Implementing Personalised Robotic-Assisted Gait Training to Improve Outcomes in Multiple Sclerosis; A Case Study

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- Robotic-Assisted Gait Training (RAGT) has been shown to be significantly effective in patients with Multiple Sclerosis (PwMS) in improving gait speed, gait endurance and balance[1]
- RAGT is more advantageous when administered to the patients with a greater degree of disability[2]
- However, its effect on fatigue and spasticity has been under-researched alongside the optimal progression and adjustment of training parameters[3]

Personalised Lokomat® Framework

1 Define Individual Training Strategy for Parameters

2 Set Boundaries Responsive to patient variability

3 Optimise Training Dose & Re-Assessment timeline



Body Weight Support
≤ 30%

Target Gait Speed
1.6 km/h (week 0-3) 1.9km (wk 3-6) 2.2 km/h (wk 6-9)

Guidance Force (GF) Prioritised
Progressively ↓ from 100% to between 30 and 50%

Intervals (3-5 minutes, 3-4 reps) of assist-as-needed support (path control – GF <50%)

3 sessions per week up to 45 minutes for 9 weeks.
Re-Assessment at 3 weekly intervals

Patient Demographics

- 44 year old PwMS
- Expanded Disability Status Scale of 6.0 - requires a walking aid to walk 100m with or without resting.
- Diagnosed 2014, relapse remitting last episode 2022.

Patient Goals

" To walk faster and longer distances"

"To have less leg tightness (spasticity)"

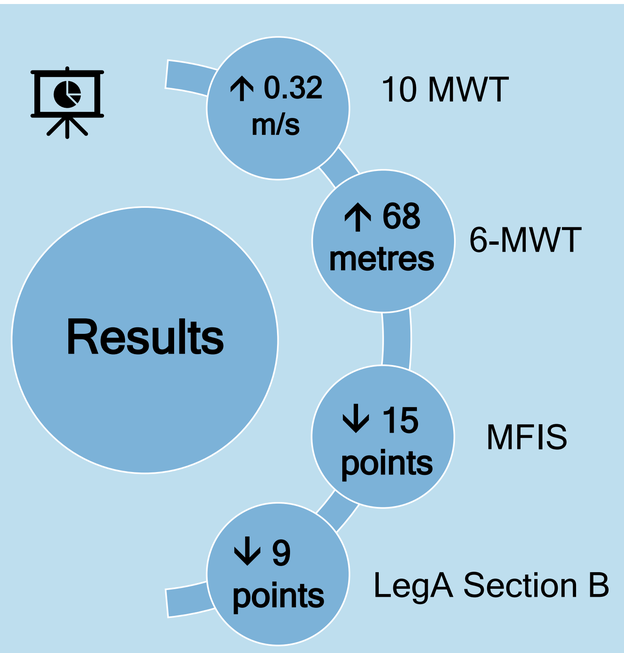
Primary Outcomes

- 10 metre walk (10MWT)
- 6-minute walk test (6-MWT)

Secondary Outcomes

- The Modified Fatigue Impact Scale (MFIS)
- Leg Activity Measure (LegA) for Spasticity

Results



Conclusion

- A Personalised RAGT Framework with the Lokomat® led to clinically meaningful improvements across gait speed and endurance.
- Fatigue and spasticity demonstrated clinically meaningful improvements following personalised intensive interval based Lokomat® training.
- Further research utilising this personalised framework to optimise parameter settings in RAGT and across neurological conditions is required.

1. Bowman, T., Gervasoni, E., Amico, A. P. et al. "CICERONE" Italian Consensus Group for Robotic Rehabilitation (2021). What is the impact of robotic rehabilitation on balance and gait outcomes in people with multiple sclerosis? A systematic review of randomized control trials. *European journal of physical and rehabilitation medicine*, *57*(2), 246-253.
2. Calabrò, R. S., Cassio, A., Mazzoli, D. et al. Italian Consensus Conference on Robotics in Neurorehabilitation (CICERONE) (2021). What does evidence tell us about the use of gait robotic devices in patients with multiple sclerosis? A comprehensive systematic review on functional outcomes and clinical recommendations. *European journal of physical and rehabilitation medicine*, *57*(5), 841-849.
3. van Dellen, F., & Labruyère, R. (2022). Settings matter: a scoping review on parameters in robot-assisted gait therapy identifies the importance of reporting standards. *Journal of neuroengineering and rehabilitation*, *19*(1), 40.

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