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**Reference**

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## Mechanical design and performance specifications of anthropomorphic prosthetic hands: A review

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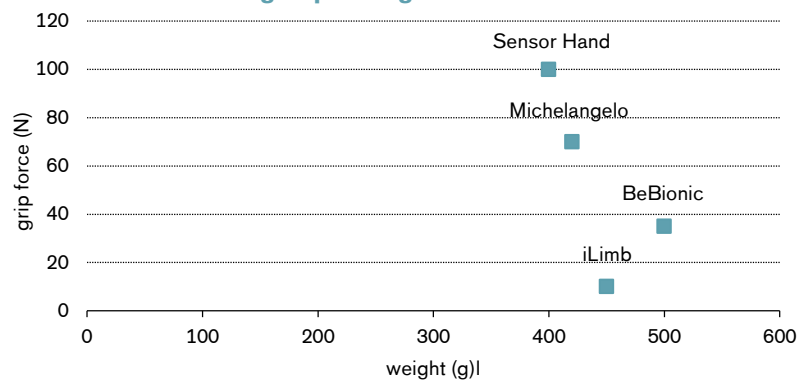
**Products****Michelangelo hand** (Otto Bock)**Vincent hand** (Vincent Systems)**iLimb hand** (Touch Bionics)**iLimb Pulse** (Touch Bionics)**BeBionic hand** (RSL Steeper)**BeBionic hand v2** (RSL Steeper)

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**Major Findings**

- **Michelangelo hand has the highest grip force in group of multi-articulating hands**
- **Michelangelo advantage is in the low number of actuators with transmissions that allow all functional grasping postures**

### Distribution of hand weight compared with amount of grip force of the hand in grasp configuration



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**Population**Subjects: no subject (technical comparison)

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**Study Design**Compare various prostheses in technical aspects

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**Results**

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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 <b>Michelangelo hand</b> (Otto Bock) <b>Vincent hand</b> (Vincent Systems) <b>iLimb hand</b> (Touch Bionics) <b>iLimb Pulse</b> (Touch Bionics) <b>Bebionic hand</b> (RSL Steeper) <b>Bebionic hand v2</b> (RSL Steeper)	Sig.*
Technical aspects	Thumb design and kinematics (authors suggestions)	Weight of the prosthesis (including mechanism, glove, electronics, etc.) should be below 500 g. Michelangelo's weight is 420g, while all other prostheses are heavier. Therefore only Michelangelo is fulfilling this criterion.	+
		Simple and robust finger kinematic designs are preferred. All listed prostheses are fulfilling this criterion.	0
		Powered adduction of the thumb. All listed prostheses are fulfilling this criterion.	0
		The use of brushless motors instead of brushed motors. All listed prostheses are fulfilling this criterion.	0
		A maximum pinch force at the finger tip of 65 N during palmar prehension. Fulfilled only with Michelangelo.	+
		230°/s should be achieved by a high-performing prosthesis, while 115°/s is a minimal acceptable speed.	n.a.
		Compliance in the mechanical design of a prosthetic hand can be achieved in various ways.	n.a.

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

### Author's Conclusion

"The rules of thumb listed here focus on the mechanical design criteria that the authors are confident in prescribing as a universal opinion, and therefore not all mechanical design criteria discussed earlier in this study are addressed. However, the list provides a thorough foundation upon which mechanical designers of prosthetic hands can reference." (Belter et al. 2011)

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