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Appraisal

Critically appraised paper: Additional, mechanised upper limb self-rehabilitation in patients with subacute stroke is not more effective than basic stretching and active exercises in reducing upper limb impairment

Synopsis

Summary of: Rémy-Néris O, Le Jeannic A, Dion A, Médée B, Nowak E, Poiroux É, Durand-Zaleski I; REM Investigative Team. Additional, Mechanized Upper Limb Self-Rehabilitation in Patients With Subacute Stroke: The REM-AVC Randomized Trial. *Stroke*. 2021;52(6):1938–1947.

Question: In people in the subacute phase following stroke, do two 30-minute daily sessions of self-rehabilitation using a gravity-compensating mechanical exoskeleton for game-based exercises improve upper limb impairment compared with self-rehabilitation involving stretching and basic active exercises? ***Design***: Multicentre randomised trial with concealed allocation and blinded assessors. ***Setting***: Twenty-one rehabilitation centres in France. ***Participants***: Inclusion criteria were age 18 to 81 years, a diagnosis of middle cerebral artery stroke 3 weeks to 3 months previously, and a Fugl-Meyer Assessment for Upper Extremity score between 10 and 40 points. Exclusion criteria were pain in the affected shoulder $>$ 3 out of 10 on a visual analogue scale, a Boston Diagnostic Aphasia Examination score $\leq$ 3 points, fatigue or visual impairment that would prevent participation, and inability to sit independently. ***Interventions***: Both groups received usual rehabilitation provided in each centre for 5 days per week. In addition, self-rehabilitation was performed twice daily for 30 minutes over a 4-week period. In the experimental group, self-rehabilitation was performed using a gravity-compensating exoskeleton for games-based exercises. In the control group, self-rehabilitation comprised basic stretching and active exercises. ***Outcome measures***: The primary outcome was the Fugl-Meyer Assessment for Upper Extremity score, which was assessed at 30 days and 3, 6 and 12 months after cessation of the intervention. Secondary outcomes were: severity of shoulder pain at rest and during active and passive movements, spasticity, functional status, upper limb function, quality of life, and perception of their additional exercise intervention, measured on a 5-point Likert scale (higher scores were better). ***Results***: Of the 215 randomised participants, 107 were allocated to the experimental group and 108 to the control group. At the end of the 4-week period, data were available on 208 participants. When adjusted for age and baseline measures at 4 weeks there was no difference in the mean change in Fugl-Meyer Assessment for Upper Extremity score 1.62 (95% CI −0.78 to 4.02). There were no between-group differences in this score at any other time point. The only secondary outcome showing a difference was the perception regarding ease of learning 0.34 (95% CI 0.06 to 0.62) and ease of practice 0.31 (95% CI 0.02 to 0.61). ***Conclusion***: In people with moderate-to-severe impairment of upper limb function shortly after a stroke, additional self-rehabilitation performed using an exoskeleton was not more effective at reducing upper limb impairment than basic stretching and active exercises.

Provenance: Invited. Not peer reviewed.

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Commentary

The well-conducted REM-AVC trial confirms the existing literature showing that upper limb robot training is equally as effective as usual care.[1,2] A recent large phase-IV trial[1] and meta-analysis of 44 trials[2] suggest that upper limb robot training may improve upper limb function by about 2 points on the Fugl-Meyer Assessment for Upper Extremity. This finding is irrespective of type of upper limb robot training that is applied.[1,2] My first concern is related to the heterogeneity introduced by the arbitrary recruitment of subjects at a mean of 55 days (SD 22) after stroke in this REM-AVC trial. A recent observational study of 412 stroke subjects showed that the proportional amount of spontaneous motor recovery may range from $<$ 10% for those with a low baseline score up to 90% in the first 10 weeks after stroke.[3] The non-fixed timing of baseline as well as post-intervention assessment and the lack of stratification on robust prognostic markers, such as voluntary finger extension,[4] may easily result in underpowered trials in which $>$ 450 participants per trial arm are required.[5]

A more fundamental concern is based on the equal dose of additional training of about 33 minutes per day applied in both the upper limb robot training group and the control group in the REM-AVC trial. Obviously, the authors did hypothesise in this trial that the difference in the *type* of training (upper limb robot training combined with virtual games versus self-rehabilitation involving stretching and basic active exercises) was sufficient to cause significant interaction effects in recovery of muscle synergies as measured with the Fugl-Meyer Assessment for Upper Extremity. However, this assumption is in contrast with findings from a number of studies showing that intensity of practice and adaptive learning are the main drivers for improving upper limb capacity.[6]

Provenance: Invited. Not peer reviewed.

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