

The iWalk 2.0 Hands Free Crutch: Comparison to Normal Gait Pattern and Functional Use for Individuals with Lower Extremity Injuries

Alyssa Fijalkowski, SPT; Allison Freehill, SPT; Luke Gentile, SPT; Andrea Rossi, SPT; Stacie Bertram, PhD, PT

BACKGROUND

- Assistive device for NWB foot and ankle injuries intended to help patients return to function faster and more efficiently compared to other assistive devices (i.e. crutches, wheeled knee scooter). iWalk advertises the product by saying “you can walk, work, dance, do yoga—pretty much anything you could do before your injury or surgery recovery.”¹
- Limited research has been conducted on a new assistive device called the iWalk 2.0, a hands-free leg crutch, that allows a similar gait pattern as unassisted ambulation and reduced use of the upper extremities. Current research has shown the iWalk to provide the patient with decreased hospital stay, perform ambulation with greater energy efficiency, lower levels of dyspnea, fatigue scores, and pre and post activity heart rate. Patients also report greater ease with ADLs. The purpose of this study is to investigate the existing controversy on whether or not the iWalk is a better assistive device compared to others, such as a knee roller or axillary crutches.^{2,3,4}



Figure 1&2. Functional Reach and Timed Up and Go testing with the iWalk.

OBJECTIVES

- To test the reliability and validity of the Functional Reach, 10 Meter Walk, and Timed Up and Go (TUG) tests
- To see the difference between a healthy, young (22-30 y.o) individual complete these tasks without the iWalk and with the iWalk
- To understand the general difficulty, stability, and comfort to individuals using the iWalk
- Overall efficiency and functionality of the device

PURPOSE

The purpose of this feasibility study was to compare how the iWalk hands-free leg crutch alters an individual’s normal gait pattern in terms of energy expenditure, ambulation time, and balance compared to gait without an assistive device to direct future data collection and study methodology.

Research question: What is the extent of the difference in gait quality in terms of completing functional tasks, gait stride, speed, and length when walking with and without the iWalk?

Hypothesis: The iWalk Hands-Free Crutch will produce results that are similar (within 10%) to the values collected when walking with a normal unencumbered gait.

MATERIALS AND METHODS

Participants

Ten healthy adults without any current musculoskeletal impairment between the ages of 22-30 participated in this feasibility study.

Study Design

The subjects completed the following functional tests: the 10 Meter Walk test, the Functional Reach test and the Timed Up and Go test with and without the iWalk leg crutch. These 3 tests function to determine if there is a difference in an individual’s gait characteristics when walking with the iWalk compared to normal

Procedures

- Randomization of order of condition and tests
 - Conditions and tests were written on slips of paper and randomly drawn by the participant
- Conditions included
 - Use of the iWalk
 - Normal gait
- Tests
 - 10 meter walk
 - Functional Reach
 - Timed UP and Go (TUG)
- Each test was done a total of 3 times per condition
- Participants completed a warm up prior to the start of the iWalk condition to learn how to ambulate with the device

Data Collection and Interpretation

- Google sheets was used to input data and calculate the average of the three trials
- Paired T-Tests was used for data analysis.
- Bar Graphs of collected data in a visual representation



Figure 3. 10 M Walk Test with the iWalk.

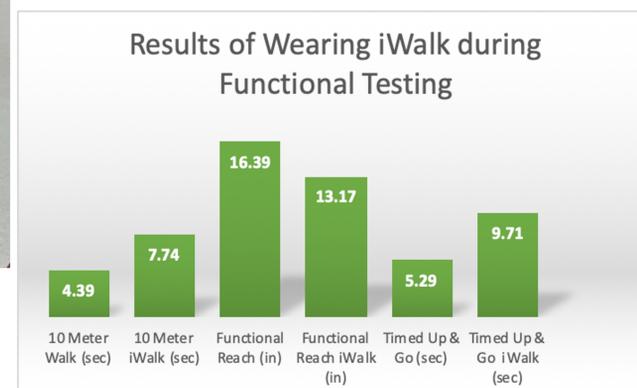
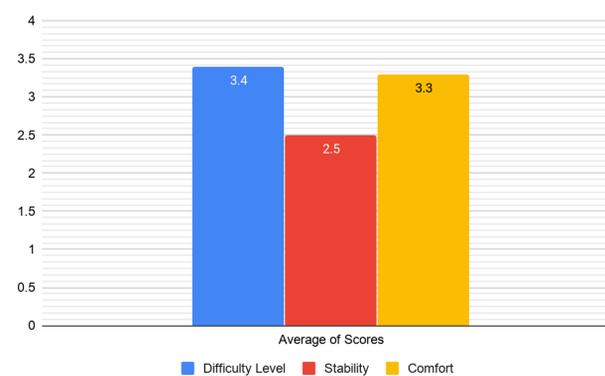


