소아재활

게시일시 및 장소 : 10 월 19 일(토) 08:30-12:30 Room G(3F)

질의응답 일시 및 장소 : 10 월 19 일(토) 11:00-11:30 Room G(3F)

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Effects of High-intensity Robot-assisted Gait Training in Children with Cerebral Palsy

Ho wook Kim[1*], Lihua Jin[1], Shin-Seung Yang[1†], Ja Young Choi[1], Min Kyun Sohn[1†]

Department of Rehabilitation Medicine, School of Medicine, Chungnam National University[1]

Objective

Robot-assisted gait training was proved as a safe and efficient therapy on the neurologic recovery or musculoskeletal system. Intervention programs with higher intensity (ie, low body weight support and high speed) robotic training seems lead to better outcomes for stepping ability, physical fitness, in children with cerebral palsy (CP). However, not enough evidence to date to draw conclusions about the effects of high-intensity robot-assisted gait training. The purpose of our study is to determine the effects of it in children with cerebral of neurological and physical function.

Subjects & Methods

This is a single center, single-blinded, randomized, controlled trial. We studied patients with cerebral palsy who satisfied all of the following criteria : (1) 98~150cm in height, (2) GMFCS level 2~3, and (3) the patients who were able to communicate and implement the instructions were studied(Communication and social interaction score in WeeFIM >10). We excluded patients with any of the following : (1) Patients who are difficult to perform each assessment due to cognitive impairment, (2) Neurosurgical or orthopedic surgical management in the past 3 months, (3) patient with joint contracture (knee flexion more than 20 degrees, hip flexion more than 40 degrees), (4)presence of peripheral neuropathy or muscular disorders, and (5)unstable medical condition. Patients were divided into two groups according to intensity of robotic therapy (high or low intensity groups) and participated in Walkbot-K training 3 times per week for 45-min sessions for 6 weeks. Body weight support of high-intensity(HI) group was no more than 5kg and that of low-intensity(LI) group was from10 to 15kg. The speed of treadmill was 1.5km/h in HI group and 1.1km/h in LI group. GMFM, WeeFIM, COPM, postural stability test, body composition, MEP, and CPET were evaluated at baseline, and after the robotic therapy intervention.

Results

Seven children with cerebral palsy(GMFCS level II~III), ages 3 to 8, were analyzed for data. Subject ages ranged from 3 to 8 years with a mean of 4.7±1.8 years. The mean height was

105.1±9.1 cm, and mean weight was 16.6±3.3 kg. There was no difference in improvement of GMFM, WeeFIM, COPM, postural stability test, body composition, gait performance, MEP latency, and CPET between HI and LI group. However, both groups showed improvement in outcome after robot-assisted gait training compared to baseline in most assessments.

Conclusion

Robot-assisted gait training was found to be a helpful therapy for neurologic recovery, gait ability, and functional gain. We could not confirm the difference in treatment effect according to intensity of robot-assisted gait training. Additional patient enrollment is required to determine the effects of robot-assisted intensive gait training on neurological recovery and functional improvement in patients with cerebral palsy.

Table 1. Clinical characteristics of intervention group

	No.1 (HI)	No.2 (HI)	No.3 (HI)	No.4 (LI)	No.5 (LI)	No.6 (LI)	No.7 (HI)
Age (years)	4	8	6	5	4	3	3
Sex (men/women)	M	M	F	F	F	M	M
GMFCS	2	3	2	2	2	2	2
Height (cm)	103.1	122.5	105.7	111	97.4	98	98
Weight (kg)	19.3	17.5	15.6	22.1	14.6	14.7	12.5
BMI (kg/m2)	18.2	11.7	14.0	17.9	15.4	15.3	13.0

HI, High-intensity group; LI, Low-intensity group; GMFCS, Growth motor function classification system; BMI, Body mass index

Table 2. Comparison of clinical outcome between HI and LI group

	HI group (n=4)	LI group (n=3)	Total (n=7)	*p* value
<GMFM>				
ΔDimension C (Crawling and kneeling, %)	3.0	5.3	0.3±0.9	0.078
ΔDimension D (Standing, %)	4.5	3.3	1.8±2.4	0.435
ΔDimension E (Walking, running, %)	3.9	4.2	3.4±6.7	0.857
<WeeFIM>				
Δmobility (score)	3.6	4.5	1.0±1.0	0.554
Δlocomotion (score)	3.5	4.7	0.7±0.8	0.445
<COPM>				
Δperformance (score)	4.1	3.8	1.0±0.4	0.858
Δsatisfaction (score)	4.5	3.	0.8±0.4	0.476
<Postural stability test>				
ΔOverall stability index (score)	5.0	2.7	-0.7±0.9	0.154
ΔTime in zone (%)	3.8	4.3	5.6±12.4	0.724
<Body composition>				
ΔSMM (kg)	4.6	3.2	0.2±0.3	0.372
ΔPBF (%)	3.3	5.0	2.7±6.7	0.289

HI, High-intensity group; LI, Low-intensity group; GMFM, Growth motor function measure; WeeFIM, Functional independence measure for children; COPM, Canadian occupational performance measure; SMM, Skeletal muscle mass; PBF, Percentage of body fat

Table 3. Comparison of gait and eletrophysiologic data between HI and LI group

	HI group (n=2)	LI group (n=2)	Total (n=4)	*p* value
<Gait performance>				
ΔStride (cm)	2.0	3.0	-3.2±4.2	0.439
ΔDouble support (%)	2.5	2.5	-1.7±9.3	1.000
ΔCadence (m/s)	1.5	3.5	12.3±4.6	0.121
ΔAverage speed (m/s)	2.5	2.5	0.0±0.1	1.000
<Electrophysiologic data>				
ΔMEP latency (ms)	2.0	3.0	-0.8±4.1	0.439

HI, High-intensity group; LI, Low-intensity group; MEP, Motor evoked potential

Table 4. Comparison of CPET outcome between HI and LI group

	HI group (n=3)	LI group (n=3)	Total (n=6)	*p* value
ΔVO2/kg mean in resting(ml/min/kg)	5.0	2.0	3.7±4.5	0.050*
ΔHR in resting (bpm)	4.0	3.0	5.2±8.6	0.513
ΔVO2/HR in resting (ml/bpm)	5.0	2.0	0.5±0.8	0.046*
Δsubmaximal VO2/kg in resting (ml/min/kg)	4.3	2.7	1.6±6.5	0.275
Δsubmaximal VO2/kg in exercise (ml/min/kg)	4.0	3.0	2.6±5.1	0.513
ΔHR peak (bpm)	4.3	2.7	-2.5±10.0	0.275

CPET, Cardiopulmonary exercise test; HI, High-intensity group; LI, Low-intensity group; VO2, Total oxygen consumption; HR, Heart rate