

# Increasing Engagement in Environmental Citizen Science with Application to Telerehabilitation

Roni Barak Ventura  
Maurizio Porfiri, PhD  
Oded Nov, PhD  
Preeti Raghavan, MD

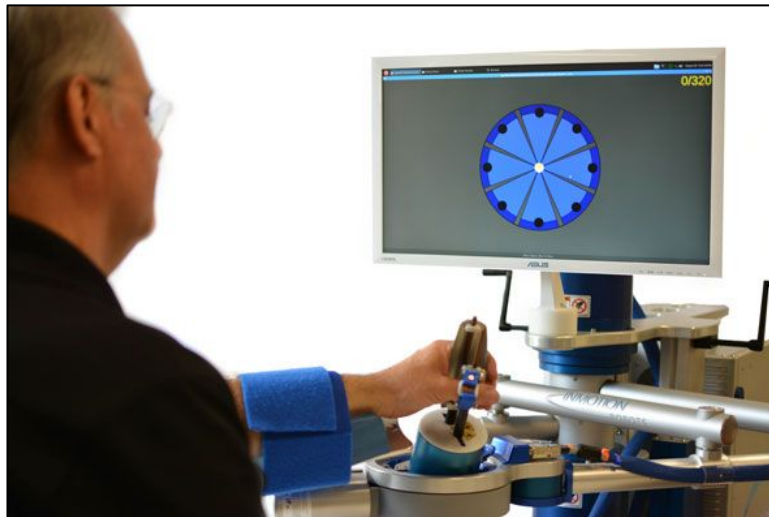
MOXXI 2019 - March 11th, 2019

- Stroke is the leading cause of adult disability
- 795,000 Americans suffer a stroke every year.
  - 600,000 are first attacks, and 185,000 are recurrent
- Physical rehabilitation is administered to regain independence
  - Repeating motor tasks with high intensity at a high frequency improves rehabilitation outcomes



# Technology-Mediated Telerehabilitation

- Convenient
- Accessible
- Cost effective
- Remotely reprogrammable
- Allows therapists to treat multiple patients simultaneously



