

European Stroke Organisation (ESO) Guideline on Motor Rehabilitation

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Disclosures

Intellectual Disclosures: NONE

Financial Disclosures: NONE

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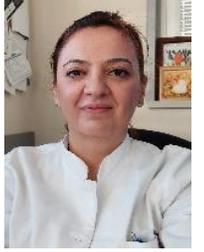
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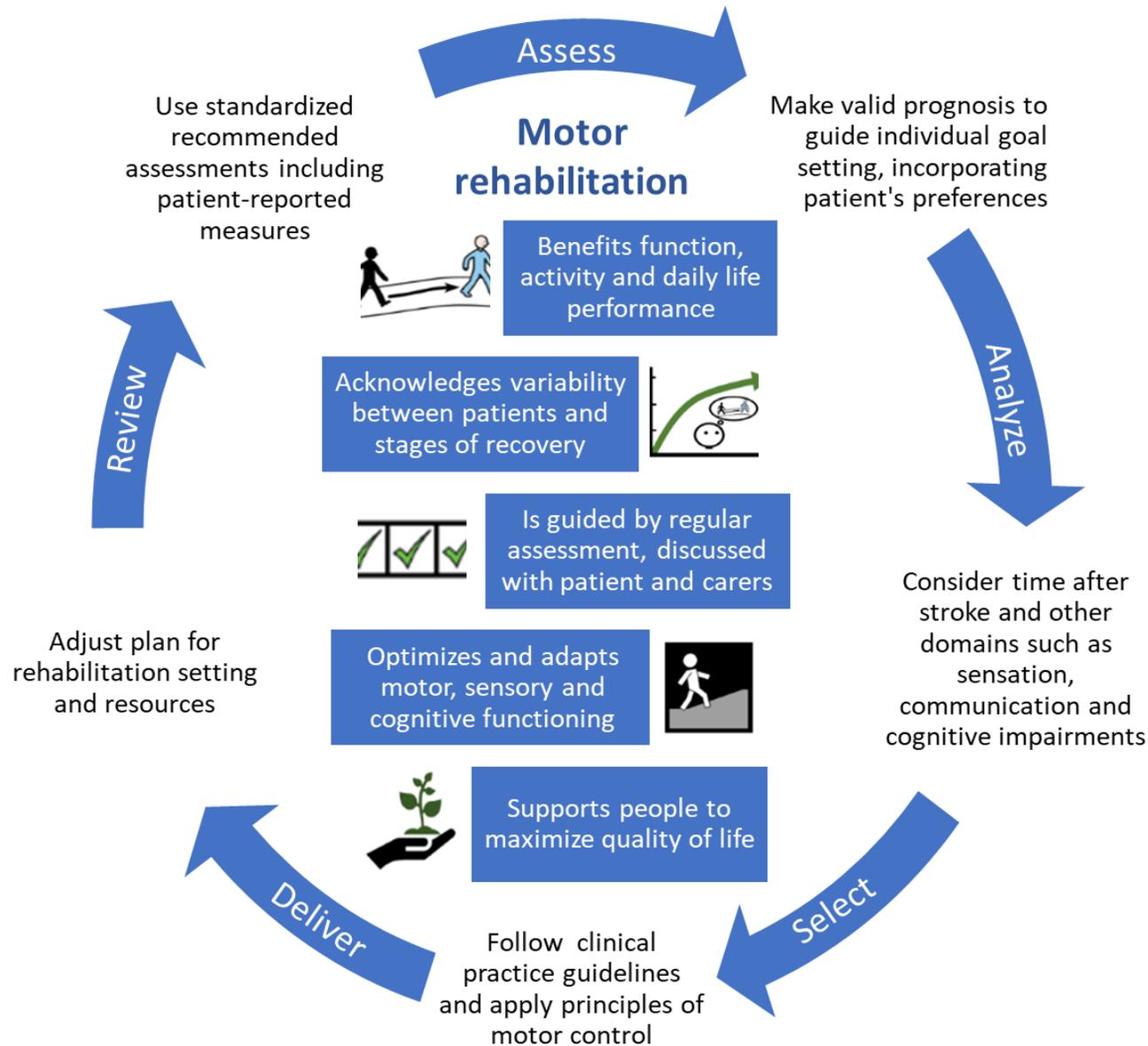
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Methodological support

ESO definition and framework of MOTOR REHABILITATION



Motor rehabilitation targets different aspects of functioning with an overall goal to maximise people's independence, participation, and well-being

