

Author

Laszczak, Piotr (Basingstoke UK) | Dr.
Chas A Blatchford & Sons - New Product Development

Title

Improvements in health-related user outcomes with microprocessor feet

Coauthors

McGrath M, McCarthy J, Zahedi S, Moser D

Summary

Patient-Reported Outcome Measures (PROMs) were compared between microprocessor foot (MPF) users and non-microprocessor prosthetic feet (NMPF) users. The findings indicated improvements in ambulation and transferring, reductions in pain and a trend towards reducing stumble and fall frequency.

Introduction

The efficacy of microprocessor-controlled prosthetic knees (MPKs) has been well-established [1], yet in spite of studies demonstrating biomechanical improvements with MPFs [2-4], their prescription is not yet common practice. One method of demonstrating the medical necessity of a given prosthetic technology is to analyse its influence on outcomes related to the health of the user. Arguably, there are four key areas of amputee rehabilitation: reducing the risk of falls; reducing the likelihood of osteoarthritis development; reducing the likelihood of lower back pain development; and protecting the vulnerable tissue of the residual limb. This study sought to establish the differences in health-related user outcomes between users of different prosthetic foot technology.

Methods

A cohort of 17 lower limb amputees, including both below knee and above knee participants, was stratified into two groups; those using an MPF and those using an NMPF. Participants completed PROM questionnaires related to their function and health and the differences between the groups were analysed.

The chosen outcome measures were selected sections of the Prosthesis Evaluation Questionnaire (PEQ) [5]. These included the mobility sub-section (constituting of the Ambulation and Transferring sub-scales) and the pain sub-section (regarding pain in the

residual limb, contralateral limb and back). Patients were asked to report the frequency of tripping and falling, as well as answering satisfaction and quality-of-life questions.

Results

The MPF users exhibited a 12% improvement in the PEQ Mobility Sub-section compared to the NMPF group, reporting increased mean scores in both Ambulation and Transferring activities. This trend was also observed in terms of gait satisfaction, where MPF users reported approximately 25% higher rating than NMPF users. The frequency of tripping was reduced by approximately 25%, although large inter-participant variability affected the significance of this finding.

Pain was rated on a scale of 0 (intense) to 100 (mild). Overall, the mean rating of pain intensity across all anatomical locations was improved by 11% for MPF users. In terms of location, the largest change was observed at the residual limb, which improved by more than 30% for MPF users.

Conclusion

The findings indicate clear improvements in user outcomes for the MPF group. It is likely that improved mobility is achieved through ground adaptation and situational awareness provided by the microprocessor-control. Other improvements indicate potential long-term health benefits. Reduced residual limb pain could suggest a lower likelihood of pressure ulcer development and reduced pain in the sound limb might be indicative of a lower chance of contralateral joint problems. Benefits to the health of users is a key goal of successful prosthetic rehabilitation and helps to build the health economic case for MPF devices.

References

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