

symbio



physical therapy

\$60 BILLION ON FALLS

20% OF PTS INJURED

EVERY YEAR

people in need

HIP & FEMUR TRAUMA

STROKES

INCOMPLETE SPINAL CORD INJURIES



pressure points

LIMITED REHAB SESSIONS

**PHYSICALLY TAXING ON PTs W/ HIGH
RISK OF INJURY**

**HEAVY RELIANCE ON PTs TRIBAL
KNOWLEDGE V.S. DATA DRIVEN REHAB**



current options

BULKY



RIGID



SCARY





symbio

THE WORLD'S MOST
NATURAL EXOTRAINER



layered shell
construction

compression layer

BREATHABLE, EASY ZIP,
AND WASHABLE KNIT





middle support layers

HIGH DENSITY FOAM AND
NEOPRENE COMBO TO CREATE A STRONG BUT
COMFORTABLE INNER LAYER



outer wrap layer

HEAVY DUTY NEOPRENE
WITH LEATHER STRAPS



registration layer

KEVLAR MOUNTING PLATES
WITH MAGNETS LOCALIZED AT EACH MOTOR
LOCATION TO LOCALIZE THE CONSTRUCTION'S
RIGIDITY AND ALLOW FOR NATURAL MOVEMENT
ELSEWHERE



hard exo layer

CARBON FIBER LIMBS AND
GENESIS LIVEDRIVE MOTORS
LIGHT AND STRONG

orthotic boot

SOFTENED BY A FOAM INSOLE AND STRENGTHENED
BY CARBON FIBER DORSIFLEXION ASSIST, WHICH
ELIMINATES THE NEED FOR AN ANKLE MOTOR



smart symbiosis

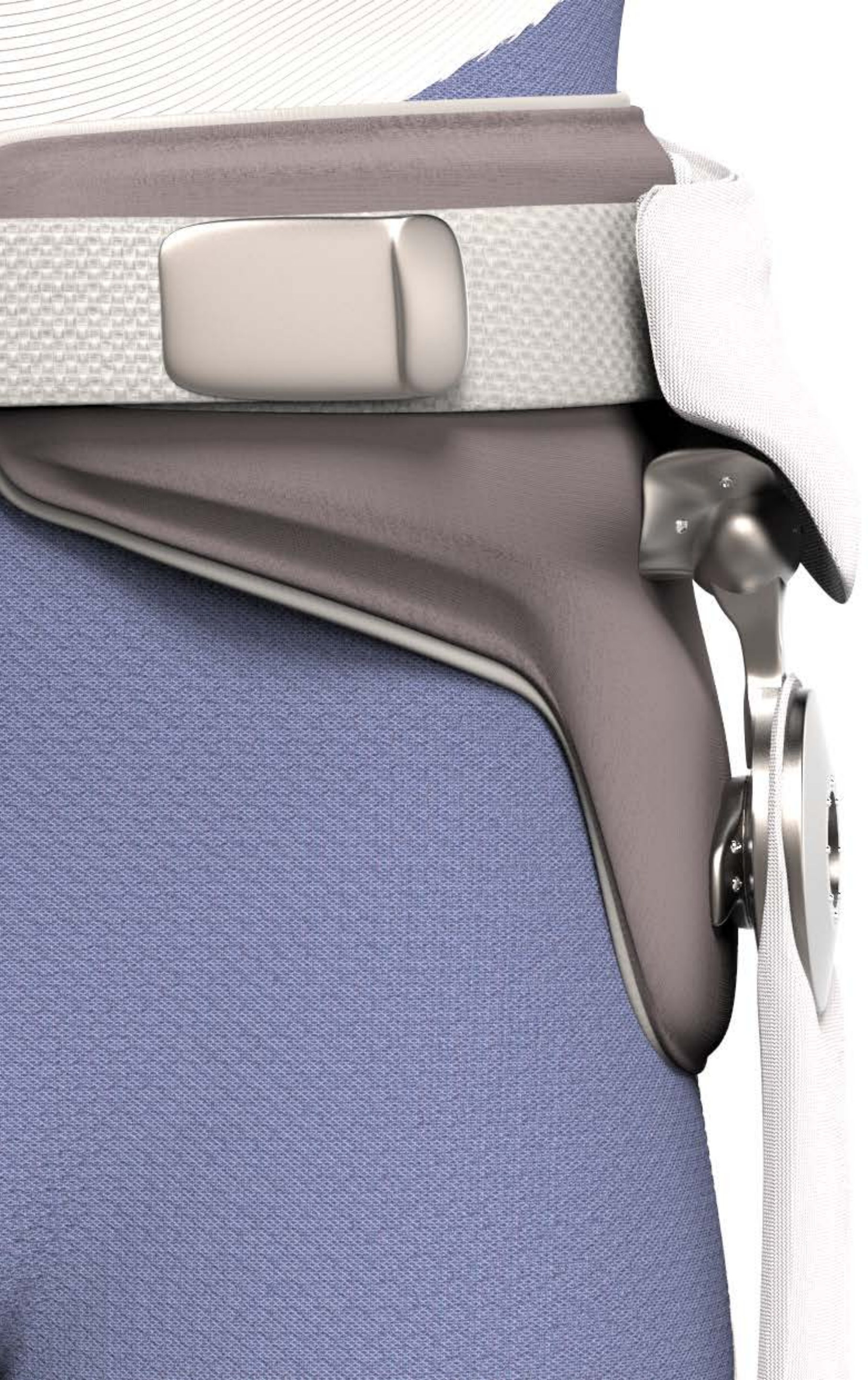
MACHINE LEARNING ENABLED PROCESSOR USES
LOCALIZED POSITIONING SENSORS AND FORCE
LOAD CELLS TO SENSE EVERY SUBTLE MOVEMENT
OF THE HUMAN BODY



