# Exoskeletons

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Perspectives in Assistive Technology, Stanford 2025

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# Who am I?

BS

Mechanical Engineering

MS, PhD

Mechanical Engineering

Power Up.

Principal Controls Engineer

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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?

- Ekso Bionics® develops technology to enhance human mobility, strength, and endurance.


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# Some Exos in the Market

- EksoNR, Ekso Bionics
- ReWalk 6.0, ReWalk Robotics
- Indego, Ekso Bionics
- Rex, Rex Bionics

FDA approved

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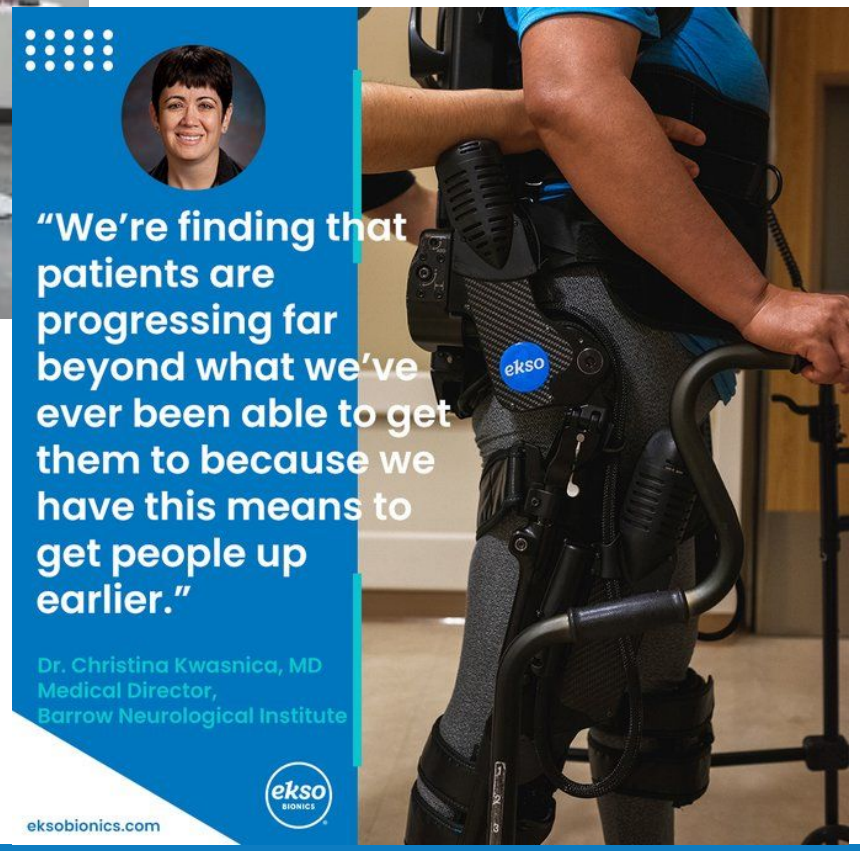
# Industrial Applications


# Ekso Acquired Indego, Medicare Covers SCI Personal Devices

# Medical Applications



# Diagnoses

- Spinal Cord Injury
- Stroke
- Acquired brain injury

- Multiple Sclerosis
- Parkinsons
- Etc.

# Benefits

## Gait Training

- Repetitive stepping
- Varied assistance
- Balance training

## Long-Term Use?

- Bone Density?
- Bowel & Bladder Function?
- Pain?
- Circulation?
- Emotions?

