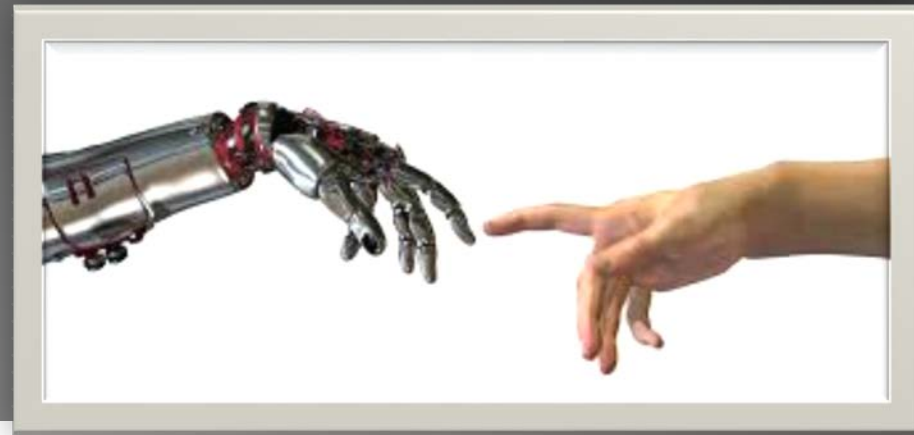


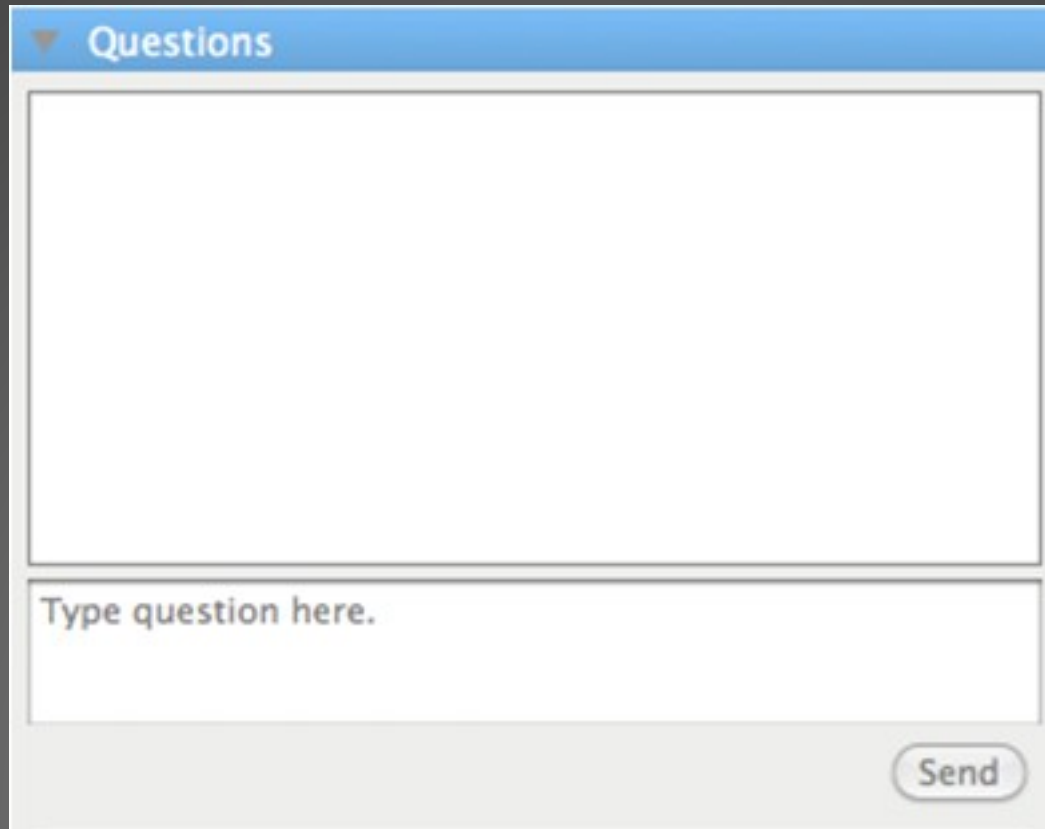
GETTING A HANDLE: TECHNOLOGY FOR THE RESTORATION OF ARM & HAND FUNCTION

Dr. Kim Anderson-Erisman & Jennifer French

January 21, 2015



Have a Question?