ESO definition and framework, ESJ Dec 2023

Total views and downloads: 27683
3-4 citations/month

First ESO Guideline on MOTOR REHABILITATION

AIM: to provide specific recommendation in areas where the need to clinical guidance was most pressing

Methods



6 prioritised PICOs



3 databases



ESO standardised procedures



GRADE tool



Expert consensus statements

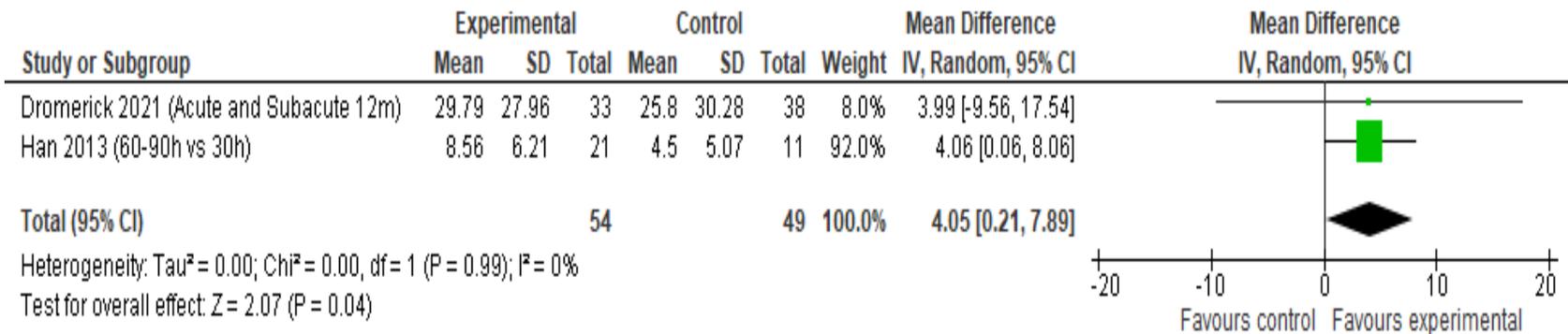


DOSE
amount and intensity

GROUP vs ONE-to-ONE
TRANSFER PACKAGE

SIT-to-STAND

PICO 1 Does adding at least 20 hours or more of the same type of active repetitive **upper limb practice** produce greater improvements in upper limb motor function, activity capacity and performance?



Upper limb activity capacity (ARAT)



Higher dose groups improved 4 points more compared to lower dose Subacute phase

Study	Risk of bias domains					Overall
	D1	D2	D3	D4	D5	
Dromerick, 2021	+	+	+	+	+	+
Han, 2013	+	-	-	-	-	-

GRADE
 QoE: Very low ⊕
 Rec: Weak↑?

PICO 2 Does adding at least 20 hours or more of same type of **gait training** produce greater improvements in walking independence, walking speed, walking endurance, and walking capacity?

Expert consensus statement

Based on the overall available evidence, **13 out of 17 MWG members (76 %)** suggest that additional time spent in walking practice can improve walking capacity in people with stroke. The exact amount of the additional practice time is unclear but will likely be **at least 20 hours, commonly delivered 3-5 times per week over 4-6 weeks.**

Thus, for clinical practice, we suggest considering adding extra time of walking practice to existing stroke rehabilitation programmes, preferably at least 20 hours.

Only 1 RCT: Klassen et al. 2020

**Walking capacity
(6MWT)**

 58m

Walking speed

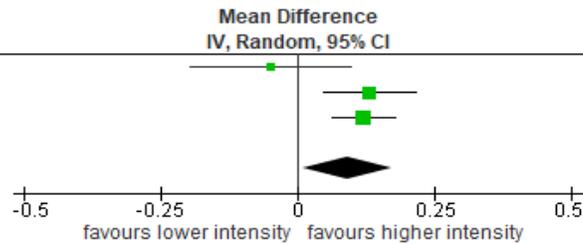
 0.19 m/s

≥ MCID

PICO 3 Does high-intensity walking training compared to dose-matched walking training at a lower intensity produce greater improvement in walking independence, walking speed, walking endurance and walking capacity?