InMotion ARM™ Interactive Therapy System



ARMin III Arm Therapy Exoskeleton

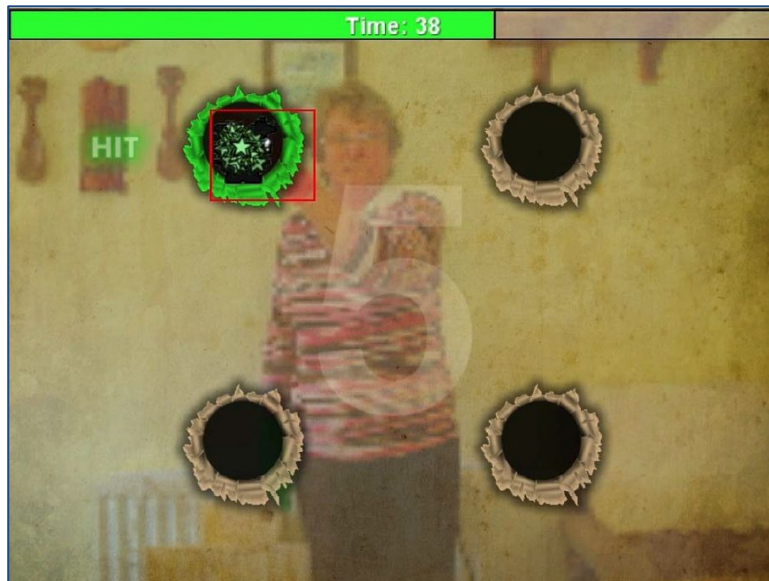


Novint Falcon

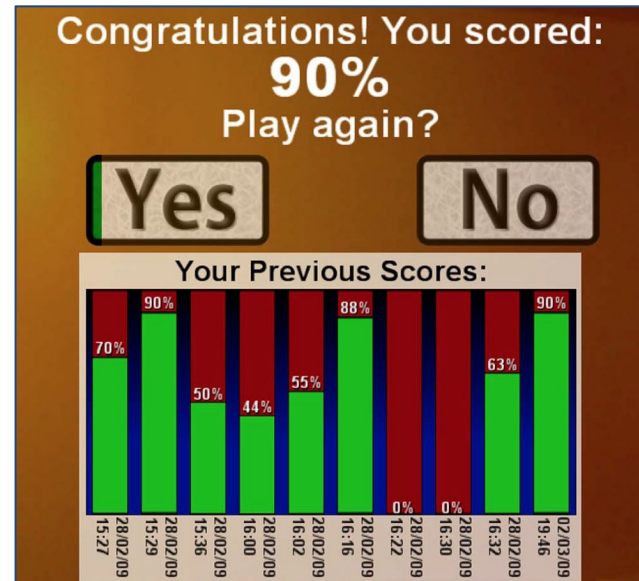


# Motivational Interventions NYU in Telerehabilitation

- Low compliance is observed among patients undergoing rehabilitation
- Game-like interfaces are developed for increasing engagement in rehabilitation exercises



Burke et al. 2009, *Vis Comput*



Burke et al. 2009, *Vis Comput*

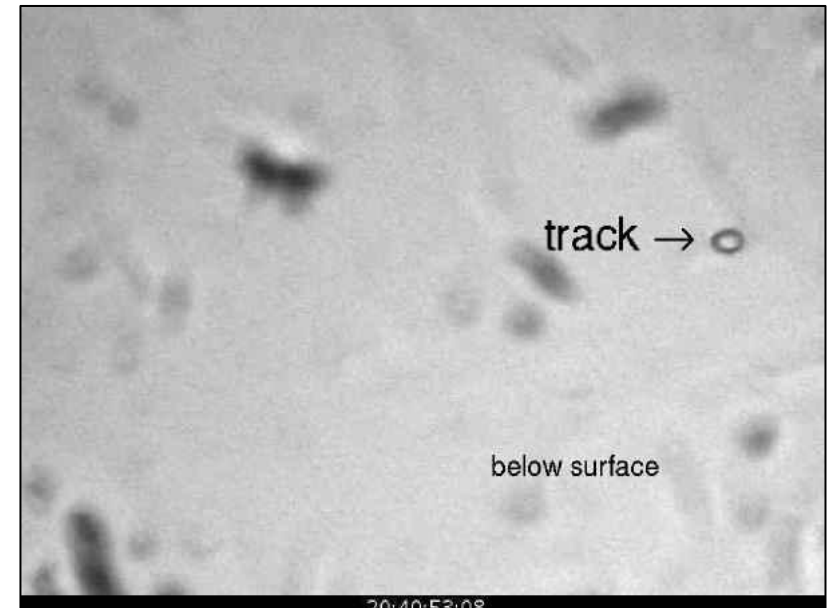


OmniVR, Accelerated Care Plan

- Scientific research conducted by amateur, non-professional scientists
- Research tasks range from analyzing pictures of the galaxy to folding proteins
- Software typically incorporate motivational interventions



South Carolina Aquarium Citizen Science



Stardust@home



# The Gowanus Canal

- Historically important passage for cargo transportation from and into Brooklyn
- Years of sewage flow and toxic waste have turned the Gowanus into one of the most contaminated canals in the U.S.

