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Ageing Well in the Community
Exploring New Horizons

Ren Ci 仁慈

Effects of robotic assisted gait rehabilitation: A pilot study

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Background and Objectives

Conventional rehabilitation therapy may be limited for patients with significant physical impairments – such as reduced muscle strength, poor balance, or coordination difficulties - particularly in the early stages of rehabilitation. Robotic exoskeleton supports multisystem body integration, and enable optimal patient positioning, facilitating movement against gravity with improved stability.

This study aimed to evaluate the feasibility and preliminary outcomes of an ExoMotus-assisted gait rehabilitation programme as an adjunct to conventional therapy for older adults, with an emphasis on improving functional abilities.

Methodology

A single arm pre-post interventional study design was conducted at Ren Ci Community Hospital and Day Rehab Centre. 47 patients were recruited and underwent an 8-session gait rehabilitation programme using the ExoMotus M4, delivered at least once weekly alongside conventional rehabilitation. The patients recruited were mostly older adults with neurological conditions, primarily Cerebrovascular Accident (CVA), as well as Parkinson's disease and dementia. These patients were also of higher level of dependency in terms of mobility, as reflected by the low baseline mean EMS score of 5.27.

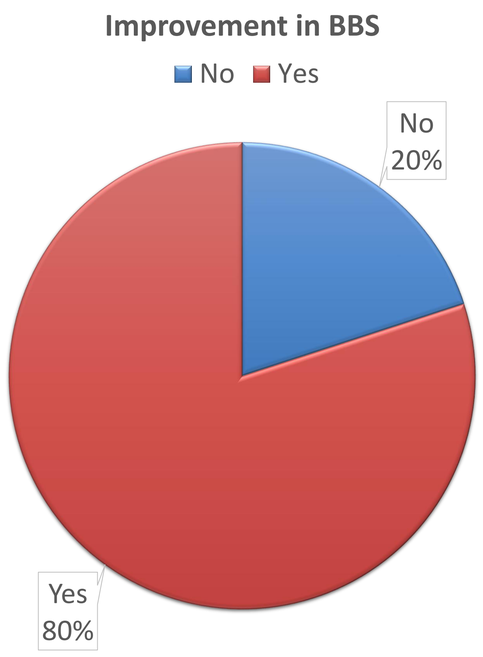
Each participant was screened by a Physiotherapist to determine his/ her suitability for enrolment into the programme. Each session lasted for at least half an hour, conducted by either a Physiotherapist or a Therapy Assistant (TA), depending on the complexity of the participant's needs. Outcome measures were collected before and after the intervention using the Berg Balance Scale (BBS), Elderly Mobility Scale (EMS), and a Mood Scale to evaluate changes in functional mobility and emotional well-being.

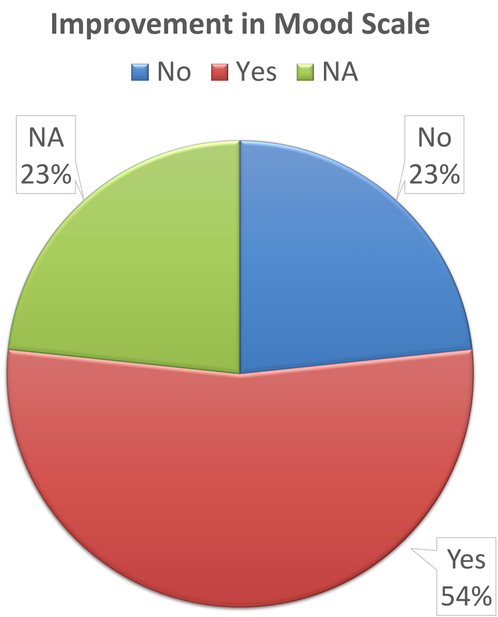
Results

Out of the 47 participants that were recruited (21 female and 26 male; mean age 73 years), 30 participants completed the programme. Common reasons for non-completion included early discharge from the rehabilitation facility and intolerance to the training sessions due to severe postural hypotension, pain, or fear.

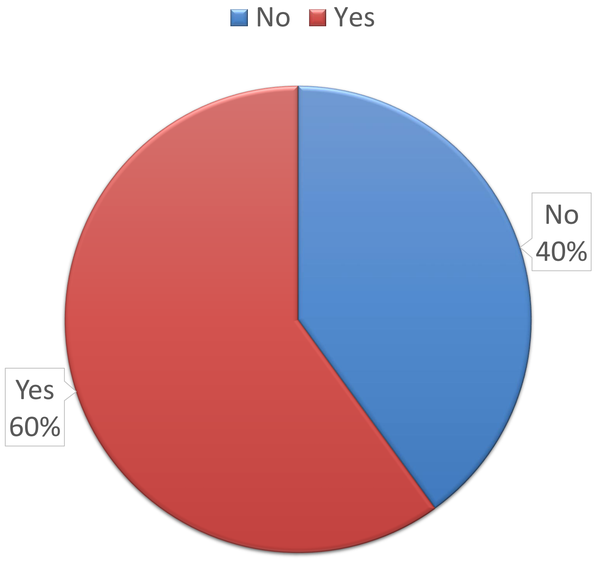
Amongst the 30 participants who completed the program, significant improvements were observed in balance, mobility, and mood. 80% and 60% of the participants (n=30) showed improvements in balance (BBS) and mobility (EMS) respectively. A paired-samples t-test was conducted to compare BBS and EMS scores pre-post. BBS scores were significantly higher post training (M=13.07, SD=12.26) compared to pre (M=8.47, SD=9.18), $t(29)=4.08$, $p<0.001$. Additionally, EMS scores were significantly higher post training (M=7.17, SD=5.13) compared to pre (M=5.27, SD=3.65), $t(29)=4.2$, $p < 0.001$. Furthermore, 54% of the participants demonstrated improved scores on the mood scale. Nil adverse events were reported during the programme.

	Pre BBS	Post BBS	Pre EMS	Post EMS
Mean	8.47	13.07	5.27	7.17
Standard Error	1.68	2.24	0.67	0.94
Standard Deviation	9.18	12.26	3.65	5.13





* NA –Participants unable to verbalise mood due to cognitive impairment or non-communicative



Discussion

These preliminary findings suggest that the ExoMotus programme is a safe and feasible adjunct to conventional rehabilitation, for older adults with neurological conditions. Use of the robotic exoskeleton supports mobilization for patients who are of high level of dependency, while reducing physical demands on therapists.

Participants demonstrated significant improvements in balance and functional mobility, suggesting that the programme is effective. Overall mood throughout the programme also improved. Furthermore, no adverse events were reported, which supports the safety of implementing the Exomotus M4 within this population.

Notably, functional gains were observed within just 8 sessions – fewer than the 12 sessions typically reported in similar studies. Future studies could explore having a control group as comparison.

The programme also contributed better manhour savings. By delegating session facilitation to TAs for lower-complexity cases, physiotherapists were able to redirect their time towards other clinical duties requiring higher levels of expertise. This task-shifting approach not only reduced the overall man-hours required from physiotherapists but also demonstrated that TAs can safely and effectively support the delivery of structured rehabilitation sessions.

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