localized motor system

THIN GENESIS LIVE DRIVE MOTORS
LEVERAGES DATA FROM
THE LOCALIZED SENSORS





natural core movement

EXOSKELETON HIP JOINT AND CORE MOTOR
SYSTEM ENABLED BY A WAIST MOTOR
LOCATED AT THE WEARER'S BACK



Sheryl Flynn, PT, Ph.D

CEO OF BLUE MARBLE HEALTH

“We should all have periodic sessions with physical therapists not just those in rehab.”

background

Sheryl Flynn is the founder and CEO of Blue Marble Health, a digital health startup that focuses on digitization and gamification of healthcare solutions. Fall prevention and elderly strength training are just two focus areas that her company is currently conducting clinical trials for in collaboration with the Centers for Medicare and Medicaid (CMS).

Sheryl is also a former Physical Therapist with a Masters in PT and a Ph.D. in Motor Control

key insights

Optimizing rehab sessions is critical. The rehab sessions that are prescribed are limited in number. On top of that, there's typically no follow-up sessions because payors don't want to pay for them.

Additionally, there's a shortage of PTs to serve the elderly population, putting more pressure on this field.

Private hospitals aren't really incentivized to properly rehab fall patients. They get more revenue when they don't.

In contrast, rehab facilities, the Centers for Medicare and Medicaid, and health insurers, are very motivated to improve physical therapy to reduce their overall expenses.



Brian Dinozo, OT

OCCUPATIONAL THERAPIST AT JOHN MUIR HEALTH

“The older a fall patient is the higher their morbidity rate because they find themselves in bed the whole time after. That’s why regaining any level of mobility is critical to a person’s life.”

background

Brian Dinozo is currently an Occupational Therapist supporting the trauma unit at John Muir Health.

A majority of his patients are admitted because of traumatic hip and/or femur fractures from falls. He previously served as an OT at an inpatient rehab hospital.

key insights

Physical therapists and occupational therapists are the health professionals who hold the most decision making power when it comes to prescribing and overseeing physical therapy and what mobility aids a patient will be prescribed. Physicians just have the ability to order in assessment by a PT and/or OT.

Patients who don’t recover quick enough from their traumatic falls are sent to a Skilled Nursing Facility. Some of which may never go home.