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# Designing an Exoskeleton

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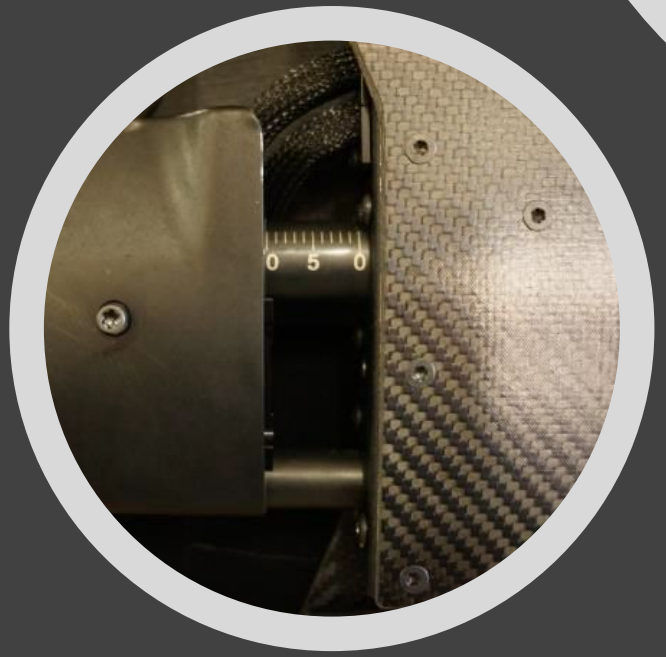
# Brainstorm

- 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?

# Size Adjustment

- Exoskeletons must adjust to fit their user
- Fit is critical for maintaining comfort and safety
- Fast and accurate adjustments needed in clinical setting



# Padding & Fit Kit

- Elimination of pressure points
- Ensure that the user stays aligned with the device

# Donning & Doffing

User must be able to get in/out of the device safely and easily

# Safety- Fail Safe

- Hard stops & soft stops
- Adjustable settings for SW Joint limits
- Normally-on brakes

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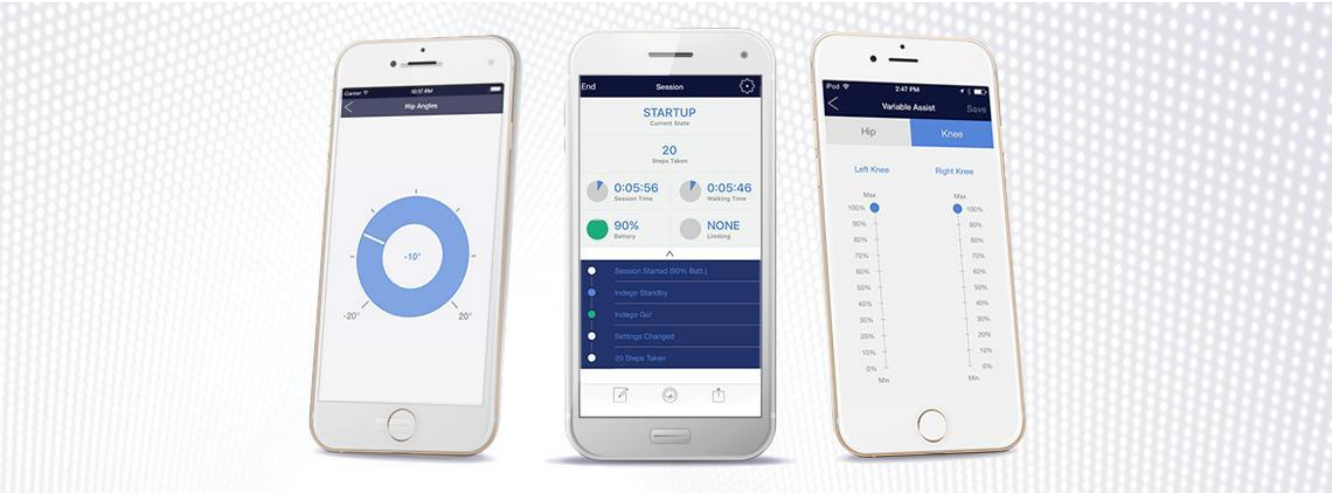
# Software- work with the Human

