

# Exoskeletons

Perspectives in Assistive Technology - Stanford, 2018

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**ekso**<sup>®</sup>  
BIONICS



# Introduction

- Job Title: Principal Engineer, Ekso Bionics
  - Focus on software and controls
- Education
  - BS, Mechanical Engineering, Carnegie Mellon University
  - MS, PhD, Mechanical Engineering, UC Berkeley

# Outline

- The Exoskeleton
- Design of an Exoskeleton
  - Design Requirements
  - Design Features
- Demo / Q&A

What is an  
Exoskeleton?

# Exoskeletons: Helping People Move

## Exos on the Market



**Indego**

Parker.com



**Rex**

Rexbionics.com



**ReWalk**

Argomedtec.com



**Ekso GT**

Eksobionics.com



# Ekso



# Diagnoses

Who can benefit from exoskeleton use?

- Spinal Cord Injury
- Stroke
  
- Multiple Sclerosis
- [Traumatic Brain Injury](#)
- Etc.

# Benefits

## Why use an exoskeleton?

- Gait Training
  - Repetitive stepping
  - Varied assistance
  - Balance training
- Long-Term Use?
  - Bone Density?
  - Bowel & Bladder Function?
  - Pain?
  - Circulation?
  - Emotions?



# Exoskeletons on the Market

- FDA Clearances for Medical Devices
- Most are cleared for Spinal Cord Injury in clinics
  - Some for SCI in community environment
  - Ekso is cleared for Stroke in clinics

# Designing an Exoskeleton

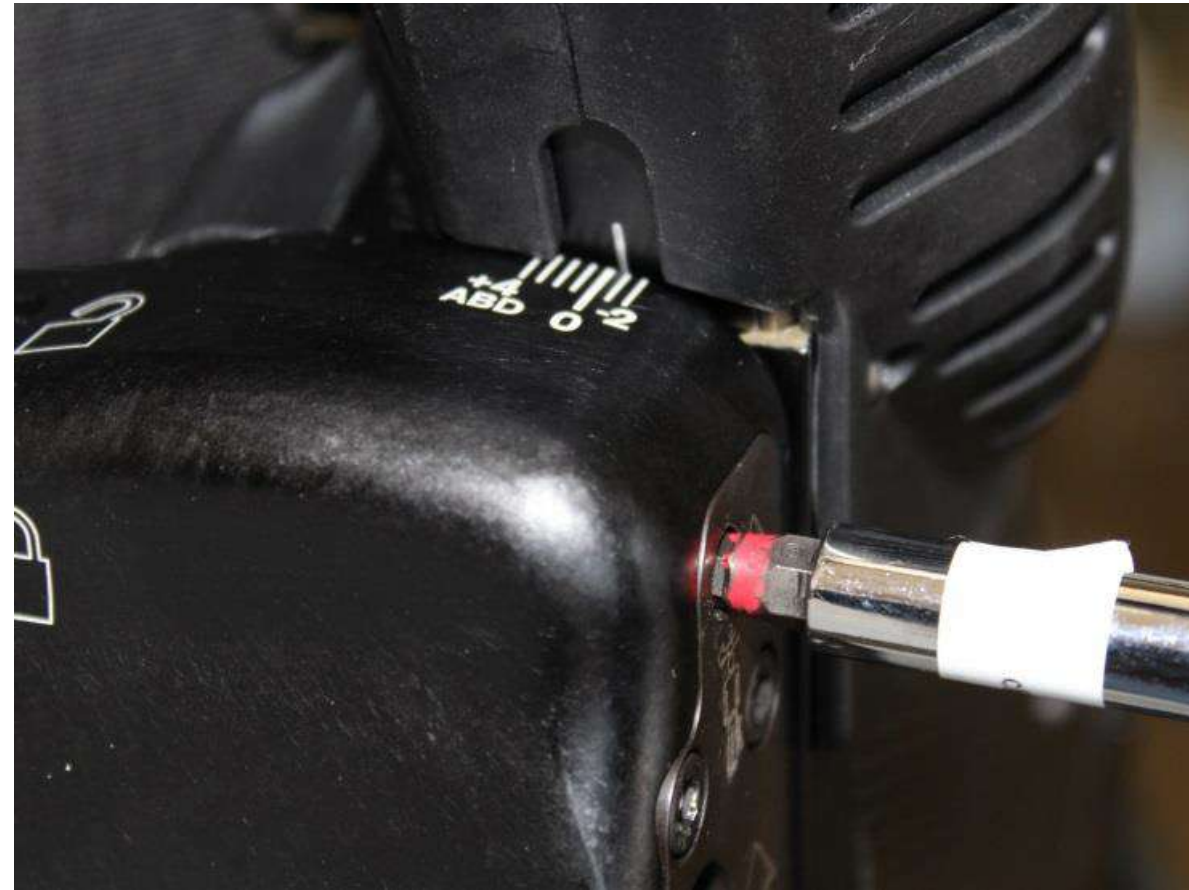
# Design Requirements

- Brainstorm time!