The majority of the mobility aids are really bulky and heavy. Even as a healthy young man, he finds walkers relatively heavy as he has to carry them around often in the hospital.

Many times functional rehab is down out in the hospital gardens to practice mobilizing over different types of terrains.



Elisa Lo, PT

PHYSICAL THERAPIST AT THE CALIFORNIA REHABILITATION INSTITUTE

“If they walked before, I expect them to walk again.”

background

Elisa Lo is a Physical Therapist at the California Rehabilitation Institute. She is experienced rehabilitating patients who have suffered limb loss, strokes, spinal cord injuries and orthopedic injuries. She is looking to specialize in geriatrics. She also has an interest in

key insights

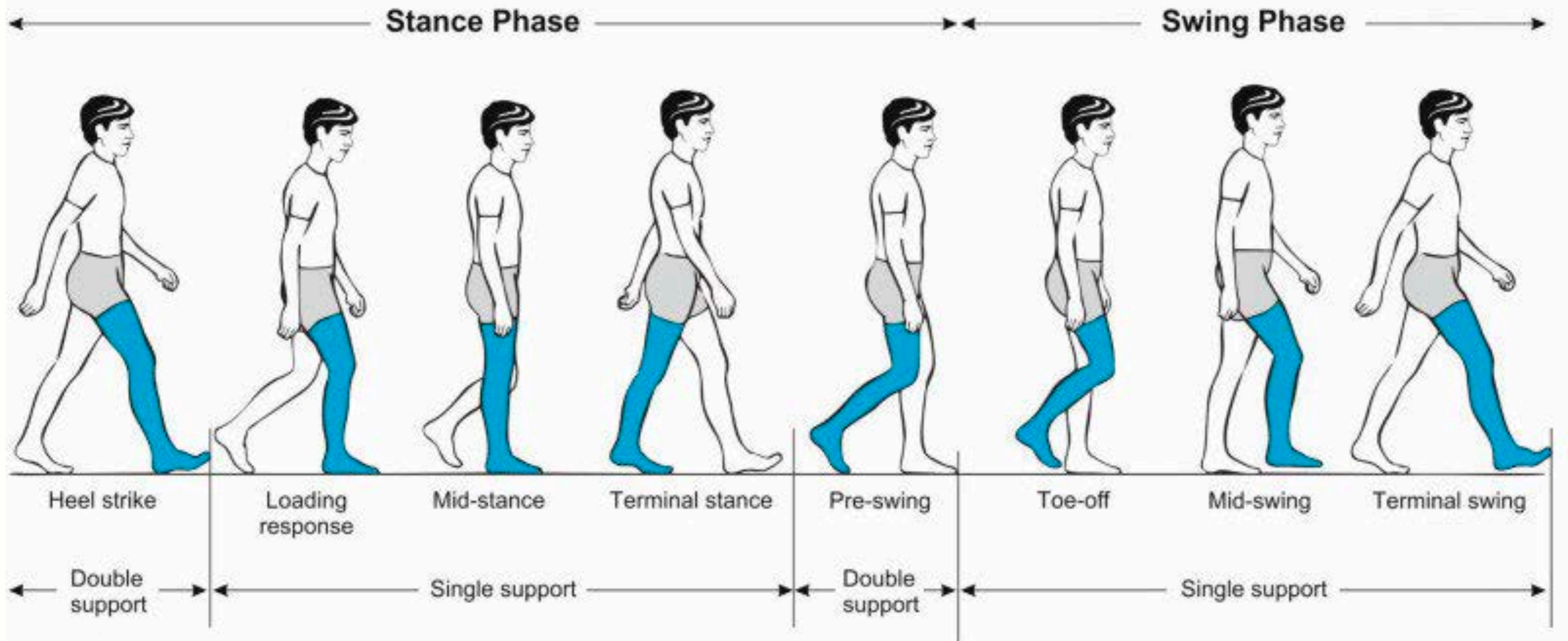
Rehab sessions may be as short as 30 minutes. Private insurance is more lenient for length of rehabilitation than the Centers for Medicare and Medicaid.

Picking which equipment to use and what exercises to do is based on remembering her past experiences.

