

C-Leg vs MPKs

Stairs

Major Findings

With C-Leg **compared to Rheo Knee:**

- **33% of subjects are less dependent on handrails during stair descent (44 vs 78%)**
- **Improved safety profile during stair descent based on reliable flexion resistance**
- **Safe positioning of the foot on the step during stair descent**
No knee extension movement immediately prior to foot positioning
- **Trend towards reduced loading on the contralateral side**
Ground reaction force on contralateral side decreased by 10%

With C-Leg **compared to Adaptive2:**

- **56% of subjects are less dependent on handrails during stair descent (44 vs 100%)**
- **Improved safety profile during stair descent based on reliable flexion resistance**
- **Safe positioning of the foot on the step during stair descent**
No knee extension movement immediately prior to foot positioning
- **Reduced loading on the contralateral side**
Ground reaction force on contralateral side decreased by 25%

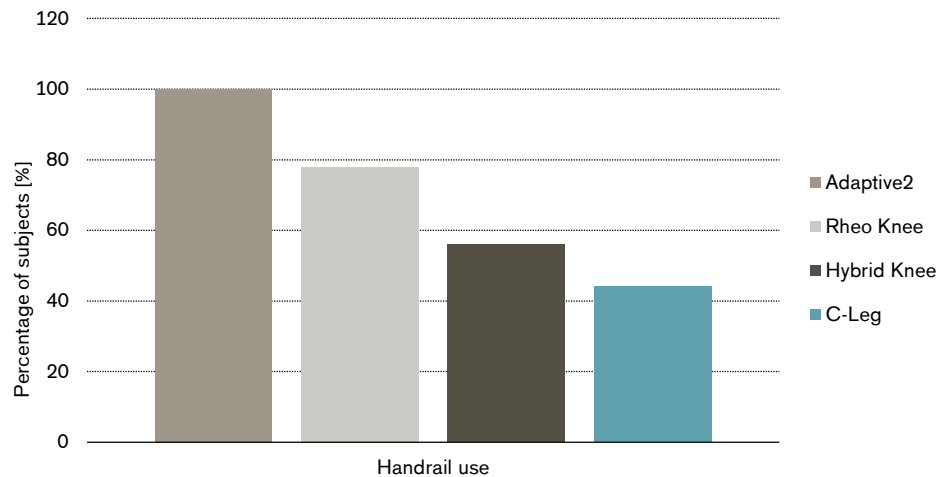
With C-Leg **compared to Power Knee:**

- **Reduced loading of the contralateral side during stair descent based on a decrease of peak ankle power generation by 21%**

With C-Leg **compared to Hybrid Knee (Synergy):**

- **12% of subjects are less dependent on handrails during stair descent (44 vs 56%)**
- **Safe positioning of the foot on the step during stair descent**
No knee extension movement immediately prior to foot positioning

Decreased use of handrail when descending stairs with C-Leg



Bellmann et al. (2010)

Clinical Relevance

Stair ambulation is an activity that is important for amputees with an activity level ranging from K2 to K4. Being able to ascend and descend stairs is a requirement to participate in daily life. Biomechanical assessment is conducted to determine load on the joints and joint angles. It was additionally recorded how many subjects need support from handrail while doing activity.

Summary

C-Leg shows a reliable extension support during stair descent and therefore allows for an appropriate positioning of the foot on the step and a safe loading. In contrast, it was observed, that with Hybrid Knee, Adaptive2 and Rheo Knee the knee is moving immediately prior to foot positioning which gives the subjects the impression of instability and insecurity (Bellmann et al. 2010). Additionally it was reported that C-Leg shows the highest safety potential of assessed MPKs based on its reliable resistance and reproducible knee angle during stair descent (Blumentritt et al. 2010). Furthermore, also improvements in perceived safety of subjects using C-Leg were confirmed due to decrease in the use of a handrail when descending stairs. With C-Leg only 44% of subjects used the hand rail compared to 56% with Hybrid Knee, 78% with Adaptive2 and 100% with Rheo Knee (Bellmann et al 2010).

A motion analysis by Bellmann et al. (2010) showed that loading of the contralateral side during stair descent is reduced by 24% with C-Leg compared to Adaptive2. Another group measured a decrease in peak ankle power of the contralateral with C-Leg compared to Power Knee (Wolf et al. 2012).

References of summarized studies

Bellmann, M., Schmalz, T., & Blumentritt, S. (2010). Comparative biomechanical analysis of current microprocessor-controlled prosthetic knee joints. *Archives of physical medicine and rehabilitation*, 91(4), 644–652. doi:10.1016/j.apmr.2009.12.014

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