Function Assessment Core (FAC)

Roger A. Fielding, PhD and Thomas Storer, PhD
Co-Directors

Roger A. Fielding, PhD
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JM USDA Human Nutrition Research Center on Aging Tufts University
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Specific Aims:

- To provide an organized infrastructure for FAC-supported procedures and activities across Tufts' Human Nutrition Research Center on Aging, and Brigham and Women's Hospital Laboratory of Exercise Physiology and Physical Function and serve as focal point for interdisciplinary collaboration by OAIC investigators in the development, evaluation, and application of new and existing tools and instruments to assess musculoskeletal impairments, physical function, and disability in older adults to evaluate the efficacy of function promoting therapies.

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Specific Aims:

- To provide direct measurement and consultative services, as well as assist with proposal development for clinical studies supported by, or associated with, the theme of the OAIC that require measures of musculoskeletal impairments, physical function, and/or disability.

- All Core services employ standardized equipment and operating protocols for the assessment of muscle performance and functional limitations in human studies, and maintain extensive quality control procedures including: personnel training and certification; equipment maintenance; and quality control.

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Specific Aims:

- To develop novel and innovative approaches to assess musculoskeletal impairments, physical function, and disability in older adults.

- The FAC will also support innovative developmental projects that seek to develop or further validate innovative approaches to assess musculoskeletal impairments, physical function, and disability in older adults.

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"Pepper-supported" Projects:

New Awardees:

Kieran Reid, PhD: Translating exercise into the community to preserve independence among older adults with motoric cognitive risk syndrome.

Lien Quach, PhD, MD: Physical Function: The roles of social engagement and cognitive impairment.

Shivani Sahni, PhD: Mediterranean diet, related antioxidants and frailty.

Prior Awardees:

Donato Rivas, PhD: The potential for microRNAs to serve as predictors of anabolic response of skeletal muscle in aged humans.

Dae Hyun Kim, MD: Home-based exercise intervention to improve functional status after trans-catheter aortic valve replacement.

Brad Manor PhD: Optimization of non-invasive brain stimulation for improving physical function in older adults.

Michael Lustgarten, PhD: The effect of prebiotic supplementation on lean mass and physical function in older adults.

Ariela Orkaby, MD, MPH: Is aspirin use associated with frailty and functional limitation in older men?

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Externally-funded Projects that have received FAC support (a few examples):

R01AI108541 **Montano (PI)**

Biomarkers For Muscle Function And Aging In Chronic HIV Infection

Source: NIAID

R21AG055415 **Montano (PI)**

Role of ART in Novel HIV-Associated Myopathy

Source: NIA

R01AG025037 **Lipsitz (PI)**

Health Outcomes of Tai Chi in Subsidized Senior Housing

Source: NIA

R01AG041785 **Lipsitz (PI)**

CEREBROVASCULAR MECHANISMS OF SLOW GAIT AND FALLS

Source: NIA

RO1AG048326 **Bhasin S (PI)**

Randomized Trial of a Multi-factorial Fall Injury Prevention Strategy

Source: NIA-PCORI

8050-51000-091-01S / USDA/ARS **Fielding (PI)**

Nutrition, Sarcopenia, Physical Function, and Skeletal Muscle Capacity during Aging

Source: USDA-ARS

1R01NR014502 **Bhasin S (PI)**

A Selective Androgen Receptor Modulator for Symptoms of Androgen Deficiency in Prostate Cancer

Source: NINR

RO1 AG060639 **Bhasin (PI)**

Improving Quality of Life of Prostate Cancer Survivors with Androgen Deficiency

Source: NIA

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Externally-funded Projects that have received FAC support (two examples):

New Awards:

R01AG055443 **Ceglia (PI)**

Impact of protein and alkali supplementation on skeletal muscle in older adults

Source: NIA

The goal of this project is to determine whether an alkaline salt supplement (potassium bicarbonate) can enhance the beneficial impact of a high protein diet on muscle performance and mass.

