

A photograph of a person lying on a table in a medical setting, undergoing an ultrasound scan of their back. A healthcare professional is using a probe on the person's back. A large monitor in the background displays a blue-toned ultrasound image. The scene is framed by decorative circular cutouts and a light blue patterned background.

Healthy Aging

of Cardiovascular & Musculoskeletal Systems

Naomi Chesler, University of California, Irvine

X. Edward Guo, Columbia University

Our Team Spans Disciplines & Schools



X. Edward Guo, CU

Biomedical Engineering, Mechanics of Soft Tissues, Preterm Birth, Hydrated Biomaterials



Natalie Bello, CU

Cardiology, Preeclampsia, Cardiac Health



Christine Hendon, CU

Electrical Engineering, Imaging, Cardiac Electrophysiology



Lance Kam, CU

Biomedical Engineering, Immune Engineering, Microfabrication



Wendy Liu, UCI

Biomedical Engineering, Chemical & Biomolecular Engineering, Materials & Microfabrication, Regulating Cell Behavior, Multicellular Behavior, Cardiovasculature



Naomi Chesler, UCI

Biomedical Engineering, Cardiovascular Mechanobiology & Biomechanics, Engineering Education, Diversity, Equity & Inclusion in STEM



Spandan Maiti, Pitt

Biomedical Engineering, Mechanical Engineering & Materials Science, Computational Mechanics



Katie Reuther, UPenn

Biomedical Engineering, Development & Translation of Early-Stage Medical Tech., Biomedical Tech. Accelerator



Gordana Vunjak-Novakovic, CU

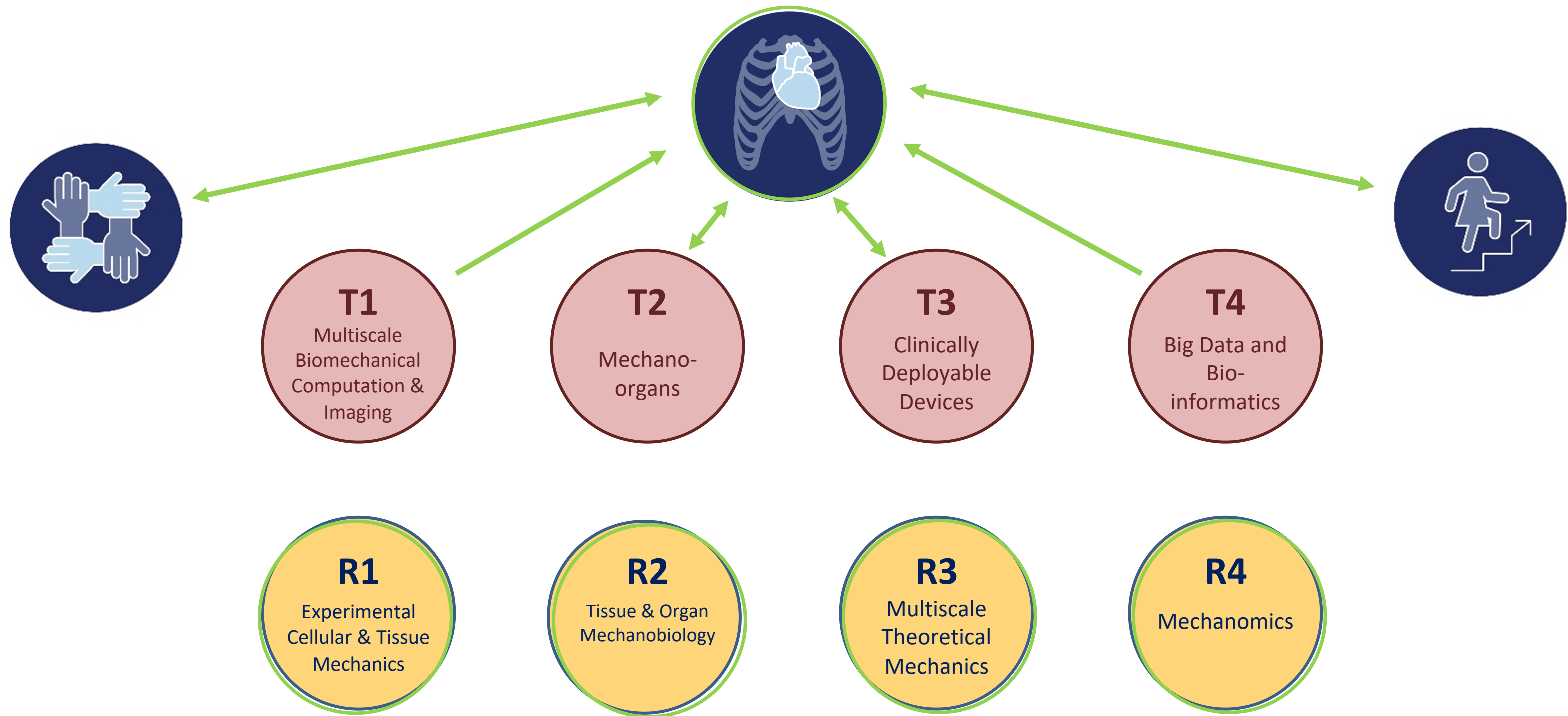
Biomedical Engineering, Medicine, Dental Medicine, Regenerative Medicine, Tissue Engineering, Organs on a chip