Study or Subgroup	higher intensity			lower intensity			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Aguiar, 2020	0.09	0.17	11	0.14	0.18	11	19.9%	-0.05 [-0.20, 0.10]
Boyne, 2023	0.19	0.16	27	0.06	0.16	28	35.3%	0.13 [0.05, 0.21]
Hornby, 2019	0.16	0.13	28	0.04	0.09	32	44.7%	0.12 [0.06, 0.18]
Total (95% CI)	66			71			100.0%	0.09 [0.01, 0.17]

Heterogeneity: Tau² = 0.00; Chi² = 4.90, df = 2 (P = 0.09); I² = 59%
Test for overall effect: Z = 2.18 (P = 0.03)



Comfortable walking speed

0.09 m/s ≥MCID

GRADE

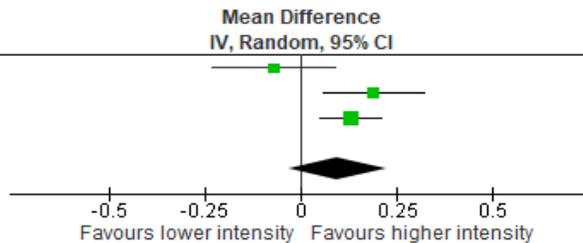
QoE: Low ⊕⊕

Rec: Weak ↑?



Study or Subgroup	Experimental			Control			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Aguiar, 2020	-0.05	0.22	11	0.02	0.16	11	27.3%	-0.07 [-0.23, 0.09]
Boyne, 2023	0.28	0.24	27	0.09	0.26	28	31.9%	0.19 [0.06, 0.32]
Hornby, 2019	0.2	0.18	28	0.07	0.13	32	40.8%	0.13 [0.05, 0.21]
Total (95% CI)	66			71			100.0%	0.09 [-0.03, 0.22]

Heterogeneity: Tau² = 0.01; Chi² = 6.45, df = 2 (P = 0.04); I² = 69%
Test for overall effect: Z = 1.46 (P = 0.14)



Maximum walking speed

Walking capacity (6MWT)

39.2 m ≥MCID

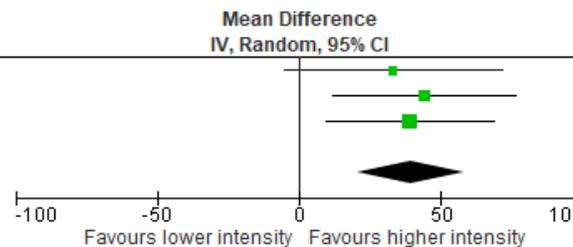
QoE: Moderate ⊕⊕⊕

Rec: Strong ↑↑



Study or Subgroup	higher intensity			lower intensity			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Aguiar, 2020	48	58	11	15	29	11	24.5%	33.00 [-5.32, 71.32]
Boyne, 2023	71	59.65	27	27	63.44	28	34.0%	44.00 [11.47, 76.53]
Hornby, 2019	77	68.18	28	38	43.96	32	41.4%	39.00 [9.51, 68.49]
Total (95% CI)	66			71			100.0%	39.23 [20.25, 58.21]

Heterogeneity: Tau² = 0.00; Chi² = 0.18, df = 2 (P = 0.91); I² = 0%
Test for overall effect: Z = 4.05 (P < 0.0001)



Risk of bias domains

Study	Risk of bias domains					Overall
	D1	D2	D3	D4	D5	
Aguiar, 2020	+	+	-	+	+	-
Boyne, 2023	+	+	+	+	+	+
Hornby, 2019	+	+	+	+	+	+

PICO 4 Does repetitive upper limb task-specific training with a **behavioural transfer package** compared to the same type of duration-matched training without a behavioural transfer package produce greater improvements in upper limb activity capacity and performance?

Expert consensus statement

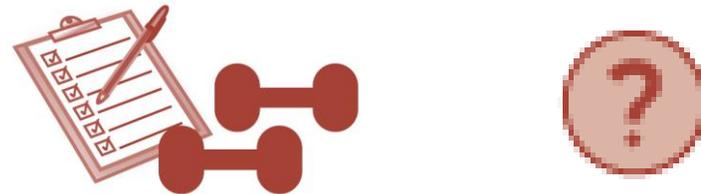
Acknowledging the current lack of evidence for this PICO, **13 out of 17 MWG members (76 %)** suggest **considering a transfer package** when providing repetitive upper limb task-specific training, when aiming to achieve a transfer from treatment to daily life.

The transfer package would include daily evaluation, a patient-kept daily diary, problem-solving, behavioural contract, home practice of specified exercises, and weekly follow-up contacts.

