

Reference

Schröder, Sarah; Pröbsting, Eva; Schmalz, Thomas; Kannenberg, Andreas; Stinus*, Hartmut

Ottobock SE & Co. KGaA, Department of Research, Duderstadt, Germany.

*Specialist in orthopaedics, Orthopaedicum Northeim, Germany.

Functional walking capacity of subjects with paralyzed knee extensors while walking with an SCO in locked vs unlocked mode

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Products

E-MAG Active

Major Findings

With E-MAG Active in unlocked mode (vs locked mode):

→ significantly increased walking speed (0.06m/s; $p < 0.05$)

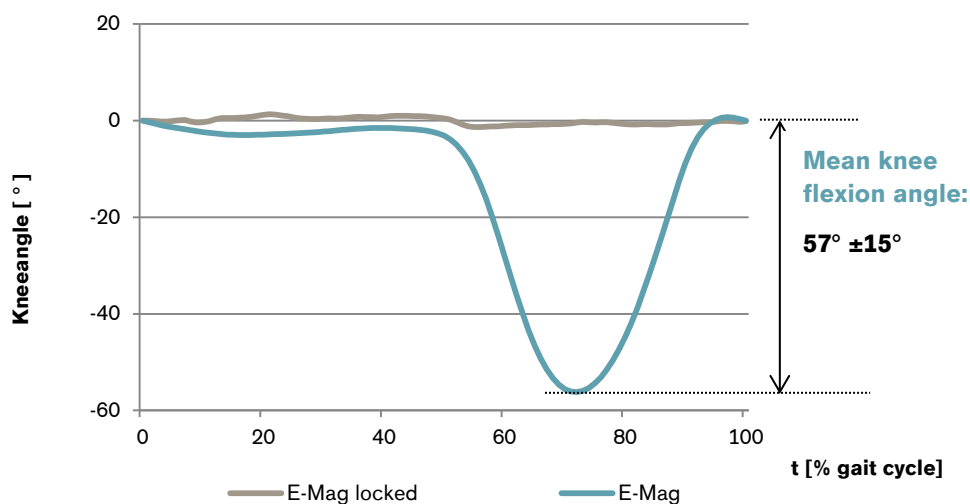
→ significantly increased walking distance in the 6-minute walk test ($+32.5 \pm 29.5$ m)

→ significantly reduced hip hiking

→ high patient satisfaction, evaluated with the QUEST (Quebec user evaluation of satisfaction with assistive technology)

- Device subscale score: 4.4 ± 0.3
- Service subscale score: 4.8 ± 0.3
- Total QUEST score: 4.6 ± 0.3

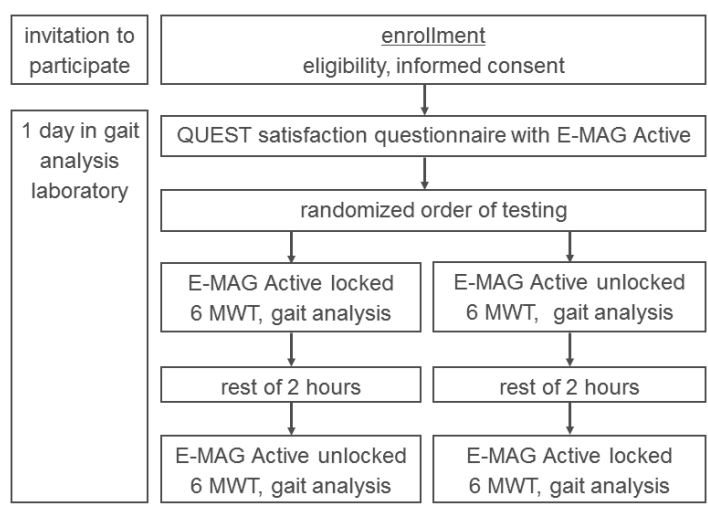
Mean knee flexion angle of 57° at about 70% of the gait cycle



During walking with E-Mag Active in unlocked mode (blue curve) there is a mean knee flexion angle of 57° at about 70% of the gait cycle, compared to full extension of the knee in the locked knee condition (brown curve).

Population	Subjects:	8 (5 male, 3 female)
	Mean age:	46.9 ± 19.0 years
	Mean body mass:	80.0 ± 11.5 kg
	Use of E-MAG Active:	since 3.3 ± 1.6 years
	Etiologies:	Incomplete spinal cord injury (4 patients) Poliomyelitis (3 patients) Myopathy (1 patient)

Study Design Randomized 2x2 crossover design with intra-individual control:



Intervention: to walk with E-MAG Active in locked and unlocked mode.