Lisa Ceglia, MD, MS, Board-certified in Endocrinology:

Received REC support from OAIC in first cycle 2008-2010

Awarded KL2 from Tufts CTSI, MS in Clinical Research 2009-2011

Received RO1 funding October 2018

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Muscle Performance

Strength

- Maximum capacity to generate force or tension; Related to muscle cross-sectional area, intrinsic force generating ability of the muscle fiber, and the ability of the nervous system to recruit motor units

Power

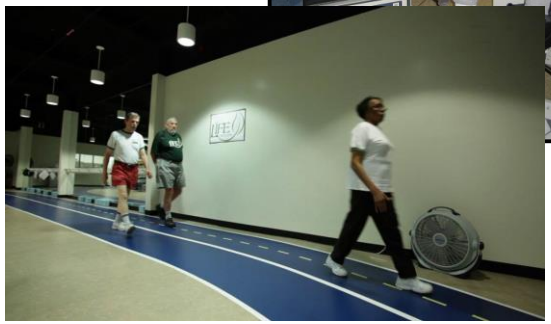
- Maximum rate of work performance; Power is related to force production and the velocity at which force can be generated

Fatigue

- Inability to maintain a given force output

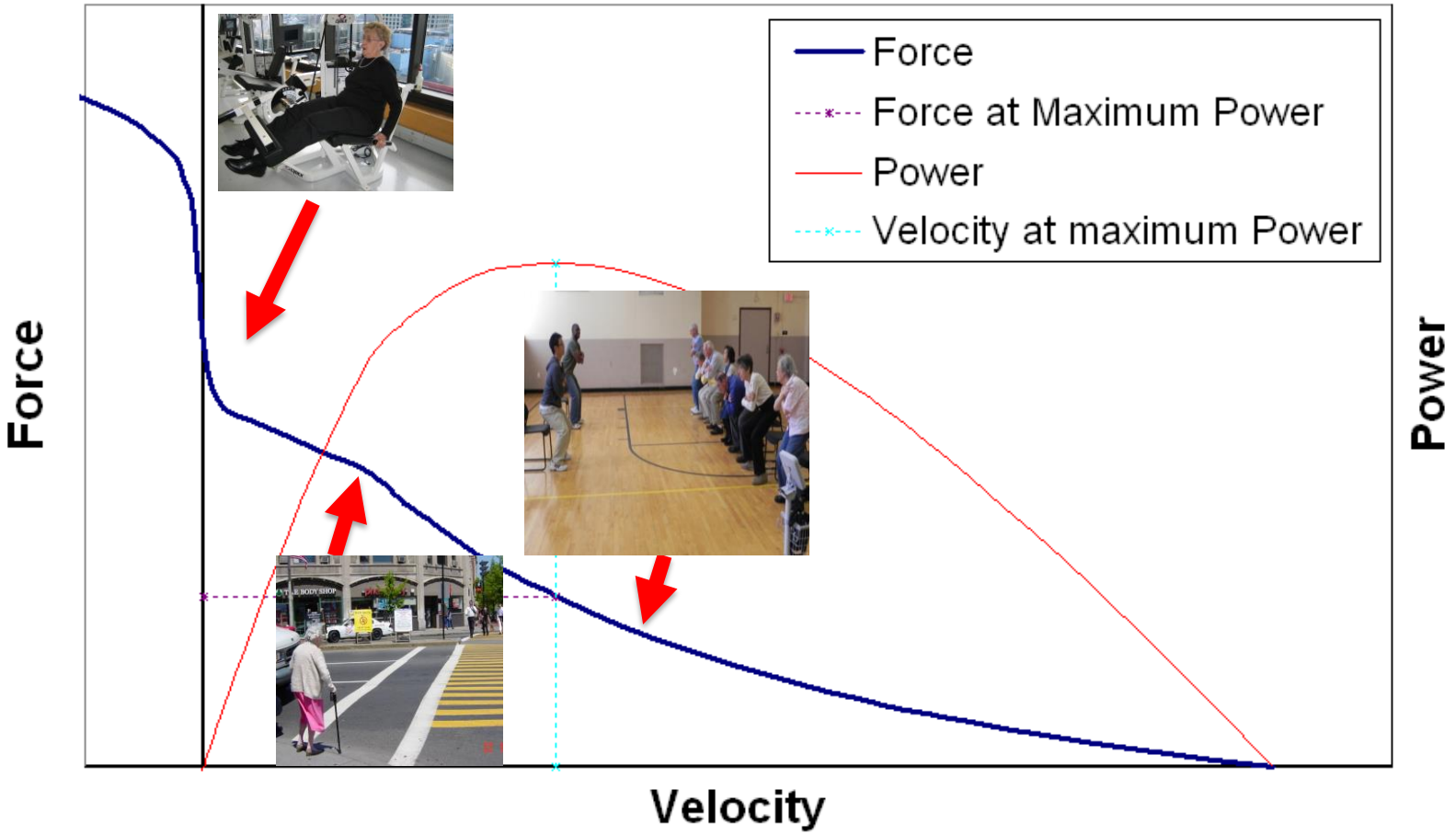
Endurance

- Submaximal aerobic exercise time to exhaustion

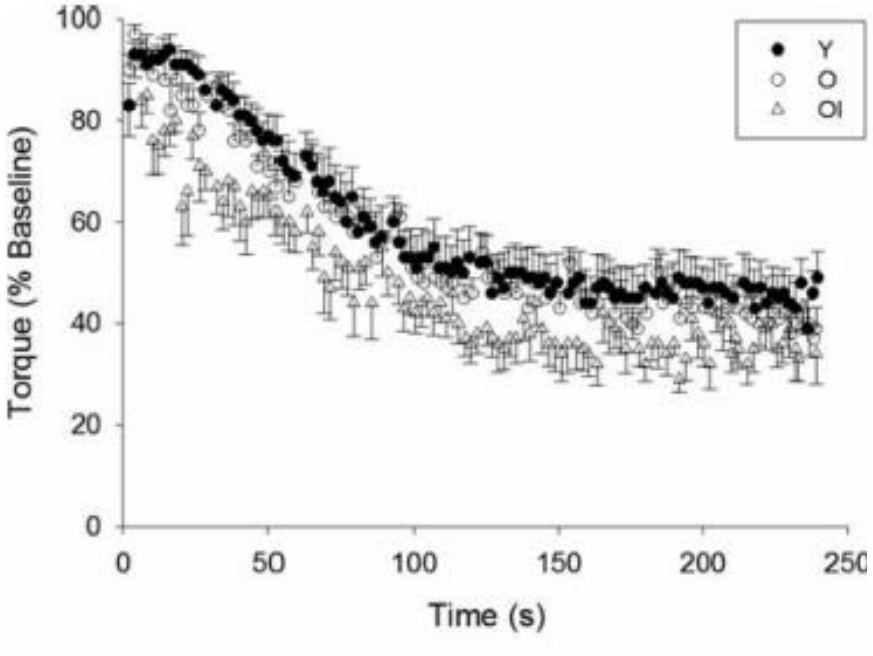


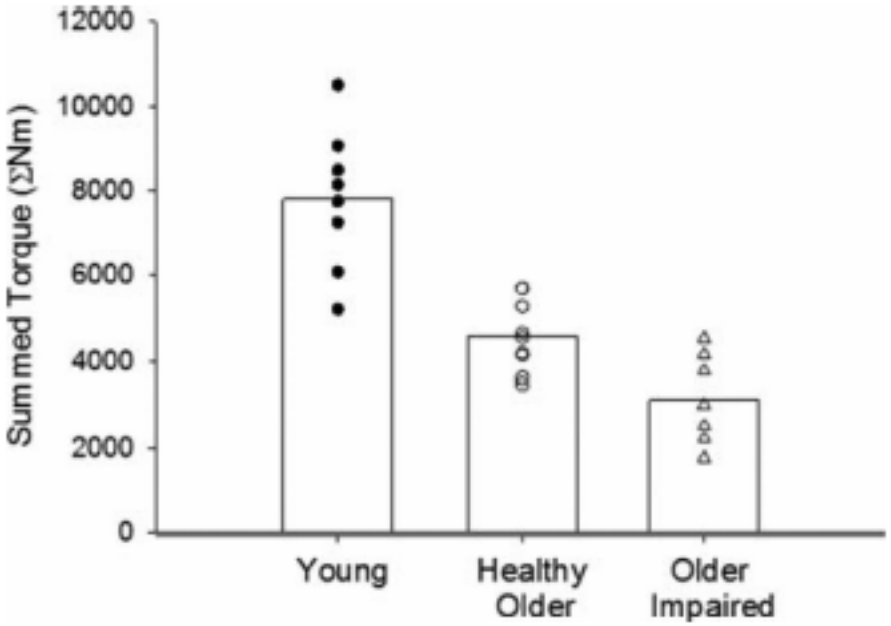
Skeletal muscle performs across a wide dynamic range of power outputs

Force-Velocity Relationship



Muscle Fatigue: methods development





Kent–Braun et al. 2014

Aims

- Establish the reliability of the fatigue protocol developed by Kent-Braun et al. and determine its validity as a measure to detect PRT-induced changes in muscle strength and fatigue.

