

# Comparison between the functional performance of the normal subjects during walking and standing with HGO and a new RGO orthoses

Mohammad Taghi Karimi <sup>1</sup>, William Spence <sup>2</sup>and Alexander Nicol <sup>3</sup>

<sup>1</sup>PhD student of Bioengineering Unit, Strathclyde University UK.

E-mail address: mohammad.karimi@strath.ac.uk

<sup>2</sup>Lecturer of Bioengineering Unit, Strathclyde University UK.

<sup>3</sup>Professor of Bioengineering Unit, Strathclyde University UK

## Introduction

Spinal cord injury (SCI) patients often undergo different rehabilitation programmes for walking and exercises. It is accepted that walking is a good form of exercise for paraplegics in order to maintain good health, decrease urinary tract infections; to improve cardiovascular and digestive functions and psychological health.

Several types of orthosis have been designed to enable SCI patients to walk, however they are not without problems which include: difficulties with regards to independent donning and doffing; difficulties in transportation of the orthosis, walking speed is reduced compared with 'normal' subjects, cosmesis is poor and the style of walking is abnormal.

A new type of RGO orthosis was designed to overcome some of the aforementioned problems. Specifically the design allows for easy, independent, donning and doffing by the user; it allows for alignment of the various segments while the user is wearing the orthosis; the modularity of the orthosis allows for easy transportation.

## Method

The functional performances of 5 normal subjects during walking and standing were compared when using HGO orthosis, which is the best available mechanical orthosis, and the new RGO orthosis. Some parameters such as the excursion of Centre of Pressure (COP) in mediolateral and anteroposterior planes during quiet standing and during hand function, spatio-temporal gait parameters, intersegmental moments of hip joint, the amount of the force applied on the foot and crutch and Physiological Cost Index (PCI) were measured during walking with both orthoses.

## Results

The results suggest that the performance of the normal subjects during standing and walking with the new design of the RGO orthosis could be better than that of the common design of the RGO orthosis. Figure 2 and 3 show the hip joint flexion extension excursion during walking with the new orthosis and HGO respectively.

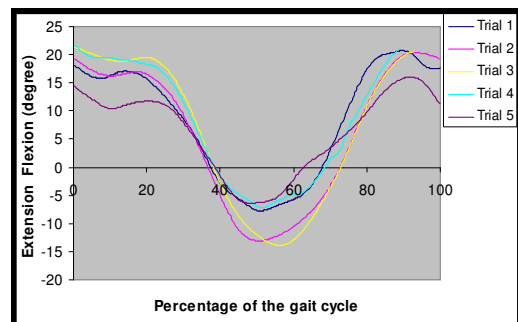


Figure 1: Hip joint flexion extension angle during walking with the new orthosis

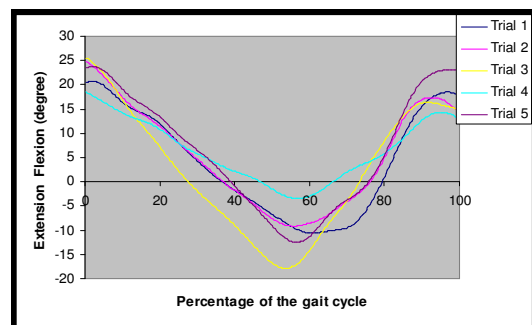


Figure 2: Hip joint flexion extension angle during walking with HGO orthosis

The amount of stability of the participants was better during standing with the new orthosis in contrast to HGO orthosis. However, there was no significant difference between energy consumption during walking with these orthoses. Figure 4 shows the amount of

stability during standing with the new orthosis and HGO orthosis.

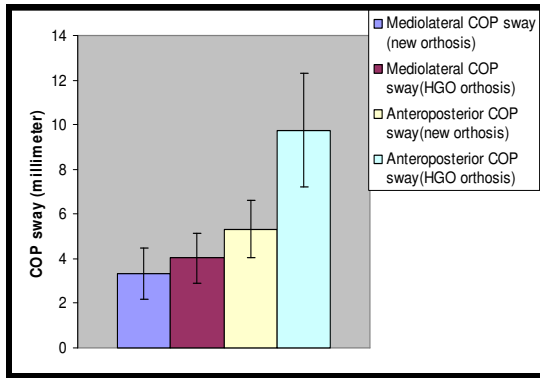


Figure 3: The amount of the stability during standing with both orthoses

### Conclusion

The functional performance of the participants during walking and standing with the new orthosis could be better than that with HGO orthosis. The new orthosis allows easy and independent donning and doffing by the users.

### Acknowledgment:

Thanks go to Mr Solomonidis for his work, advice and cooperation in every kind of technical question. I must extend my gratitude to David Rob and Steve in the workshop for their support