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Upper Limb Prosthetic Rehabilitation

for

Occupational Therapists: EVALUATION

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Disclosures

- Consumer
- Clinician
- Contributor
- Consultant

Disclosures

- **Financial:**
  - Receives payment for this series
  - Owner, **Single-Handed Solutions, LLC**
  - Inventor of record of patented prosthetic technology and method of use
  - Business relationship with **TRS,** Boulder, CO
  - Business relationship with **Handspring,** Middletown, NY
  - Business relationship with **Liberating Technologies Inc.,** Hopkinton, MA
  - Business relationship with **Shriners Hospitals for Children**
    - owner of patented technology mentioned in the series
- **Non-financial**
  - Member, **Upper Limb Advisory Council**, **Amputee Coalition of America** (ACA)
    - services mentioned in the presentation
  - Member, **Association of Children's Prosthetic Orthotic Clinics** (ACPOC)
    - services mentioned in the presentation

OT

- Critical component of UL prosthetic rehabilitation
- Rarely see an individual with an UL amputation
- Often unfamiliar with UL prosthetic technology
- Specialty training is beneficial

OT

- Limb preparation
- Adjustment-Accommodation
- Prosthetic training
  - specific tasks
  - motor skills
  - positioning
  - posture
- Accelerates the rehabilitation process
- Essential to success in functional independence and achieving quality of life.

Course SERIES Overview

- Course 1: Overview and Introduction
- Course 2: Understanding Technology
- Course 3: Evaluation
- Course 4: Management and Resources

EVALUATION

It is the third in a series building upon a foundation of understanding

- the types of limb deficiency/loss
- the diverse technologies available
- approaches to evaluation and management
- patient education and consumer advocacy

OBJECTIVES

evaluation

- Clinical Assessment
- Outcomes Measures and Tools
- Developing a Plan of Care
- Contributing to Medical Necessity
- Collaborating with Prosthetist
- Resources and References

CLINICAL ASSESSMENT

- Demographic
- Past Medical History
- Prosthetic History
- Condition of Limbs
- Occupation and Requirements
- Levels of Function
- ROM
- Strength
- Myosite Evaluation
- Functional Evaluation
- Outcomes Measures

CLINICAL ASSESSMENT

Demographic

- Name
- DOB
- CA
- Height
- Weight
- Hand dominance
- Diagnosis: reason for referral to OT

CLINICAL ASSESSMENT

Medical History

- General medical history
- Surgeries
- Co-morbidities
- Medications
- Side effects
- History of limb loss

CLINICAL ASSESSMENT

Prosthetic History

- Current prosthetic technology
  - Description
  - Wear schedule
  - Training
  - Likes/dislikes
- Past use of prosthetic technology
  - Description
  - Wear schedule
  - Training
  - Likes/dislikes

CLINICAL ASSESSMENT

Condition of Limbs

- Description
  - Scar tissue
  - Boney prominences
  - Other
- Sensation
- Pain
- Overuse

CLINICAL ASSESSMENT

Occupation and Requirements

- Education
- Occupation history
  - ?At time of limb loss
- Current occupation
  - Responsibilities, requirements
  - Other details

CLINICAL ASSESSMENT

Levels of Function

- Systems: Vision/Hearing/Cognition
- Developmental if pediatric
- Learning style, preferences
- Home environment
- Daily routine
- Current services: OT/PT, PCA, other
- Interests

CLINICAL ASSESSMENT

ROM

- Bilateral
- All available joints

CLINICAL ASSESSMENT

Strength

- Bilateral, available anatomy
- General MMT
- Power grip
- Pinch

CLINICAL ASSESSMENT

Myosite Evaluation

- Typically only if externally-powered technology is being considered
- Otto Bock and Touch Bionics tools



CLINICAL ASSESSMENT

Functional Evaluation

- Basic ADLs
- Instrumental ADLs
  - Home
  - Community
- Vocational
- Avocational
- Summary

