Reference

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Differences in myoelectric and body-powered upper-limb prostheses: Systematic literature review

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Products

Myoelectric vs body-powered prostheses

Major Findings

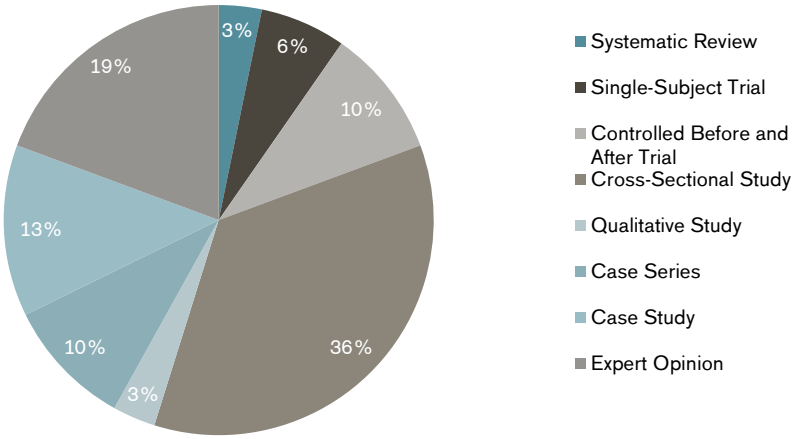
→ Advantages of myoelectric prostheses

– preferred for office related jobs
– preferred in contact with general public
– cosmetic acceptance
– more comfortable
– may reduce affect phantom limb pain when intensively used

→ Advantages of body-powered prostheses

– preferred for heavy jobs
– more robust and durable
– less maintenance needed
– less training time needed
– perceived sensory feedback

Studies included for analysis

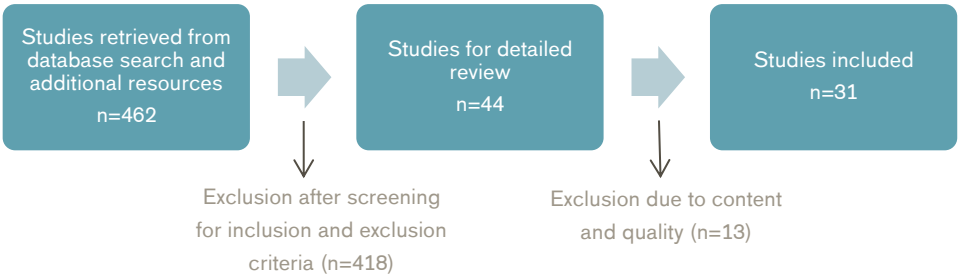


Population

Subjects:	1 - 1,216 adults per study (median: 12 subjects)
Previous prostheses:	not mentioned
Amputation causes:	not mentioned
Mean age:	43.3 yrs
Mean time since amputation:	not mentioned

Study Design

Systematic Review:



Included publications: Systematic Review (1), Single-Subject Trial (2), Controlled Before and After Trial (3), Cross-Sectional Study (11), Qualitative Study (1), Case Series (3), Case Study (4), Expert Opinion (6)

Quality assessment: Internal validity was low in 19 studies, moderate in 5 studies and high in 1 study; external validity was low in 5 studies, moderate in 8 studies and high in 12 studies; overall quality was rated as low in 18 studies, moderate in 11 studies and high in 2 studies.

The included publication spanned the years from 1993 to 2013, with the majority of publication occurring in 2012.

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	Empirical Evidence Statements	Supporting publications	Level of confidence
Pain	Myoprosthetic use decreases cortical reorganization which leads to reduction of phantom-limb pain.	2	Low
Activities of daily living (ADL)	Depending on functional needs, control scheme familiarity and preference body-powered prostheses or myoelectric prostheses are advantageous. Myoelectric prosthesis are preferred for office related jobs, supervisory work or contact with general public, while body powered prosthesis are mostly used in jobs that required heavy lifting objects, materials handled were dirty, greasy or sharp.	10	Moderate
Satisfaction and Quality of life (QoL)	Compared with myoelectric prostheses, body-powered prostheses are more durable, require less adjustment, are easier to clean and function with less sensitivity to fit.	3	Low
	Body-powered prostheses provide more sensory feedback than myoelectric prostheses.	3	Low
	Cosmesis is improved with myoelectric prostheses compared to body-powered prostheses.	4	Low
	Proportion of rejections is same with myoelectric (mean 23%) and body-powered (mean 26%) prostheses.	3	Insufficient

Category	Empirical Evidence Statements	Supporting publications	Level of confidence
Training	Compared with myoelectric prostheses, body-powered prostheses require shorter training time.	3	Low
	Intuitive prosthetic control may require use of multiple control strategies. It should require less visual attention and ability to make coordinated motions of both joints. These should be evaluated for each prosthesis user.	8	Moderate
	Prosthetic rehabilitation plan addressing EMG site selection, controls and task training could improve function and long-term success of myoelectric prosthesis users.	2	Low
Technical aspects	Improvements in body-powered prosthetic operation should be made within harness and cabling systems.	3	Low
	Roll-on sleeve improves suspension and increases range of motion.	1	Low

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

Author's Conclusion

"This report is a systematic review of publications related to upper-limb prostheses with the goal of identifying evidence comparing currently available MYO and BP prosthetic devices. Eleven EESs were generated addressing the areas of interest: control, function, feedback, cosmesis, and rejection. Conflicting evidence has been found in terms of the relative functional performance of BP and MYO prostheses. Several specific domains have been established that show advantages of each type of prosthesis. Activity-specific passive and BP prostheses can provide significant advantages to prostheses users and are typically lower cost than alternatives. BP prostheses have been shown to have advantages in durability; training time; and frequency of adjustment, maintenance, and feedback. Some evidence demonstrated BP prosthetic control can be improved by optimizing harness and cabling systems. MYO prostheses have been shown to provide a cosmetic advantage, are more accepted for light-intensity work, and may positively affect phantom limb pain when used actively. MYO prostheses can be improved with more advanced control methods; however, there is little evidence of these methods transitioning into larger controlled studies and further into clinical practice.

Outside of surveys, there is little evidence addressing the functional capabilities of prostheses users and fewer studies making a direct comparison of prostheses in a controlled setting. A few standardized tests to directly evaluate prostheses function were found in multiple studies. Currently, evidence is insufficient to conclude that either the current generation of a MYO or a BP prosthesis provides a significant general advantage. Selection of a prosthesis should be made based on a patient's individual needs with regard to domains where differences have been identified. A patient's personal preferences, prosthetic experience, and functional needs are all important factors to consider. This work demonstrates that there is a lack of empirical evidence regarding functional differences in upper-limb prostheses." (Carey et al. 2015)."