# Size Adjustment



# Size Adjustment



# Fit Kit & Padding



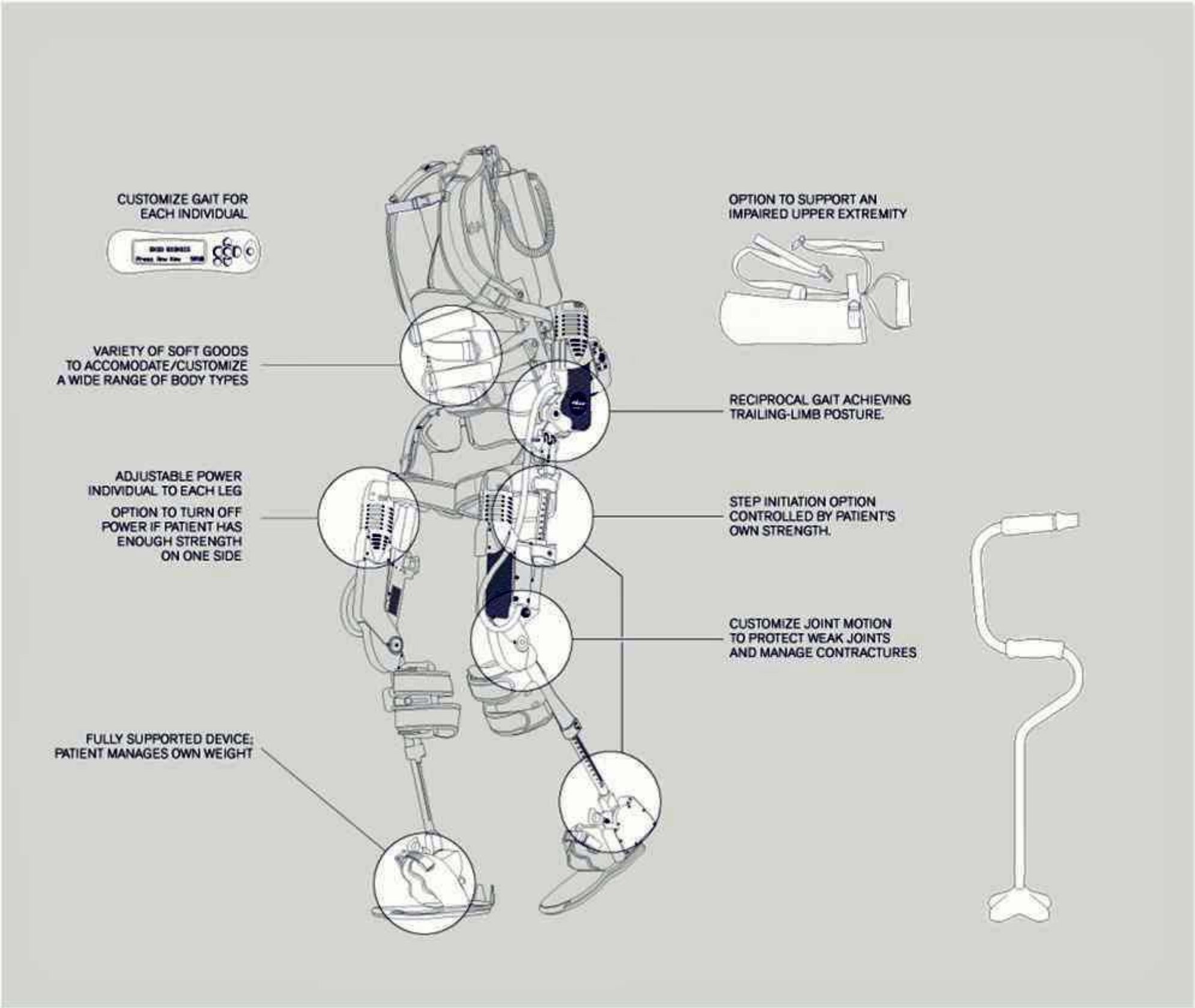


# Donning / Doffing



# Safe Motion / Fail Safe

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



# Demonstration by Fernanda 2016



[Video](#)

THANK  
YOU

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