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Meta-analysis of the effects of upper limb robot-assisted training on cognitive function and upper limb function in patients after stroke

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Zhu, SS¹; Zhang, HM²; Xu, K³; Guo, X⁴; Ma, JY⁵; Zhang, XY⁶.

Corresponding author:

ZHU Shanshan

zhushanshanvip@163.com

Author Affiliation:

School of Nursing, Xinxiang Medical University.

ADMINISTRATIVE INFORMATION

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Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 04 July 2023 and was last updated on 04 July 2023.

INTRODUCTION

Review question / Objective To systematically evaluate the therapeutic effect of upper limb robot-assisted training on cognitive function and upper limb motor dysfunction in stroke patients..

Condition being studied Post-stroke cognitive impairment (PSCI) is a clinical syndrome characterized by cognitive impairment that occurs after stroke and lasts for 3-6 months, with an incidence of 80 %. PSCI makes the beneficiaries unable to cooperate well with rehabilitation training, hinders the recovery of physical function, affects the activities of daily living (ADL), reduces the quality of life and survival time of patients, and significantly increases the family and social economic burden. A study by Nys et al.showed that 6 months after stroke, the overall functional

status of physical, psychological and social functions in patients with cognitive impairment decreased significantly. Meta analysis has shown that upper limb rehabilitation robot-assisted training can significantly improve the upper limb motor function of stroke patients. At the same time, studies have shown that upper limb robot-assisted training can improve the cognitive function of stroke patients, but there is a lack of systematic evaluation reports on upper limb robot-assisted training to improve post-stroke cognitive impairment, and lack of evidence-based medical evidence support.

METHODS

Search strategy We will search PubMed, The Cochrane Library, Scopus, Web of Science, EMBASE, Wanfang Data, CNKI, and VIP full-text databases for the effects of robot-assisted training

on cognitive function and upper limb function recovery in stroke patients until July 2023. The search string will be built as follows:(Robotics OR robot therapy OR robot-assisted therapy OR robot-assisted rehabilitation OR Robot-assisted training OR robot-aided rehabilitation) AND (Upper Extremity OR Extremities, Upper OR Upper Extremities OR Upper Limb OR Limb, Upper OR Limbs, Upper OR Upper Limbs OR Extremity, Upperexercise OR physical activity OR resistance training OR endurance training) AND (cognitive function OR cognition OR attention OR memory OR executive function OR neuropsychological test) AND (dementia*, vascular OR stroke OR cerebrovascular accident OR brain ischemia OR poststroke OR post-stroke OR vascular dementia* ORvascular cognitive impairment) AND (Randomized controlled trial OR Randomized controlled trials as topic OR Randomized controlled trial OR Randomized controlled trial AND RCT.

Participant or population Clinically diagnosed as stroke, or consistent with the relevant Adults (≥ 18 years) who are diagnosed with stroke according to the Stroke Society 's diagnostic criteria for stroke, or who are identified by imaging evidence as stroke patients and have cognitive impairment confirmed by screening or assessment.

Intervention Robot-assisted training.

Comparator Any comparative therapy as well as treatment asusual or no treatment.

Study designs to be included Clinically administered random trials with controls.

Eligibility criteria Intervention : (robot-assisted training or combined with conventional rehabilitation therapy (physical therapy) Treatment, occupational therapy and cognitive training). (Dosage, intensity, and frequency matched cognitive training or upper limb rehabilitation training with sham robot-assisted training) ; primary outcome : the main outcomes (cognitive function, including global cognition measured by Mini-Mental State Examination [MMSE], or Montreal Cognitive Assessment [MoCA], attention measured by Auditory Continuous Performance Test [CPT], or Visual CPT ; executive function measured by Word of color word test, Color of color word test, T. Secondary outcome measures : Fugl-Meyer Assessment for the Upper Extremity (FMA-UE), all efficacy outcomes should be measured before intervention.Exclusion criteria :Repetitive published literature ; Non-Chinese-English literature ; unable

to obtain the full text of the literature ; Data or data not all and contact the author fruitless.Inclusion criteria : Adult participants aged over 18 with a clinical diagnosis of a first stroke and confirmed at least one specific domain of cognitive impairment, including global cognition, attention, working memory, executive function and upper limb dysfunction.