Only 1 RCT: Taub et al. 2020

High RoB

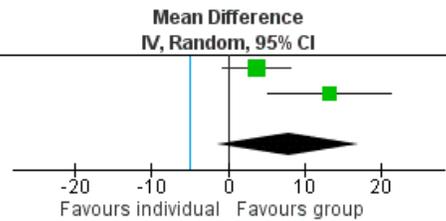
The effect of transfer package on upper limb activity performance (MAL-AoU) was unclear



PICO 5 Does the provision of task-specific training in a group with at least 2:1 patient-therapist ratio compared to the same type of time-matched one-to-one training have the same effect on motor function, activity capacity and performance?

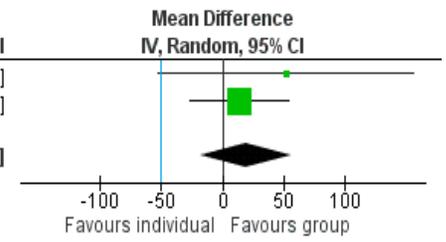
Study or Subgroup	group			individual			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Kim, 2016	7.6	4.56	15	3.9	7.36	15	56.4%	3.70 [-0.68, 8.08]
Quart-ul-ai, 2018	19.4	9.2	15	6.13	12.85	15	43.6%	13.27 [5.27, 21.27]
Total (95% CI)			30			30	100.0%	7.88 [-1.43, 17.18]

Heterogeneity: Tau² = 34.97; Chi² = 4.23, df = 1 (P = 0.04); I² = 76%
Test for overall effect: Z = 1.66 (P = 0.10)



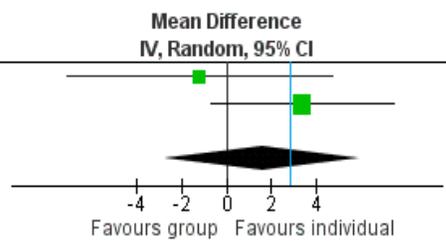
Study or Subgroup	group			individual			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Kim, 2016	93	161.56	15	41	128.03	15	12.8%	52.00 [-52.32, 156.32]
Renner, 2016	112.52	67.85	29	98.66	95.13	35	87.2%	13.86 [-26.18, 53.90]
Total (95% CI)			44			50	100.0%	18.76 [-18.62, 56.14]

Heterogeneity: Tau² = 0.00; Chi² = 0.45, df = 1 (P = 0.50); I² = 0%
Test for overall effect: Z = 0.98 (P = 0.33)



Study or Subgroup	group			individual			Weight	Mean Difference IV, Random, 95% CI
	Mean	SD	Total	Mean	SD	Total		
Kim, 2016	-3.8	8.92	15	-2.6	7.47	15	38.5%	-1.20 [-7.09, 4.69]
Renner, 2016	-4.64	6.03	29	-8	10.26	35	61.5%	3.36 [-0.69, 7.41]
Total (95% CI)			44			50	100.0%	1.60 [-2.75, 5.95]

Heterogeneity: Tau² = 3.75; Chi² = 1.57, df = 1 (P = 0.21); I² = 36%
Test for overall effect: Z = 0.72 (P = 0.47)



Postural balance capacity (Berg Balance Scale)



Walking capacity (6MWT)



Mobility (Timed Up and Go)