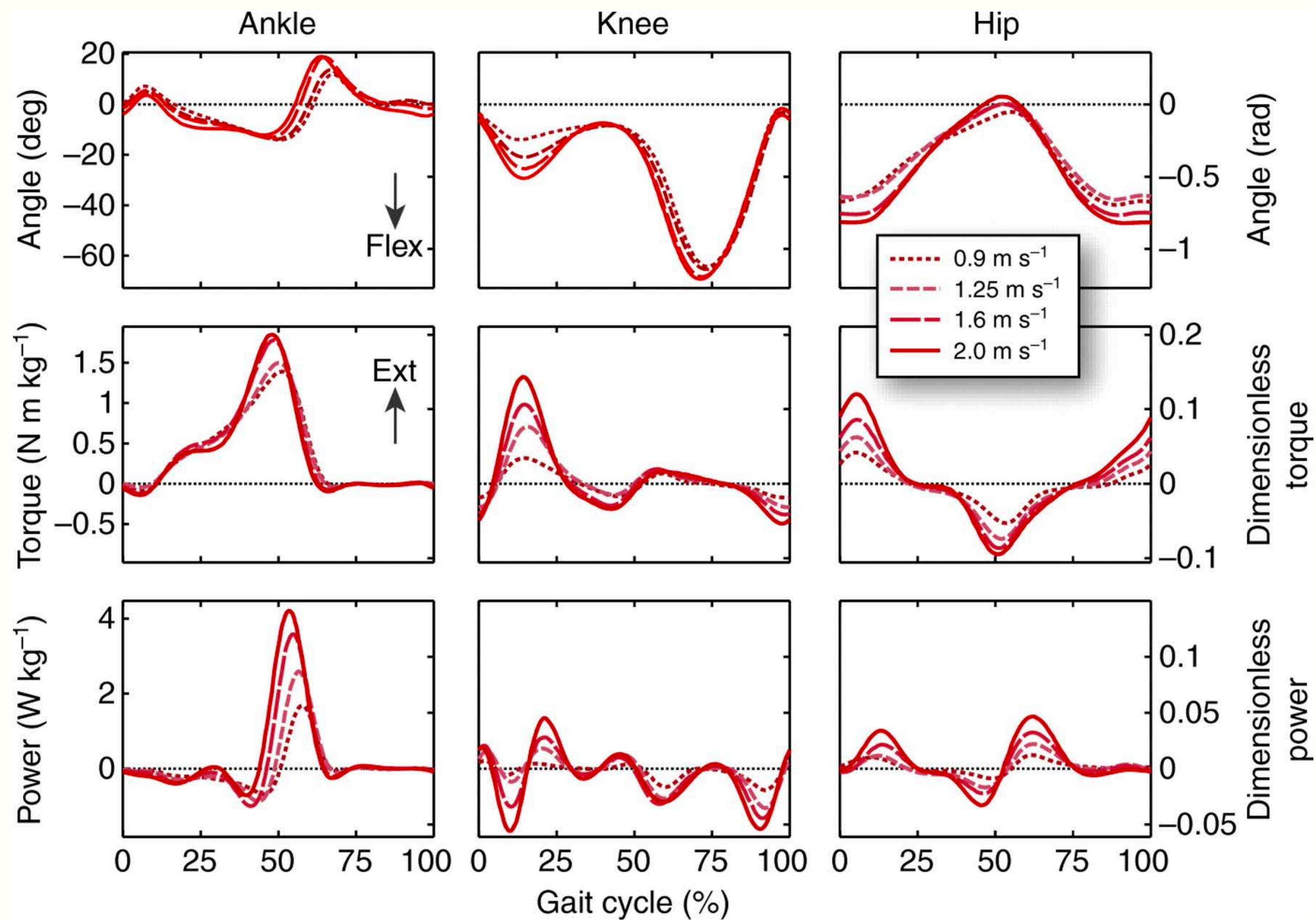
Set up of rehab equipment needs to be easy and quick in order to maximize rehab time because PTs' time is already fully booked. For the same reason, ease of sanitation is important.

