

Reference

Touillet A, Billon-Grumillier C, Pierret J, Herbe P, Martinet N, Loiret I, Paysant J. Centre Louis Pierquin, Institut Régional de Médecine Physique et de Réadaptation, UGECAM, Nancy, Nord-Est, France.

Comparison of compensatory shoulder movements, functionality and satisfaction in transradial amputees fitted with two prosthetic myoelectric hooks

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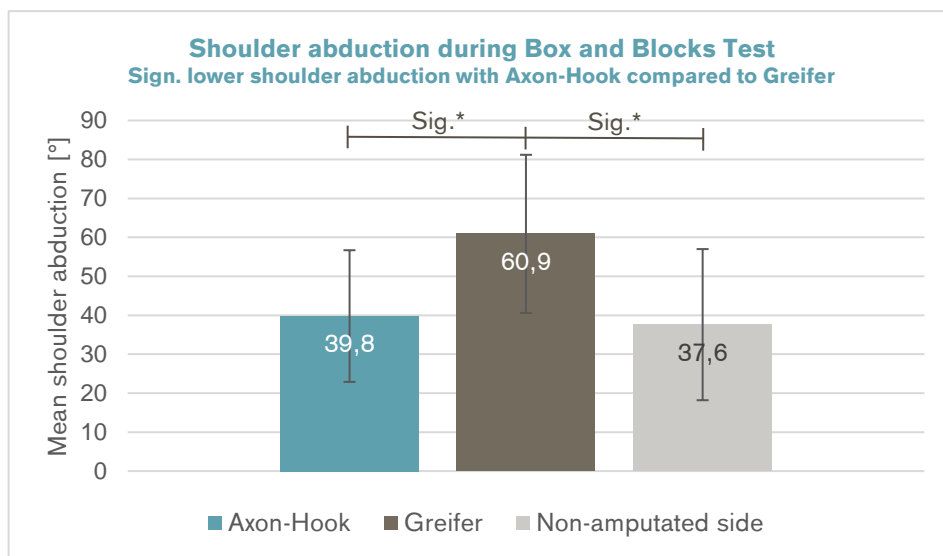
Products

Axon-Hook vs Greifer

Major Findings

With Axon-Hook compared to Greifer:

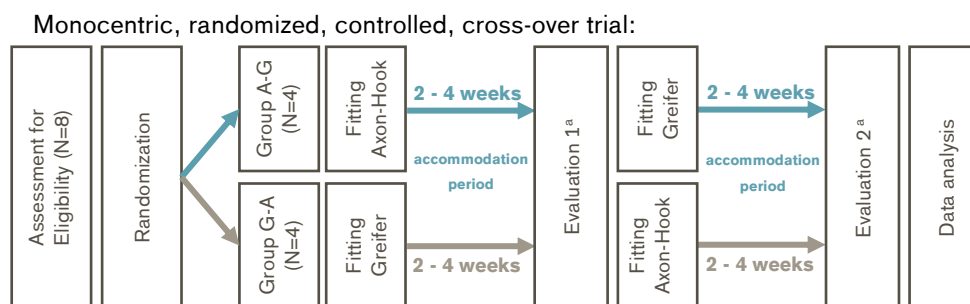
- **Significantly lower shoulder abduction with the Axon-Hook compared to the Greifer in the Box and Blocks Test (BBT)**
- **No significant difference between the shoulder abduction of the Axon-Hook and the non-amputated side in the BBT**
- **The time spent with shoulder abduction > 60° was lower with the Axon-Hook than with the Greifer during BBT**
- **75% of the participants preferred the Axon-Hook over the Greifer**



Population

Subjects: 8 unilateral, transradial amputees (all male)
Previous prosthesis: Greifer (50%), information not available (50%)
Amputation causes: Trauma (87.5%), Congenital (12.5%)
Mean age: 44.8 ± 15.8 yrs
Mean time since amputation: 17.5 ± 18 yrs

Study Design



Prior to the first evaluation, each participant could choose:

- Most suitable wrist radial/ulnar deviation with the Greifer
- Flexion/extension with the Axon-Hook
- Motorized or non-motorized wrist rotation

All choices were retained for both evaluations.

^a The Evaluation consisted of the BBT, Evaluation of Satisfaction with Assistive Technology (ESAT 2.0; French version) and prosthesis preference.

BBT is a manual dexterity test that consists of moving, as many cubic wooden blocks as possible one by one from one compartment of a box to the other in one minute. During this test, shoulder kinematics were recorded for the prosthetic and non-amputated side.

Results

Body Function		Activity			Participation	Others	
Mechanics	Pain	Grip patterns / force	Manual dexterity	Activities of daily living (ADL)	Satisfaction and Quality of life (QoL)	Training	Technical aspect

Category	Outcomes	Results for Axon-Hook vs Greifer	Sig.*
Manual dexterity	Box and Blocks Test (BBT) scores [Number of blocks moved]	No significant difference between the Axon-Hook and Greifer (23.9±8.6 and 25.4±10 blocks, respectively) Non-amputated side: 57.4±6.2 blocks	0
	Mean shoulder abduction during BBT [°]	Significantly lower mean shoulder abduction with the Axon-Hook (39.8±16.9°) compared to the Greifer (60.9±20.3°). No significant difference between the mean shoulder abduction of the Axon-Hook (39.8±16.9°) and the non-amputated side (37.6±19.4°).	++ 0
	Time with shoulder abduction >60° during BBT [%]	The percentage of time spent with shoulder abduction > 60° was lower with the Axon-Hook (17.6±27%) than with the Greifer (53.3±34.4%).	+
		The percentage of time spent with shoulder abduction > 60° was comparable for the Axon-Hook and the non-amputated side (17.6±27% and 18.4±34.9%, respectively)	0

Category	Outcomes	Results for Axon-Hook vs Greifer	Sig.*
Satisfaction and Quality of life (QoL)	Global Satisfaction score ESAT 2.0	No significant differences for the Axon-Hook and the Greifer (4.43 ± 0.52 and 4.39 ± 0.26 , respectively)	0
	Preference	75% of the participants preferred the Axon-Hook, while 25% preferred the Greifer.	+

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

Author's Conclusion

"This study showed that transradial amputees fitted with hooks mainly use shoulder abduction as a compensatory movement during the BBT functional capacity test. Mean abduction amplitudes were significantly lower with the Axon-Hook than with the Greifer and time spent above 60° was also lower with the Axon-Hook than with the Greifer, but not significantly for this variable. The higher amplitudes and durations of shoulder abduction with the Greifer are important variables that must be taken into consideration because they provide information on the risk of developing musculoskeletal disorders in transradial amputees.

This study showed that the effect of settings on compensatory shoulder movements not only concern prosthetic hands, but also non morphometric end effectors. Manual dexterity was similar with both hooks, but relatively poorer than with the non-amputated hands. Global satisfaction scores were also similar with both hooks, even though 6 of the 8 participants declared they preferred the Axon-Hook. Further research on compensatory strategies and end effector specifications would help adapt rehabilitation programs, optimize patient-prosthesis interactions, and improve the autonomy and quality of life of amputees." (Touillet et al, 2023)

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