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ADMINISTRATIVE INFORMATION**Support** - None.**Review Stage at time of this submission** - Data extraction.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202440014**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 03 April 2024 and was last updated on 03 April 2024.**INTRODUCTION**

Review question / Objective Parkinson's disease (PD) is a common neurodegenerative disorder characterized by bradykinesia, rest tremor, rigidity, and postural instability. Apart from pharmacological treatment, nonpharmacological treatment such as deep brain stimulation and rehabilitation may be beneficial for PD patients. Some studies have shown that repetitive transcranial magnetic stimulation (rTMS) may have beneficial effects in PD patients, while others have reached inconsistent conclusions because of the variation in rTMS stimulation parameters. Most of the studies vary greatly in stimulation targets, inclusion/exclusion criteria, methods of sham-TMS, and statistical methods. Currently, most of the studies involved small sample sizes and vary widely in methods. Stimulation targets of rTMS for PD include the primary motor cortex (M1), the supplementary motor cortex (SMA), the dorsolateral prefrontal cortex (DLPFC) and cerebellum. At present, there is

a lack of unified opinions on the parameters and effectiveness of rTMS for PD treatment. This meta-analysis is conducted to evaluate the efficacy of high-frequency rTMS on PD motor symptoms, and to compare the treatment effects of different stimulation sites and stimulation frequency by subgroup analysis, so as to determine more effective rTMS treatment parameters.

Condition being studied Currently, most of the studies involved small sample sizes and vary widely in methods. Stimulation targets of rTMS for PD include the primary motor cortex (M1), the supplementary motor cortex (SMA), the dorsolateral prefrontal cortex (DLPFC) and cerebellum. A meta-analysis suggested that multi-session rTMS of high frequency appeared to be the optimal parameter for improving motor function in PD. At present, there is a lack of unified opinions on the parameters and effectiveness of rTMS for PD treatment. This meta-analysis is conducted to evaluate the efficacy of high-frequency rTMS on PD motor symptoms, and to compare the

treatment effects of different stimulation sites and stimulation frequency by subgroup analysis, so as to determine more effective rTMS treatment parameters.

METHODS

Participant or population (1) Randomized controlled study;(2) The study subjects were patients with PD and had motor dysfunction;(3) Patients in the experimental group received high-frequency rTMS, and the control group received sham stimulation;(4) Except for rTMS or sham stimulation, both the experimental group and the control group received the same treatment.

Intervention Patients in the experimental group received high-frequency rTMS, and the control group received sham stimulation.

Comparator Patients in the experimental group received high-frequency rTMS, and the control group received sham stimulation.

Study designs to be included (1) Randomized controlled study;(2) The study subjects were patients with PD and had motor dysfunction;(3) Patients in the experimental group received high-frequency rTMS, and the control group received sham stimulation;(4) Except for rTMS or sham stimulation, both the experimental group and the control group received the same treatment.

Eligibility criteria (1) The study subjects include patients with Parkinson's syndrome or Parkinson's superposition syndrome;(2) No control group or no control group without sham stimulation;(3) The original data is still not available after contacting the authors.

Information sources Searched the English literature published in PubMed, Embase, Web, Science and Cochrane libraries.

Main outcome(s) Effect sizes for continuous data were calculated using standardized mean differences (SMD) to pool and compare different outcome measures across individual studies. I^2 was used to assess the heterogeneity between the different studies. $I^2 < 50\%$, considered low heterogeneity, using a fixed effect model; $I^2 \geq 50\%$, considered high study heterogeneity, using a random effect model. Subsequently, sensitivity analysis was performed by each elimination to search for sources of heterogeneity by subgroup analysis.

Quality assessment / Risk of bias analysis Each study was assessed using the Cochrane Risk of Bias Assessment tool.

Strategy of data synthesis All statistical analyses were performed using RevMan 5.4.

Subgroup analysis subgroup analysis of stimulation frequency and stimulation targets.

Sensitivity analysis None.

Country(ies) involved China.

Keywords Repetitive Transcranial Magnetic Stimulation, Parkinson's Disease.

Contributions of each author

Author 1 - Chao Han.

Author 2 - Yuanyuan Hou.

Author 3 - Anmu Xie.