An assistive device like an exoskeleton with fall prevention technology would be most beneficial in the near term for those who have suffered from incomplete spinal cord injuries, strokes, and traumatic falls.

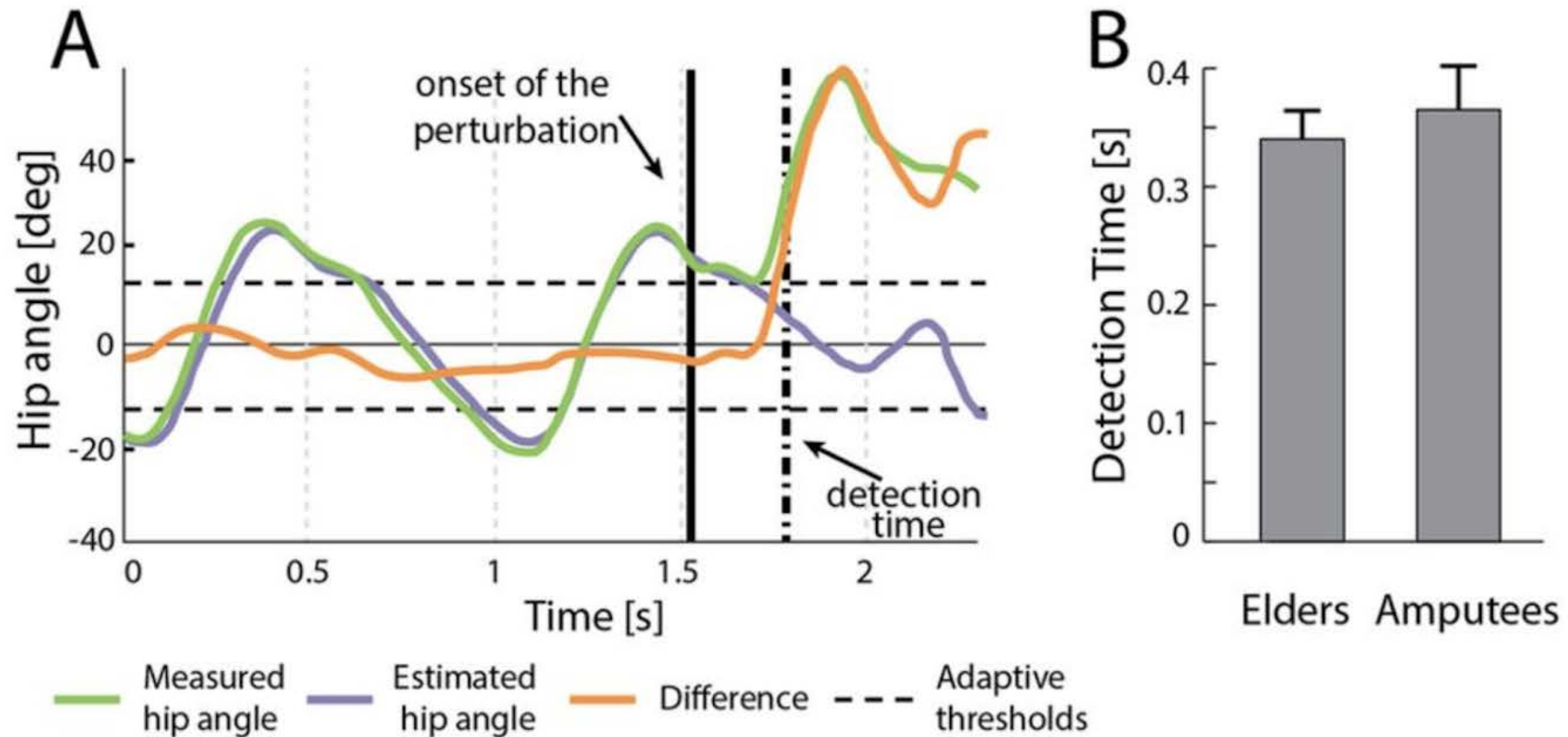
Biomechanics



Torque Requirements



Fall Prevention Algorithm



(A) The adaptive-threshold based algorithm analyses the difference between measured (light green) and estimated (purple) hip joint angles. If the error signal (orange) is over the thresholds (dashed lines), a balance loss is detected. (B) Detection time obtained during the experimental trials for the elderly subjects and amputees (mean values \pm SD).