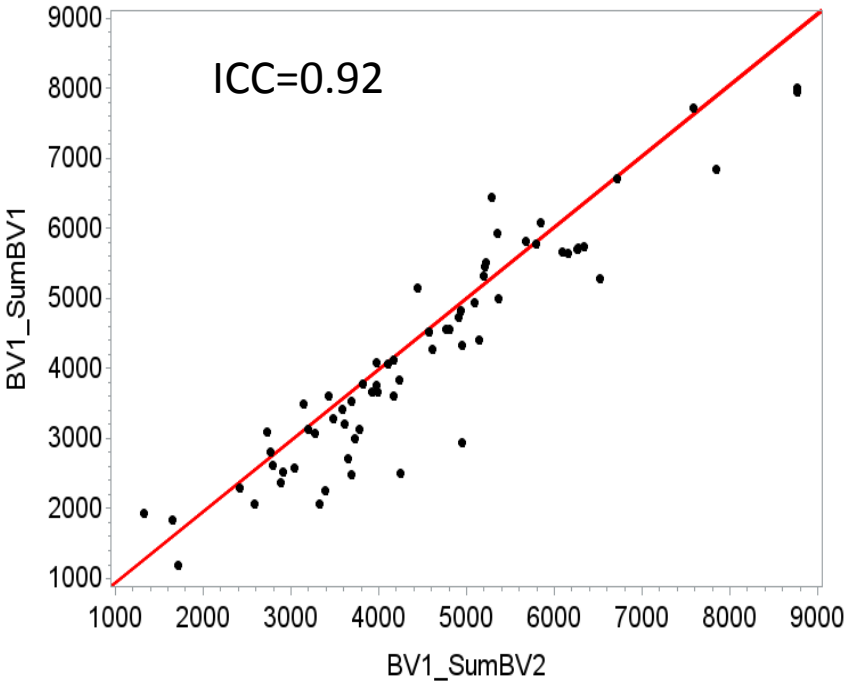
Baseline Characteristics

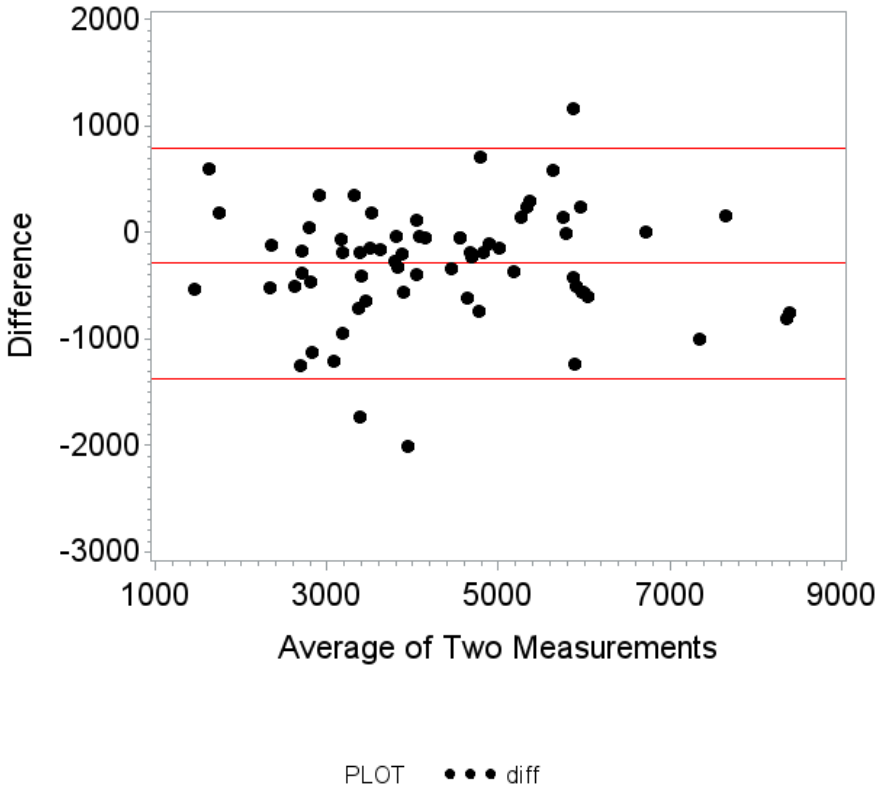
Participant Characteristics at Baseline[1]

