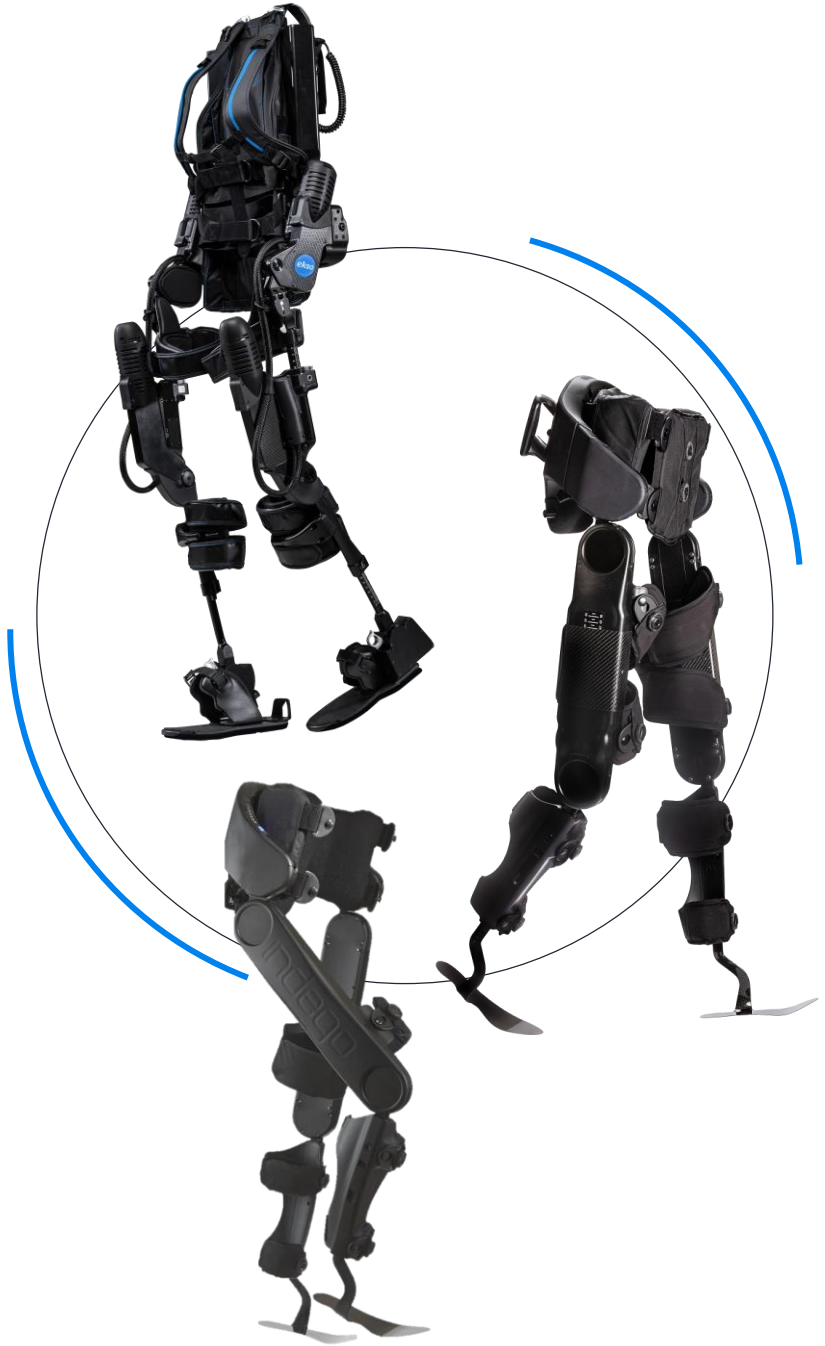

Exoskeletons for Rehabilitation and Industry

Perspectives in Assistive Technology, Stanford 2024

Joanna Weakley, MS, PT

Clinical Manager-Southeast

eksoBIONICS

Who am I?

BS in Allied Health Science

MS in Physical Therapy

Physical Therapist

UT Southwestern Medical Center, Dallas, TX

Baylor Scott & White Institute for Rehabilitation, Dallas, TX

Clinical Training Specialist

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Clinical Manager

Clinical Trainer

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What is an Exoskeleton?

Structure which supports the body from the outside and protects soft tissue.

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Who is Ekso Bionics?

