



Pilot Study on Customized Wearable Walking Devices for Mild Gait Impairment

Doyoung Kim¹, Chung Hwan Choi^{1*}, Sanghyun Jee¹, Daebok Jeon¹, Jung Hyun Park^{1†}

1. Department of Rehabilitation Medicine, Gangnam Severance Hospital, Yonsei University College of Medicine, Seoul, Republic of Korea

Purpose

A wearable robot, for supporting of daily life, has been developed for individuals with mild gait impairment. However, research on its real-world application remains limited. This pilot study aims to evaluate the efficacy and safety of the device in patients with mild gait impairment.

Material and Methods

- Participants : 2 inpatients at Gangnam Severance Hospital with Mild Gait Impairments, October 2024
- Applied Device : Angel SUIT H10 (Angel Robotics Co., Ltd.)
- Type of Test : 6-minute Walking Test
- Gait Analyzer : Smart Insole (I-SOL) with wearable device(Galaxy FIT) for monitoring of heart rate



Figure 1. Angel SUIT H10

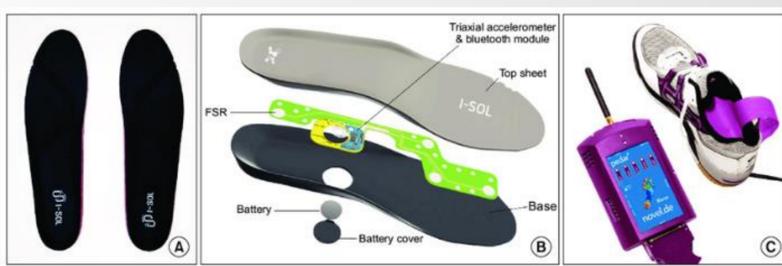


Figure 2. (A) Smart Insole, I-SOL® (Gilon, Seongnam, Korea) (B) Composition of smart insole (C) In-shoe plantar pressure measurement system



Figure 3. Galaxy FIT

Results

Case 1.

- M/77
- Dx: Epidural hematoma s/p Decompressive total laminectomy L2,L3 and hematoma removal (2024.09.14)
- FAC (Functional Ambulation Category) : level 3

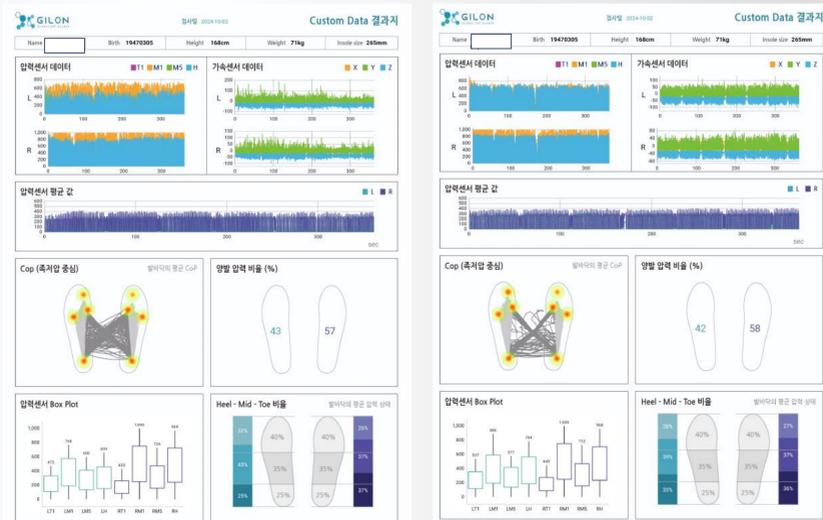


Figure 4. H10 OFF

Figure 5. H10 ON

Case 2.

- F/71
- Dx: Cervical myelopathy d/t Rt. EDH C4-T3 s/p PHL C5, HL C6/7, PHL T1 upper, PHL T1/2, and hematoma removal (2024.08.16)
- FAC (Functional Ambulation Category) : level 4

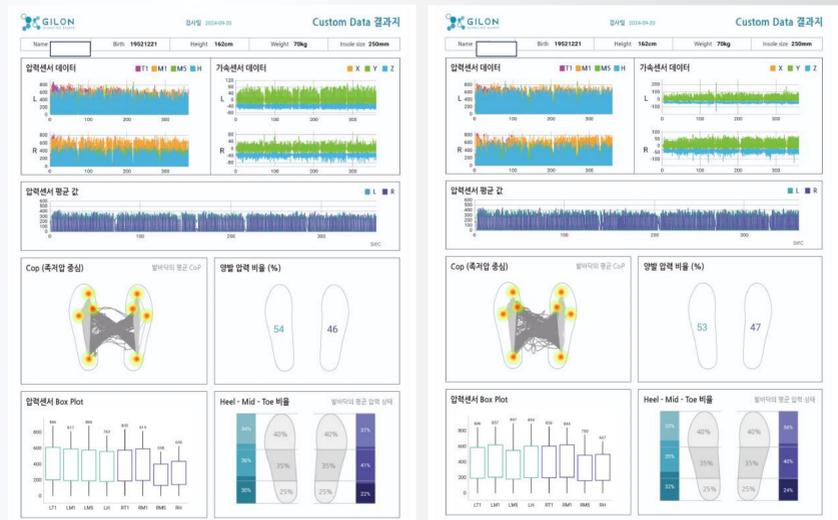


Figure 6. H10 OFF

Figure 7. H10 ON

6-min Walking Test with Gait Analysis: Case 1

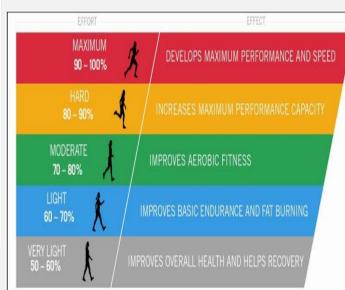
	Step Count	Velocity (km/h)	Distance (m)	Calorie (kcal)
H10 OFF	194	1.8	170.3	11.3
	↓	↓	↓	↓
H10 ON	208	2.4	226.1	13.3

6-min Walking Test with Gait Analysis: Case 2

	Step Count	Velocity (km/h)	Distance (m)	Calorie (kcal)
H10 OFF	191	2.01	182.04	10.69
	↓	↓	↓	↓
H10 ON	204	2.41	226.45	12.60

6-min Walking Test with HR Monitoring: Case 1

	Restorative (<50%)	Light (50~60%)	Fat burn (60~70%)	Moderate (70~80%)
H10 OFF	0%	5.4%	94.6%	0%
	↓	↓	↓	↓
H10 ON	0%	0%	100%	0%



6-min Walking Test with HR Monitoring: Case 2

	Restorative (<50%)	Light (50~60%)	Fat burn (60~70%)	Moderate (70~80%)
H10 OFF	2.7%	45.9%	51.4%	0%
	↓	↓	↓	↓
H10 ON	0%	0%	94.6%	5.4%

Conclusion

In patients with mild gait impairment, for supporting of daily life, the wearable robot can significantly improve walking distance, speed, and especially exercise intensity according to cardiac fitness. It also demonstrates its potential as an effective rehabilitation tool for patients with mild gait impairment.