

Exploratory study of a passive wearable device (ExoBand) as walking aid in neuromuscular patients

**C Semplicini¹, M Agostini^{2,3}, C Andriago¹, V Notararigo⁴, S Masiero^{2,3},
F Piccione² and G Sorarù⁴**

1 UOC Neurologia Ospedale S. Antonio; Azienda Ospedale-Università di Padova; 2 Dipartimento di Neuroscienze, Medicina Fisica e Riabilitazione, Università degli Studi di Padova; 3 UOC di Neuroriabilitazione; Azienda Ospedale-Università di Padova; 4 Dipartimento di Neuroscienze, Università degli Studi di Padova

Background and Aims

A passive wearable device (ExoBand ©) was recently approved for patients with impaired walking abilities in Italy. The device is a walking brace consisting of a belt and two leg loops, connected each other by a mechanism that stores the energy generated in the first phase of the gait cycle to return it in the second phase, thus enhancing the thrust of the hip flexors, and leading to functional walking improvement.

Aim of this exploratory study was to evaluate the effect of ExoBand on motor function of neuromuscular patients with proximal weakness.

ExoBand©



source: www.moveowalks.com

Patients and Methods

Patients: consecutive patients affected by different neuromuscular diseases (CIDP, motor polyneuropathy, MND) referring to the Neurology Unit of Ospedale S. Antonio, Padova, all characterized by proximal muscle involvement and gait abnormalities.

Evaluation protocol: a trained evaluator administered the following walking-related outcome measures in standard conditions with and without the device, with adequate rest between the tests:

- 10m walk test
- Time-up-and-go (TUG) test
- 2-minute walk test (only the last three patients)

Statistics: Wilcoxon signed-rank test

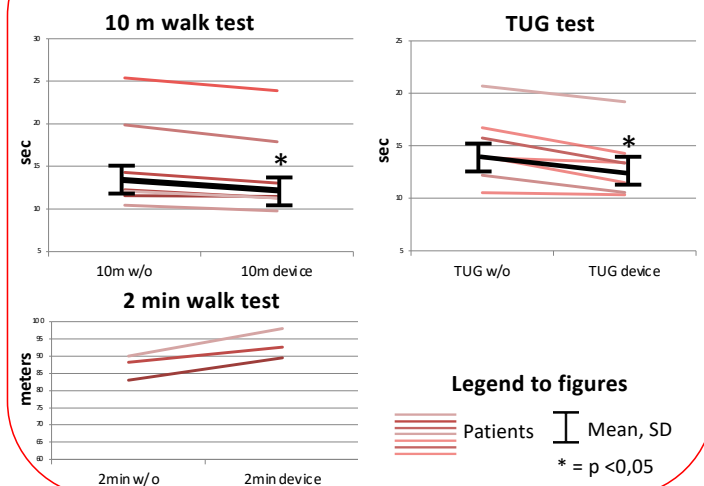
Patient Population

Pt ID	Sex	Age	Disease	Walking aids
1	F	75	polyneuropathy	AFO, cane
2	M	67	CIDP	2 canes
3	M	60	Kennedy's disease	-
4	M	74	CIDP	-
5	M	78	CIDP	-
6	M	77	CIDP	Rollator
7	F	64	CIDP	-
8	M	77	West Nile (polyradiculopathy)	Cane

Results

Eight patients were assessed (6M and 2F, age 63-78 yrs) affected by CIDP (5 patients) or other neuromuscular diseases (3). Four used walking aids continuously (Tab. 1) A significant decrease in timed test was observed in 10m walk (13.4 sec \pm 5.5 vs 12.2 \pm 5.0, $p < 0.05$) and TUG test (13.94 sec \pm 2.3 vs 12.4 \pm 1.7, $p < 0.05$) (Fig. 1-3) In all patients that performed 2 min walk test we observed an increase in walked distance (n.s. because of the number of included patients). Since first use, six patients reported a subjective benefit on walking stability, speed and confidence, and less fatigue (see below)

Figures



Patients' impressions after first use

- It was wonderful, I felt much better, I immediately perceived the difference, I no longer dragged my feet
- I feel better, it gives stability, I walk better, more in the balance than in the strength
- I feel better, like in a train track
- I feel lighter, more balanced; I walk in a better way
- I feel more secure in walking
- With the device, the muscles work better, I feel less fatigue, I want to walk more
- I am not sure about it, but without the device the leg rises less
- I felt a little constriction initially, quite unnatural for me, but I walk in a better way

Conclusions and Discussion

This exploratory study suggests the usefulness of a passive wearable device in neuromuscular patients with proximal weakness and gait abnormalities. The device improves walking function, by reducing the energy cost, supporting the hip flexion weakness and increasing stability (1-3). It is not harmful and well tolerated by patients.

Future Perspectives

Further studies are needed to evaluate the long-term effect and of the regular use of ExoBand on muscle function and risk of fall, to evaluate this device in specific neuromuscular diseases, both in adults and children, and its usefulness as a rehabilitation device.

References

- 1) F.A. Panizzolo, E. Annese, A. Paoli, G. Marcolin. A single assistive profile applied by a passive hip flexion device can reduce the energy cost of walking in older adults. *Appl. Sci.* 2021, 11(6),
- 2) F.A. Panizzolo, S. Cimino, E. Pettenello, A. Belfiore, N. Petrone, G. Marcolin. Effect of a passive hip exoskeleton on walking distance in neurological patients. *Assist Technol.* 2022 Sep 3;34(5):527-532.
- 3) F.A. Panizzolo, C. Bolgiani, L. Di Liddo, E. Annese, G. Marcolin. Reducing the energy cost of walking in older adults using a passive hip flexion device. *J Neuroeng Rehabil.* 2019 15;16:117