

INPLASY

Evaluating the impact of rTMS on upper extremity motor dysfunction in post-stroke patients through task-based fMRI: A Systematic Review

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ADMINISTRATIVE INFORMATION

Support - Support from the department.

Review Stage at time of this submission - Data extraction.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202430033

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 10 March 2024 and was last updated on 10 March 2024.

INTRODUCTION

Review question / Objective This paper investigates the alteration of brain activity using task-based fMRI after rTMS over the primary motor cortex (M1) in patients with upper extremity motor dysfunction after stroke. The primary aim is to delve deeper into the neural mechanisms of rTMS in stroke rehabilitation, and the second aim is to investigate the correlation between brain activations and functional outcomes.

Rationale Various repetitive transcranial magnetic stimulation (rTMS) protocols over the primary motor cortex (M1) have demonstrated efficacy in facilitating poststroke upper extremity motor recovery. Neural biomarkers yielded by functional magnetic resonance imaging (fMRI) can be utilized to investigate the neural mechanism underlying

rTMS-induced motor facilitation in patients with stroke. However, a focused review on the mechanism of rTMS in post-stroke upper limb motor dysfunction assessed by task-based fMRI is not yet available.

Condition being studied Applying rTMS in post-stroke upper extremity motor dysfunction, assessed by take-based fMRI.

METHODS

Search strategy ("Transcranial Magnetic Stimulation" [Mesh] OR (TMS) OR (repetitive transcranial magnetic stimulation) OR (rTMS) OR (theta burst stimulation) OR (TBS) OR (intermittent theta burst stimulation) OR (iTBS) OR (continuous theta burst stimulation) OR (cTBS)) AND ("Magnetic Resonance Imaging"[Mesh] OR (MRI) OR (functional magnetic resonance imaging) OR

(fMRI) AND ((Motor Cortex) OR (primary motor cortex) OR (M1) OR (Brodmann area 4)).

Participant or population Post-stroke upper extremity motor dysfunction.

Intervention rTMS stimulate the M1(one-site), or a combination of rTMS with additional rehabilitation training (e.g., physiotherapy and occupational therapy).

Comparator The comparison group could be sham TMS (sham coil/ sham control brain area/ ineffective intensity), sham TMS combined with motor training, a control group performing motor training or just pre-post rTMS compare.

Study designs to be included Randomized controlled trials.

Eligibility criteria 1) Participants: Participants included in this study were the patients with ischemic or hemorrhagic stroke who has upper limb motor dysfunction (>18 years old).2) Interventions: rTMS stimulate the M1(one-site), or a combination of rTMS with additional rehabilitation training (e.g., physiotherapy and occupational therapy).3) Comparisons: The comparison group could be sham TMS (sham coil/ sham control brain area/ ineffective intensity), sham TMS combined with motor training, a control group performing motor training or just pre-post rTMS compare.4) Outcome measurements: Task-based fMRI evaluation before rTMS and after rTMS treatment. 5) Study design: All randomized controlled clinical trials published in English from 1st January 2000 to 17th January 2024 were included.

Information sources Databases: PubMed, the Cochrane Library, Web of Science and EMBASE Contact the authors when the full text cannot be found. Grey literature from any possible resources.

Main outcome(s) BOLD signal changes are measured by task-based fMRI.

Additional outcome(s) 1. laterality index (LI); 2. correlation between MRI outcomes and functional assessments.

Quality assessment / Risk of bias analysis Quality assessment: PEDro.

Strategy of data synthesis Mainly focused on summarize the fMRI outcome of each included study. Try to extract the MNI coordinates of all

brain areas with significant activation changes and use ALE for analysis.

Subgroup analysis 1. LF-rTMS / cTBS; 2. HF-rTMS / iTBS.

Sensitivity analysis No.

Language restriction English.

Country(ies) involved Hong Kong.

Keywords Neuromodulation; Neuroimaging; Stroke; Transcranial Magnetic Stimulation; Functional magnetic resonance imaging.

Contributions of each author

Author 1 - Youxin SUI - conception and design of the work, acquisition, analysis, quality assessment, interpretation of data for the work, and drafting the manuscript.

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