- Level of ability
- ?Adaptive strategies
- With/w-o prosthesis
- With/w-o AD
- Need for assistance
- Necessity of task
- Desire to access task

CLINICAL ASSESSMENT

Standardized Outcomes Measures

Virginia Wright: Prosthetic Outcome Measures for Use With Upper Limb Amputees: A Systematic Review of the Peer-Reviewed Literature, 1970 to 2009

- to establish the current state of measurement, a
- to propose future directions for prosthetic field

OUTCOMES MEASURES AND TOOLS

- Tests of Prosthesis Use
- Tests of Hand Function
- Tests of Satisfaction and QOL
- Pediatric Tests
- Other

HAND FUNCTION

- Assessment of Capacity for Myoelectric Control (ACMC)
- Southampton Hand Assessment Profile(SHAP)
- Carrol Observational Test
- UNB Test of Prosthetic Function-Modified
- Box and Block Test
- Jebsen-Taylor Test of Hand Function

ACMC: Hermansson et al

- Observational measure
- Amputee-specific: capacity for control of a myoelectric prosthesis
- Rasch-built 4-point capability scale
- measures the quality of performance.
- 30 gripping, releasing, holding, and coordinating items
- UL functional activity considered to be meaningful to patient
- Does not require specific supplies, completion of an intensive ACMC, 2.5–day, training workshop and test is required before the ACMC is used for clinical or research work.
- Information on the ACMC, training workshops, and scoring software for trained users can be accessed at the measure's website.
- www.acmc.se/Default.asp

SHAP: LIGHT ET AL

- observational assessment
- determines the effectiveness of a terminal device with respect to unilateral prosthetic hand function
- contains 26 self-timed prehensile tasks
- 12 are abstract-unilateral tasks with form board objects
- 14 are activities of daily living (ADL) tasks
- Several of the ADL tasks are bilateral; the sound hand must be used as a stabilizer
- Six prehensile patterns are represented in these tasks
- Minimal arm movement required: prehensile ability is primarily assessed
- 20 minutes to complete
- also suitable for use with individuals with other clinical groups
- portable kit with standardized administration protocol
- can be obtained from its developers
- http://www.shap.ecs.soton.ac.uk/

OTHER

Carrol Observational Test

- comparison of the hand function of adult B-E amputees (1* myoelectric users) with individuals who had arm replantation posttraumatic injury
- Observation of ease performance of 33 skills, representing 7 key hand function areas
- Scoring: 4-point degree of difficulty scale
- Modifications made by Graham et al
- Eliminated 12 individual digit-dependent prehension tasks to test evaluation of performance with a prosthesis
- Modified version detected differences in manual skills levels of individuals in the amputee group
- No specific validation work carried out on the modified Carroll test
- No evidence that it has been used again in amputee populations

UNB Test

- Lake
- adapted pediatric version of the UNB Test
- created new response scale on the efficiency of prosthesis use
- added new tasks for evaluation
- reliability of the modified test was not evaluated
- demonstrated changes in performance of individuals using their UL pre- and post- functional training session compared with that of a non-therapy control group
- No further work on validation of this modified UNB test for adults has yet been published.

GENERIC HAND FUNCTION

Box and Blocks Test

- Timed test

Jebsen-Taylor Test of Hand Function

- Timed test

specific validation work has not been carried out in amputee populations with any of the manual dexterity tests, these generic measures are not presented

Upper limb abilities

- Orthotics and Prosthetics User Survey (OPUS)
- Upper Extremity Functional Status (UEFS)
- Disabilities of the Arm, Shoulder Hand Outcome Measure (DASH)

OPUS: HEINEMANN ET AL

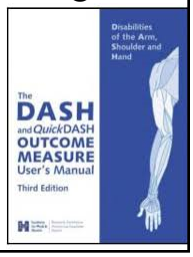
- original OPUS consisted of a LL functional status module, as well as satisfaction and health-related QOL
- Psychometric testing was done with prosthetic and orthotic users (combined sample of adults and children)
- not clear from this work that how many of these individuals had UL deficiencies