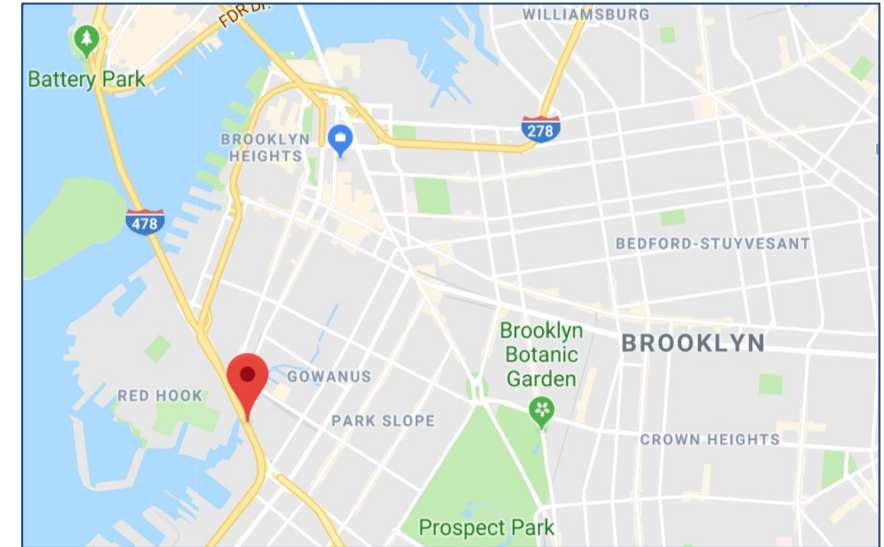


Photo Credit: Epoch Times



Photo Credit: Damon Winter



Photo Credit: Fritz Hoffmann

- A local initiative for environmental monitoring of the Gowanus Canal using a remotely controlled robotic boat, made by our lab