Information sources We will search PubMed, The Cochrane Library, Scopus, Web of Science, EMBASE, Wanfang Data, CNKI, VIP full-text databases, and clinical trial registration websites, and screened clinical randomized controlled trials published in peer-reviewed journals. for the effects of robot-assisted training on cognitive function and upper limb function recovery in stroke patients until July 2023.

Main outcome(s) cognitive function, including global cognition measured by Mini-Mental State Examination [MMSE], or Montreal Cognitive Assessment [MoCA], attention measured by Auditory Continuous Performance Test [CPT], or Visual CPT ; executive function measured by Word of color word test, Color of color word test, T.

Additional outcome(s) Fugl-Meyer Assessment for the Upper Extremity (FMA-UE).

Data management Literature screening and data extraction were performed by 2 researchers who independently screened the literature, extracted the data, and cross-checked the data. Disagreement was resolved through discussion or consultation with a third person. The literature was screened by first reading the title of the text and, after excluding irrelevant literature, fourth reading the abstract and full text to determine inclusion. If necessary, the authors of the original studies were contacted by email or telephone to obtain information that was not identified but was important for this study. Information extraction included (1) basic information about the included studies: study title, first author, and so on; (2) baseline characteristics of the study population and interventions; (3) key elements of the risk of bias assessment; (4) outcome indicators and outcome measures of interest.

Quality assessment / Risk of bias analysis Two researchers evaluated the risk of bias in the included studies and cross-checked the results independently. If there were disagreements, they were resolved by third-party negotiation. We assessed the overall quality of the trials by using the RCT risk of bias assessment tool recommended in the Cochrane Handbook.²² The

main components of the assessment included (1) randomization grouping, (2) allocation concealment, (3) blinding (investigator, intervention implementer, outcome measure), (4) completeness of outcome data, (5) selective reporting, and (6) other sources of bias. “Low” indicates that the risk of bias is low, “high” indicates that the risk of bias is high, and “unclear” indicates that the literature does not provide sufficient information for bias analysis.

Strategy of data synthesis Cognitive results were grouped according to the cognitive domains that were evaluated (such as global cognition, executive function, and memory), and the baseline–endpoint difference of neuropsychological tasks was used to conduct a meta-analysis of related cognitive domains. The following correlation coefficient equation was used to calculate the baseline–endpoint SD change: $SD1/change = \sqrt{SD1/baseline^2 + SD1/final^2 - (2 * R1 * SD1/baseline * SD1/final)}$ $R1 = 0.5$. Review Manager (version 5.2) was used for the meta-analysis and data processing. Review Manager (version 5.2) was used for the metaanalysis and data processing. The standardized mean difference (SMD) of continuous variables and a 95% CI were used for quantification. The heterogeneity between the experimental design schemes was unclear; so the fixed effects model was chosen. I² statistics measured heterogeneity.

Subgroup analysis We will consider subgroups such as clinic type, duration of intervention.

Sensitivity analysis Sensitivity analysis was performed by stata software, and the sensitivity of the article was reflected by deleting the change of the effect size after one of the articles. After excluding a low quality study, the combined effect size was re-estimated and compared with the results of the Meta-analysis before exclusion to explore the extent of the effect of the study on the combined effect size and the robustness of the results. If the results did not change significantly after exclusion, it indicates that the sensitivity is low and the results are more robust and credible; on the contrary, if large differences or even diametrically opposite conclusions are obtained after exclusion, it indicates that the sensitivity is high and the robustness of the results is low, and great care should be taken when interpreting the results and drawing conclusions, suggesting the existence of important and potentially biased factors related to the effects of the intervention, and the source of the controversy needs to be further clarified.

Country(ies) involved China.

Keywords stroke ; post-stroke cognitive impairment ; robot - assisted training ; function ; upper limb function ; meta-analysis.

Contributions of each author

Author 1 - ZHU Shanshan.
Email: zhushanshanvip@163.com
Author 2 - ZHANG Huimin.
Email: ZHANG Huimin
Author 3 - XU Ke.
Email: 695182033@qq.com
Author 4 - GUO Xin.
Email: 907827461@qq.com
Author 5 - MA Junyan.
Email: 1152595814@qq.com
Author 6 - ZHANG Xiaoyan.
Email: 1291141299@qq.com