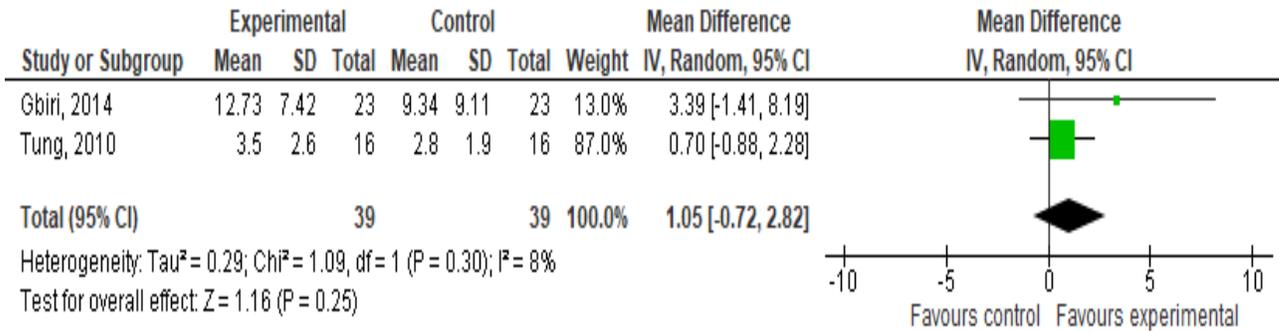
GRADE

QoE: Very low ⊕

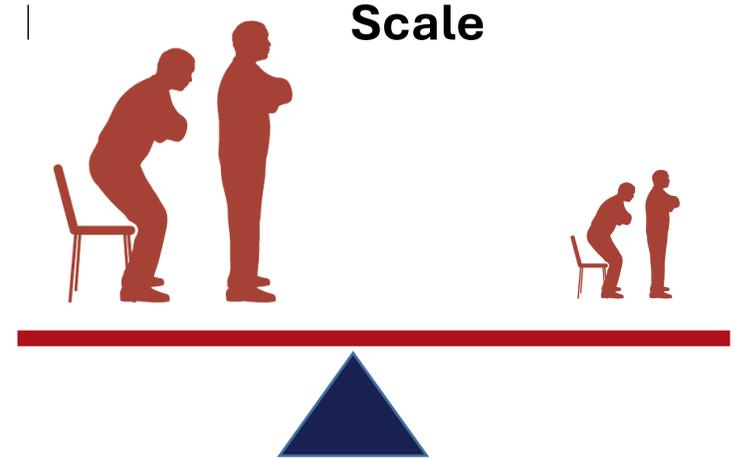
Rec: Weak↑?

Study	Risk of bias domains					Overall
	D1	D2	D3	D4	D5	
Kim 2016	?	?	-	-	-	-
Renner 2016	+	+	-	+	-	-

PICO 6 Does the provision of usual care plus **additional sit-to-stand training** compared to usual care alone produce greater improvements in balance capacity, independence and time taken in sit-to-stand?



Postural balance capacity



+
 15 min
 OR
 45 min

Study	Risk of bias domains					Overall
	D1	D2	D3	D4	D5	
Gbiri, 2014	+	+	+	-	+	-
Tung, 2010	+	+	+	+	+	+

GRADE
 QoE: **Moderate** ⊕⊕⊕
 Rec: **Weak**↑?

Evidence-based recommendations



PROVIDE High-intensity walking for those with stable cardiovascular health in chronic stage to improve walking endurance and **consider** this intervention to improve walking speed

Evidence-based recommendations

CONSIDER



Adding extra 20+ hours repetitive arm training to existing stroke rehabilitation programmes to improve arm activity capacity.

The exact amount of additional practice time is unclear but will likely be at least 20 hours, commonly delivered 3-5 times per week over 4-6 weeks.



Group therapy focusing on task specific lower limb practice as equally effective as individual training for improving balance capacity, gait speed, and walking endurance



Adding sit-to-stand practice on top of usual care to improve postural balance capacity. Include sufficient repetitions, training sessions and adequate duration and content of this additional training. What these parameters are is currently unclear.

Expert consensus statements



Add extra 20+ hours walking training to the existing stroke rehabilitation programmes to improve walking capacity



Offer a behavioural transfer package to translate therapy gains into real-life activities

The exact amount of the additional practice time is unclear but will likely be at least 20 hours, commonly delivered 3-5 times per week over 4-6 weeks.

The transfer package would include daily evaluation, a patient-kept daily diary, problem-solving, behavioural contract, home practice of specified exercises, and weekly follow-up contacts,

Areas of future research

- The evidence-base is strong for motor rehabilitation in general, but limited for focused research questions
- Future trials should concentrate on specific comparisons of the critical elements of an intervention
- DOSE is a crucial multifactorial element and when not selected wisely intervention effects remain unknown

Conclusion

Despite the limited evidence, this first guideline on motor rehabilitation after stroke provides **evidence-based recommendations for nine clinically critical rehabilitation outcomes.**

The recommendations can be used to guide future research and clinical practice across Europe and around the world, **in the context of varied stroke rehabilitation needs, access, delivery, and resources.**

The guideline emphasises the **need for future trial designs to focus on specific comparisons of therapy elements** to strengthen evidence-based recommendations and calls for global collaborations to optimize resources and enhance stroke rehabilitation research and practice.

Thank you !

Chairs: Geert Verheyden and Margit Alt Murphy

On behalf of the whole MWG members,
mentors *Pooja Khatri and Linxin Li*,
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