

Reference

Brüggenjürgen, B.^{1*}, Kannenberg, A.², Stukenborg-Colsman, C.³ (in memoriam), Hahn, A.⁴

Health-related quality of life in amputees with a microprocessor-controlled prosthetic knee measured by the EQ-5D-5L

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Products

Genium, C-Leg

- Major Findings

With Genium and C-Leg:

→ High health-related quality of life (HRQoL) on the EQ-5D-5L reported by MPK users

- Total mean EQ-5D-5L index: 0.84 (max. 1)
 - Total mean EQ-VAS: 77.4 (max. 100)

→ Most users reported no or only minor health limitations

- 18.2% reported a completely problem-free health state
 - 58.0% reported only minor limitations

→ Mobility limitations were still common despite use of advanced prosthetic knees.

- 53.3% reported no mobility problems; 46.7% reported some degree of mobility limitation.

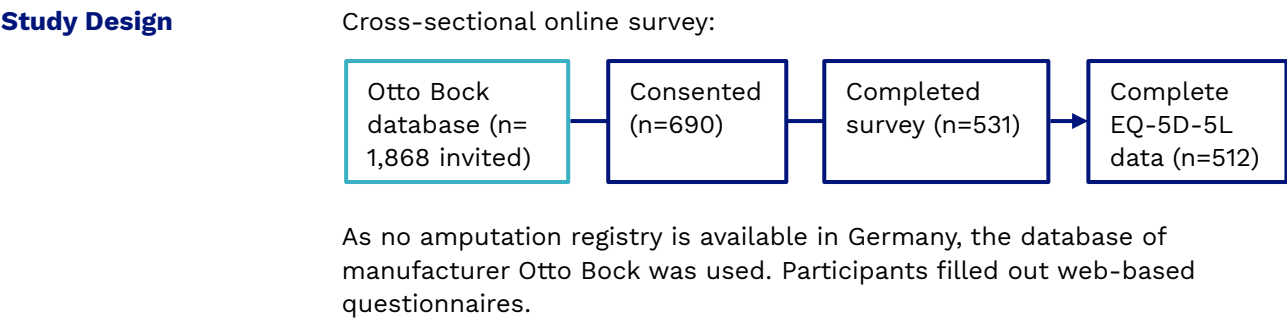
→ Pain/discomfort was the main remaining challenge despite MPK use.

- 75.0% reported pain/discomfort problems
 - 25.0% reported no pain/discomfort

→ Self-care was largely unaffected.

- 88.1% reported no self-care problems

Population	Subjects:	512 participants (19.7% female) in Germany
	Current prosthetic knee:	Genium / X3 (348), C-Leg (164)
	Amputation causes:	trauma (56.1%), tumor (15.6%), peripheral arterial disease (PAD; 11.3%), severe infection (4.5%), congenital limb deficiency (2.9%), diabetes mellitus (0.2%), other (9.4%)
	Amputation level:	2.9% hip disarticulation, 68.0% transfemoral, 26.6% knee disarticulation and 2.5% bilateral
	Mean age:	54.0 ± 12.6 years
	Median time since amputation:	15 years
	MFCL:	n.r.



Results

Functions and 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 <i>Genium</i> and <i>C-Leg</i>	Sig. ^a
Preference, Satisfaction, Quality of Life (QoL)	EQ-5D-5L Descriptive System - Dimensions	Problem free ratings: 18.2% of responses.	n.a.
		Not exceeding minor problems: majority of responses (58%), (max. “2” in any dimension).	n.a.
		Severe problems were very rare: 2.1% of responses (at least one “5” in any dimension).	n.a.
	Self-care (SC)	- Fewest problems reported for this domain with only 11.9% of responses	n.a.
		- Proportion among males reporting “no problems” was slightly lower than in females	0
		- No SC impairments reported by amputees with congenital limb deficiency	0
		- Significantly less impairments for SC with <i>Genium</i> / X3 than <i>C-Leg</i>	--
	Pain/discomfort (P/D)	- Most affected domain with 75% reporting problems	n.a.
		- P/D differed between amputation etiologies	0
	Mobility (MO)	- 2 nd most affected domain with 46.7% reporting problems	n.a.
		- Lowest impact on MO reported by amputees aged 35–44 years	0
		- Greater impairments in MO reported by amputees with peripheral artery disease or severe infections as causes of amputation	0
		- Significantly less impairments for MO with <i>Genium</i> / X3 than <i>C-Leg</i>	--
	Usual activities (UA)	- Decline in impact on UA with increasing age	0
		- Greater impairments in UA reported by amputees with peripheral artery disease or severe infections as causes of amputation	0
		- Significantly less impairments for UA with <i>Genium</i> / X3 than <i>C-Leg</i>	--
	Anxiety depression (A/D)	- Worse A/D scores in participants with shorter duration of use	0
		- Proportion of males reporting “no problems” in the A/D domain was higher than in females	0
	EQ-5D-5L Value Set-Based Index	- Average generated index values ranged from 0.82 to 0.86 (categorized by both sex and age)	
		- Study population mean of 0.84	

Category	Outcomes	Results for <i>Genium</i> and <i>C-Leg</i>	Sig. ^a
		(differences to normative German value set for individuals with at least one medical condition (male: 0.91; female: 0.89) are not clinically meaningful, except for the comparison between the age groups "18-34" and ">65", however, the difference was not statistically significant)	0
	EQ-5D-5L VAS	Mean VAS score was similar for male and female amputees: 77.4 male, 77.4 female (n=497; with female being 6.3 years younger) and was in the middle between VAS means reported in two German studies (85.1 and 71.6)	0
		Score varied depending on whether problems were reported in the individual dimension: - Problem free health state: VAS=89.6 (18.2% of participants) - At least one problem: VAS=74.7 (81.8% of participants)	++
		Score was significantly lower in the oldest group (≥65) vs youngest group (18-34): ΔVAS -9.2 points	--

^a no difference (0), positive trend (+), negative trend (-), significant (++/--), not applicable (n.a.); significance set at $p < 0.05$; trends set at $0.1 > p > 0.05$
statistical ratings based on Benjamini-Hochberg correction for multiple testing;

Author's Conclusion

"Patients who used microprocessor-controlled prosthetic knees after amputation reported a high level of health-related quality of life (HRQoL) based on EQ-5D-5L assessments suggesting a beneficial impact of the MPK technology. They experienced very few issues in the self-care dimension but more challenges in the pain/discomfort and mobility dimensions. The HRQoL and utilities of amputees using an MPK were found to be similar as those of the general German population reporting one dimension-related problem. Our VAS mean data from the EQ-5D-5L showed notably greater scores compared to published non-microprocessor knee data, with the share of problem-free individuals being comparable to normative data. Microprocessor-controlled knees enable individuals to achieve quality of life outcomes that are comparable to those observed in the general population. Further research is required to enable comparisons with non-microprocessor-controlled knees and to establish standardized frameworks for evaluating prosthetic outcomes, including the development of comprehensive databases and longitudinal follow-up studies." (Brüggenjürgen et al., 2026)

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