- We develop disruptive wearable robotics to take on loss of mobility. In doing so, we have helped thousands of patients with lower extremity disabilities take hundreds of millions of Ekso-aided steps and have inspired an entirely new medical device industry.
- **We are rethinking rehabilitation with assistive technology, and we still have the same goal: helping people regain their full rehabilitation potential.**

eksoNR

eksoINDEGO

eksoEVO

eksoBIONICS

Brainstorm

What would you consider when designing an exoskeleton for gait rehabilitation to be used in a rehab center?

What features are important?

How do you figure out if your design works?

eksoNR

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eksoNR

- FDA Clearance for Stroke, Spinal Cord Injury, Acquired Brain Injury, and Multiple Sclerosis
- Primarily Used in Inpatient and Outpatient Rehabilitation Centers
- Also being used in Acute Care Hospitals, Long Term Care Facilities, and Skilled Nursing Facilities
- Device weighs 50 lbs.
- Weight limit 220 lbs.
- Height Range: 5’0” – 6’4”

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Front

Key #	Description
1	Backpack Straps
2	Chest Strap
3	Torso Pad and Straps
4	Knee Motor
5	Upper Leg Length Adjustment
6	Shin Support
7	Foot Binding and Strap
8	Battery and Torso
9	Hip Motor
10	Hip Joint
11	Thigh Brace and Strap
12	Knee Brake Release
13	Knee Joint
14	Lower Leg Length Adjustment
15	Adjustable Ankle Joint
16	Foot Plate

The manual **Knee Brake Release** button is located on the side of each knee joint. This release button functions only when the EksoNR is powered OFF. Pressing the button enables knee flexion/extension. Releasing the button locks the knee in place.

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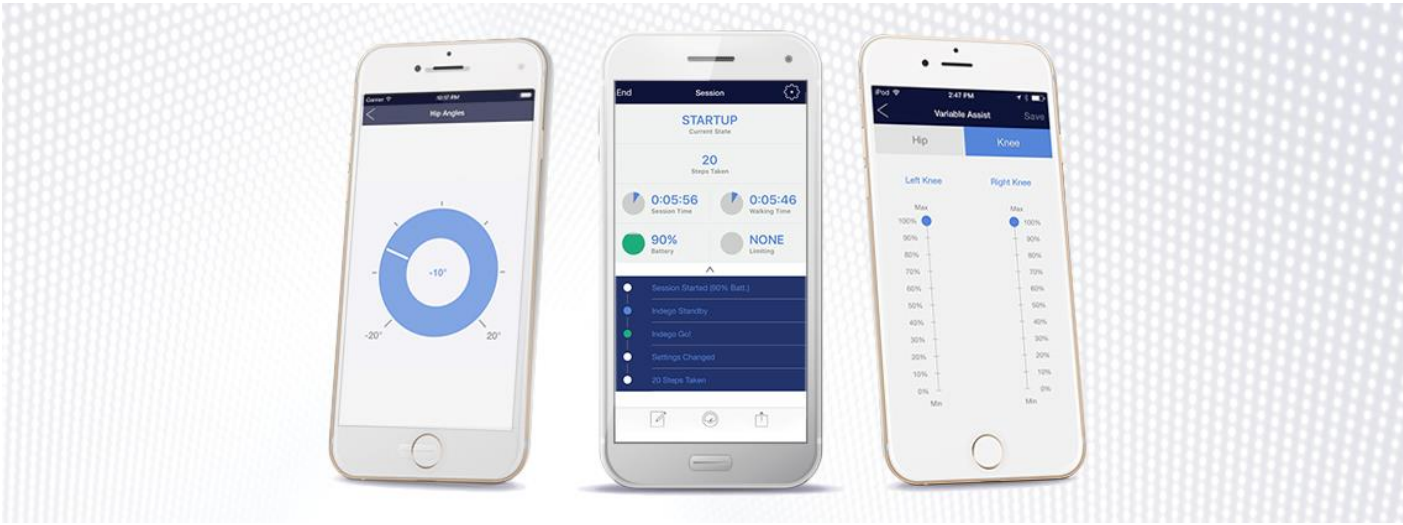
Software - work with the Human

Assist	Provide assistance or resistance as needed but only as much as needed
Engage	Give the user live guidance and keep engaged
Feedback	Provide feedback to improve performance
Alert	Alert and react to safety concerns

Software - work FOR the Human

- How the therapist interacts with the device is critically important!