Harry West, CU

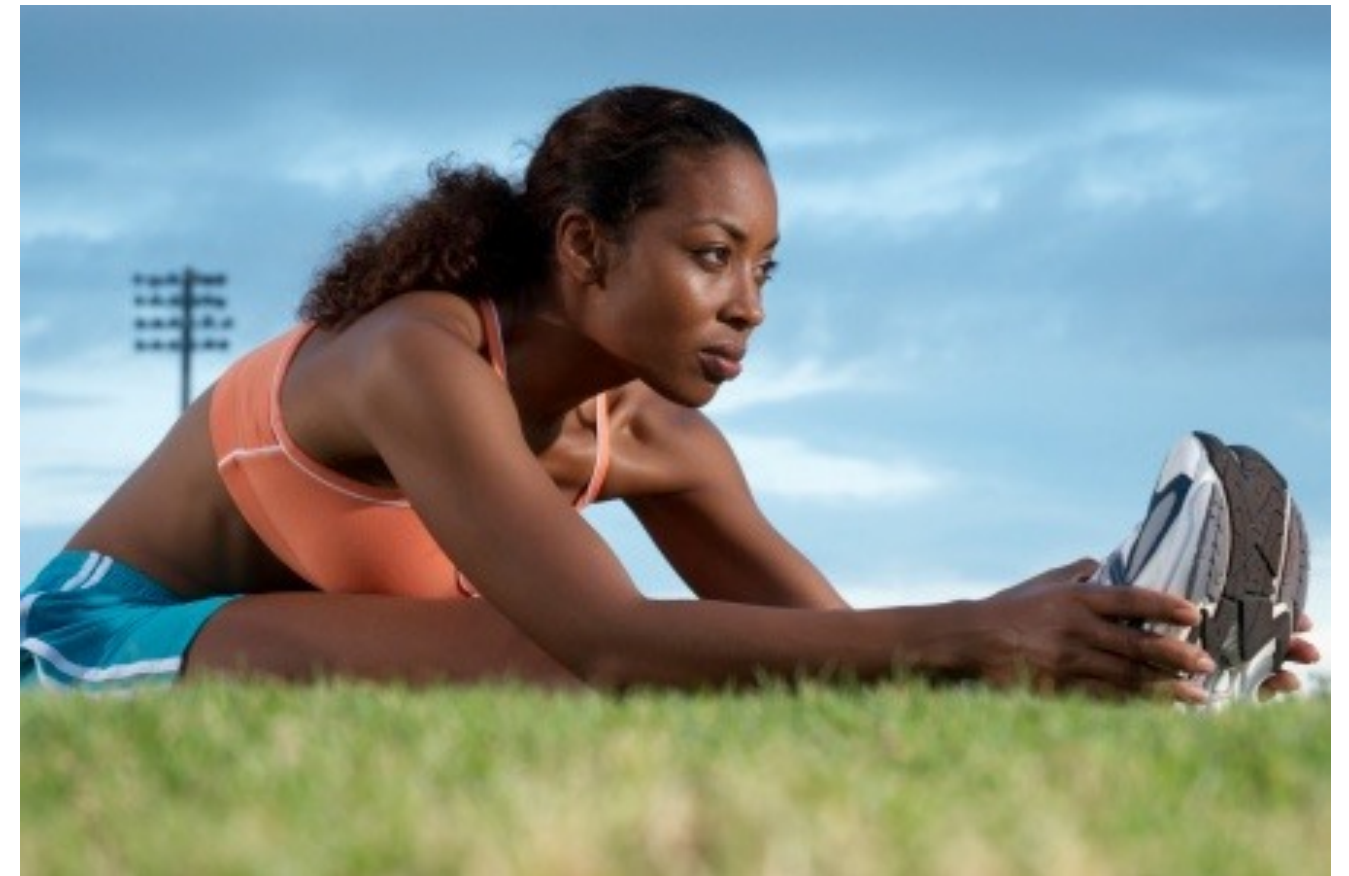
Mechanical Engineering, Industrial Engineering and Operations Research, Product Design Methodology, Service and Experience Design

