

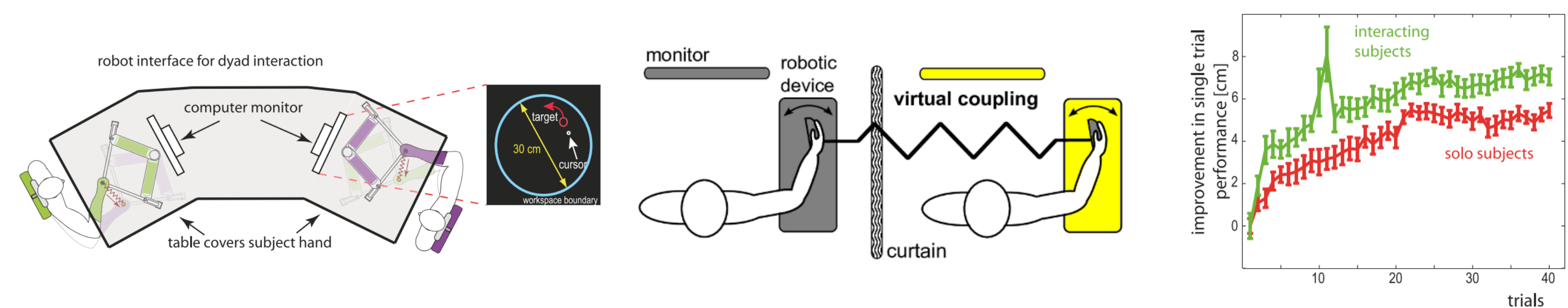
Co3-Robot controllers for human-like physical interaction and enhanced motor learning

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<https://www.sralab.org/clinical-trials/human-robot-controllers-enhanced-motor-learning-hrceml>



