

## Using Technology: Tools on Your Path to Recovery



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## Objectives

- Discuss neuro-plasticity in rehabilitation
- Explain motor recovery for survivors of brain injury with the use of technology

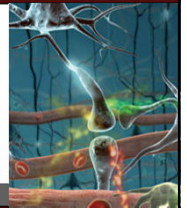
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## Rehabilitation

- Improves **functional** abilities for everyday living
- Involves **neuro-plasticity**, which is real and makes a major difference
- Is a life-long process

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## Mechanisms of Recovery

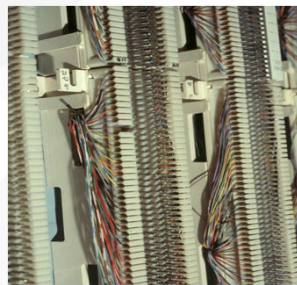
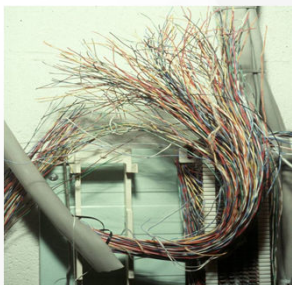


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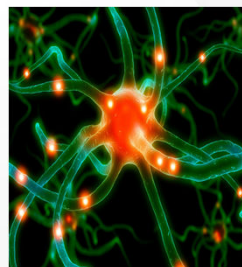
## Cut Wires

## Back Together



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## Neuro-Plasticity



- Development of new pathways in the brain (**neuro-plasticity**)
- Improvement requires the performance of **functional** tasks
- Neuro-plasticity changes can take place for years after a brain injury

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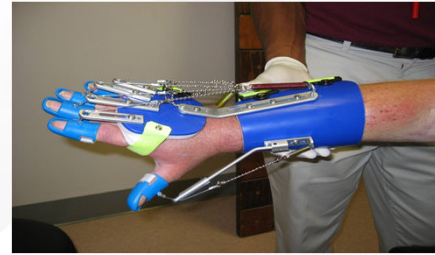
## Technology Tools in Rehabilitation



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## Functional Arm Training

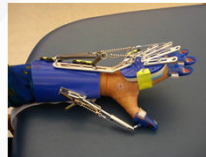


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## Functional Arm Training

- Non-electrical/purely mechanical device
- Positions wrist and fingers in extension in preparation of **functional** activities
- Must have some shoulder and elbow movement and be able to flex fingers when wrist placed in extension
- Allows patient to perform "**functional**" tasks to promote neural plasticity



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## Functional Electrical Stimulation(FES)

- Is stimulating the muscles to contract, sending signals to the brain to form new pathways
- Repeated movements may help reinforce those new pathways, improving motor recovery

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## Hand Rehabilitation



Ness H200®

- Uses electrical stimulation to open and close grasp
- Can be used in the hospital or at home
- Electrical stimulation may **retrain** the brain

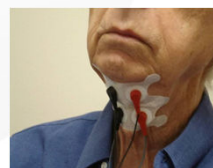


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## Dysphagia

- Weak muscles can cause aspiration
- Electrical current stimulates motor nerves and throat muscles
- Muscles are **strengthened and re-educated**
- Improvement in diet and swallow function

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## Dysphagia Treatment



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Electrical Stimulation for the Swallowing Muscles

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## Improving Ambulation Using Technology



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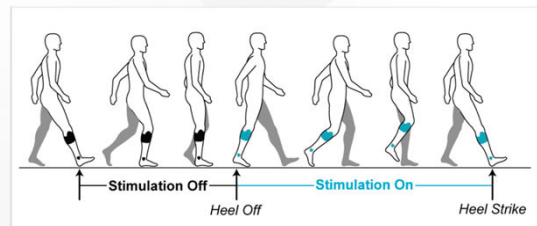
## Motor Rehab for Walking



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## The Gait Cycle



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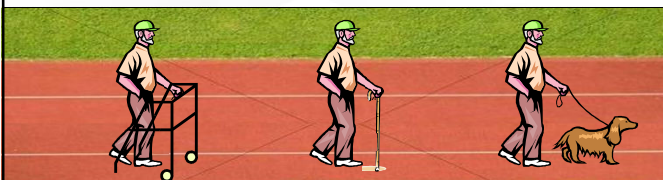
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## Gait Speed

Complications/  
Increased Falls  
**<0.6 m/sec**

Community  
Walker  
**0.6 m/sec**

Average Older Adult  
Speed  
**0.8 m/sec**



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## Body Weight Supported Treadmill Training

### Motion

- Unloading lower extremity
- Fall free environment
- Maintain balance
- Goal oriented and specific
- Increase bone density
- Increase circulation
- Maintain range of motion
- Increase muscle strength
- Decrease spasticity

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## Interactive Technologies

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## Robot-Assisted Interactive Therapy



- Robot-assisted technology**
- stimulates brain re-organization
  - triggers greater **functional recovery**
  - assists with neuro-plasticity with **numerous repetitions** of functional movements

recovery

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## Patient Outcomes Reo-Go

- Reduced **tone** and **joint pain**
- Increased active Range of Motion (ROM)
- Improved coordination
- Improved hand function
- Improved gait and balance
- **Improved overall function**
- Patients report feeling:
  - Highly engaged
  - Very satisfied: "I feel more together."

outcomes

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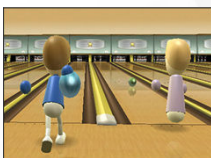
## Interactive Metronome

- IM training activates areas of the brain involved in motor control, cognition, and timing.
- Engages
- Incorporates body movement with repetitions
- Facilitates neuro-plasticity
- Gives real-time feedback



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## Off-the-Shelf Virtual Reality



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## What does it all mean?

### Technology:

- Based on Scientific evidence
- Used for many therapeutic tasks
- Rapidly advancing



rehabilitation

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**There is Always  
More To Do!**



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