

Exploring the efficacy of rTMS in reducing symptoms of Tourette's in comparison to sham treatment: a rapid review.

Harpreet Singh BSc MSc MBPsS, Athana Thangarajah BSc MSc, Lorelei-Jane Wyman BSc MBPsS, Dr Pegah Shojaii BSc MSc PhD MBPsS, Dr Leigh A Neal MB BCh FRCPsych MRCGP

Introduction

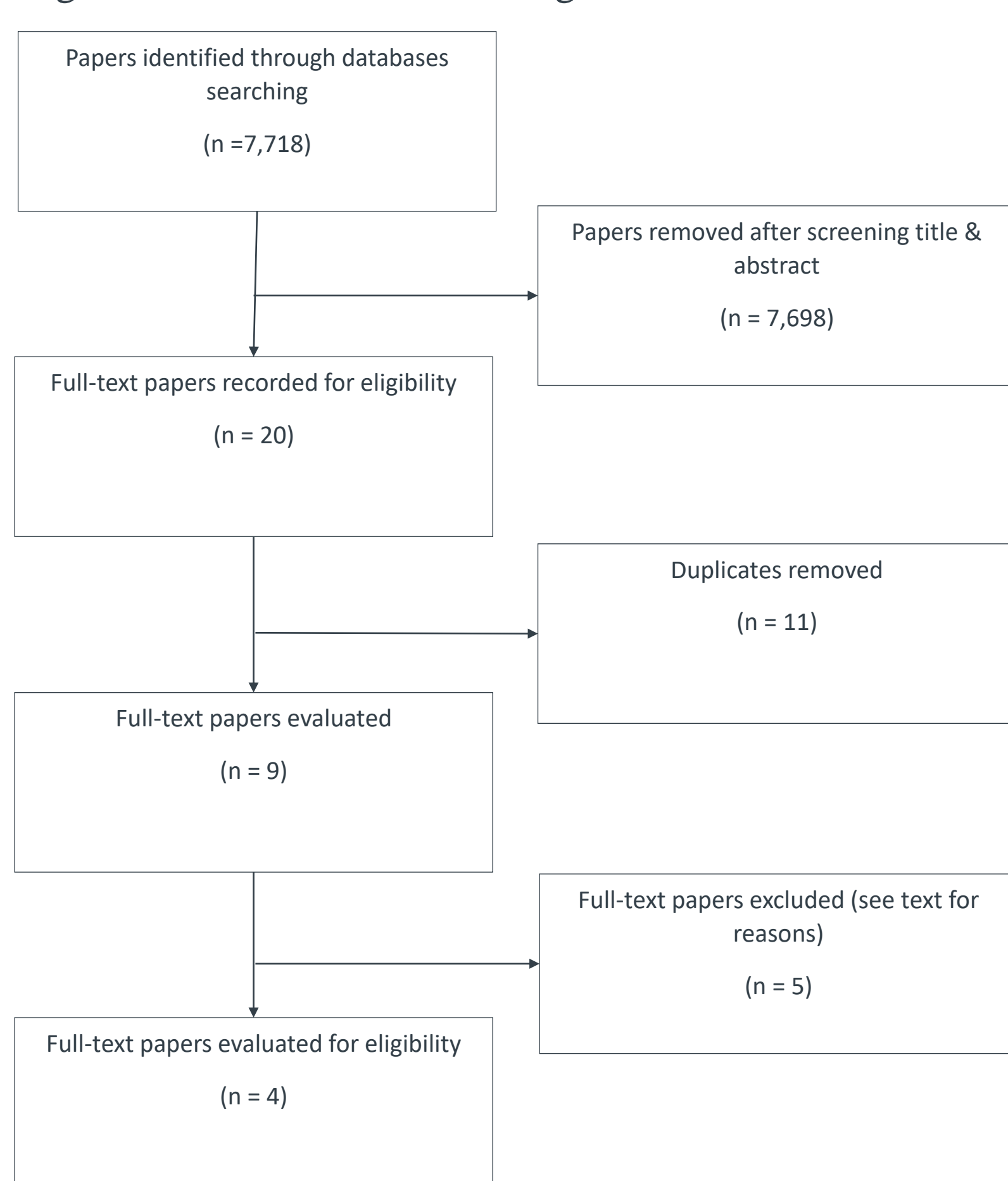
Repetitive TMS (rTMS) is a non-invasive method of neuromodulation used to treat psychiatric and neurological disorders. Since NICE approved rTMS as safe and clinically effective for the treatment of depression in 2015, research has explored effectiveness for several other disorders. Roughly 1.4 million people suffer from tic disorders in the UK, with many being treatment resistant. This rapid review has been conducted to explore the viability and utility of rTMS as an intervention to treat tic disorders. This is a secondary study method whereby components of a systematic review are simplified to answer the research questions in a reduced time

Aim: To critically evaluate evidence from randomized controlled trials exploring the utility of transcranial magnetic stimulation (TMS) for tic disorders.