- The robot collects information about water quality and takes pictures of the canal and its surroundings



Photo Credit: Jeff Laut

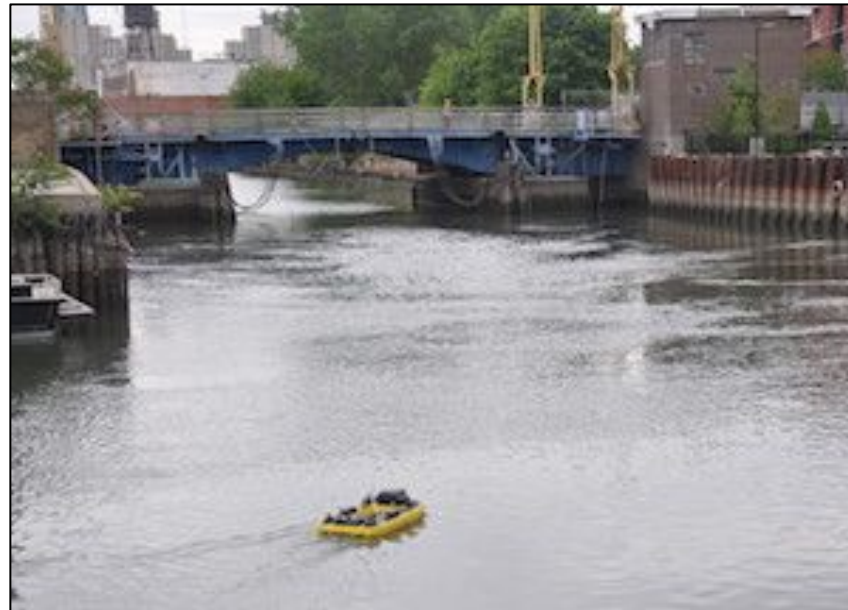
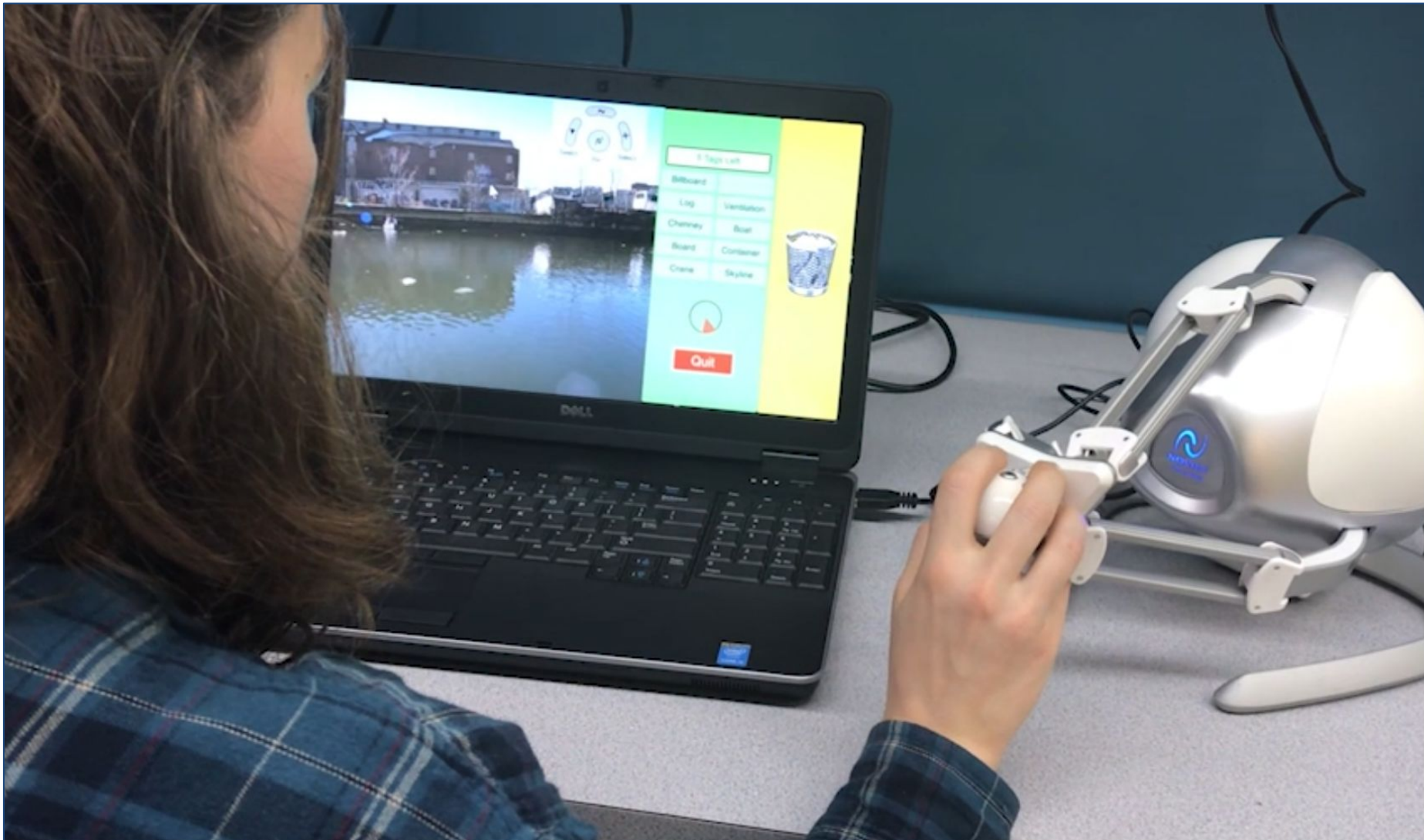


