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Robot-Assisted Gait Training in Parkinsonism : A Prospective Randomized Controlled Study

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Introduction

- Patients with Parkinsonism has a common neurologic disease resulting in a progressive, degenerative disease manifested by motor and non-motor symptoms. Robot-assisted gait training (RAGT) is believed to offer promising benefits; however, there is still limited research regarding the optimal treatment approach.
- This includes aspects such as specifying targeted treatment objectives, categorizing types of robots, the methodologies employed by these robots, and potential synergistic effects when combined with additional treatments options.
- The aim of this study is to investigate the effect of RAGT, using the end-effector type gait robotics "Morning Walk®", on improving motor and non-motor symptoms in patients with Parkinsonism.

Method

- Design : Prospective, single-center, randomized controlled trial
- Participants : 20 patients with Parkinsonism randomly allocated to two groups: the RAGT (n=9)
- and the conventional physical therapy (CPT) group (n=11).
- Intervention : Both the RAGT and control groups underwent a total of 18 sessions (30 minutes/day, 3 days/week for 6 weeks).
  The former was treated with the end-effector type gait robotics "Morning Walk®," while the latter received therapeutic exercises and/or manual therapy
- Outcomes : The primary outcomes were the 2-minute walk test (2MWT) and 10-meter walk test (10MWT). The secondary outcomes of motor symptom were Berg Balance Scale (BBS), Timed Up and Go Test (TUG), New Freezing of gait questionnaire (FOG-Q), the Movement Disorder Society-Unified Parkinson's Disease Rating Scale (MDS-UPDRS) part II and III. Non-motor symptom was assessed by MDS-UPDRS part I and Non-Motor Symptoms Assessment Scale (NMSS). These measures were evaluated at two different time points; E1 (pretreatment) and E2 (posttreatment).

Results

Table 1.	V1	V2	V1-V2	Intra *p* value	Inter *p* value
2MWT					
Control group	85.63 ± 37.96	93.88 ± 35.76	−8.25 ± 7.68	0.019[1)]	0.422[2)]
Intervention group	100.50 ± 45.90	114.50 ± 40.09	−14.00 ± 12.60	0.007[1)]	
10MWT					
Control group	40.06 ± 59.67	47.59 ± 84.56	−7.52 ± 30.20	0.476[1)]	0.111[4)]
Intervention group	14.00 ± 8.50	10.81 ± 4.50	3.20 ± 4.33	0.005[1)]	

Primary outcomes in intervention group and control group pre and post treatment.

Table 2.	V1	V2	V1-V2	Intra *p* value	Inter *p* value
BBS					
Control group	39.56 ± 15.40	35.22 ± 17.34	−1.67 ± 4.50	0.299[2)]	0.907[4)]
Intervention group	34.18 ± 17.19	37.09 ± 17.25	−2.91 ± 2.59	0.004[2)]	
TUG					
Control group	35.12 ± 59.62	20.83 ± 24.01	14.30 ± 35.90	0.297[2)]	0.326[3)]
Intervention group	16.49 ± 9.09	13.70 ± 5.65	2.79 ± 3.72	0.042[2)]	
FOG-Q					
Control group	7.78 ± 2.54	8.00 ± 3.39	−0.22 ± 1.48	0.655[2)]	0.838[4)]
Intervention group	7.91 ± 6.02	7.36 ± 4.92	0.55 ± 1.51	0.258[2)]	
MDS UPDRS-part2					
Control group	14.44 ± 5.79	14.56 ± 6.35	−0.11 ± 1.83	0.860[2)]	0.089[4)]
Intervention group	13.27 ± 9.51	11.82 ± 8.29	1.45 ± 1.69	0.010[1)]	
MDS UPDRS-part3					
Control group	38.00 ± 16.89	35.89 ± 17.79	2.11 ± 5.99	0.321[2)]	0.909[4)]
Intervention group	34.00 ± 30.45	32.13 ± 27.29	3.95 ± 6.27	0.036[1)]	

Secondary outcomes in intervention group and control group pre and post treatment.

Table 3.	V1	V2	V1-V2	Intra *p* value	Inter *p* value
MDS UPDRS-part1					
Control group	12.78 ± 4.82	11.33 ± 4.15	1.44 ± 1.81	0.044[2)]	0.923[3)]
Intervention group	13.45 ± 7.85	12.09 ± 7.45	1.36 ± 1.86	0.035[2)]	
NMSS					
Control group	49.56 ± 32.92	37.78 ± 27.84	5.78 ± 8.09	0.053[2)]	0.790[4)]
Intervention group	80.64 ± 111.02	67.91 ± 91.51	12.73 ± 21.85	0.028[1)]	

Non-motor symptoms outcomes in intervention group and control group pre and post treatment.

All values are given as means ± SD. V1, pretreatment; V2, 6weeks after treatment
1) Wilcoxon signed rank test 2) Paired t-test 3) Independent t-test 4) Mann-Whitney U test

Conclusion

- RAGT with the end-effector type gait robotics "Morning Walk®" can be one of the effective treatments for Parkinsonism in improving both motor and non-motor symptoms.