business model



B2B SALES & UPKEEP FEES

**TO ACUTE REHAB CENTERS
AND HOSPITALS**



DIRECT MARKETING

**TO THE INFLUENCERS IN
THE REHAB SYSTEM:
PHYSICAL THERAPISTS
AND PAYORS**

revenue forecast

63,000 REHAB FACILITIES (TOTAL ADDRESSABLE MARKET)

\$70,000 PURCHASE PRICE

\$5,000 ANNUAL UPKEEP FEE

\$4.4B IN EXOSKELETON SALES

\$315M IN ANNUAL REVENUE

multiyear plan

PHASE 1 1-2 YEARS

ASSEMBLE TEAM

BUILD RELATIONSHIPS

BUILD ML ALGORITHMS

CREATE AND TEST
PROTOTYPE, CO-DESIGNING
WITH PTs AND PHYSICIANS

SECURING CLINICAL TRIALS
WITH MEDICARE AND
MEDICAID (CMS)

PHASE 2 3-6 YEARS

SERIES A AND B

ORTHOTIC BOOT

UPPER HALF EXOSKELETON

HIGH-FIDELITY PROTOTYPE

400 CLINICAL TRIALS

SOFTWARE LICENSING OF
ML ALGORITHMS

PHASE 3 7-10 YEARS

LATE SERIES FUNDING

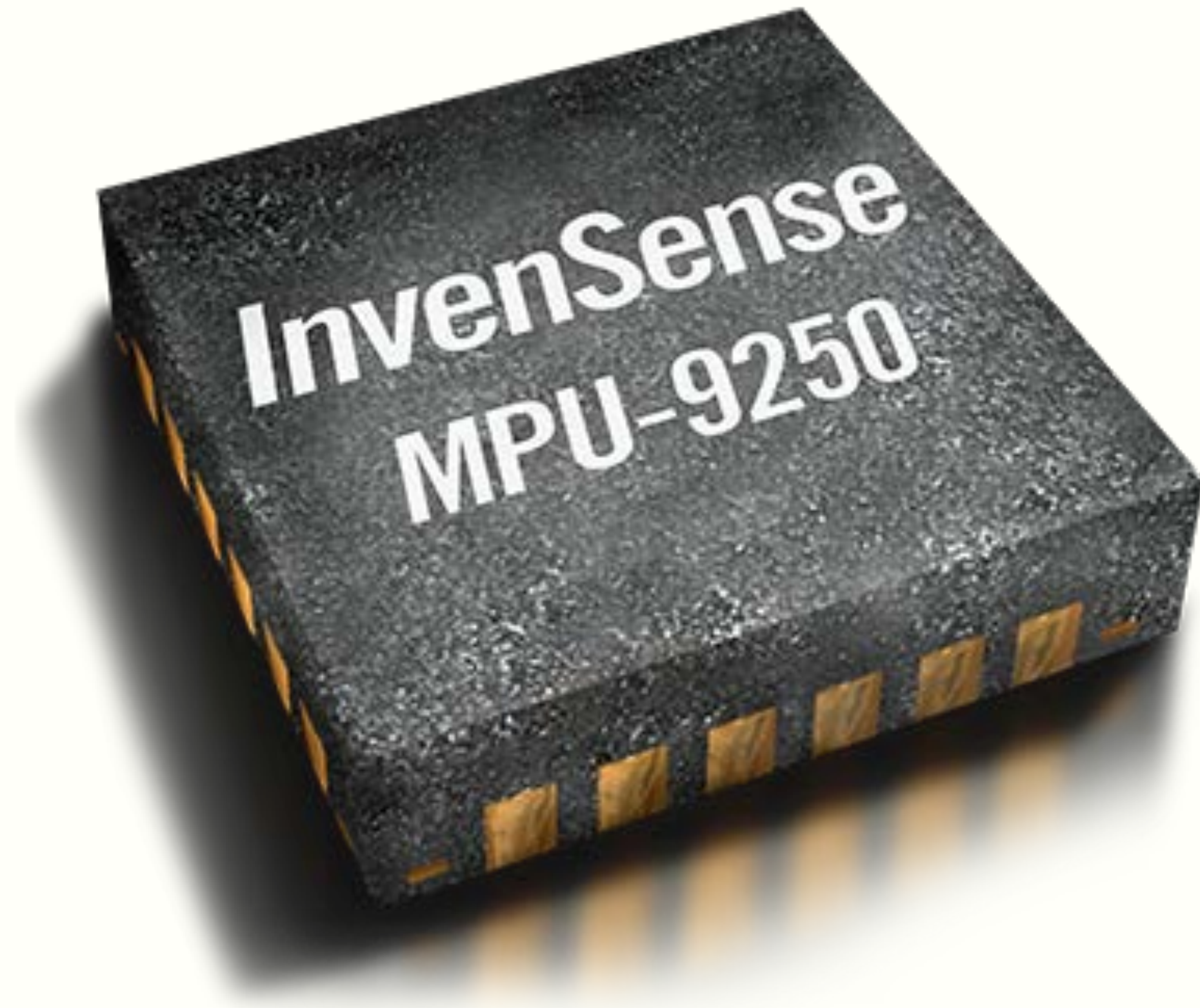
SCALE

FULL EXOSKELETON
PRODUCT LAUNCH



Supplemental
Research

Positioning Sensor



THE MPU-9250 IS A MICRO POSITIONING SENSOR THAT COMBINES CONTAINS A 3-AXIS GYROSCOPE, A 3-AXIS ACCELEROMETER, AND AN ONBOARD DIGITAL MOTION PROCESSOR™ AND THE MARKET LEADING 3-AXIS DIGITAL COMPASS.