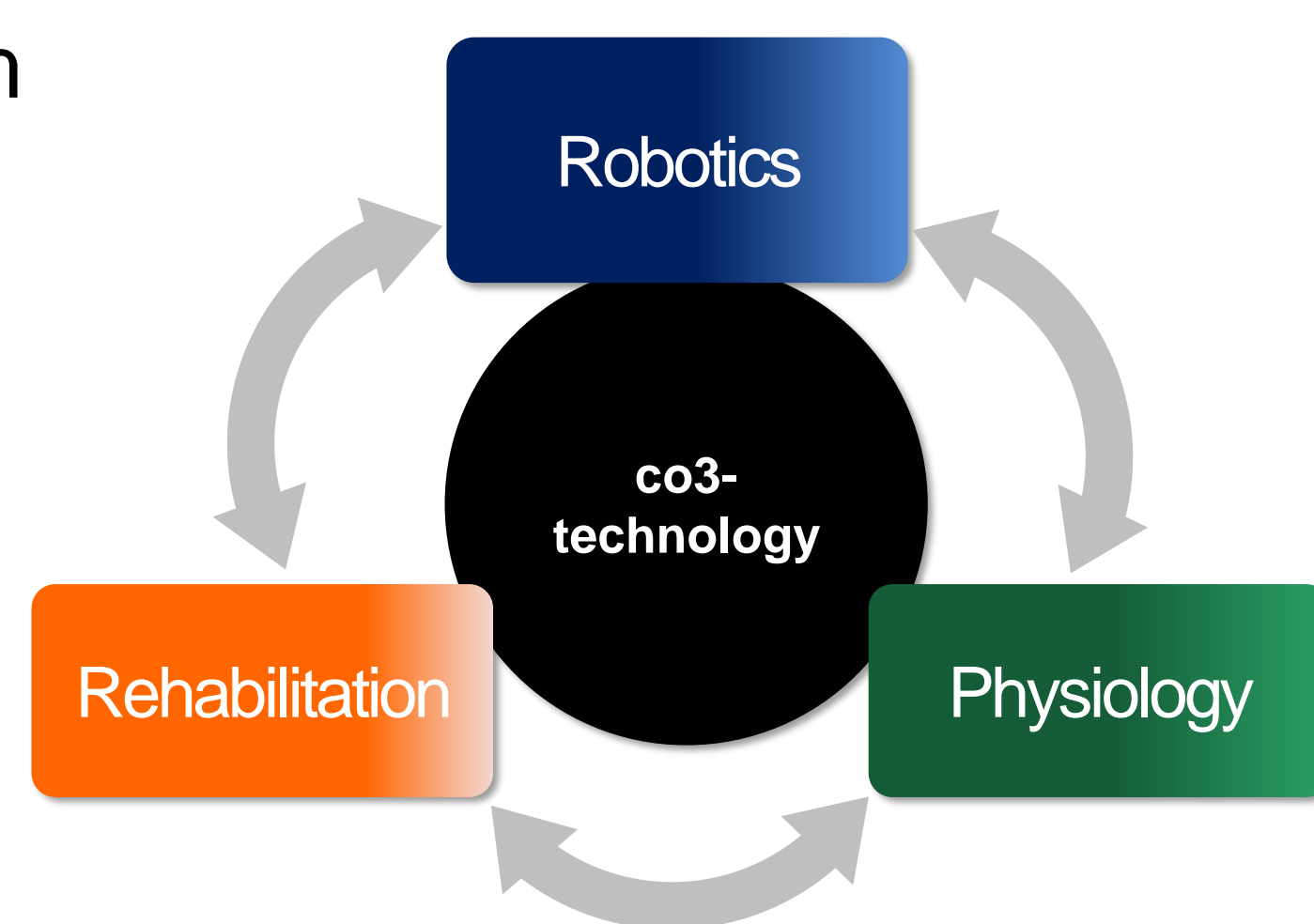
A Background

- Human *dyads* or pairs were shown not only to perform motor tasks better but also learn new tasks faster during certain physical interaction tasks compared to doing it alone (Ganesh, 2014)(Takagi, 2018)



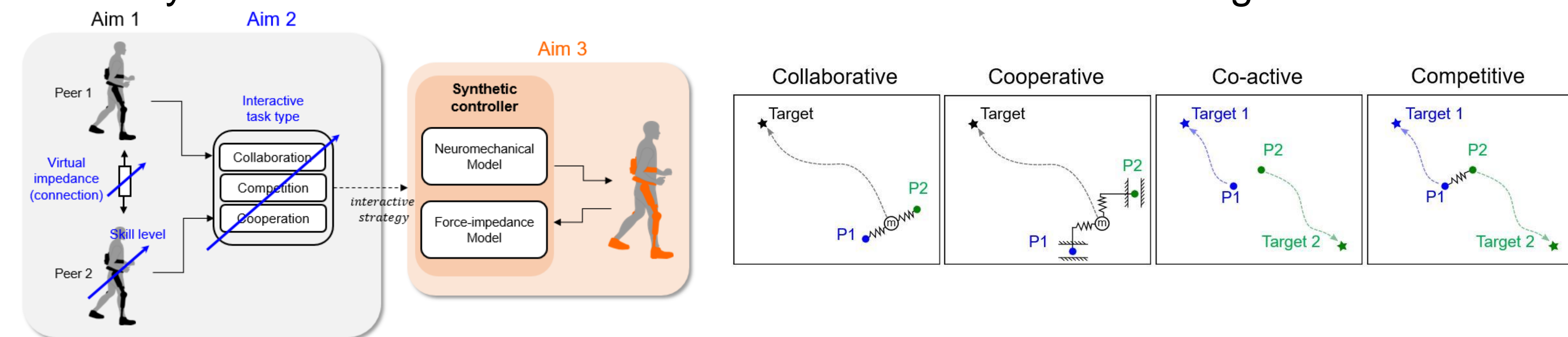
B Scientific Impact

- Understanding the underlying mechanism of human-human interactive motor behaviors is critical for the design and control of a robot system to improve human-machine performance (e.g. teleoperation/collaborative robots) or to enhance human motor learning capabilities (e.g. rehabilitation robots).

