Cochrane Evidence on Rehabilitation using Robotic Technology

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Trusted evidence.
Informed decisions.
Better health.

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Cochrane SR search

20 CSR

15 for surgery

4 robotics for rehabilitation

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14 ☑ **Locomotor training for walking after spinal cord injury**

Jan Mehrholz, Joachim Kugler, Marcus Pohl

Show Preview ▾ Intervention Review 14 November 2012 New search

8 ☑ **Interventions for improving upper limb function after stroke**

Alex Pollock, Sybil E Farmer, Marian C Brady, Peter Langhorne, Gillian E Mead, Jan Mehrholz, Frederike van Wijck

Show Preview ▾ Overview Review 12 November 2014 Free access

6 ☑ **Electromechanical-assisted training for walking after stroke**

Jan Mehrholz, Simone Thomas, Cordula Werner, Joachim Kugler, Marcus Pohl, Bernhard Elsner

Show Preview ▾ Intervention Review 10 May 2017 New search Conclusions changed Free access

4 ☑ **Electromechanical and robot-assisted arm training for improving activities of daily living, arm function, and arm muscle strength after stroke**

Jan Mehrholz, Marcus Pohl, Thomas Platz, Joachim Kugler, Bernhard Elsner

Show Preview ▾ Intervention Review 3 September 2018 New search Conclusions changed

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Upper limb functions

Lower limb functions

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Upper limb functions

Electromechanical and robot-assisted arm training for improving activities of daily living, arm function, and arm muscle strength after stroke (Review)

Mehrholz J, Pohl M, Platz T, Kugler J, Elsner B

2018

Interventions for improving upper limb function after stroke (Review)

Pollock A, Farmer SE, Brady MC, Langhorne P, Mead GE, Mehrholz J, van Wijck F

2014

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Searches a relevant articles up to January 2018 – included 45 studies

P People with stroke without severe co-morbidities

I Robotics technology

C Other rehabilitation /placebo intervention/ no treatment

O Activities of daily living (Barthel Index, FIM, stroke Impact Scale, Frenchay arm Test)

Arm function (Fugl-Meyer score, Motricity Index Score)

Muscle strength

The interventions

- Amadeo (2012)
- Arm robot, ARMin (2005)
- Neuro-rehabilitation Robot, NeReBot (2007)
- Robotic Rehabilitation System for upper limb motion therapy for the disabled, REHAROB (2007)
- Bi-Manu-Track (2003)
- InMotion
- MIT-Manus

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ADL at the end of intervention (overall)
ADL at the end of intervention (within or more than 3 months post stroke)
Arm functions

Results: ADL at the end of intervention (overall)

Analysis 1.1. Comparison 1 Electromechanical and robotic assisted training versus all other intervention, Outcome 1 Activities of daily living at the end of intervention phase.

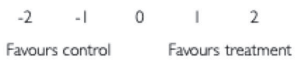
(. . . *Continued*)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Std. Mean Difference IV,Random,95% CI	Weight	Std. Mean Difference IV,Random,95% CI
Total (95% CI)	**488**		**469**		◆	**100.0 %**	**0.31 [0.09, 0.52]**

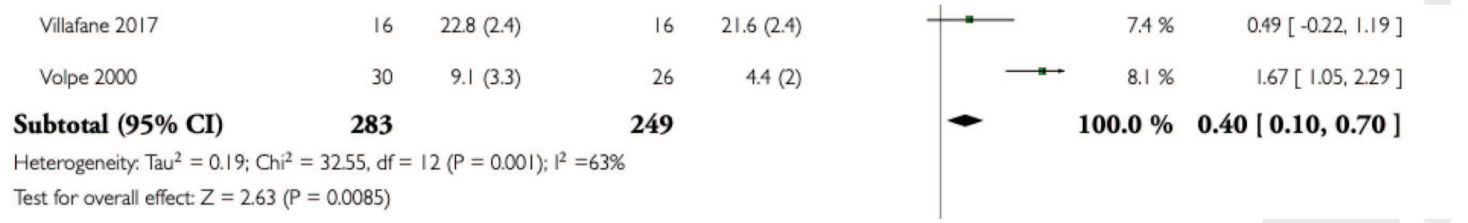
Heterogeneity: $Tau^2 = 0.16$; $Chi^2 = 55.54$, df = 23 (P = 0.00016); $I^2 = 59\%$