Photo Credit: Jeff Laut

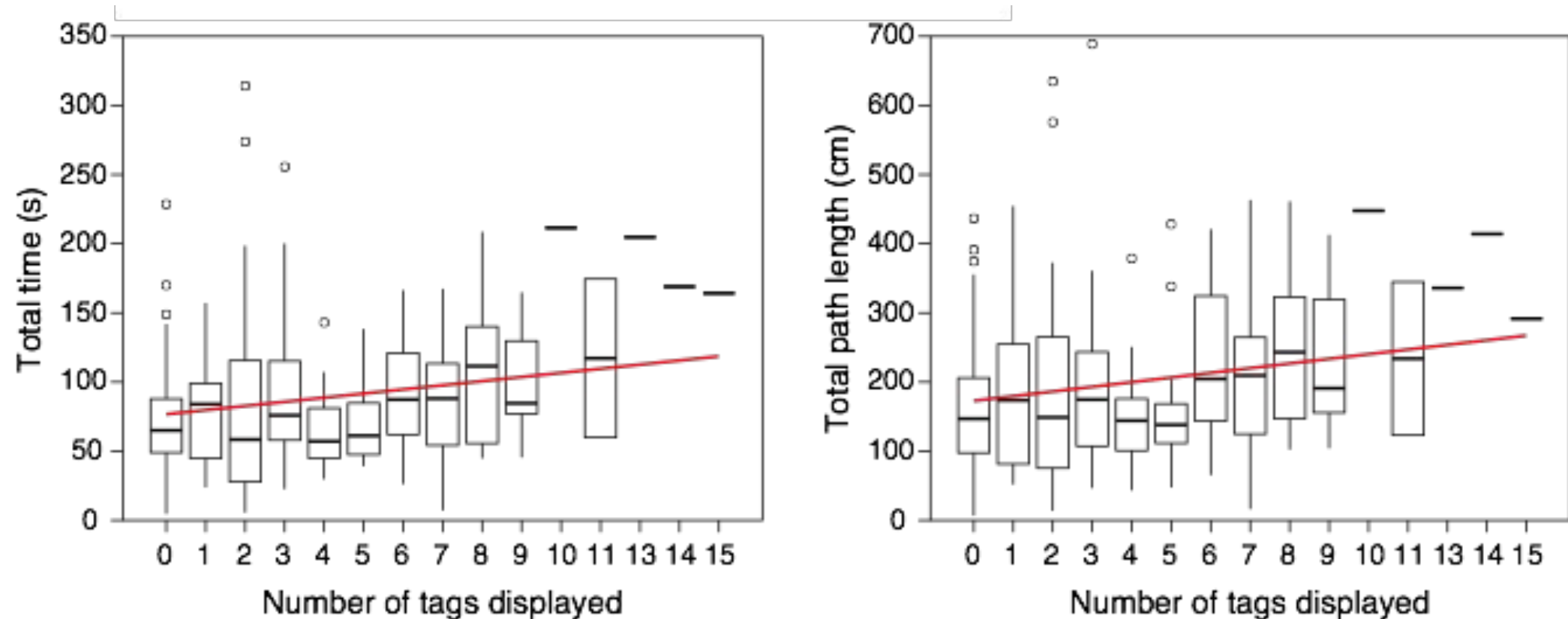








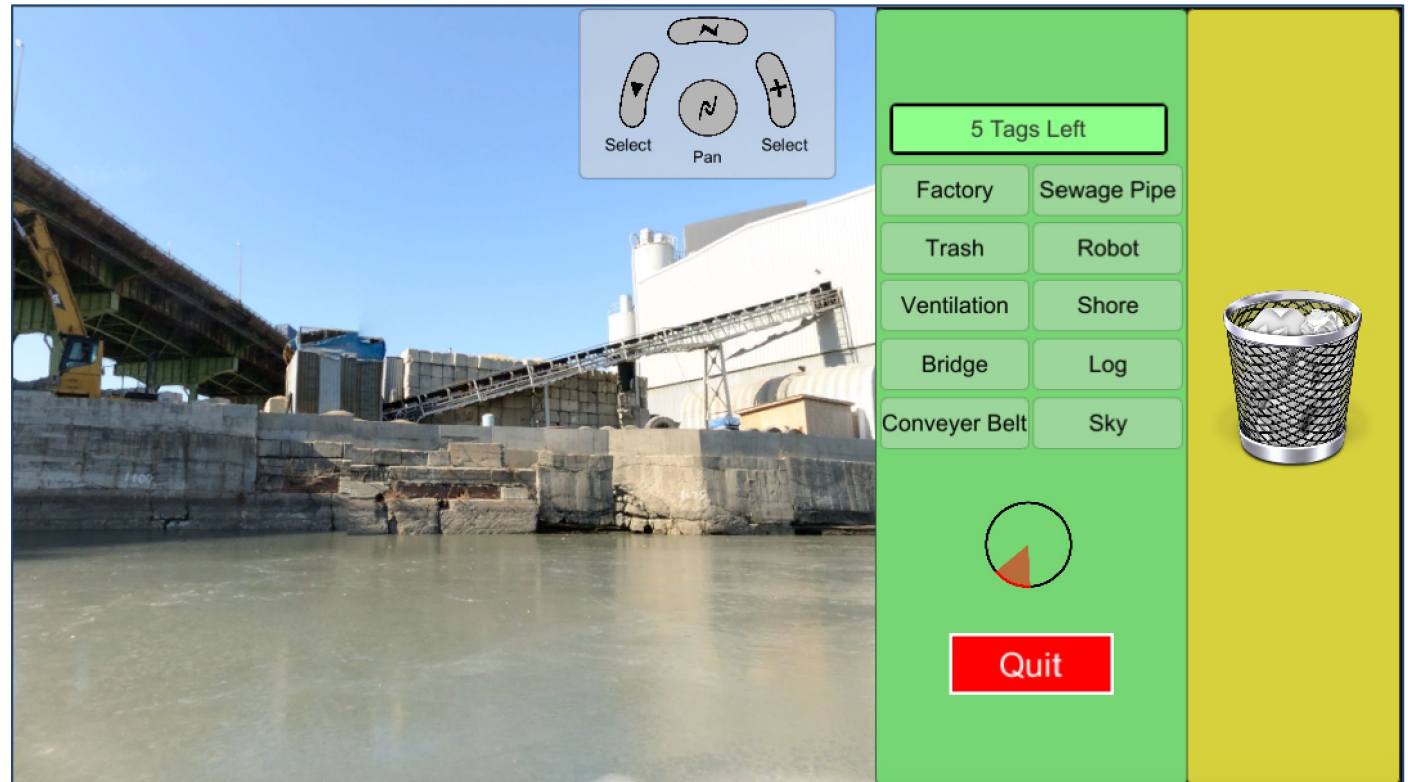