UEFS

- 23 B-ADL AND I-ADL UL-based skills
- 5-point degree of difficulty scale
- Recent collaborative work between Heinemann and Burger et al
- Creation, initial validation of a Rasch-based, revised module
- addition of a response option that determines whether the patient uses the prosthesis for the activity,.
- Rasch analysis identified four misfitting items, two of which were bilateral activities and were removed
- Modified UEFS consists of 23 items
- 9 activities identified as purely unilateral (unaffected hand),
- 7 that are typically bimanual but can be done in a unilateral manner
- 7 activities that are truly bilateral
- Available from developer

DASH

- UL-focused functional status questionnaire
- developed through Canadian-US collaboration
- self-report format
- does not require interviewer guidance
- 30 items in the categories of UL physical function, symptoms, and social/role functioning
- 2 optional modules, sports/arts and work
- Quick-DASH: shortened 11-item version
- available free of charge, paper and online



QUALITY OF LIFE

- Trinity Amputation and Prosthesis Experience Scales (TAPES)
- Nottingham Health Profile (NHP)
- Short Form 36 Health Survey (SF-36)
- DASH: perception of disability

TAPES

- self-report, HR-QOL questionnaire
- developed by a prosthetic research team in Ireland
- designed specifically for use by adults with UL or LL amputations
- assesses psychosocial processes related to adapting to a prosthesis, activity restrictions associated with wearing a prosthesis, and to satisfaction with the prosthesis
- 54-item questionnaire
- 9 subscales: psychosocial adjustment, activity restriction, satisfaction
- 3-5point response scales are used
- separate questions on pain and general health
- 15 to 20 minutes to complete; administered in a mail-out format.
- can be accessed without cost at the development team's website
- Available at: www.tcd.ie/Psychoprosthetics/pages/tapes.html

NHP

- self-report survey for adults (ages 16 years and above)
- designed by Hunt et al in the 1980s in Great Britain
- measures perceived health status (mental, social, and functional) in population surveys and HRQOL outcomes in clinical and research contexts.
- consists of two parts
- 10 to 15 minutes to complete
- mail survey or interview
- available in numerous languages.
- Part 1: 6 subscales of 38 items
- emotional reactions, physical mobility, pain, sleep, social isolation, and energy level
- Part 2: 7 questions about the effect of health problems on various aspects of life
- yes/no response.
- Scores for each subscale are calculated on a 0 to 100 scale of worst to best QOL
- Part 1 can be used without Part 2; appears to be the section most commonly used
- Information can be obtained through its developer.
- www.atsqol.org/sections/instruments/ko/pages/nott.html .

SF-36

- Internationally-known questionnaire
- Designed in the US
- Indicator of perceived health status for individuals, age 14 years and above
- With acute or chronic adult health conditions
- 8 subscales that cover the areas of
  - physical functioning, role limitations due to physical health problems,
  - pain, general health perceptions, vitality, social function, role limitations due to emotional problems and mental health, emotional reactions, physical mobility, pain, sleep, social isolation, and energy level
- 36 items, each composed of a 5- or 6-level response scale
- can be calculated either manually or via scoring software
- available in more than 50 languages
- can be administered either by an interviewer or self-administered
- requires 5 to 10 minutes to complete
- www.SF-36.org

Pediatric tests

- ACMC (previously discussed)
- Unilateral Below Elbow Test (U-BET)
- University of New Brunswick Test of Prosthetic Function (UNB)
- Assistive Hand Assessment (AHA)
- Prosthetic Upper Extremity Functional Index (PUFI)
- ABILHAND-Kids
- Pediatric Orthopedic Data Collection Outcomes Instrument (PODCI)
- Pediatric QOL Inventory (PEDS-QL)