Test for overall effect: Z = 2.82 (P = 0.0049)

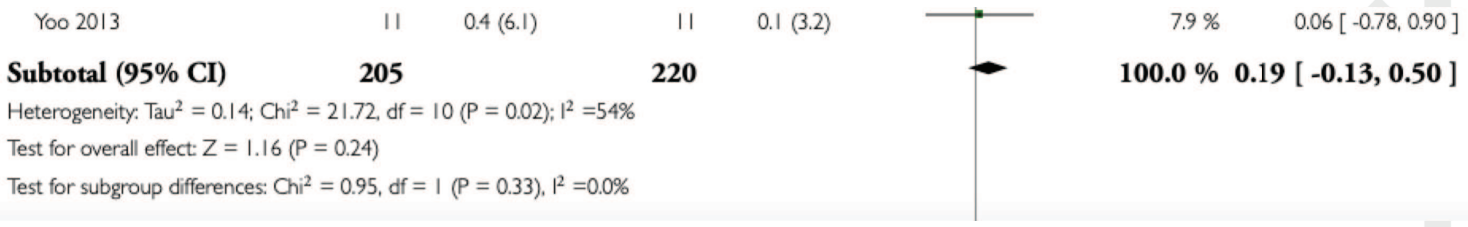
Test for subgroup differences: Not applicable



Results: ADL at the end of intervention (Within / more than 3 months)



More than 3 months



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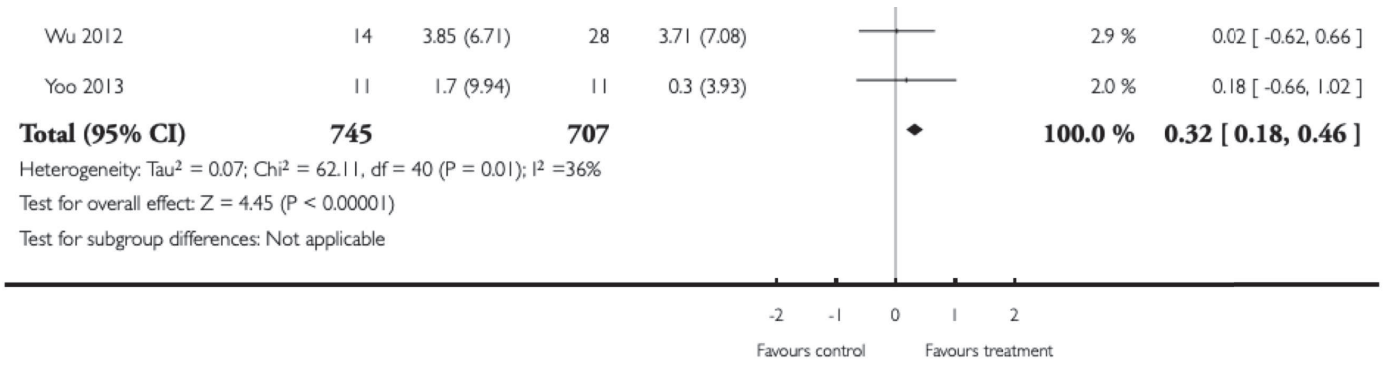
Arm function at the end of treatment