## Improves Performance



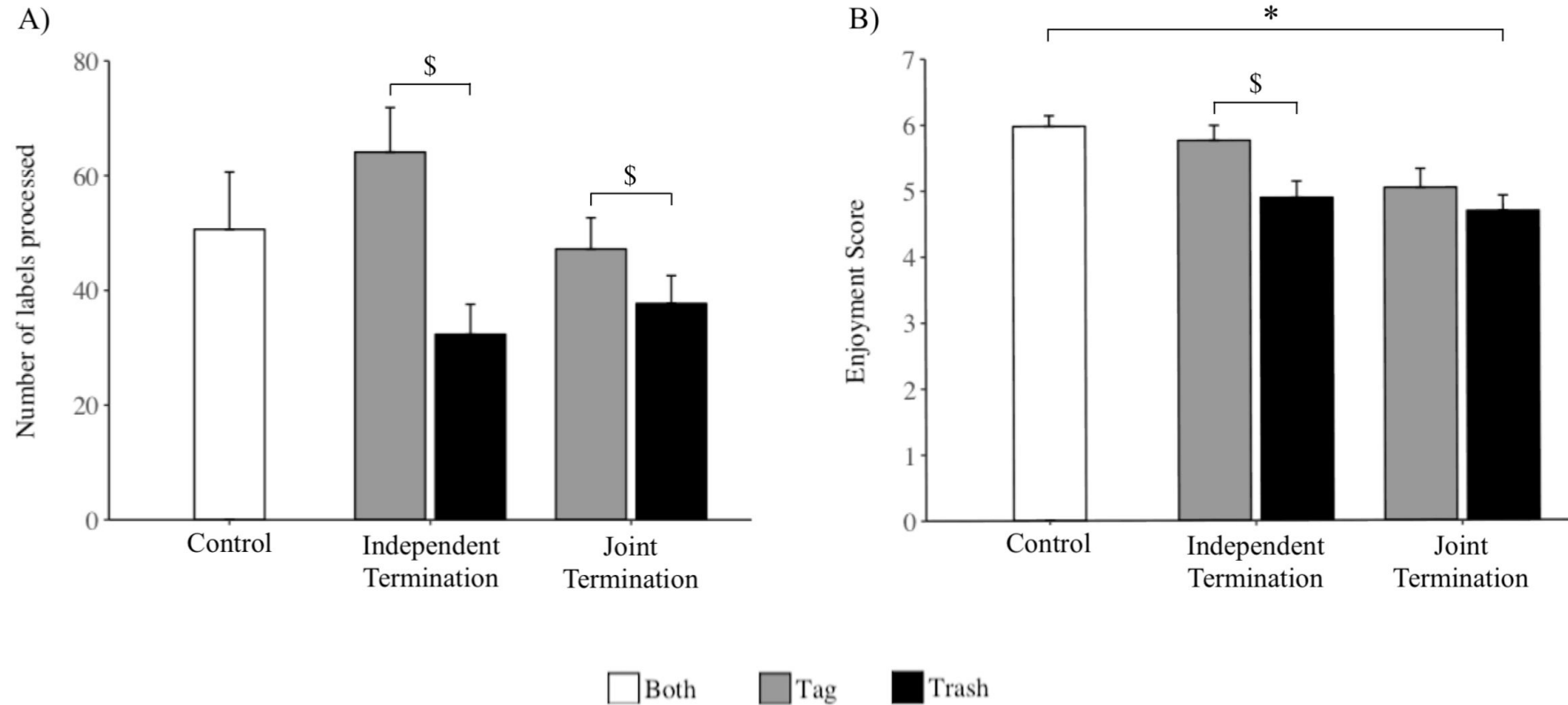
People spent longer and moved more in tagging as more tags were displayed