Chart 1&2. Top Bar Graph: subjective report of the difficulty level, stability and comfort of the iWalk. Bottom Bar Graph: Comparison of wearing the iWalk to completing the test without an Assistive Device on Functional Testing measures.

RESULTS

- On average participants walked 3.35 (43%) seconds slower on the 10 meter walk test while wearing the iWalk. A paired samples t-test showed this increase to be significant ($t(9) = -9.416, p < .001$). Their functional reach was 3.22 inches (19%) less, ($t(9) = 2.914, p = .017$) and their Timed Up and Go was 4.42 seconds (46%) slower ($t(9) = -10.93, p < .001$) while wearing the iWalk.
- Average rating by the participants on difficulty of use was 3.4/5, stability during gait was 2.5/5, and 3.3/5 for comfort of use while wearing the iWalk 2.0.

Paired Samples T-Test: Results of Functional Tests with and without iWalk					
			t	df	p
10 M Walk	-	10 M Walk with iWalk	-9.416	9	< .001
Functional Reach	-	Functional Reach with iWalk	2.914	9	0.017
Timed Up & Go	-	Timed Up & Go with iWalk	-10.934	9	< .001

Note. Student's t-test.

Descriptive statistics: Functional Tests results with and without iWalk				
	N	Mean	SD	SE
10 M Walk (sec)	10	4.390	0.727	0.230
10 M Walk iWalk (sec)	10	7.746	1.113	0.352
Functional Reach (in)	10	16.399	2.456	0.777
Functional Reach iWalk (in)	10	13.179	3.766	1.191
Timed Up & Go (sec)	10	5.219	0.540	0.171
Timed Up & Go iWalk (sec)	10	9.708	1.518	0.480

CONCLUSIONS

Preliminary results are consistent with previous research showing differences in functional ambulation between individuals wearing the iWalk and those walking unencumbered by a device. This does not support our initial hypothesis that there would be less than a 10% difference between the two groups in results from the three functional tests. Additional research could include comparing an individual’s gait pattern when wearing an iWalk compared to another assistive device such as the axillary crutches or wheeled walker and include data such as step length, step width, and stride time in addition to our current parameters when comparing the two gait patterns with different assistive devices.

Limitations:

- Some individuals in our study may have had previous experience with assistive mobility devices.
- This feasibility study with 10 participants was conducted during COVID-19 restrictions.
- There are plans to conduct a fully realized version of this study in the future.
- Results can only be generalized to our sample, and serve to direct data collection in future studies.

REFERENCES

- The Best Crutch Substitute: Introducing the iWALK 2.0. iWALK Free. <https://iwalk-free.com/product-introduction/>. Published 2018. Accessed March 21, 2020.
- Bertrand K, Raymond M-H, Miller WC, Ginis KAM, Demers L. Walking aids for enabling activity and participation. *American Journal of Physical Medicine & Rehabilitation*. 2017;96(12):894-903. doi:10.1097/ptm.0000000000000836.
- Lange DT, Neal MM, Takahashi CI, Reissner JJ, Stockero AM, Ebben WP. Kinetic and subjective analysis of knee rollers, hands free crutch, and conventional crutches. *International Society of Biomechanics in Sports*. 2019; 37(1): 81-84.
- Martin KD, Unangst AM, Huh J, Chisholm J. Patient preference and physical demand for hands-free single crutch vs. standard axillary crutches in foot and ankle patients. *Foot & Ankle International*. 2019;40(10):1203-1208. Doi: 10.1177/1071100719862743.