

Effect of Combined Tai Chi and Repetitive Transcranial Magnetic Stimulation for Sleep Disturbance in Older Adults: A Randomized Controlled Trial

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Abstract:

Background: Hyperarousal states have been well documented as the pathophysiological mechanism underlying sleep disturbance. Research has shown that Tai Chi (TC) as well as repetitive transcranial magnetic stimulation (rTMS) regulate arousal components in a bottom-up and top-down pathway, respectively. This work was a pioneering attempt to investigate the efficacy of TC combined with rTMS in improving sleep disturbance in the elderly. Trial registration at ClinicalTrials.Gov: NCT06411509.

Methods: A total of 152 participants were randomly assigned to: (1) TC combined with active rTMS group (n = 38), (2) TC combined with sham rTMS group (n = 38), (3) TC-alone group (n = 38), and (4) physical exercise (PE) group (n = 38). Each group underwent a four-week intervention. Outcomes included insomnia severity, objective sleep patterns assessed using ActiGraph, and subjective sleep patterns measured through sleep diary.

Results: Significant improvements in objective sleep onset latency were observed in TC combined with active rTMS group compared to the sham comparator after intervention, and this advantage lasted three months. In addition, TC combined with active rTMS yielded a superior benefit in objective sleep efficiency and wake time after sleep onset for participants without depressive symptoms after intervention, compared to PE group and its sham comparator. Meanwhile, all three TC groups, either alone or combined with rTMS, showed a significant improvement in subjective sleep onset latency for participants with depressive symptoms at both post-intervention and three-month follow-up assessments.

Conclusion: Findings from our study suggested that integrating TC with rTMS had synergistic and long-lasting effects on sleep disturbance in older adults. Specific sample characteristics, such as depressive symptoms, should be considered in clinical application. Further studies are warranted to optimize the protocol to maximize therapeutic effectiveness and to unravel the underlying mechanisms.