Maximizing Function after Partial Hand Amputations

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ASHT International Committee
Virtual Education Series

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Objectives

1. Describe the prevalence of partial hand amputations and the impacts on ADL independence and participation
2. Identify impacts on social roles and participation after amputation
3. Differentiate between types of upper limb prosthetics and features that promote ADL participation and independence
4. Design a "prosthosis" with common splinting materials to enhance function either before prosthesis is appropriate or without a prosthesis.

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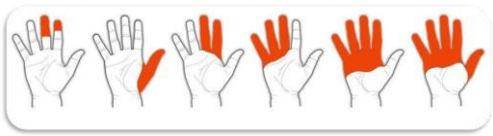
Etiology

- 90% of upper limb amputations are distal to wrist
  - Nearly 17,000 per year
  - Vast majority are trauma related



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Statistics

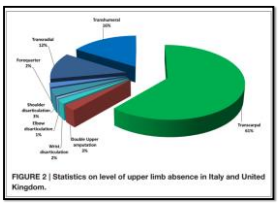
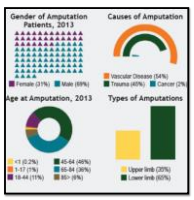


FIGURE 2 | Statistics on level of upper limb absence in Italy and United Kingdom.

Cordella, F. Et al (2016)



Amputee Coalition, 2022

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Complicated?

- We do so much with our hands
  - Some unconscious
  - Some conscious
- Psychosocial
- Personal identity
- Cultural relevance
- Self care
- Daily function

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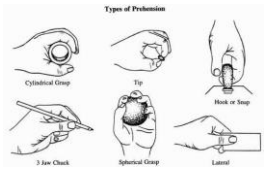
Functions of the Hand

- We regularly use 12 functions of the hand to interact with the environment
- Divided into three categories:
  - Pinch
    - Tripod, tip, lateral
  - Grasp
    - Power, hook, lateral, spherical, cylindrical, lumbrical
  - Manipulation
    - Translation, shift, rotation



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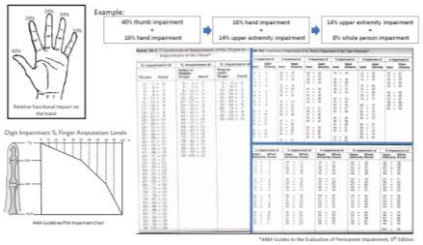
Levels of Disability



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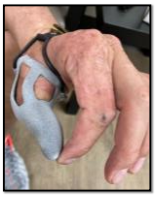
Uncomplicate It…



- Research says:
  - Early prosthetic intervention is key:
    - Higher rates of return to work
    - Higher prosthetic usage
    - Better ADL independence
  - Early skilled therapy
    - Better ADL independence
    - Higher prosthetic usage
    - Higher patient satisfaction and return to participation
- How do we provide early intervention as a team?

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Prosthetist

- Determines what prosthesis types are best WITH the patient NOT FOR the patient
- Communicates cost/insurance benefits with the patient before fabrication
- On delivery:
  - Has the patient don and doff the prosthesis
  - Reviews care of the prosthesis
  - Shows how to operate the prosthesis components

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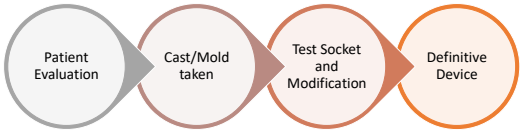
Prosthesis "Flow"



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- Post Op
- No prosthesis
- Oppositional
- Body powered & Positional
- Externally powered/myo
- Activity specific

Summary of partial hand prosthetic options by level of amputation

Amputation Level	Prosthesis Class	Prosthetic Options
Distal to DIPJ	Passive Opposition	Low-definition silicone High-definition silicone
DIPJ and middle phalanx	Passive Opposition	Low-definition silicone High-definition silicone
	Body powered	PIP Driver
PIPJ and proximal phalanx	Passive Opposition	Low-definition silicone High-definition silicone Point Partial Titan Partial Vincent Partial Passive
	Positional	
	Body powered	MCP Driver Partial M-Finger
MCPJ and transmetacarpal	Passive Opposition	Low-definition silicone High-definition silicone Point Digit Grip-Lock Titan Full Vincent Passive
	Positional	
	Body powered	M-Fingers and Pediatric M-Finger Palmar DP ProCuff
	Externally powered	i-Digits Vincent Partial
Thumb, Partial or Complete	Passive Opposition	Low-definition silicone High-definition silicone 3D Solutions Point thumb Titan thumb M-Thumb Vincent Passive thumb
	Positional	
	Body Powered Externally powered	Thumb Driver i-Digits Vincent Partial