Results

Following our systematic search and elimination, a total of 4 studies were selected of this review (see Figure 1). Once all databases were scanned, papers that were deemed qualified based upon screening of the titles and abstract were recorded in a shared file. After removal of the duplicates 10 studies were selected for eligibility. Upon further evaluation, 5 studies were eliminated because: 4 had no comparison group (i.e., no sham treatment), and 1 was a meta-analysis. Main findings:

Figure 1. CONSORT Flow Diagram of Selection Process.



- 1 was single blinded RCTs, 1 was a single blinded placebo-controlled study, and 2 were double blinded RCTs
- all the selected studies only included patients we met the Diagnostic and Statistical Manual of Mental Disorder (DSM-IV) criteria for Tourette syndrome. The overall age range was between 10 to 52 years
- oldresting motor threshold (rMT) of the patients were measured in all of the studies before commencing rTMS
- resting motor threshold (rMT) of the patients were measured in all of the studies before commencing rTMS
- Each study had used a form of figure-of-8 coil from Magstim to administer low frequency rTMS
- All the studies had some form of sham treatment to compare to the effectiveness of the TMS treatment
- YGTSS was a primary or secondary measure in the selected studies

The RCT CASP (CASP, 2020) was used to assess the quality of the selected studies. The checklist consisted of 11 questions, divided into four sections, looking at different aspect of an RCT. Overall, most of the studies were rated as moderate. This was primarily because of a lack of statistical reporting and generalisability.

Table 2. CASP Quality Assessment Summary.

| | Fu et al., (2021) | Landeros-Weisenberger et al., (2015) | Wu et al., (2014) | Orth et al., (2005) |
|--|-------------------|--------------------------------------|-------------------|---------------------|
| Is the research question focused? | Yes | Yes | Yes | Yes |
| Were participants randomly assigned to groups? | Yes | Yes | Yes | Yes |
| Are all participants accounted for in their conclusion? | Yes | Yes | Yes | Can't Tell |
| Was the study single, or double blinded? | Yes (single) | Yes (double) | Yes (double) | Yes (single) |
| Were the study groups similar at the start of the RCT? | Yes | No | Yes | Can't tell |
| Were the groups treated equally (apart from intervention)? | Yes | No | Yes | Yes |
| Were the results reported comprehensively? | Yes | Yes | Yes | Yes |
| Was the estimate of the intervention or treatment effect reported? | No | No | No | No |
| Does the benefit of the study outweigh the cost? | Yes | Yes | Yes | Yes |
| Can the results be applied to your local population/in your context? | No | Yes | Yes | No |
| Is the study generalizable? | No | No | Yes | No |

Method

A selection criteria with set inclusion and exclusion criteria was used to assess and select the most relevant articles (see Table 1). This consisted of randomized controlled trials (RCTs) testing low frequency rTMS vs sham-TMS in patients with tic disorders - where everity of tic disorder was measured by the Yale Global Tic Severity Rating Scale (YGTSS).

Table 1. Summary of Inclusion and Exclusion Criteria.

| | Inclusion Criteria | Exclusion Criteria |
|--------------|--|--|
| Population | Patients with a diagnoses of tic disorder | Patients with brain injury Patients with a history of epilepsy |
| Intervention | TMS Low frequency treatment Treatment with figure of 8 coil | |
| Comparator | Sham-TMS Sham-rTMS | Combination of treatment |
| Outcome | Severity of tic disorder with the Yale Global Tic Severity Rating Scale | |
| Study design | Language: English Randomized controlled trials Years of publication: 2000-2021 | Any form of qualitative study Opinion piece Editorials Commentaries |

A systematic search, with pre-selected search terms, was applied to SCOPUS, Science Direct, PubMed, APA psychinfo, and EBSCO Host for RCTs between 2000 and 2021. The search terms entered into each database, with Boolean terms, were TMS OR tms OR transcranial magnetic stimulation OR brain stimulation OR stimulation OR rtms AND tic disorder OR Tourette's syndrome.

This review was conducted using a narrative synthesis, where all the findings were summarized using text. Then comparison was made in relation the similarities and differences of the studies to effectively answer the research question and draw conclusions.

Each of the selected studies were also assessed for quality using the Critical Appraisal Skills Program Randomized Controlled Studies Standard Checklist (CASP, 2020).

Conclusion

TMS when applied to specific brain regions has shown a statistically significant effect on improving symptoms of tic disorder, future studies should seek to replicate these findings in larger samples.

Conflict of Interest & Funding

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