# Cooperative Citizen Science

- 2 tasks
  - Allocate tags, trash tags
- 3 conditions:
  - Isolated user
  - Cooperating peer, independent termination
  - Cooperating peer, joint termination



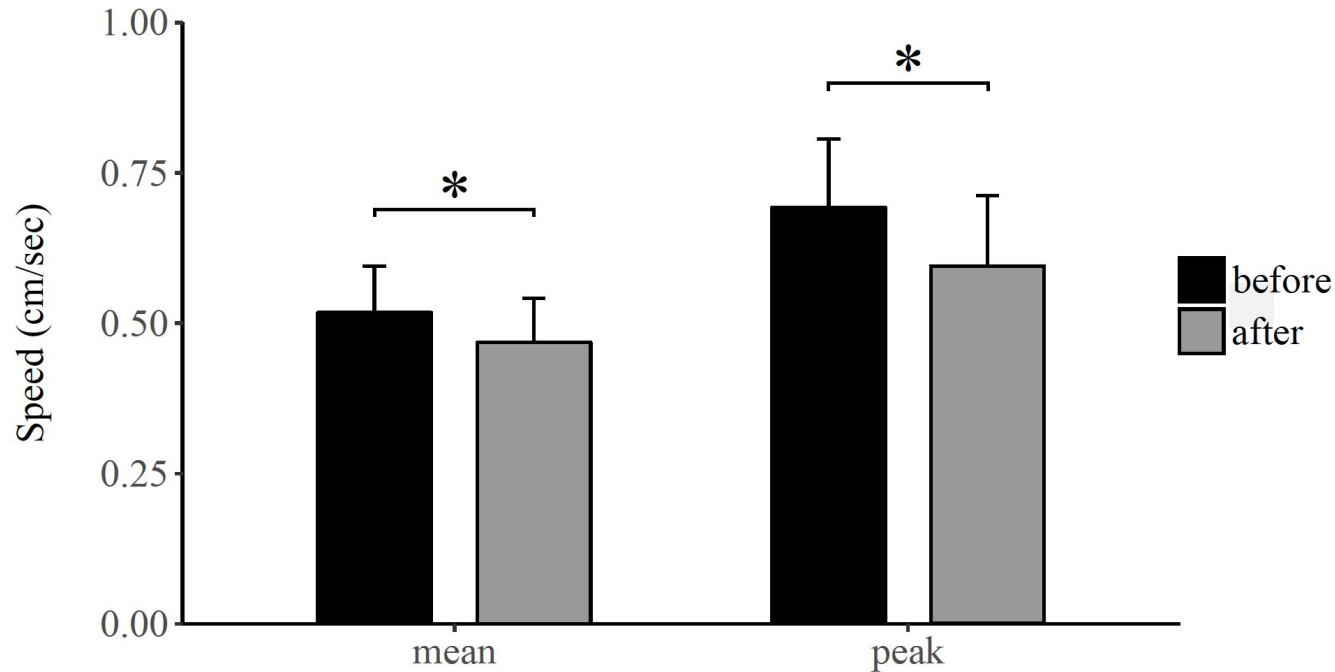
# Cooperative Citizen Science



Patients engagement can be tuned through task assignment and the level of interdependence



