

Effect of Robot-Assisted Gait Training on Balance and Gait Function in Patients with Parkinsonian Syndrome: A Randomized Controlled Trial



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OBJECTIVES

To compare the effects of end-effector Robot-assisted gait training with conventional gait focused rehabilitation on balance outcomes and spatiotemporal gait parameters in Parkinsonian Syndrome.

MATERIAL AND METHODS

❖ **Design** : Single blinded, Randomized controlled trial

❖ **Inclusion Criteria** :

1. Clinically diagnosed Parkinson's disease
2. Patients who can gait, independently or with assistance
3. Hoehn & Yahr scale ≥ 4
4. Age ≥ 19 & MMSE ≥ 24

❖ **Intervention**

Total 12 sessions : 30 min each, 3 days per week, 4 weeks

- **Control group (CG)** : conventional gait focused rehabilitation
- **Robot assisted gait training group (RATG)** : end-effector type robot (GTR-A), Contralateral rhythmic upper-limb motion

❖ **Evaluation**

Baseline(T0), Post-intervention(4weeks later, T1)

RESULTS

Table 2. Comparison of balance ability between experimental and control group.*

Parameter	Group	Δ Mean \pm SD	P-value**
BBS(scores)	RATG	+2.19 \pm 2.93	0.753
	CG	+1.11 \pm 2.93	
COP range (mm)	RATG	+1.14 \pm 11.81	0.707
	CG	+1.12 \pm 27.87	
Romberg-eye open (OSI Scores)	RATG	+0.05 \pm 0.59	0.865
	CG	-0.06 \pm 0.58	
Romberg-eye closed (OSI Scores)	RATG	-0.48 \pm 0.87	0.650
	CG	-0.13 \pm 0.79	
Dynamic balance test (OSI Scores)	RATG	-0.19 \pm 0.48	0.864
	CG	-0.17 \pm 0.13	

No significant between-group differences were observed in overall balance outcomes.

Table 3. Comparison of gait performance between experimental and control group.*

Parameter	Group	Δ Mean \pm SD	P-value**
Double limb support proportion (%)	RATG	-3.97 \pm 3.98	0.015
	CG	-0.42 \pm 1.39	
Step length (mm)	RATG	+30.75 \pm 36.54	0.031
	CG	-1.38 \pm 20.01	
Step duration (sec)	RATG	-0.00 \pm 0.07	0.664
	CG	-0.00 \pm 0.03	
Step cadence (steps/min)	RATG	+4.45 \pm 5.06	0.003
	CG	-2.74 \pm 2.98	
TUG (sec)	RATG	-0.64 \pm 0.84	0.838
	CG	-1.61 \pm 4.30	
Stance phase (%)	RATG	-2.50 \pm 3.50	0.080
	CG	+0.12 \pm 2.42	
Swing phase (%)	RATG	+4.00 \pm 2.76	0.005
	CG	0.00 \pm 2.20	

RATG group demonstrated significant between-group superiority in spatiotemporal gait parameters compared to the control group

(BBS = Berg Balance Scale; COP = center of pressure; OSI = Overall Stability Index; APSI = Anteroposterior Stability Index; MLSI = Mediolateral Stability Index; TUG = Time up and go)
 *Values expressed as mean \pm SD.
 **Significance at P-value $< .05$ (intergroup comparison using Mann-Whitney U Test).

RESULTS

Table 1. General characteristics of the groups

Participants	Age (y)	Disease type, (n) MSA-C : MSA-P : PD	H&Y scale, (n) I : II : III : IV
	Mean		
RATG (N=16)	66.4	3 : 1 : 12	1 : 8 : 5 : 2
CG (N=9)	62.4	1 : 0 : 8	3 : 4 : 2 : 0

H&Y scale : Hoehn & Yahr scale; RATG, Robot assisted gait training group; CG, Control group

CONCLUSION

❖ Robot-assisted gait training improved spatiotemporal gait parameters compared with conventional gait training in patients with parkinsonian syndrome. No significant between-group differences were observed in balance outcomes. Further studies in larger groups are needed to validate these.

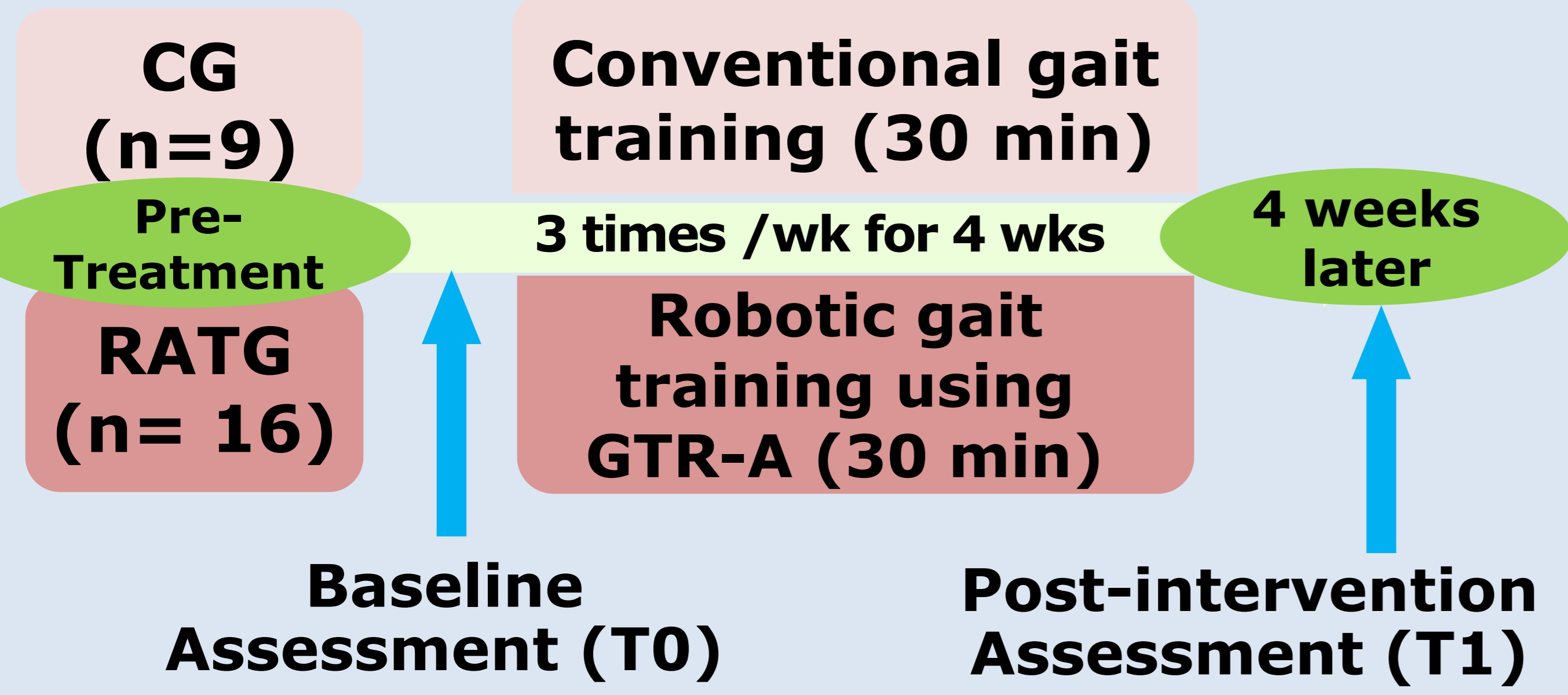


Figure 1, 2 : Gait Training Robot (GTR-A, Huca system)
 Figure 3 : Feet pressure scan