Fidlock magnets



**USER FRIENDLY QUICK PULL
MAGNETS DESIGNED BY FIDLOCK.**

50,000 KG STATIC BREAK LOAD

3D Prieto Battery

NONFLAMMABLE, BENDABLE, INEXPENSIVE TO MAKE

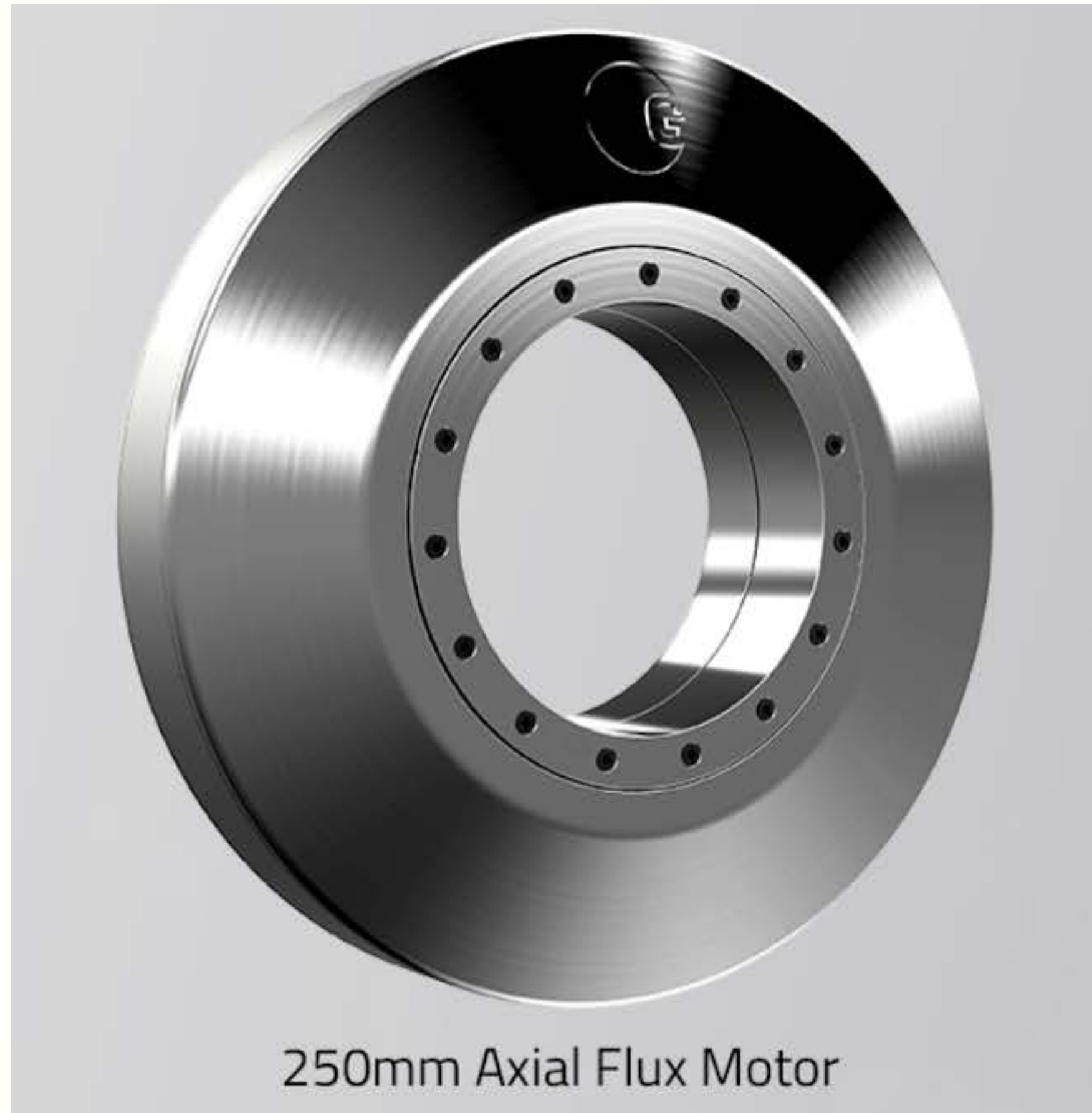
3 TO 5 TIMES THE ENERGY PER VOLUME THAN A CONVENTIONAL BATTERY



HERE'S HOW PRIETO BUILDS ITS 3-D BATTERY:

- ✦ **IT STARTS WITH A COPPER FOAM SUBSTRATE.**
- ✦ **USING AN ELECTROPLATING PROCESS, THE FOAM IS COATED WITH THE COPPER ANTIMONIDE ANODE.**
- ✦ **THEN IT'S COATED WITH A SOLID STATE ELECTROLYTE.**
- ✦ **THEN IT'S COATED WITH A LITHIUM COBALT OXIDE CATHODE SLURRY.**
