

Prosthetic knee design changes effecting two performance measures in transfemoral amputees

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INTRODUCTION

The RHEO KNEE from Ossur is a microprocessor prosthetic knee designed with a non-hydraulic actuator. The knee's name derives from magnetorheological fluid, which works in conjunction with a series of blades to create a braking force. Magnetic fields, the fluid and rotary blades are used to vary the knee's resistance. In comparison with microprocessor hydraulics, the system has shown reducing energy consumption with enhancing the smoothness of gait. This offers the user a device which is very easy to control and to walk with a great amount of fluidity and dynamics. A new version of the system has been developed with the main objective to increase stability in stance (during standing and walking) and enhance swing characteristics. The study was executed to confirm the benefits of the design changes.

METHODS

The test will be a single group design to evaluate the short term functional improvement. The group consisted of 7 subjects. Only unilateral transfemoral users that have been using a RHEO KNEE for more than 3 months were included. Measurements were taken with the current knee (baseline) and the upgraded version (initial fitting) at the same visit and in a follow up after 3 weeks. The measures included a self-reported and performance assessment such as:

- knee questionnaire for the user-confidence and perception
- PEQ group 4 and 5
- L-Test
- 2 minute walking test (2-MWT)

RESULTS

7 unilateral transfemoral amputees, all men, mean age 52.5 year, have been selected to participate. By using the new version of the RHEO KNEE walking distance of the 2-MWT improved by 9.1%. Distance improved by average from 176,9 m at baseline testing to 193 m at follow-up after three weeks. The improvement in the L-Test was approximately 13% with the upgraded version. Time decreased by average from 21 sec at baseline testing to 18.5 sec at follow-up after three weeks. This was

confirmed by the BORG scale and PEQ. The BORG pre and post-difference measurement showed a decrease in effort of about 63% between baseline and at follow-up after three weeks. The PEQ showed an average score increase of from 6.9 to 8.3, from baseline to 3 weeks follow up.

DISCUSSION

Clinical research^{1,2} has identified RHEO KNEE as a device indicated for amputees on MCFL-K3 and/or K4 functional level of activity. Changes in the design have increased the functional outcome of the users in the study with the device. Although the small number of participants, we consider these differences to be clinically relevant and anticipate a significant impact of such differences on mobility, as proven by the results of the functional assessments. The L-test and 2-MWT are validated functional tests used in clinical situations.

CONCLUSION

A new version of the RHEO KNEE has been developed with the main objective to increase functional outcome. First results of clinical measurements suggest that amputees can benefit from a default swing device, where the objective is to have balance between stability and fluidity when walking!

REFERENCES

1. Johansson, J.L., Sherrill, D.M., Riley, P.O., Bonato, P. & Herr, H. A clinical comparison of variable-damping and mechanically passive prosthetic knee devices. *Am J Phys Med Rehabil* 84, 563-575 (2005).
2. Veltmann U, Wühr J, Linkemeyer L, Wetz HH. C-Leg and Rheo Knee: are they interchangeable? ISPO Congress 2007, Vancouver, Canada. Vancouver: Canadian National Society for Prosthetics and Orthotics; 2007; p 286 [abstract].