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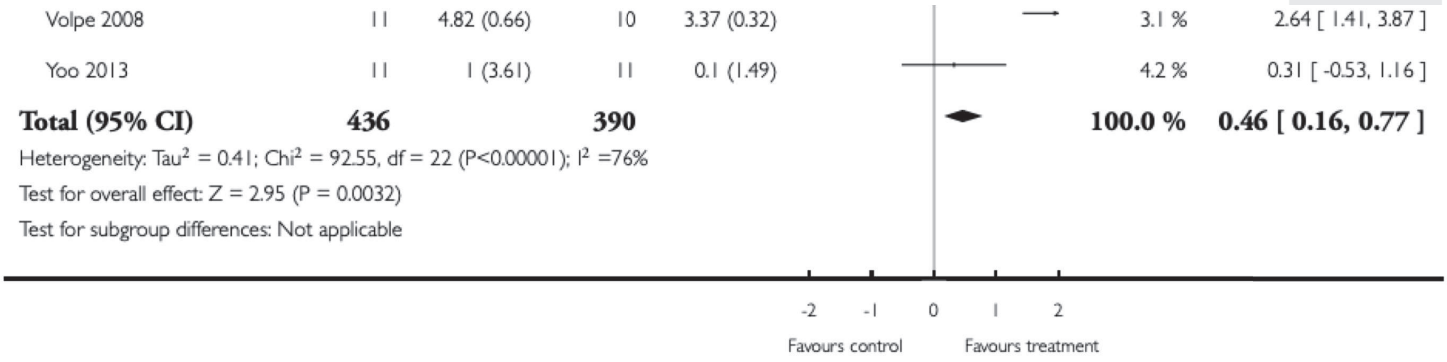
Arm strength



Sensitivity analysis by trial methodology

- Isolated and analyse trials with good methodology
  - Randomisation
  - Concealed allocation
  - Blinded assesors
  - **No differences in ADL and arm functions**

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Summary

- Improved activities of daily living scores (24 studies, 957 participants), arm function (41 studies , 1452 participants), and arm muscle strength (23 studies, 826 participants)
- High quality evidence
- Greatest effect in patients with stroke less than 3 months
- Treatment effects were relatively small
  - Muscle strength: 0.46 stronger
  - Will it be clinically meaningful?
  - The effect may be less than patient & therapist expectation

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Do machine and robot assisted training devices improve walking after stroke?

Electromechanical-assisted training for walking after stroke (Review)

Mehrholz J, Thomas S, Werner C, Kugler J, Pohl M, Elsner B 2017

Population	Adults with stroke	
Interventions	Automated electro mechanical gait machines Robotic assisted gait training machines	**Plus physiotherapy
Comparison	Other interventions	
Outcome	Walking • At end of intervention • At follow up	Independent walking Recovery of independent walking Walking velocity Walking capacity (meters walked in 6 minutes)

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Robotic interventions studied

Lokomat (17 studies)

Gait trainer (9 studies)

Geo

Anklebot

Gait assisted robot

Walkbot

AlterG

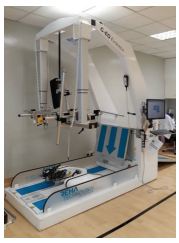
Portable rehab robot

Stride assist

HAL

Gait master





What's included in this review?

Study population:
36 studies with 1472 participants

Type of stroke:
Majority iscahemic stroke
Left sided hemiplegia

Duration of intervention:
10 days to 8 weeks with most 3-4 weeks

Frequency of intervention:
2-3 times to 5 times a week
20-60 minutes each

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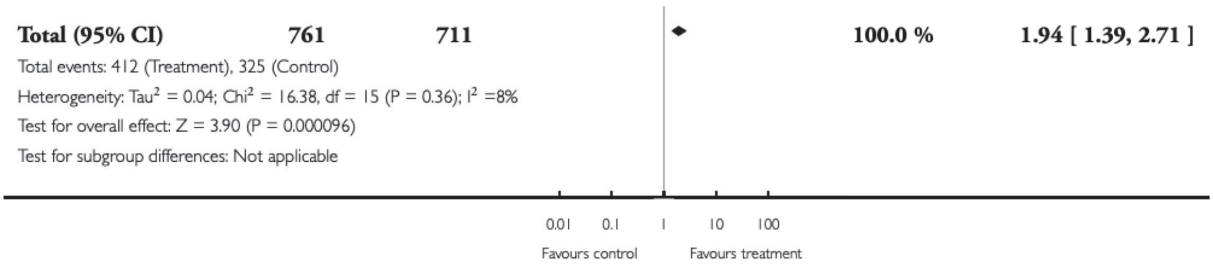
Independent walking at the end of treatment



