# TMS TRENDS

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## TMS DEVICES: ARE THERE DIFFERENCES?

With so many individuals suffering from major depressive disorder (MDD) worldwide, there is an urgent need to develop new strategies and methods to treat individuals who are suffering from depression. The treatment options available for individuals suffering from depression are suboptimal, with most patients being refractory. Aside from different forms of talk therapy, electric shock treatment (ECT) and numerous antidepressants, repetitive transcranial magnetic stimulation (rTMS) is known to be a safe, noninvasive, treatment for major depressive disorder. We at the TMS Institute of Pennsylvania adopted this fascinating technology soon after the FDA cleared this technology in 2008.

Although there are now 4 TMS devices cleared by the FDA for use in treating depression, our facility utilizes the NeuroStar system (Neuronetics, Inc.), the first and most widely used device in the US. This begs the question of whether one particular system is more effective and better tolerated than another, and whether different treatment protocols offer greater efficacy.

These questions were addressed by Brunoni et al. in a recent issue of *JAMA Psychiatry.* The researchers conducted a meta-analysis of 81 separate studies (4233 subjects) investigating several strategies of rTMS to address the differences in accessibility and efficacy between the several types of rTMS therapy for acute depressive disorder.

Different treatment methods assessed included priming low-frequency, bilateral treatment, high-frequency, low-frequency, and theta-burst rTMS. Were any of these types of treatment modalities more effective and tolerable than another?

Newer methods of rTMS include deep H-coil stimulation (e.g. Brainsway) over the dorsal-lateral prefrontal cortex (DLPFC), which purportedly activates deeper cortical and subcortical structures. Another novel form of rTMS therapy is theta-burst stimulation (TBS), which continuously stimulates the DLPFC, or intermittently stimulates the left. This particular method is auspicious due to its shortened treatment session (5 minutes) and neuroplasticity induction.

A third method performs synchronized pulses to an individual's frequency, which is referred to as low-field synchronized TMS (sTMS). Lastly, high-frequency rTMS (HF-rTMS), such as accelerated, applies 4 or more HF-rTMS sessions per day, where as low-frequency rTMS (LF-rTMS), also known as "priming," delivers high frequency pulses before LF-rTMS theoretically boosting efficacy.

Direct evidence showed that bilateral rTMS was superior to HF for remission and network evidence showed that it was also superior to sTMS for response and remission. These findings suggest that larger RCTs should be performed to explore the efficacy of this intervention. Also, TBS was more effective than sham for treating MDD – something that warrants further investigation given the short duration of treatment compared to other strategies.

With respect to patient discomfort and tolerability, all of the studied treatments were at least as acceptable as sham. Interestingly, deep, synchronized, and accelerated TMS were not more effective than sham based on the ITT data and statistical approach. Thus current evidence cannot support novel rTMS interventions as a treatment for MDD.

Finally, the estimated relative ranking of treatments suggested that priming low-frequency and bilateral rTMS might be the most efficacious and acceptable interventions among all rTMS strategies. However, results were imprecise and relatively few trials were available for interventions other than low-frequency, high-frequency, and bilateral rTMS.