Questions

Type question here.

Send



www.themiamiproject.org

The Miami Project is dedicated to finding more effective treatments and, ultimately, a cure for paralysis resulting from spinal cord injury.



www.NeurotechNetwork.org

*Helping people regain life thru
neurotechnology*

Focusing on education of and advocacy to access neurotechnology devices, therapies and treatments for people living with impairments, their care-givers and medical professionals.

DISCLAIMER PAGE

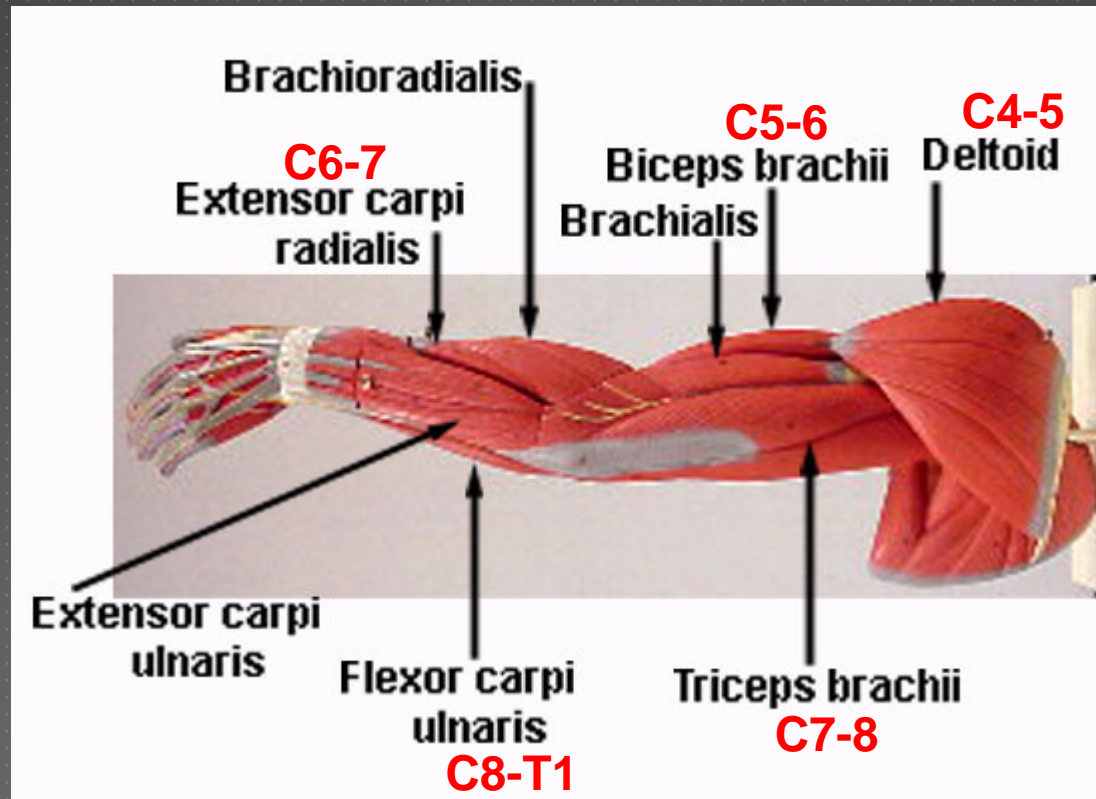
The information presented in this session is not meant to replace the advice from a medical professional. You should consult a health care professional familiar with your specific case, concerns and condition.

Neurotech Network and its representatives do not endorse, rate, sell, distribute, prescribe, administer or recommend any products, procedures or services. We highly suggest for you to take information to a trained medical professional familiar with your case to discuss options that are best for you.