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No Prosthesis

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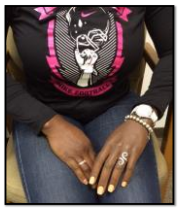
Oppositional



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Oppositional

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Positional

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Body Powered

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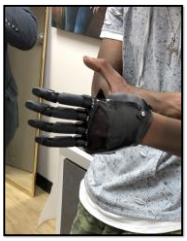
Externally Powered/Myoelectric



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Activity Specific

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Activity Specific – Handi Hook

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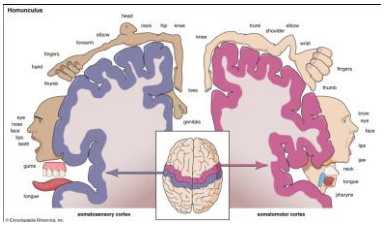
American Society of Hand Therapists

Is it "Just a Finger?"



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American Society of Hand Therapists

"Prosthosis"

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American Society of Hand Therapists

Journal of Hand Therapy Articles

Early and Temporary Use of Finger Prosthetics to Aid Rehabilitation

Almond, B. 2011

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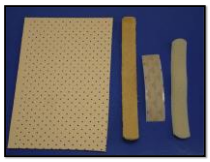
American Society of Hand Therapists

Journal of Hand Therapy Articles

A Thermoplastic Thumb Splint after Amputation of the Thumb

Sudhagar, G. & Le Blanc, M., 2008



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"Prosthosis" Case Study

- Pt: exploring options of prosthetics after thumb amputation
- Prosthetist: challenges with alignment due to other existing issues with hand and wrist
- Materials: OrfiCast
- Timeline: two, week long trials
- Outcome: Pt satisfaction and increased independence with final prosthetic device

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Foundation

- BADL-self care, feeding, toileting, dressing, bathing, sleep
- IADL-home care, caregiving, full meal prep, work, recreation
- Essential functions of the hand

- Wound, edema, vascular, scar
- Movement patterns, range of motion, deformities, strength
- Pain, hypersensitivity, sensory impairment

- Roles prior to amputation and current
- Engagement or avoidance in prior roles and activities
- Stage of grief: denial, anger, depression, bargaining, acceptance

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Patient Well Being

- Retrospective, 250 patients with unilateral UL amputation
- Five self report measures looked at well being, participation, px satisfaction, pain interference, bimanual activities
- Results: Patients with **higher levels of well being**:
  - Report high levels of **activity and participation**
  - Report high levels of **bimanual physical function**
  - Report high levels of **prosthesis satisfaction**
  - Report lower levels of **pain interference**
  - Wear times, experience post-amputation, age and gender appear to be **less relevant**

EMPOWERING HUMAN POTENTIAL

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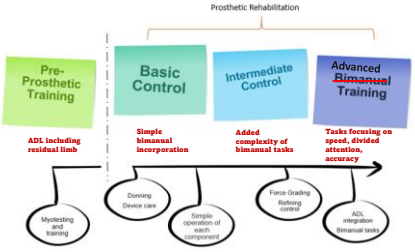

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Pre-Prosthetic Therapy

- Contractures
- Poorly healing wounds
- Edema
- Limited function
- Goals:
  - Gain independence with ADLs
  - Begin psychosocial interventions – Peers, virtual, in person, etc
  - Prepare residual limb for function and prosthetic intervention
  - Promote healing and tissue remodeling early in the healing phase
  - Evaluate the hand function keeping essential functions in mind
- A limb that is prepared for a prosthesis is prepared for function without a prosthesis as well

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Mental Health, Adjustment, and Peer Mentorship

HangerClinic.com/AMPOWER

amputee coalition

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Rehab Protocol Foundation

Basic Control

Basic control of each component and simple bimanual incorporation

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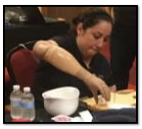
Rehab Protocol Foundation

Intermediate Control

Body mechanics, pre-positioning, graded force and added complexity of bimanual tasks



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Rehab Protocol Foundation

Advanced ~~Bimanual~~ Training

Tasks focusing on speed, divided attention, accuracy in all-day, every-day routines

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Take Home Messages:

- Remember: A residual limb that is prepared for a prosthesis is prepared for life
- The best prosthesis is the one that your patient will use, not the most technologically advanced
- Talk to your referring physicians about referring these patients for care
- Get them involved in peer mentorship
- Refer for a consultation for prosthetics
- Prevent disuse, poor body mechanics and hypersensitivity

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More Information

- Continuing education courses
- Get to know your prosthetist
  - Shadow them
- Refer patients to them and ask for their referrals
- Ask for training on the type of prosthesis fit
- Phone "a friend"
- Literature
  - Just make sure to critically review the article

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THANK YOU

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