

Not all microprocessor knees are created equal

At Ottobock, our mission is to improve human independence and mobility. We believe that one of the best ways to do that is to provide high-quality, clinically sound products that deliver strong outcomes for your patients.

In that spirit, we wanted to share the following summary of an article that was presented at AOPA in 2013. If you would like more information about the study, or about reimbursement support that is available through Ottobock US, please contact your Sales Representative or our Reimbursement Department at 800 328 4058.

Summary of the article, “Designs and Performance of Microprocessor-Controlled Knee Joints”

Thiele J, Westebbe B, Bellmann M, Kraft M

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Since the C-Leg microprocessor-controlled prosthetic knee (MPK) first entered the market over 15 years ago, several other MPKs have been introduced. Because the various MPKs have different technical features, a question has arisen: do all MPKs provide the same functional advantages regardless of their technical features, or do the differences in their technical features result in different functional outcomes?

The independent pilot study – conducted by the department of medical engineering (headed by Marc Kraft) at the Technical University Berlin in Germany, and presented at the AOPA 2013 world congress – analyzed the gait patterns of three unilateral transfemoral MFCL-3 (Medicare Functional Classification Level 3, also known as K3) amputees using four different MPKs (C-Leg, Orion, Plié 2.0, REL-K) in randomized order. The study also compared the construction and technical principles of these MPKs to explain potential functional differences found.

Results

The present study found clear differences in the functional features of stance control as well as swing phase control among the four MPKs investigated.

Differences in stance control

- Stance extension dampening is smoothest in the C-Leg, followed by the Orion. There is very limited stance extension dampening in either the Plié 2.0 or the REL-K.
- The abrupt terminal stance phase extension observed with the Plié 2.0 and REL-K could be attributed to the absence of microprocessor control of extension resistance.

Differences in swing control

- Swing initiation, as measured by the hip flexion moment at late stance, is significantly easier with the C-Leg, followed by the REL-K and Orion. Swing initiation is most difficult with the Plié 2.0.
- The maximum knee flexion angle that is physiologically independent of walking speed (which is important for providing sufficient foot clearance) is, to a significant degree, most constant with the C-Leg, followed by the Orion and REL-K. The Plié 2.0 is most dependent on walking speed.
- Full extension at the end of swing phase is reliably achieved with the C-Leg and the Plié 2.0. In contrast, with the Orion and the REL-K, the extension stop was seldom reached, especially at mid-velocity.

Analysis of construction and technical principles

Analysis of the construction and technical principles of the four MPKs explained the differences in their functional features.

- The Plié 2.0 does not have means for microprocessor control of the swing angle.
- The Plié 2.0 and REL-K do not offer the functional technological means to adjust between stance extension and swing extension behavior.

Conclusion

The present study found clear differences among the functional features of the four MPKs, which result from the differences in their construction and technical principles. These findings suggest that transferring trial results for one specific MPK to the entire group of microprocessor-controlled prosthetic knees is unjustified. It further suggests the importance of conducting separate clinical trials with every MPK in order to evaluate the patient benefits.

Links to the full text of this study can be accessed by going to our web site at professionals.ottobockus.com and clicking on the C-Leg page.