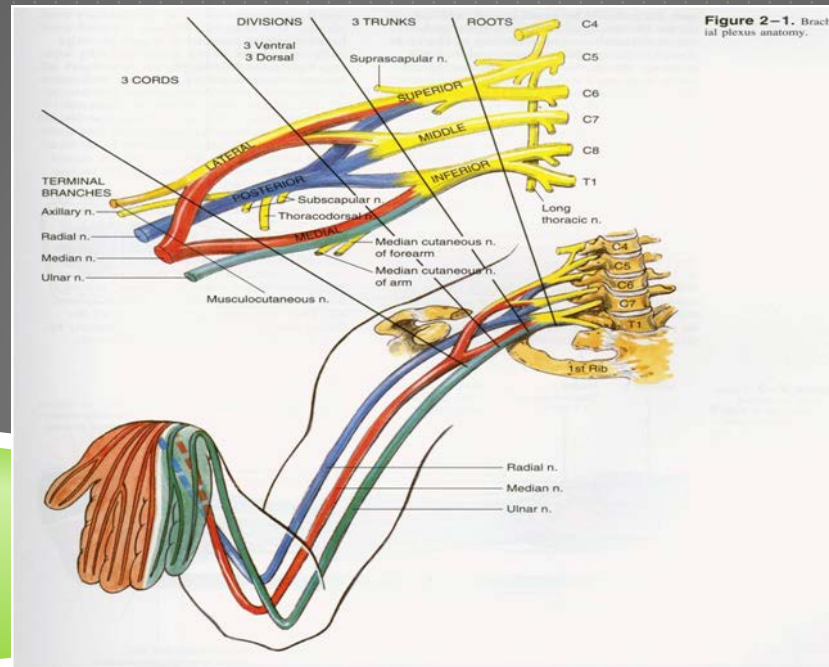
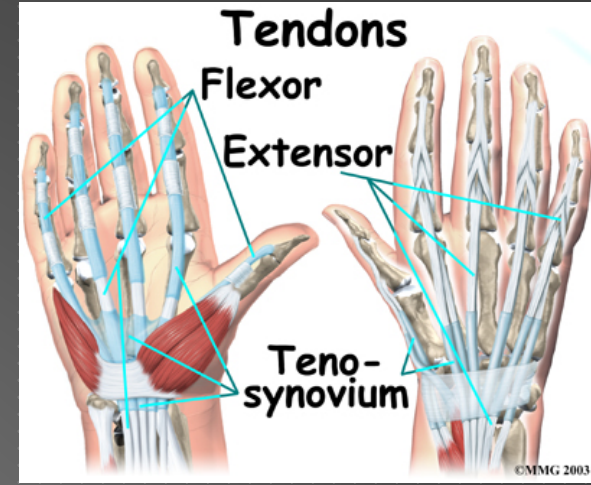
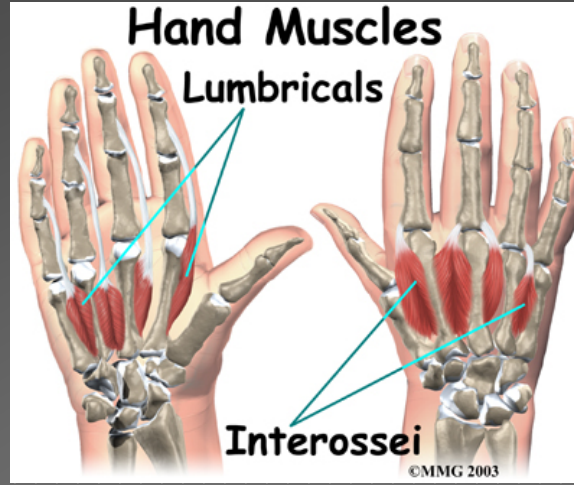
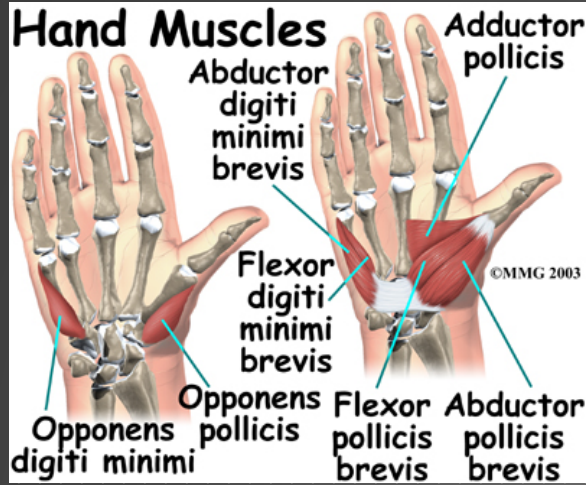
OBJECTIVES