Increased the chance of independent walking

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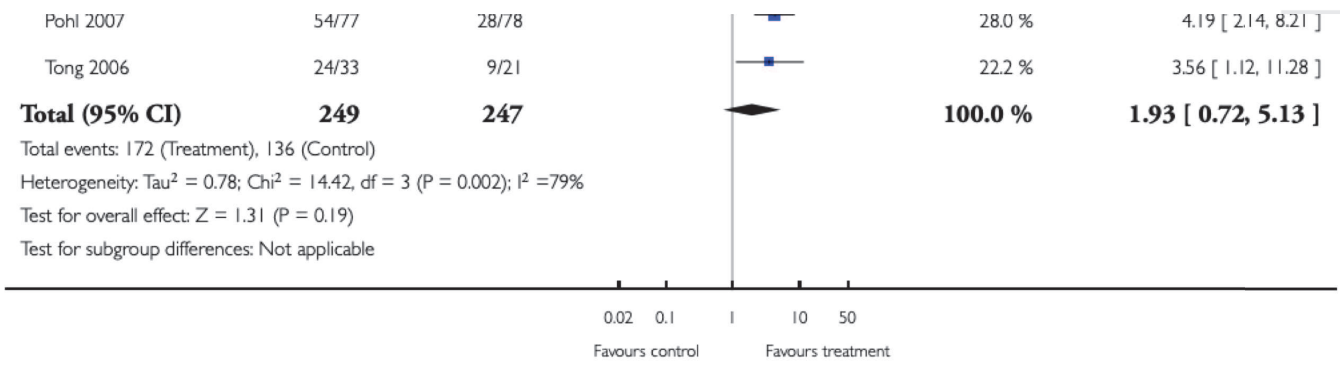
Independent walking at follow up



The use of electromechanical devices for gait rehabilitation did not significantly increase independent walking.

Walking velocity (m/s) at end of treatment

Analysis 1.3. Comparison 1 Electromechanical- and robotic-assisted gait training plus physiotherapy versus physiotherapy (or usual care), Outcome 3 Walking velocity (metres per second) at the end of intervention phase.

(. . . Continued)

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Random,95% CI	Weight	Mean Difference IV,Random,95% CI
Total (95% CI)	**518**		**467**			**100.0 %**	**0.04 [0.00, 0.09]**

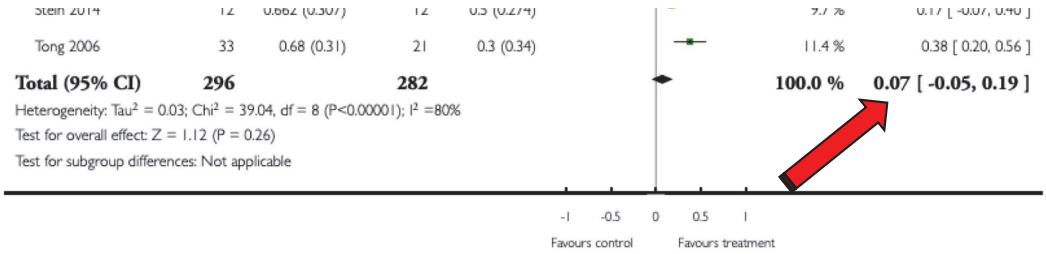
Heterogeneity: $Tau^2 = 0.01$; $Chi^2 = 64.96$, df = 23 ($P<0.00001$); $I^2 = 65\%$

Test for overall effect: Z = 1.77 (P = 0.077)

Test for subgroup differences: Not applicable

The use of electromechanical devices for gait rehabilitation did not significantly increase walking velocity.