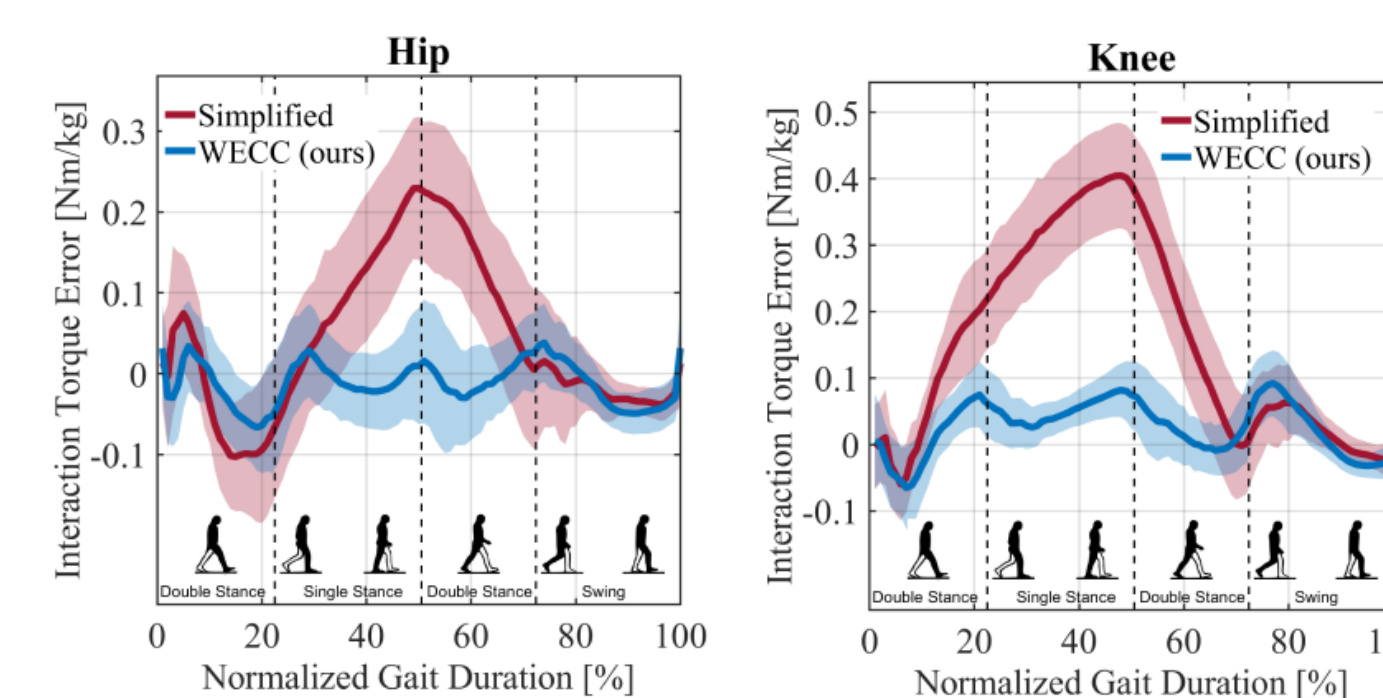


C Key Innovation & Contributions

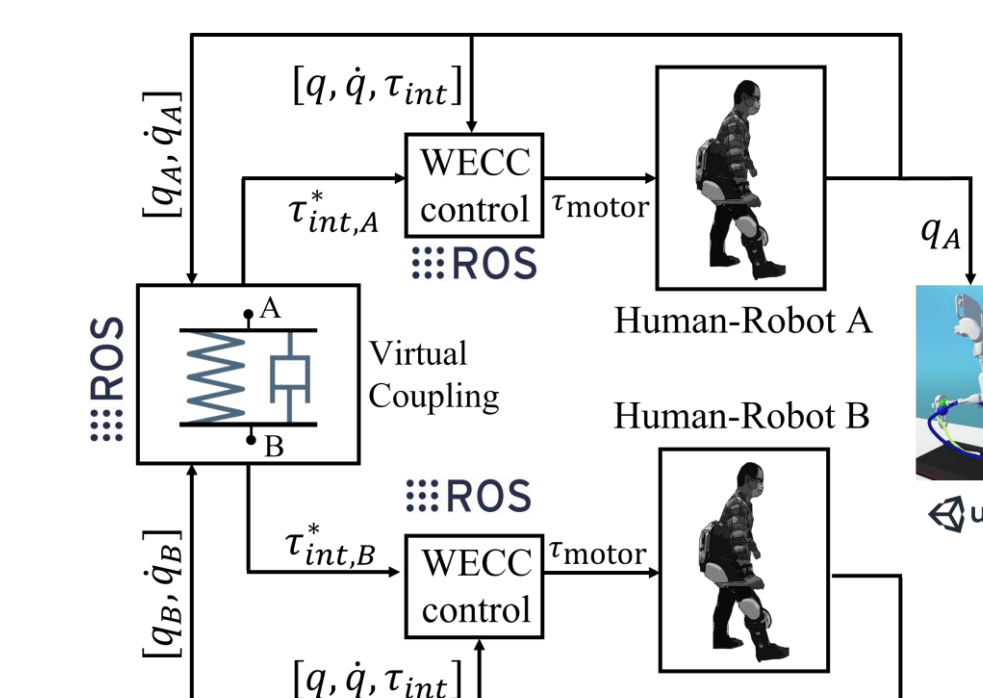
- Project Overview
 - Aim 1: Infrastructure development
 - Aim 2: Mechanisms of human-human dyadic haptic interaction
 - Aim 3: Synthetic robotic co3-controller for enhanced motor learning



