Reference

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Learning to Control Opening and Closing a Myoelectric Hand

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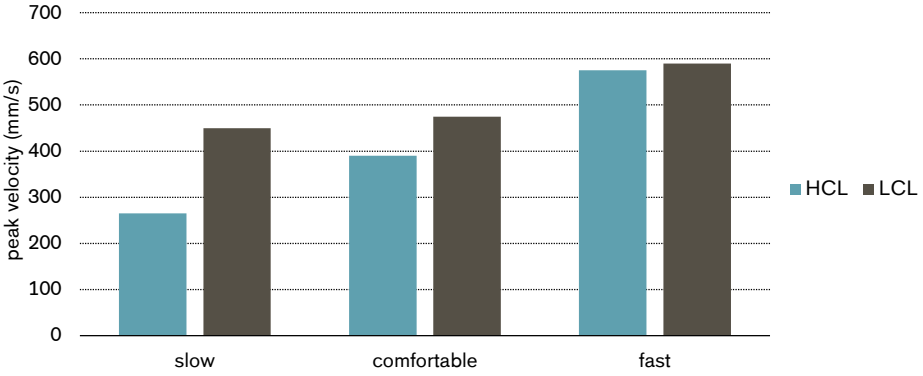
Products

Virtual hand – PAULA; Myoelectric simulator; Table-top hand (acts like Sensor Hand Speed)

Major Findings

→ **Prosthetic users differ in learning capacity which determines time needed to learn how to use myoelectric prosthesis.**
→ **Acquired control of a myoelectric hand is irrespective of the type of device used for training** (PAULA/ simulator/ table-top hand)
→ **PAULA software is as effective as tabletop hand and prosthetic simulator.**

Peak velocity after the training period



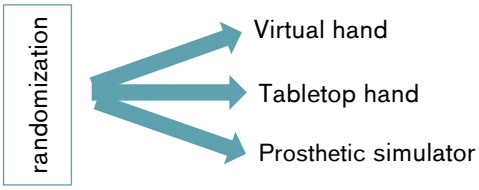
Graph shows peak velocities of opening and closing the hand reached in the post-test (after the training period) for the high capacity learners (HCL) and low capacity learners (LCL) plotted for each of the velocity conditions – slow, comfortable and fast. High-capacity learners could make a good distinction between the 3 different velocity conditions, whereas low-capacity learners could not make this distinction.

Population

Subjects:	34 able-bodied participants
Previous:	none
Amputation causes:	none
Mean age:	21 years
Mean time since amputation:	none

Study Design

A randomized study:



After entering into the study, the subjects were randomized into three groups based on type of the training they will receive. On the first day a pretest was conducted. Afterwards, the subject's control of the hand was trained on 3 consecutive days either by using virtual hand, tabletop hand or prosthetic simulator. After the last training session on the 3rd day, a posttest was administered to determine the level of

skill after the training. The pretest and the posttest test were the same and consisted of 2 parts: the participant was asked to first provide a maximum myoelectric signal for at least 2 seconds (this was repeated 5 times) and, second, to open and close the hand to the maximal aperture on 3 different velocities at command. Participants were asked to control hand opening and closing at the slowest speed possible, at a comfortable speed, and at the highest speed possible. All velocities were executed 3 times in a random order. When the hand was not fully opened or closed, the participants were corrected and instructed again.

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 training with PAULA vs simulator vs table-top hand:	Sig.*
Training	Peak and mean velocity	Both peak velocity and mean velocity showed the same main effects.	0
	Number of peaks	A large effect of the velocity conditions showed that in the slow condition the most peaks occurred, whereas in the fast condition the fewest number of peaks were shown.	0

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

Author's Conclusion

"In conclusion, learned control of a myoelectric hand does not depend on the type of training (with a virtual hand, an isolated hand, or a prosthetic simulator). Prosthetic users may differ in learning capacity, and this should be taken into account when choosing the appropriate type of control for each patient." (Bouwsema et al. 2010)