

Reference

Cutti A, Parel I, Luchetti M, Gruppioni E, Rossi N, Verni G

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The Psychosocial and Biomechanical Assessment of Amputees Fitted with Commercial Multi-grip Prosthetic Hands – Case Study: Michelangelo hand

In Castelli, VP & Troncosi M, "Grasping the Future: Advances in Powered Upper Limb Prosthetics" (2012), Chapter 5, pp: 59-77. ISBN 978-1-60805-438-1

Products

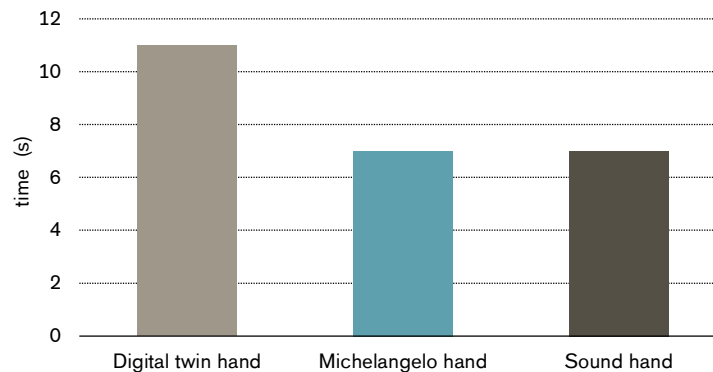
Michelangelo hand vs Digital twin hand

Major Findings

With Michelangelo hand compared to Digital twin hand:

- **Michelangelo hand reduces compensatory movements**
- **Michelangelo hand gives more natural gesture and posture**
- **Patient is more satisfied with Michelangelo hand**

Disk task performance test with Michelangelo and Digital twin hand



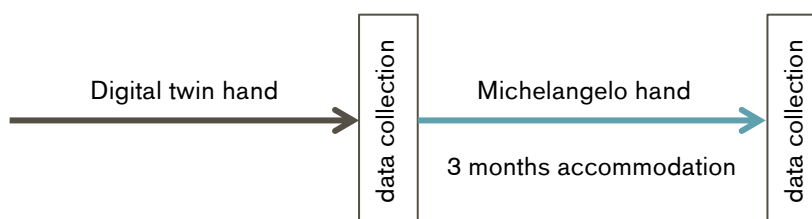
In disk task participant is moving the disk, positioned in front of the prosthetic hand, over the table. The participant moves disk over the table from the prosthetics hand to the sound hand, then in front of the participant and backwards. Michelangelo hand took same amount of time to perform disk task as sound hand (7s). Digital twin hand needed much more time to complete the same task (11s).

Population

Subjects: male, unilateral transradial amputee, dominant side
Previous: Digital Twin hand (Otto Bock)
Amputation causes: trauma
Mean age: 50 years
Mean time since amputation: 30 years

Study Design

Case report



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 Michelangelo hand vs Digital twin hand	Sig.*
Mechanics	Biomechanical analyses	Elbow flexion restriction was present with both prosthesis	0
		Michelangelo hand gave more natural approach to the object. With Digital Twin hand the patient approaches the object in adduction and with a relevant posterior tilting. With the sound and the Michelangelo hand, the patient approaches the object in abduction and almost without relying on scapula tilting.	+
		Michelangelo hand reduced compensatory movements	+
		Michelangelo hand was faster when performing some activities of daily life (moving the disk and jar).	+
Satisfaction	Questionnaire	Patient was more satisfied with Michelangelo than with previous prosthesis	+

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

Author's Conclusion

"Results highlighted an increased satisfaction with the new multi-grip hand and, remarkably, the new prosthesis triggered a higher level of embodiment, with a mind changing in the use the previous hand as well. Thanks to pleasant appearance and functional features of Michelangelo, the patient started to assume more natural gestures and postures also with the traditional myoelectric hand, reporting this different way of thinking the prosthesis as "a fundamental step for an amputee". Regarding the biomechanical assessment, the shoulder biomechanics was positively influenced by the availability of the lateral grip and by the overall hand shape, which allowed the patient to approach cylindrical and coin-shaped objects in a more natural way, limiting the shoulder compensatory movements." (Cutti et al. 2012)

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