- ▶ Anatomy of the arm & hand
- ▶ Common Clinical Concerns for Upper Extremity Impairment
- ▶ Understanding Terms: Exercise, Rehabilitation, Therapeutics & Prosthetics
- ▶ Overview of Assistive Devices
- ▶ Introduction to Neurotechnology Devices
 - ▶ Repetitive Motion Therapy
 - ▶ Sensing Orthotics
 - ▶ Stimulating & Sensing Therapy
 - ▶ Neural Prosthetics
- ▶ Resources to Learn More

ANATOMY OF THE ARM & HAND



ANATOMY OF THE ARM & HAND





COMMON CLINICAL CONCERNS OF THE NEUROLOGICALLY IMPAIRED UPPER LIMB

www.saebo.com

ATROPHY:

WEAKNESS is the main contributor to **ACTIVITY LIMITATIONS** and the **ABILITY** to use the arm.



(Lids Drexel Rehabil 2006, Harris Phys Ther 2007)

CONTRACTURES

Research states that **CHANGES AND SHORTENING OF MUSCLES** and connective tissue can start occurring *within hours/days*.

(Stroke Month News 2002)

SOFT TISSUE SHORTENING has been observed to begin in *as little as 4 weeks* in a non-functional joint.

(Painlevé Clin Rehabil 2007)

APPROXIMATELY 50% of all stroke patients develop at least 1 contracture within 6 months. *Shoulders and hips* most commonly affected.

(Stroke J of Physiotherapy 2012)



SPASTICITY

POST STROKE SPASTICITY is found in chronic patients (> 3 months) with a **FREQUENCY RANGING FROM 17%-42%**.

SIGNIFICANT IMPACT ON ADL'S IS THE RESULT.



(Wissel Amer Acad of Neurology 2013)

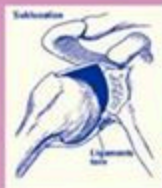
PAIN

24% OF FIRST TIME STROKE PATIENTS experience shoulder pain by month 16.

(Lindgren Stroke 2013)



SUBLUXATION



Shoulder **subluxation** affects up to **81%** OF STROKE PATIENTS.

(Yungquist J Rehabil Med 2002)

Shoulder **SUBLUXATION, soft tissue SHORTENING, and SPASTICITY** are most **FREQUENTLY ASSOCIATED WITH SHOULDER PAIN.**

(Tassell Evidence Based Review of Stroke Rehabil 2013)

HAND FUNCTION

45% of patients had limited hand use at **18 MONTHS** post stroke.

(Wester J Rehabil Med 2008)

AT 6 MONTHS, 11.6% of stroke patients had achieved complete functional recovery, while 38% had some dexterity function.

(Kwakkel Stroke 2002)

FOUR YEARS POST STROKE, only 50% of stroke survivors had fair to good hand function.