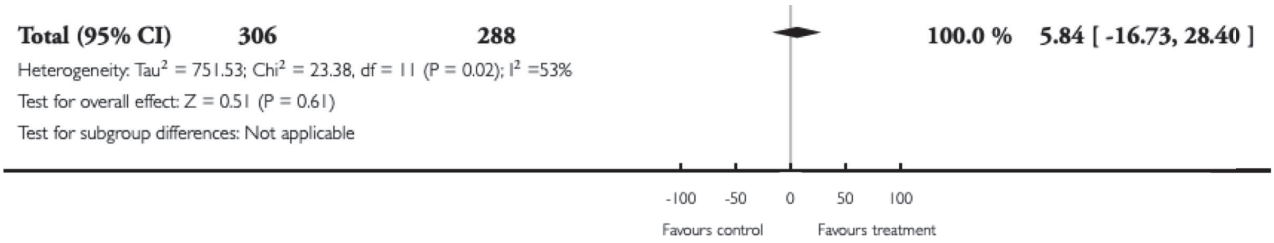
Walking velocity (m/s) at follow up



The use of electromechanical devices for gait rehabilitation did not significantly increase the walking velocity at follow-up after study end

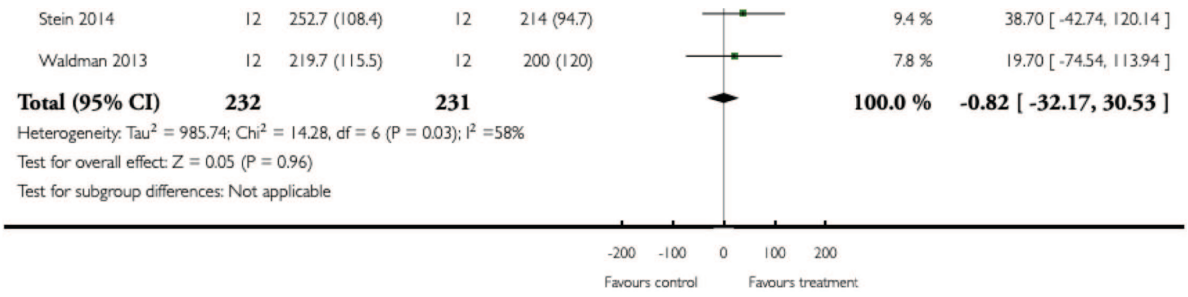
Walking capacity at end of intervention

Analysis 1.5. Comparison 1 Electromechanical- and robotic-assisted gait training plus physiotherapy versus physiotherapy (or usual care), Outcome 5 Walking capacity (metres walked in 6 minutes) at the end of intervention phase.



The use of electromechanical devices for gait rehabilitation did not significantly increase the walking capacity at end of intervention

Walking capacity at follow up



Subgroup & Post Hoc sensitivity analysis

Acute/subacute vs chronic stroke
Ambulatory status at study onset
Types of devices

Independent walking
Walking velocity
Walking capacity

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Summary

Increased chance of independent walking at the end of treatment but not at follow up

No difference in walking velocity and walking capacity

Outcome not influenced by:

- Acute/subacute vs chronic stroke
- Ambulatory status at study onset
- Types of devices

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Cochrane Library

Trusted evidence.
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English

Title Abstract Key

Cochrane Reviews | Trials | Clinical Answers | About | Help

Cochrane Database of Systematic Reviews

Locomotor training for walking after spinal cord injury

Cochrane Systematic Review - Intervention | Version published: 14 November 2012 see what's new

https://doi.org/10.1002/14651858.CD006676.pub3

New search | Am score 4 | View article information

Jan Mehrholz | Joachim Kugler | Marcus Pohl

View authors' declarations of interest

2012

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