- ✦ **THE THREE SEPARATE LAYERS SEEP INTO THE CREVICES AND EDGES OF THE FOAM, WHICH HAS GREATER SURFACE AREA TO STORE ENERGY. THE 3-D TEXTURE ALSO SHORTENS HOW FAR ELECTRONS MUST TRAVEL, WHICH SPEEDS UP CHARGING AND DISCHARGING.**

Genesis LiveDrive Motors



250mm Axial Flux Motor

"WE CAN MAKE A MOTOR AS SMALL AS 10 CENTIMETERS IN DIAMETER ALL THE WAY UP TO 76 CENTIMETERS, AND ANY SIZE IN BETWEEN"

WITH 3X TORQUE-TO-WEIGHT OF OTHER DIRECT-DRIVE MOTORS AND 22X TORQUE-TO-INERTIA COMPARED TO BEST-IN-CLASS ACTUATORS, THE LIVEDRIVE™ 250 ELECTRIC MOTOR PROVIDES HIGH PRECISION AND INCREASED STOPPING CAPABILITY, OFFERING HIGHER OVERALL PERFORMANCE THAN COMPARABLE ACTUATORS ON THE MARKET.

**22X TORQUE TO INERTIA, 3X POWER DENSITY,
AND 100X HIGHER PRECISION.**