Healthy Aging Employs all Enabling Technologies and Contributes to all Research Thrusts



Promote Healthy Aging

- Investigate and improve women's health through physical exercise
- Focus on cardiovascular and musculoskeletal systems
- Be intentional about Black women's health



Answer Key Questions about Healthy Aging

- What are the multi-organ effects of exercise and different exercise regimes?
- How can we use exercise to restore pelvic floor strength?
- Can an exercise regime prevent preterm birth?
- How can we mimic the impact of exercise on cells and tissues?
- Does exercise have a disproportionate benefit for Black women?



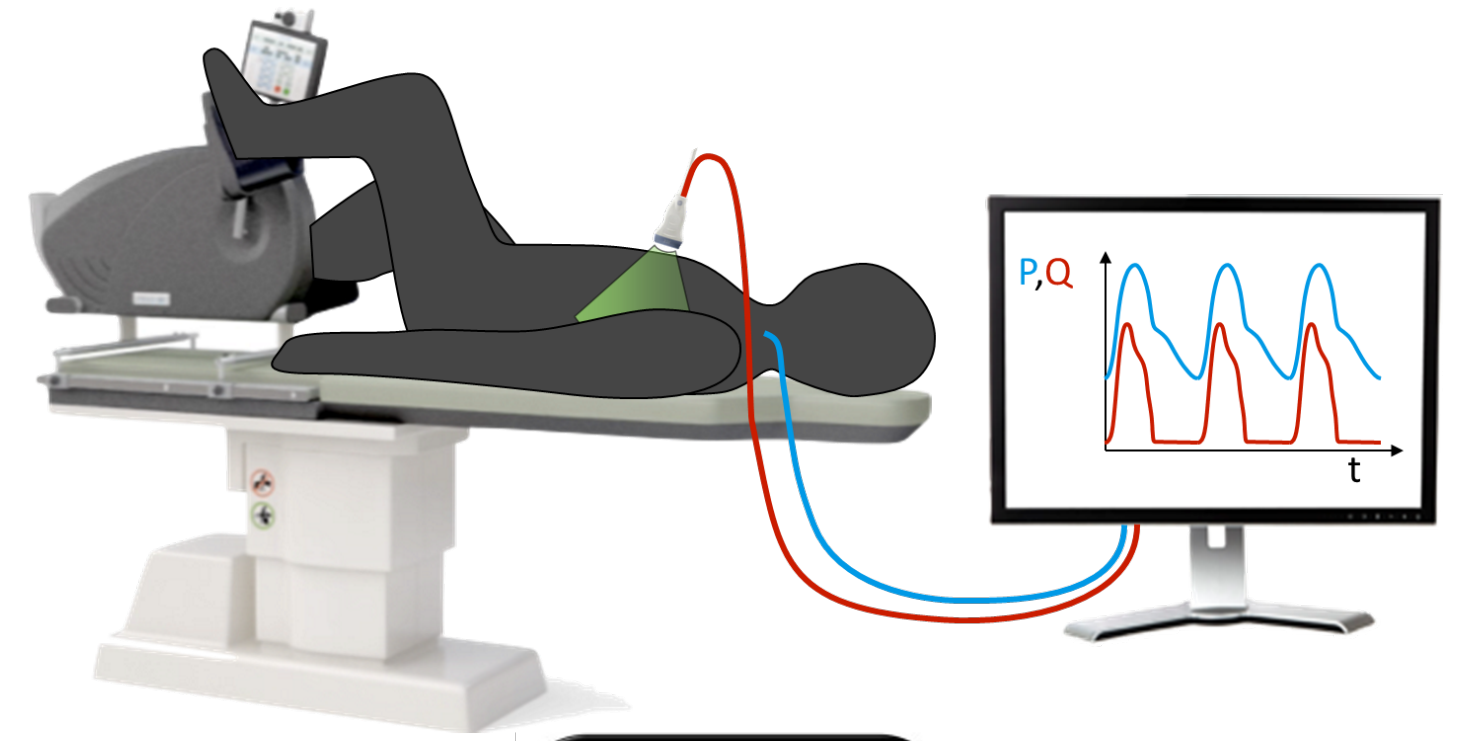
Healthy Aging Goals

- Scientific basis for benefits of exercise on women's health
 - Regimes
 - Equipment
 - Monitoring Devices
 - Pharmaceuticals
- Therapeutic exercise programs for Pelvic Floor health
- Impact of mild to moderate exercise programs on Pre-term Birth
- Advance understanding of health disparities