U-BET: BAGLEY ET AL

- Observational test
- Shriners Hospitals for Children UL amputee study
- Compared functional abilities, QOL of wearers and non-wearers
- designed to fill a gap in measurement of hand function capability of children and youth (ages 2 to 21 years) who have an amputation and do not wear a prosthesis.
- 9 bimanual tasks
- specific to developmentally-based age groups
- If the child is a prosthetic wearer, he performs the tasks in both the prosthesis on and off conditions, whereas non-wearers perform the tasks without a prosthesis.
- Ratings are done on two subscales
  - Completion of Tasks (5-point degree of difficulty-based scale)
  - Method of Use (4-point nominal scale)
- 20 minutes
- Administration guidelines can be obtained from the first author of the validation publication.[3]

UNB

- well-known in clinical circles internationally
- first of the formal observational tests of function
- developed specifically for children (2-13 years of age) with a unilateral UL amputation
- designed for use within the prosthetic clinic
- measures the method of performance and spontaneity of prosthetic performance in children
- four age-based modules of developmentally appropriate bimanual tasks
- Method and spontaneity are each rated on 5-point scales
- Assumed that performance via active prosthesis use is superior to use as stabilizer*
- Scored from live performance
- 20 to 30 minutes to complete
- There is no specific training program for those administering the test
- available online www.unb.ca/biomed/unb_test_of_prosthetics_function.pdf
- Test kit can be built by the clinician according to the instructions in the manual

AHA: Krumlinde et al

- observational assessment
- designed in Sweden
- measures the effectiveness with which children with unilateral impairment use the affected hand along with the noninvolved hand in bimanual play activities
- Purpose: how the involved hand functions as an "assisting hand."
- Elicit spontaneous and natural performance of grasp, release, and manipulation skills during 12 to 14 fun-play activities.
- Designed for children with hemiplegic cerebral palsy or obstetric brachial plexus palsy ages 18 months to 12 years
- Rasch-built measure
- 22 actions that are
- Scored on a 4-point effectiveness of performance-rating scale
- 15 minutes to perform this play-based assessment
- Scoring is done from a video of the assessment
- Intensive 2.5-day training program that is required before a therapist uses the AHA
- Information on training, testing manual and materials kit is available at the developers' website www.ahanetwork.se

PUFI

- Functional status questionnaire
- Designed specifically for evaluation of children/teens who have unilateral UL amputation & prosthesis
- Evaluates a child's ability to perform bimanual activities with and without prosthesis
- Examines perceived usefulness of the prosthesis
- 2 versions:
  - young-child version (ages 3 to 6 years); 26 items; parent-report format,
  - older-child version (ages 7 to 18 years); 38 items; parent-report and child-report formats
- 4 separate response scales
  - method of performance: 6-point scale;
  - ability to perform with prosthesis: 4-point difficulty scale;
  - usefulness of prosthesis: 3-point scale; and
  - ability to perform without prosthesis: 4-point scale
- originated as a paper-report questionnaire, redesigned as a direct access software program
- 20 to 30 minutes to complete
- available in English, Dutch, Swedish, Slovenian and French
- free of charge from author by joining the PUFI database network

ABILHANDS-kids

- Functional status questionnaire
- Developed in France
- Assesses a child's ability to perform everyday manual activities
- Parent-report paper questionnaire that assesses the child's difficulty in performance as perceived by the child's parents
- Children 6 years of age and older
- 21 activities are mostly bimanual tasks
- Each task is rated on a 3-point degree of difficulty scale
- Rasch-measurement model, is a linear measure
- Scale was calibrated in children with CP aged 6 to 15 years
- 10 minutes to complete
- Available in French, English, and Dutch
- assessment and scoring program can be accessed free of charge online through the ABILHAND website after registration www.rehabscales.org/abilhand-downloads.html