Stroke Patient in Ekso

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- 2 Models: Indego Personal Exoskeleton & Therapy Device
- FDA Clearance for Spinal Cord Injury and Stroke
- Personal device used at home or in the community (SCI T3 & below)
- Therapy device used in inpatient or outpatient rehab centers (SCI C7 and below)
- Weighs: 29 lbs (personal)
- Weight limit: 250 lbs
- Height range: 5’1” – 6’3”

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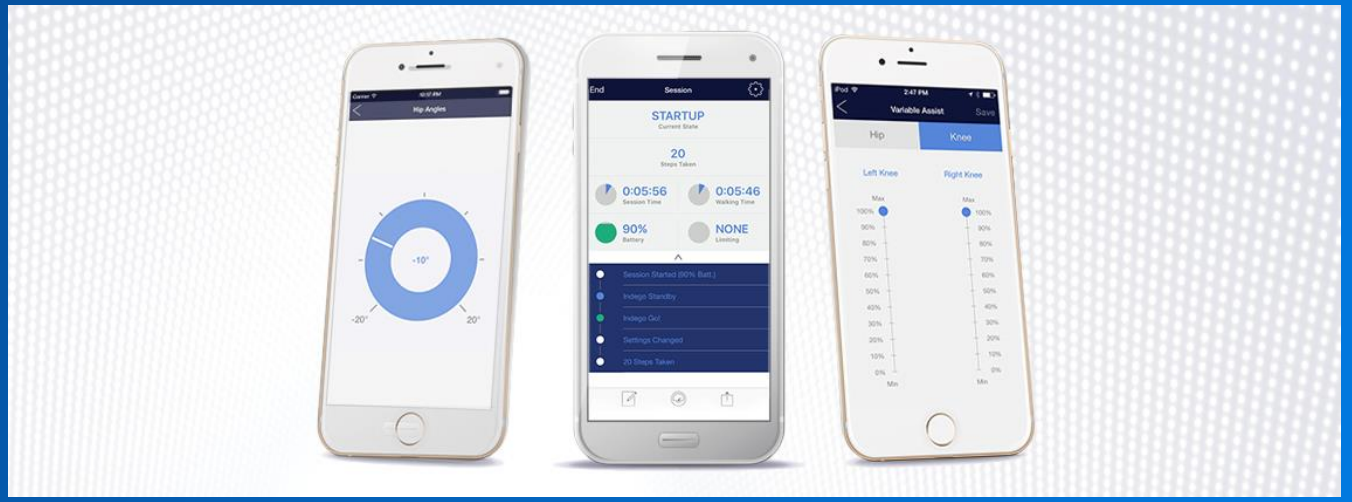

Modular with Bluetooth App

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Modular Self Donning

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Community Ambulation

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Bridge the Gap

End Users

Engineering & Design

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How do you Bridge the Gap?

Communication

Understanding engineering & healthcare terms

Mutual goals

Test & Re-Test

Listen to feedback from each other

Get external feedback

-patients and healthcare

Strive to continue to improve!

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Back to Brainstorming - What's important for exoskeleton design?

- Manageable weight
- Adjustable fit
- Easy to don/doff
- Easy to use
- Fits the purpose
- Safety
- Easy maintenance
- Tech support

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ekso EVO

Upper Extremity Industrial Exoskeleton

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ekso EVO

- Spring loaded assistance for overhead activities
- GOALS:
  - Prevent Chronic Overuse Injuries
  - Decrease fatigue

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The Evolution of ekso EVO

eksoZeroG

eksoVest

eksoEVO

eksoNR

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EksoVest & Ford Motor Co. (2018)

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Evolution to ekso EVO

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ekso NR ekso INDEGO ekso EVO

All require INTERACTIONS between Engineers, Physical Therapists & End Users

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Careers in Exoskeletons

- Engineering
  - Mechanical
  - Electrical
  - Software/Controls
  - Manufacturing
  - Soft goods
  - Regulatory
- G & A
  - Sales
  - Marketing
  - Finance
  - Management
  - HR
- Operations
  - Supply chain management
  - Assembly
  - Service
  - Customer Support
  - Shipping
- Clinical
  - Physical Therapist
  - Orthotist

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Thank You!

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