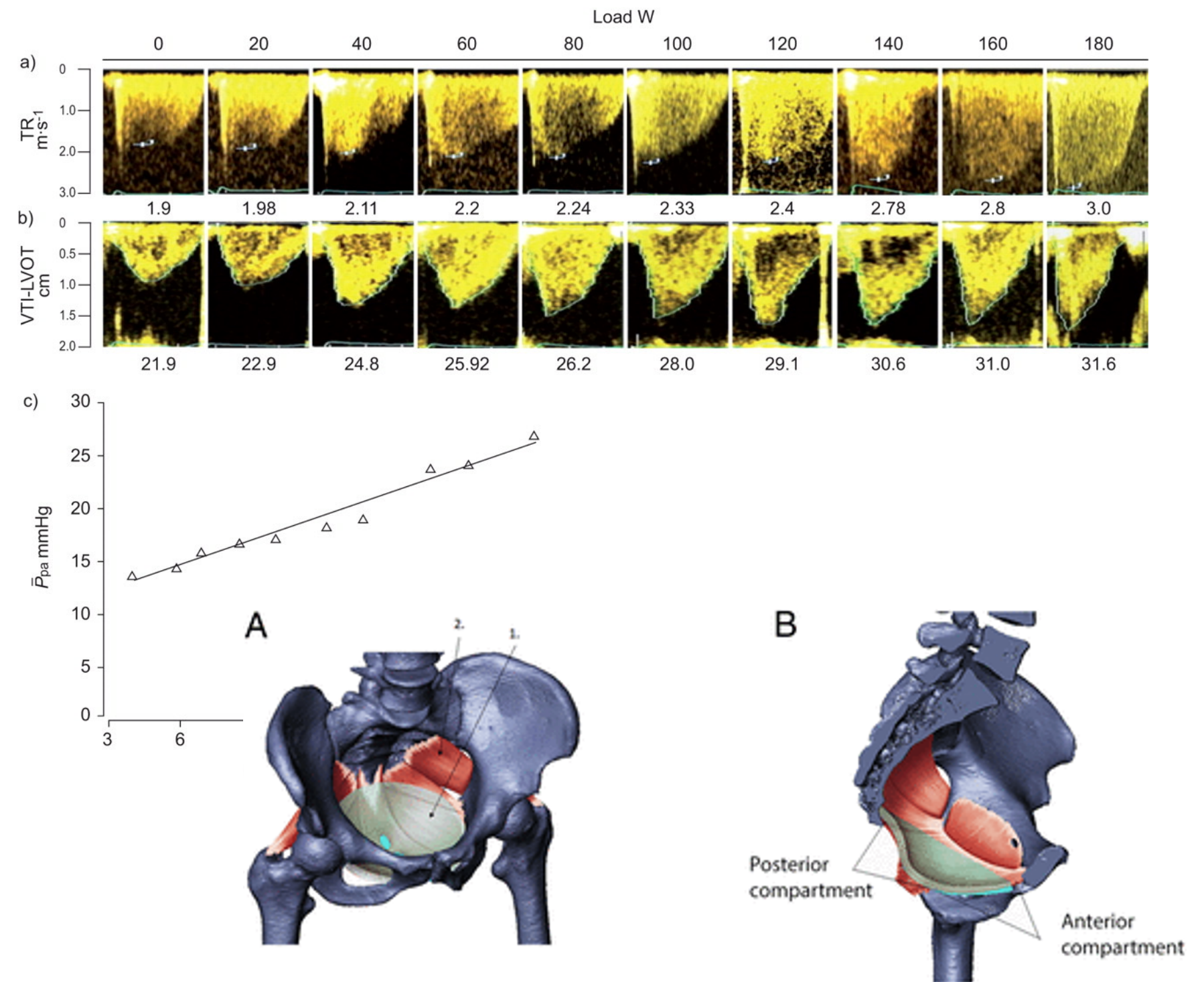
Enabling technology needs

- Multiscale biomechanical computation & imaging
 - Quantify impact of exercise
- Mechano-organs
 - Deliver mechanobiological stimuli
 - Screen/discover novel compounds
- Clinically deployable devices
 - At home monitoring
 - Magnetic stimulators
- Big data and bioinformatics
 - Identify therapeutic targets
- Recruit racially diverse populations