(Brooks Disabil Rehabil 1999)



REHABILITATION VERSUS EXERCISE

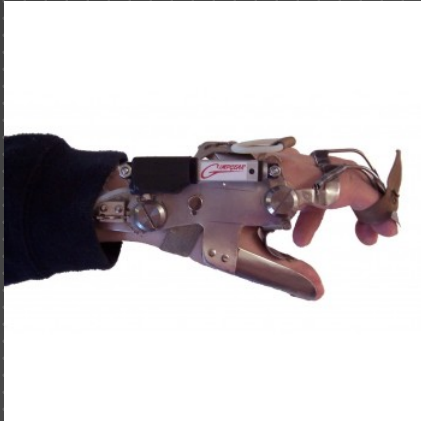
- ▶ **Rehabilitation:** is a treatment or treatments designed to facilitate the process of recovery from injury, illness, or disease to as normal a condition as possible.
- ▶ Focus is
 - ▶ Restoration/recovery
 - ▶ Compensation
 - ▶ Limitations/adjustment
 - ▶ Independence
- ▶ **Exercise:** is physical activity that is planned, structured, and repetitive for the purpose of conditioning any part of the body.
- ▶ Focus is
 - ▶ Improve health condition
 - ▶ Maintain or improve fitness and
 - ▶ Prevention/performance

THERAPEUTIC VERSUS PROSTHETIC

- ▶ **Therapeutic Application:**
Rehabilitative approach designed to facilitate the process of recovery from injury, illness, or disease to as normal a condition as possible.
- ▶ **Focus is**
 - ▶ Restoration/recovery
 - ▶ Voluntary control and
 - ▶ Community Orientation

- ▶ **Prosthetic Application:**
Tool used to compensate or replace lost function.
- ▶ **Focus is**
 - ▶ Improve health condition
 - ▶ Compensatory measures and
 - ▶ Prevention/performance

UPPER EXTREMITY: ASSISTIVE DEVICES



Electric Powered Prehension Orthosis (EPPO) Wrist-Hand Orthosis

<http://www.broadenedhorizons.com>

-Uses wrist extensor strength to create a 3-point pinch

Gripability

<http://gripability.de>

-Entirely mechanical



JACO Robotic Arm:

<http://kinovarobotics.com>

-Prosthetic device mounted to wheelchair; controlled by a joy stick; has 7 degrees of freedom

UPPER EXTREMITY DEVICES - EXERCISE



RT300 Arm: Restorative Therapies

www.restorative-therapies.com

- Uses electrical stimulation to enhance arm cycling movement
- No research results available



MotoMed: RECK

www.ri-llc.com

- Passive, motor-assisted, or active Resitive
- No research results available

UPPER EXTREMITY DEVICES - EXERCISE

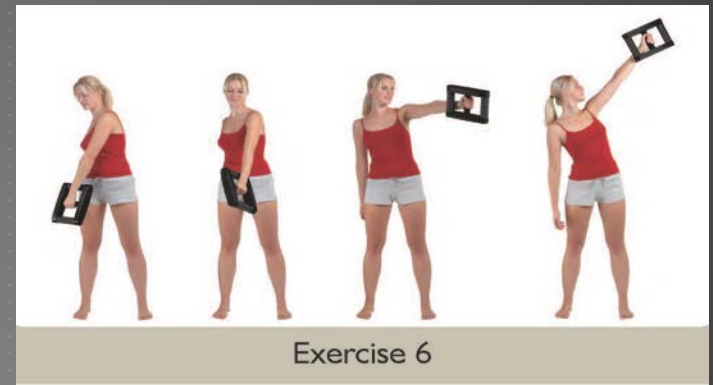


Galileo UpX Dumbbell: Stim Designs

stimdesigns.com

-Vibration, depending on the frequency it can be used to enhance arm strength or promote relaxation of muscles

There is research that shows that whole body vibration during exercise can improve upper body strength. More research is needed regarding the effectiveness in different neurologically impaired populations.