Results

Functions and Activities						Participation
Biomechanics – Static measures	Biomechanics – Gait analysis	X-Ray	EMG	Functional tests	Clinical effects	Satisfaction

Category	Outcomes	Results for E-MAG Active in unlocked mode (vs locked mode)	sig.*												
Biomechanics – Gait analysis	Walking speed	The walking speed was significantly faster with E-MAG Active in unlocked mode	++												
		<table border="1"> <thead> <tr> <th></th> <th>E-MAG Active locked</th> <th>E-MAG Active unlocked</th> </tr> </thead> <tbody> <tr> <td>walking speed [m/s]</td> <td>0.88</td> <td>0.94</td> </tr> </tbody> </table>		E-MAG Active locked	E-MAG Active unlocked	walking speed [m/s]	0.88	0.94							
	E-MAG Active locked	E-MAG Active unlocked													
walking speed [m/s]	0.88	0.94													
	Gait symmetry	Gait symmetry was marginally improved with E-MAG Active in unlocked mode													
		<table border="1"> <thead> <tr> <th></th> <th>E-MAG Active locked</th> <th>E-MAG Active unlocked</th> <th>sig.*</th> </tr> </thead> <tbody> <tr> <td>difference in stride length [m]</td> <td>0.05</td> <td>.03</td> <td>+</td> </tr> <tr> <td>difference in stance phase length between orthotic and contralateral side [%GC]</td> <td>7.3</td> <td>6.5</td> <td>+</td> </tr> </tbody> </table>		E-MAG Active locked	E-MAG Active unlocked	sig.*	difference in stride length [m]	0.05	.03	+	difference in stance phase length between orthotic and contralateral side [%GC]	7.3	6.5	+	
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Category	Outcomes	Results for E-MAG Active in unlocked mode (vs locked mode)	sig.*								
	Knee flexion angle	During walking in the unlocked mode, there was a mean knee flexion angle of $57^\circ \pm 15^\circ$ at about 70% of the gait cycle compared to full extension of the knee during walking in the locked condition. Every subject showed an increased knee flexion angle during swing in the unlocked mode within a range between 31° and 80° .	n.a.								
	Compensatory movements	Compensatory movements were reduced with E-MAG Active in the unlocked mode. Hip hiking was reduced in 6 out of 8 subjects based on the angle of pelvis tilt (obliquity) in the coronal plane. Vaulting was reduced in 2 out of 3 subjects based on the sagittal angle and moment of the ankle	n.a.								
Functional tests	Functional walking Capacity "6-minute walk test"	In the locked mode, subjects walked a shorter distance in the 6MWT than in the unlocked condition. The difference in the distance walked of 32.5 ± 29.5 m was statistically significant ($p = 0.04$).	++								
		<table border="1"> <thead> <tr> <th></th> <th>E-MAG Active locked</th> <th>E-MAG Active unlocked</th> </tr> </thead> <tbody> <tr> <td>distance [m]</td> <td>284.4 ± 53.0</td> <td>316.9 ± 59.6</td> </tr> </tbody> </table>		E-MAG Active locked	E-MAG Active unlocked	distance [m]	284.4 ± 53.0	316.9 ± 59.6			
	E-MAG Active locked	E-MAG Active unlocked									
distance [m]	284.4 ± 53.0	316.9 ± 59.6									
Satisfaction	QUEST score	QUEST scores showed a high overall satisfaction with the E-MAG Active in unlocked mode	n.a.								
		<table border="1"> <thead> <tr> <th>score</th> <th>rating</th> </tr> </thead> <tbody> <tr> <td>device subscale score</td> <td>4.4 ± 0.3</td> </tr> <tr> <td>service subscale score</td> <td>4.8 ± 0.3</td> </tr> <tr> <td>Total QUEST score</td> <td>4.6 ± 0.3</td> </tr> </tbody> </table> <p>"Quebec user evaluation of satisfaction with assistive technology, Version 2.0" (QUEST 5-point rating scale: 1 = "not satisfied at all"; 2 = "not very satisfied"; 3 = "more or less satisfied"; 4 = "quiet satisfied"; 5 = "very satisfied")</p>	score	rating	device subscale score	4.4 ± 0.3	service subscale score	4.8 ± 0.3	Total QUEST score	4.6 ± 0.3	
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* no difference (0), positive trend (+), negative trend (-), significant (++/--), not applicable (n.a.)

Author's Conclusion

"Compared to the unlocked condition, the locked mode imposed a clinically meaningful restriction to the functional walking capacity on the subjects. Therefore, fitting of an SCO [stance control orthosis, E-MAG Active] may be considered beneficial in individuals dependent on a KAFO [knee-ankle-foot-orthosis] to improve their functional walking capacity." (Schröder et al. 2017)

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