

Reference

Lura DJ, Wernke MM, Carey SL, Kahle JT, Miro RM, Highsmith MJ.

School of Physical Therapy & Rehabilitation Sciences, University of South Florida, Tampa, FL, USA.

Differences in knee flexion between the Genium and C-Leg microprocessor knees while walking on level ground and ramps

Clinical Biomechanics 2015; 30(2): 175-181.

Products

Genium vs C-Leg

Major Findings

With Genium compared to C-Leg:

→ **More physiological movement pattern**

→ **Increased knee flexion angle in both stance and swing phase due to accommodation, training and use of Genium during level walking and walking on ramps**

by up to 7° during swing phase when level walking

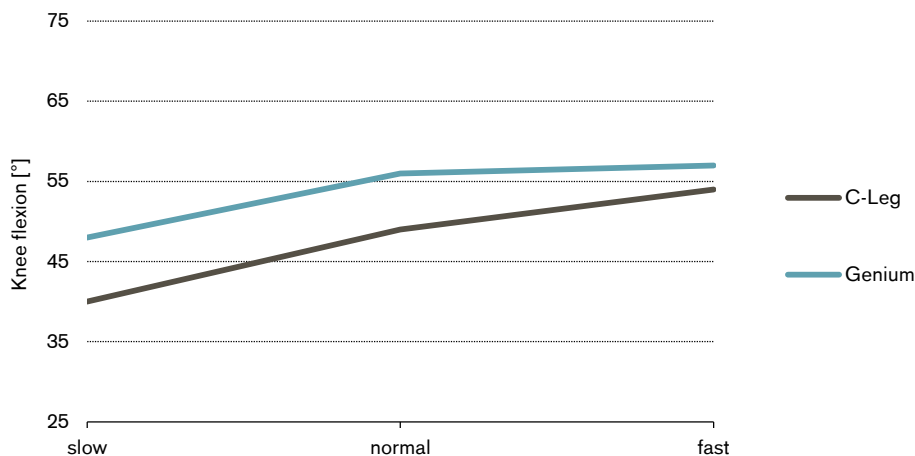
by up to 2° during stance phase when level walking

by up to 8° during swing phase when descending a ramp

by up to 4° during stance phase when descending a ramp

by up to 9° during swing phase when ascending a ramp

Increased swing phase knee flexion angle during 5° ramp ascent



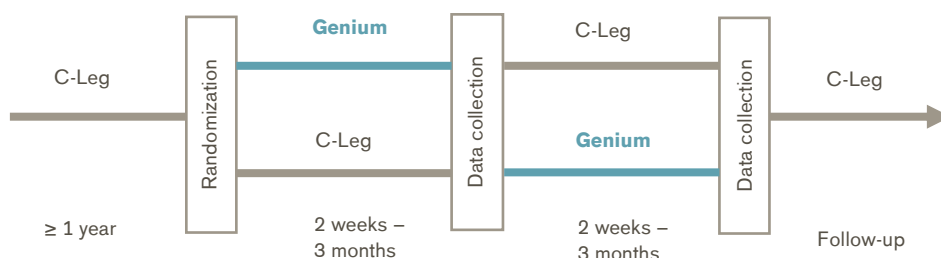
Peak knee flexion angle was measured at slow, normal and fast walking speed.

Population

Subjects: 20 unilateral, transfemoral amputees
Previous prosthesis: C-Leg
Amputation causes: 70% trauma, 20% malignancy, 10% vascular disease
Mean age: 46.5 yrs (± 14.2 yrs)
Mean time since amputation: 17.7 yrs (± 15.6 yrs)
MFCL: K3

Study Design

Interventional, randomized crossover design:



Results

Activities								Participation	Environment
Level walking	Stairs	Ramps, Hills	Uneven ground, Obstacles	Cognitive demand	Metabolic energy consumption	Safety	Activity, Mobility, ADLs	Preference, Satisfaction, QoL	Health economics

Category	Outcomes	Results for Genium compared to C-Leg			
		Very slow	Slow	Normal	Fast
Level Walking	Peak knee flexion angle in swing phase	++ 7°	++ 6°	++ 6°	+
	Peak knee flexion angle in stance phase	+	++ 2°	++ 2°	+
	0.5 kg ankle weight attached to each leg Peak knee flexion angle in swing phase	++ 6°	++ 5°	++ 4°	++ 3°
	0.5 kg ankle weight attached to each leg Peak knee flexion angle in stance phase	++ 1°	+	+	++ 2°
Ramps, Hills	5° slope Descent Peak knee flexion angle in swing phase		++ 8°	++ 7°	++ 3°
	5° slope Ascent Peak knee flexion angle in swing phase		+	++ 9°	-
	5° slope Descent Peak knee flexion angle in stance phase		++ 3°	+	++ 4°
	5° slope Ascent Peak knee flexion angle in stance phase		+	+	+

Category	Outcomes	Results for Genium compared to C-Leg			
		Very slow	Slow	Normal	Fast
	10° slope Descent Peak knee flexion angle in swing phase		+	+	+
	10° slope Ascent Peak knee flexion angle in swing phase		+	++ 8°	0
	10° slope Descent Peak knee flexion angle in stance phase		+	+	+
	10° slope Ascent Peak knee flexion angle in stance phase		+	+	+

* no difference (0), positive trend (+), negative trend (-), significant (++/--), not applicable (n.a.)

Author's Conclusion

'Accommodation, training and use of the Genium were found to produce increased knee flexion compared with the C-Leg in both the stance and swing phases of gait. This increased knee flexion is clinically significant as it better recreates a normalized, anatomic movement pattern. The knee flexion angle of the non-amputated leg was not significantly affected by use of the Genium relative to the C-leg. Control subjects typically had the greatest knee flexion, followed by the amputees' sound side, and then prosthetic side of the subjects with the Genium and C-Leg respectively. This shows that Genium use increases stance and swing knee flexion angles compared with the C-Leg, but improvements are still possible, especially in certain walking conditions such as when walking uphill., (Lura et al. 2014)

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