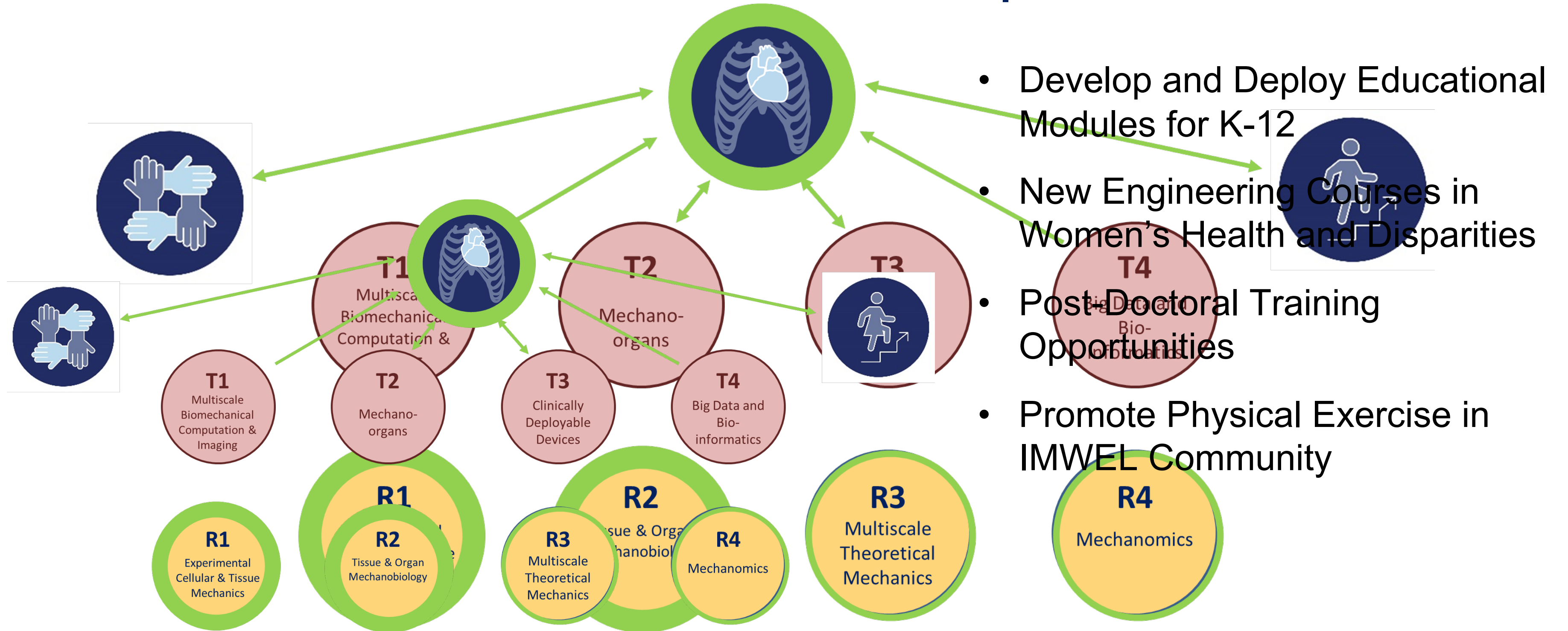


Healthy Aging Research Contributions

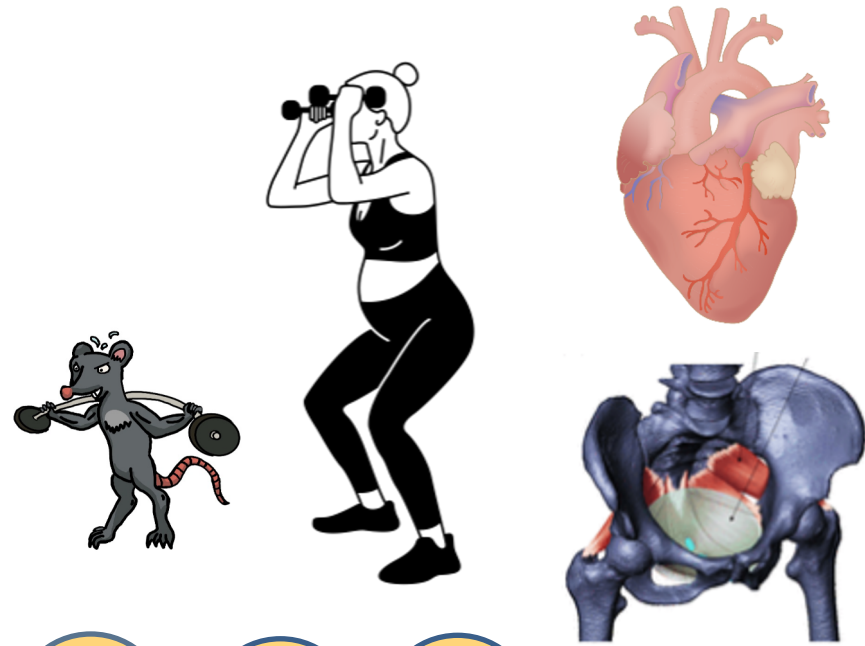
- Experimental cell and tissue mechanics
 - Model and measure the impact of exercise
- Tissue and organ mechanobiology
 - Measure response to exercise stimuli
- Multiscale theoretical mechanics
 - Predict effects of exercise
- Mechanomics
 - Use Big Data to identify drivers of healthy aging
- Mechanobiological understanding of health disparities



Healthy Aging Promotes and Benefits from Inclusion and Workforce Development



Human & Animal Exercise Studies

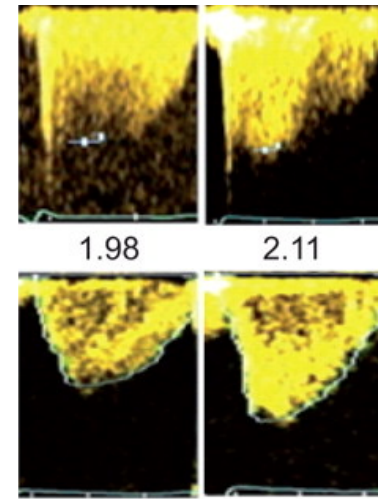


R1

R2

R4

Mechanical Stimulation of Tissues and Cells



R1

T1

T2

Women-Centered Physical Exercise In All Age Groups and Pregnancy



R4

T1

YEARS 1-2

- Evaluate effects of exercise with focus on pregnancy and aging
 - Animal models
 - Human studies

YEARS 3-5

- Organ-on-Chip studies under mechanical stimulation
 - Stimuli developed from multiscale mechanics
 - Mechanomics
 - Big data to identify key factors
 - Advanced mechano-organ systems
- Contribute to clinically deployable device development

YEARS 5-10

- Implement prescribed exercise studies
- Test novel exercise devices
- Distribute User experience (Ux) Apps
- Test novel therapeutics

Systems Testbeds Q&A