| | |
|---|---|
| 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

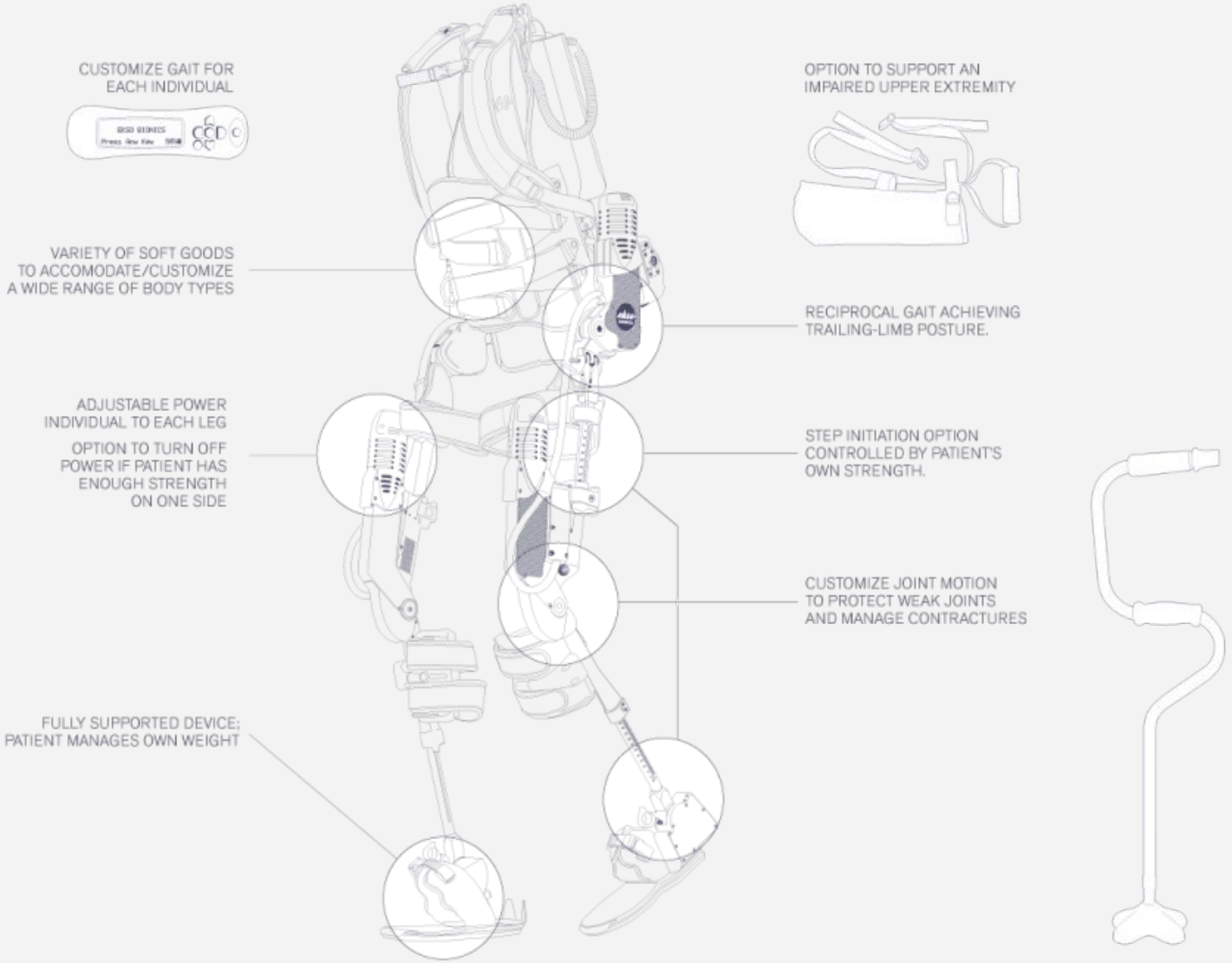
- How the therapist interacts with the device is critically important



# Ekso in Action w/ Fernanda

- https://youtu.be/NuwKS4FkzlE?t=3894

# Other Features



# Careers in Exoskeletons

- Engineering
  - Mechanical
  - Electrical
  - Software/Controls
  - Manufacturing
  - Soft goods
  - Regulatory
- Operations
  - Supply chain management
  - Assembly
  - Service
  - Customer Support
  - Shipping
- Clinical

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# Thank you

*Katie Strausser*

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