only 14% of those who need help are actually getting it, with 40% determined to be unresponsive to treatments considered evidenced based (Project Healing Heroes, DU). We know there are major gaps in accessing quality care through the VA system and this is for many veterans their only viable source of healthcare. TBI and post concussive symptoms are extremely difficult to treat in military personnel, and these consequences are all too frequently observed in veterans who are homeless, jobless, have few if any, social contacts, and essentially have lost their purpose or meaning in life. With the advent of the relatively new MCN, certified practitioners report overwhelmingly positive anecdotal evidence regarding the effectiveness of MCN in military personnel suffering from TBI. Anecdotal evidence also contributes to MCN potentially being more effective to the "treatment resistant" veteran suffering from TBI and PTSD. The reviewers of this EBP project firmly believe that we have an ethical and professional obligation to meet the needs of those who serve to protect our country and who seemingly have the most problems accessing quality care.

NOTE: While this review did not focus on veterans with TBI, it was spurred by the passion of the primary author to address the major problem of PTSD experienced by veterans in our community. Three IASIS providers in Tyler have treated veterans with seemingly hopeless futures with incredible results. While the published evidence is favorable toward NFT, there are clear advantages of IASIS MCN over traditional NFT as indicated in the tables below. The special population of veterans and Active Duty military personnel are underserved and when considering the sacrifices on their part made on behalf of our country and communities, it is incumbent on us to facilitate credible and rigorous scientific evidence in order to have available more effective strategies to positively impact their daily quality of life. It is the least we can do.

IASIS MCN
Subject can be passive and engaged in activity, e.g. reading, or just relax; no interaction required; Only 1 published pilot study with few rigor flaws; Evidence image-based per MEG that showed significant improved brain electrical activity; Results are seen sooner; Enduring sustainability attained sooner; Anecdotal evidence that veterans with extreme moderate, early-severe PTSD are improved.

NFT
Requires interaction and concentration by person receiving it; Longer history of evidence of effectiveness, but published studies lack rigor on many levels; One study showed white and grey matter growth; May take several sessions longer to see results; Difficult to determine due to lack of anecdotal or evidence; Not recommended for anyone with severe TBI due to anticipated ineffectiveness (Homecoming for Veterans, DU).

The University of Texas at TYLER