REHABILITATION ROBOTICS LAB

Located at 1800 Lombard street, Philadelphia, 19146

http://www.med.upenn.edu/rehabroboticslab/
ABOUT US

• Led by Director Dr. Michelle Johnson, the lab consists of an interdisciplinary team working in the fields of robotics, rehabilitation, and neuroscience. Our mission is to develop affordable, assistive and therapeutic robots that can provide effective neurorehabilitation both nationally, and around the world.

Core Research Areas
NEUROREHABILITATION

• Assess the underlying extent of impairment
  • Clinically and experimentally

• Capitalize on neuroplasticity to facilitate motor function recovery via human-robot interaction

• Use both unilateral and bilateral robots
  • Perform activities of daily living (ADLs) such as drinking, pouring, etc.
Unilateral and bilateral Robots

ADLER

BI-ADLER
MOBILE THERAPEUTIC ASSISTANCE

**Purpose:**
Explore and develop technologies that permit remote rehabilitation between the patient, clinician and caregiver

**Why is it necessary?**
- **Health Care Crisis**
  - Changing demographics
  - Aging population
  - Low birth rates
  - **Not enough rehabilitation professionals**

*Source: World Population Ageing 2013, UN Department of Economics and Social Affairs (Population Division)*
Baxter as a therapist

- Current study involves 3 stages
  - *Learning* how to mimic a therapist
  - *Demonstrating* what has been learned
  - *Teaching* desired therapy to the patient

- Development of grippers with tactile sensing
  - Capable of dexterous manipulation

Flo

- Combination of two off the shelf robots (Nao and VGo)
- Designed to provide remote and in-person “hands off” therapy
Why affordable robots?

- Outpatient & Inpatient rehabilitation services have limited outcomes
- Need for access outside of these rehabilitation services
  - Community rehabilitation
- In LMICs these issues are compounded
  - **Economics:** Not affordable
  - **Training:** Unavailability of skilled caregivers
  - **Technology:** Limited access to state of the art technology
AFFORDABLE GLOBAL PROJECTS

- Design and develop low cost therapy devices like the Thera Drive
  - Went through a few iterations and upgrades continue

- The current system features:
  - Haptic feedback (with varying level of assistance or resistance)
  - Off-the-shelf video game integration (but without force feedback)

- Future challenges
  - Integrate force feedback in game mechanics
  - Develop system that includes a mix of lower extremity therapies too
Partners abroad

- Established partnership with an institute (ITESM) in Mexico

- Working with partners in Botswana through the Botswana – UPenn partnership

- In the process of establishing partnership with a university in Latin America
Video Compilation of projects