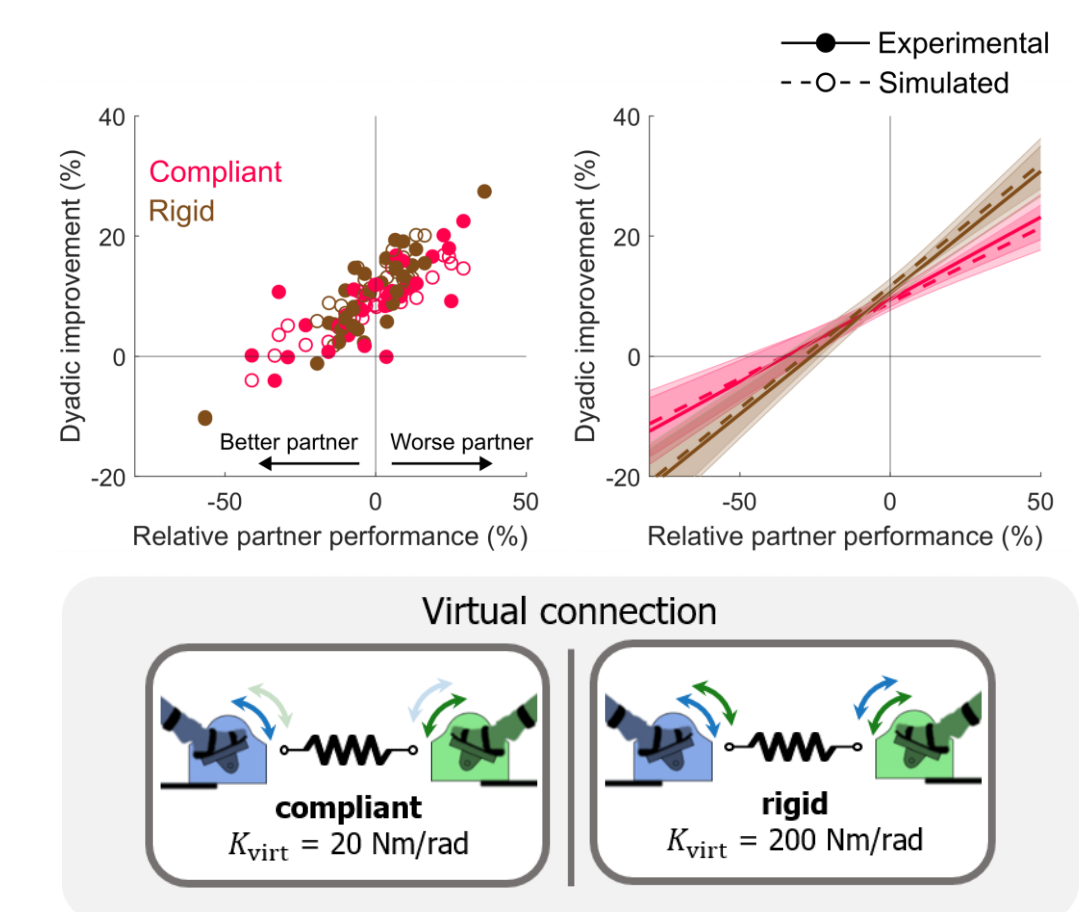
- Current Development and Experimentation (Aims 1 & 2)



Comparison of transparent control methods for lower limb exoskeleton



Schematic for virtual haptic connections across multiple individuals



Effects of virtual stiffness on ankle tracking performance

D Broader Impact

- Co3-technologies can enhance existing tools and devices with a haptic communication modality, thus supporting joint physical interaction between humans and robots.
- Develop an open source dyadic haptic co3-robot that can be used for motor control studies, robot controller design and motor learning during dyadic haptic interaction.
- Hospital-based outreach programs to increase science awareness in the community, and through a related K-12 learning module in math, science and social science.
- Annual summer school on neurorehabilitation to provide education on advanced procedures for neurorehabilitation.



K-12 education photo