# Cooperative Citizen Science



- Patients reduced speed after their peer has withdrawn
- Suggests social presence encourages patients to perform better

## **Citizen science can increase engagement in physical therapy**

- Patients' self-esteem will be boosted
- Patients will be motivated to perform exercise more frequently
- Patients will perform exercise more intensely

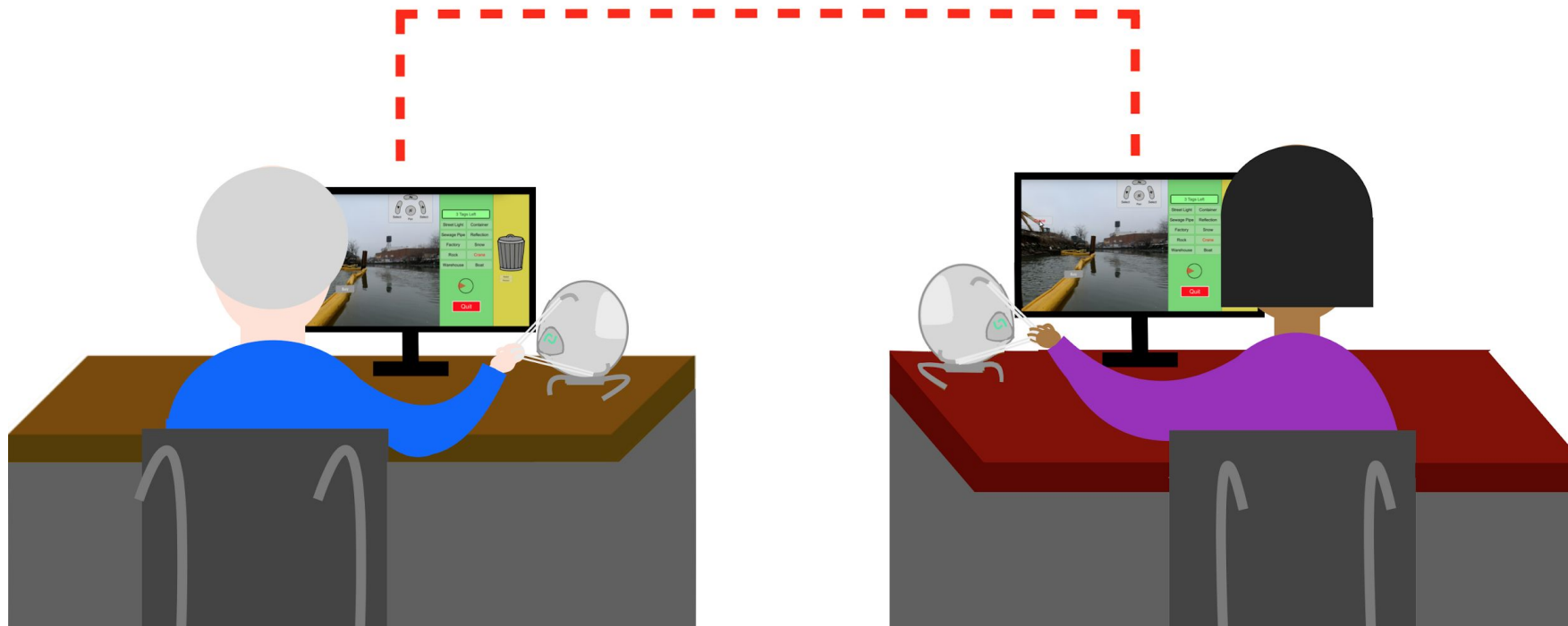
## **Low-cost gaming systems increase accessibility to high quality physical therapy**

- Devices are small, portable, and affordable
- Remote monitoring by medical professionals

## **Social interactions can further enhances engagement**

- Alleviate loneliness and depression

- Explore other low cost gaming systems
- Establish remote data collection for medical assessment by therapists





# Thank you



**Mitsui USA**

## Questions?