PODCI

- Generic questionnaire
- School-aged children/youth with musculoskeletal conditions
- Measure of ability to participate in normal daily activities and sports activities
- Brief measure of pain and overall health
- 3 versions:
  - Parent-report questionnaire (for use with parents of children up to 11 years of age),
  - Parent-report adolescent version,
  - Adolescent-report version
- 4 main functional scales (seven of the functional items are bimanual activities)
  - basic mobility and transfers [11 items],
  - sport and physical functioning [12 items],
  - UL and physical function [8 items], and
  - pain/comfort [3 items]) and
- Additional items: pain/comfort, treatment expectations, happiness, and health satisfaction
- 4-point to 6-point degree of difficulty response scales
- 20 minutes to complete
- Questionnaires and scoring templates can be accessed without charge:

www.aaos.org/research/outcomes/outcomes_peds.asp and www.aaos.org/research/outcomes/Pediatric.pdf

PEDS-QL

- Internationally-known questionnaire
- Evaluates HR-QOL of children
- 26-item generic version
- Consists of four multidimensional scales
  - (physical, emotional, school, and social function)
- Age-appropriate versions
- Child-report for those who are aged 5 years and above
- Available in multiple languages
- Internet version
- Has been used as a population health measure, for numerous diagnostic groups and in numerous cross-cultural validation projects
- Condition-specific modules for a number of disorders
- 5 minutes to complete
- There is a licensing fee that is based on the type of use; can be obtained online www.mapi-research.fr/t_03_serv_dist_Cduse_pedsql.htm

other

- Activities Measure-Upper Limb Amputee (AM-ULA)
  - *Linda Resnik, PT, PhD*
- Mental-Health Screening in Upper-Limb Outpatient Prosthetics Clinics
  - *Tiffany A. Ryan, OTR, MOT*

DEVELOPING A PLAN OF CARE

- What?
- When?
- Where?
- Why?
- How?

THE VISION: GOALS

- Client-centered
- Behavioral
- Objective
- Measureable

PHASES OF CARE

- Pre-prosthetic Readiness
- Prosthetic Training
- Refinement

COLLABORATING WITH THE PROSTHETIST

- Client-Centered
- Communication
- Consultation
- Plan of care
- Continuous

CONTRIBUTING TO MEDICAL NECESSITY

- Medical vs functional
- What is client using now?
- What is level of ability vs disability?
- What is being considered?
- What is being eliminated … and why?
- Bang for the buck: what is the most optimal/impactful yet least costly?
- Dot your i's; cross your t's

TIP Sheet

- Certified by the American Board for Certification (ABC)
- Minimum of five years of current UL experience and has fit >10 patients in the last year
- Can specify what types of electrically-powered prostheses they have fit in the past two years
- Received certification /training from the following prosthetic component manufacturers:
  - Motion Control:
  - Otto Bock:
  - RSLSteeper:
  - Touch Bionics:
  - Liberating Technologies:
  - Hosmer:
- Works with an OT who has extensive UL prosthetic rehabilitation experience
- Will arrange for you to speak with some of their patients to discuss care experience

TEAM APPROACH

Occupational Therapist

- Functional Evaluation
- Preparation for Prosthesis
- Client Education
- Adaptive Strategies
- Consultation to develop prosthetic prescription
- Prosthetic Training

Prosthetist

- Evaluation
- Client Education
- Consultation to develop prosthetic prescription
- Molding
- Fabrication
- Modification

RESOURCES

Amputee Coalition:	www.amputee-**coalition**.org
Amplitude:	www.oandp.com
Amputee Empowerment Partners:	www.**empoweringamputees**.org
Association of Children's Prosthetic and Orthotic Clinics:	www.**acpoc**.org
American Occupational Therapy Association:	www.aota.org
American Academy of Orthotics and Prosthetics:	www.oandp.com
American Orthotic and Prosthetic Association:	www.**aopa**net.org

RESOURCES

- Evidence Note: Upper-Limb Prosthetic Outcome Measures; F. Virginia Wright, PT, PhD, Senior Scientist, Bloorview Research Institute; Chair in Pediatric Rehabilitation, Bloorview Children's Hospital Foundation; Associate Professor, Department of Rehabilitation Medicine, University of Toronto

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QUESTIONS

THANK YOU!