NEUROTECHNOLOGY: REPETITIVE MOTION THERAPY



Armeo: Hocoma
www.hocoma.com



WAM Arm – Barrett Technology
www.wambotics.com

- Also called Robotic Rehabilitation Training
- Studies show users have greater benefit if they begin with some minimal function

NEUROTECHNOLOGY: REPETITIVE MOTION THERAPY



AMES Therapy Device:
AMES Technology
www.amesdevices.com



InMotion Interactive Therapy
Interactive Motion Therapies
interactive-motion.com

- Motion Therapy may also improve sensorimotor impairments, proprioception
- American Heart Association & VA/DOD have recommended guidelines post-stroke

NEUROTECHNOLOGY: SENSING ORTHOTICS



MyoPro: Myomo
www.myomo.com



SaeboGlove: Saebo
www.saebo.com

NEUROTECHNOLOGY: SENSING & STIMULATING THERAPY



Biomove Home: Curatronic Ltd
www.biomove.com



MyndMove: MyndTec
www.myndtec.com



Neuromove: Zynex Medical
www.zynexneuro.com/neuromove/

- Devices combine voluntary movement with electrical stimulation
- Studies show maintaining function movement post treatment

NEUROTECHNOLOGY: NEURAL PROSTHETICS



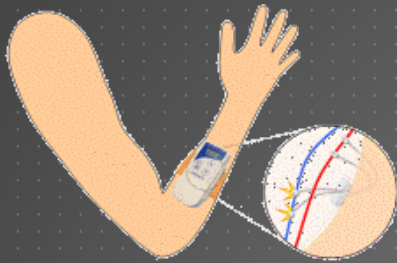
Ness H200: Bioness

www.bioness.com

- Task specific training and movement
- Studies have shown potential benefits of increase range of motion & hand function, reeducation of muscles, increase circulation & reduce muscle spasms

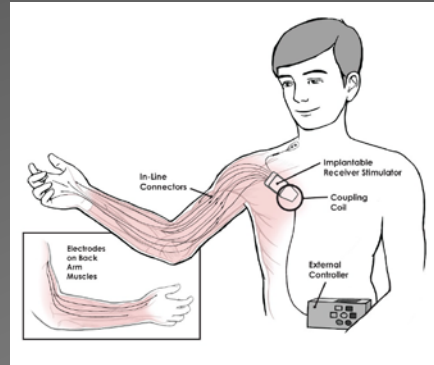
NEUROTECHNOLOGY: STIMULATING EXPERIMENTAL DEVICES

www.ClinicalTrials.gov



STIMuGRIP: FineTech

<http://finetech-medical.co.uk/>



Upper Extremity for SCI

[Freehand User Group](http://fescenter.org)

<http://fescenter.org>

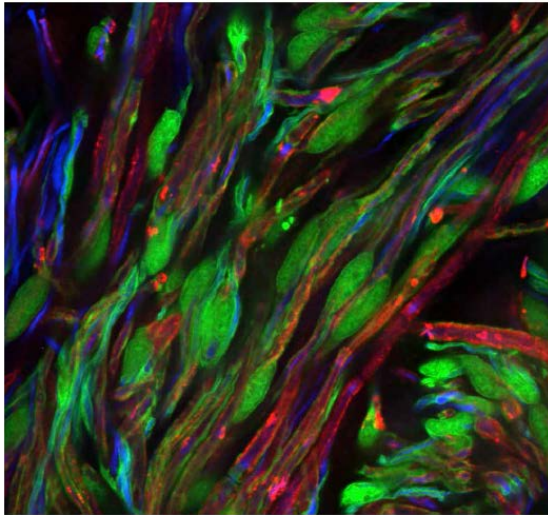


Contralaterally Controlled FES for Stroke

<http://fescenter.org>

RESOURCES

Experimental treatments for spinal cord injury:
What you should know (Version 2)



A guide for people living with spinal cord injury,
their family, friends and health care professionals

Free download of this booklet:

<http://www.miamiproject.miami.edu/page.aspx?pid=428>

Follow: Paralysis Support/Research
Participation/Experimental Treatments

ISCOS
The International
Spinal Cord Society



International Spinal Cord Society
(ISCOS), www.iscos.org.uk



Free Fact Sheet Resources
Spinal Cord Injury, Stroke, MS, CP, Brain Injury, & more
Listings: <http://www.neurotechnetwork.org/factsheet.html>

QUESTIONS



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