	PRT (n = 35)	HBF (n = 35)
Age, years	77.4 (4.4)	80.3 (6.3)
Male	14 (40%)	14 (40%)
Height (m)	1.7 (0.1)	1.7 (0.1)
Weight (kg)	78.0 (13.1)	77.1 (14.9)
Body Mass Index, kg/m^2	28.6 (4.0)	27.7 (3.9)
MMSE Score	27.6 (2.0)	28.1 (1.7)
Number of Medical Diagnoses	3.9 (2.1)	3.1 (2.7)
SPPB	7.6 (1.4)	7.3 (1.7)

[1]Results are means (SD), unless otherwise stated. MMSE, Mini-Mental State Exam; SPPB, Short physical performance battery.

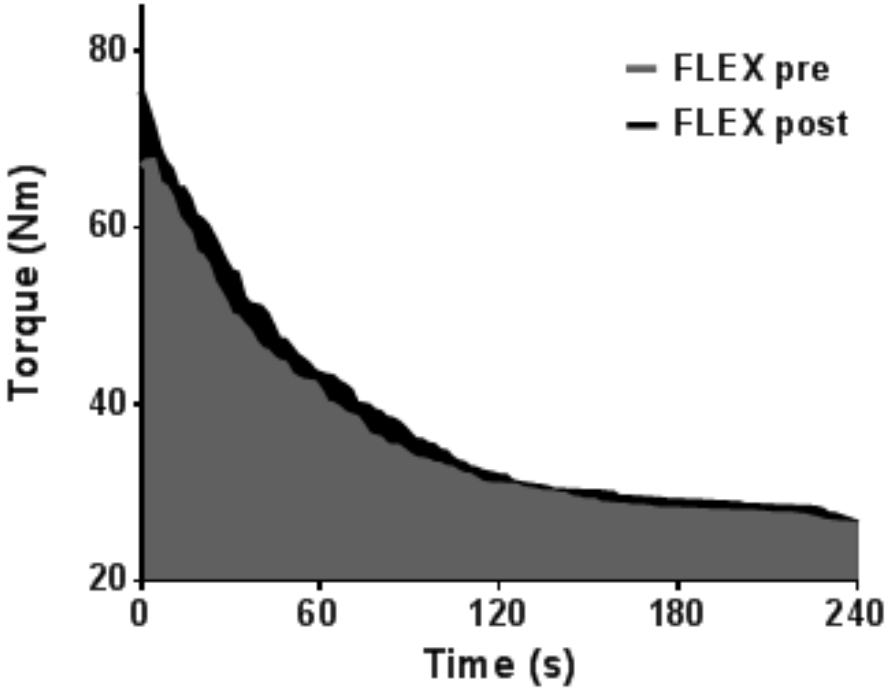
Fatigue Test: Reliability

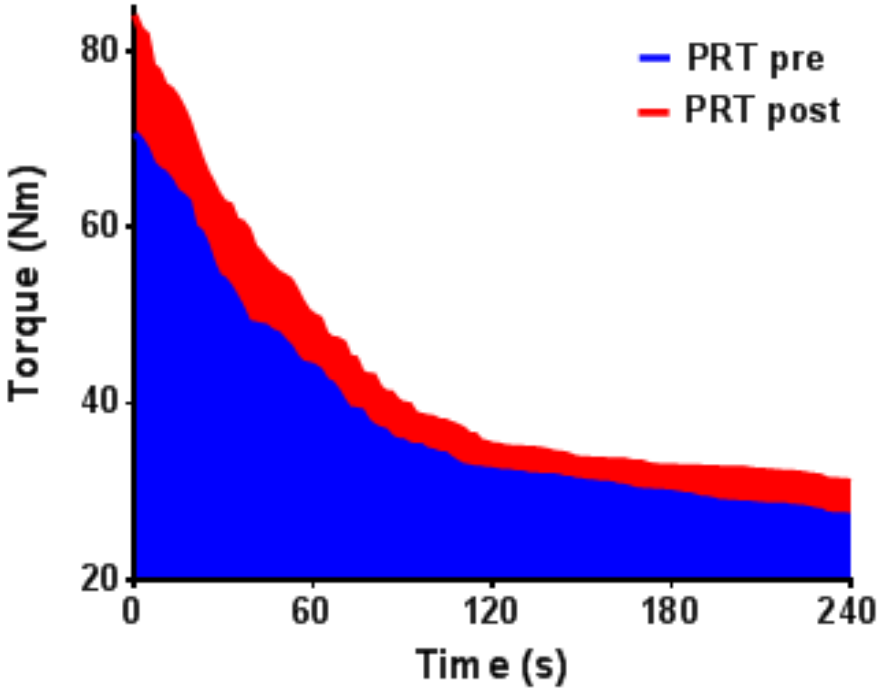




BV1 summed peak torque / BV2 summed peak torque

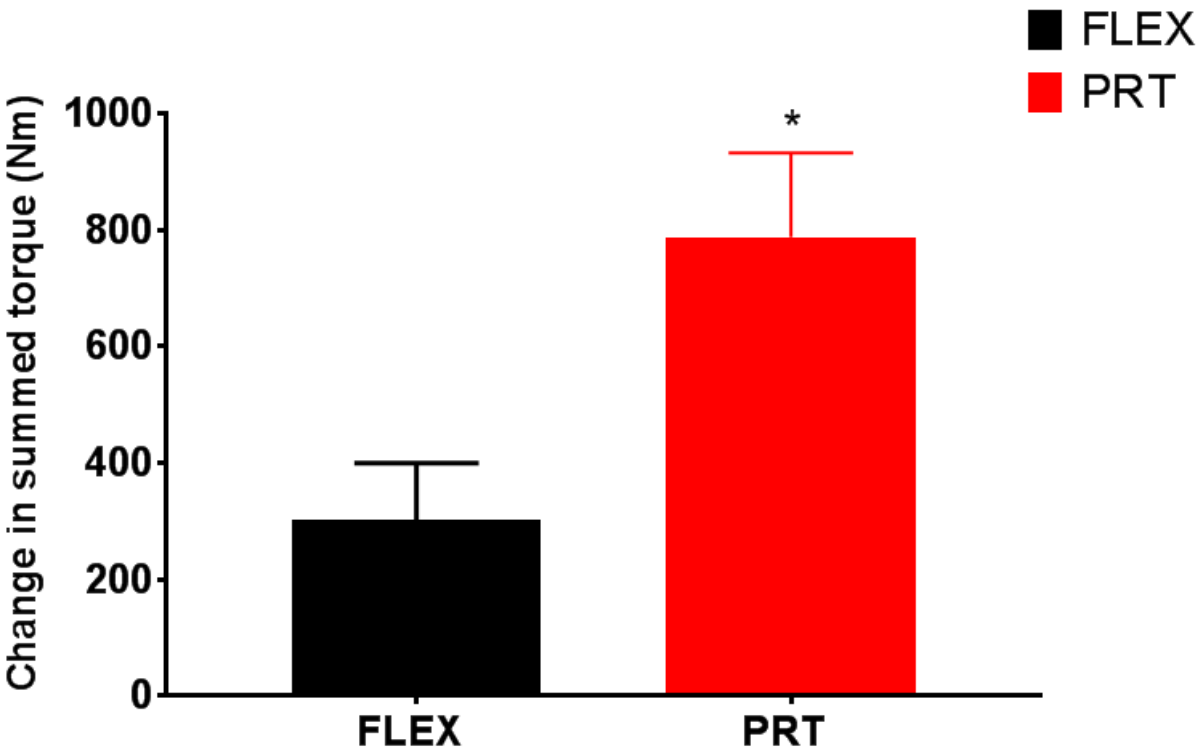
Summed Torque





Mean torque produced for each group over the duration of the fatigue test before and after the 12 week intervention period. Significant change between groups: P = 0.006.

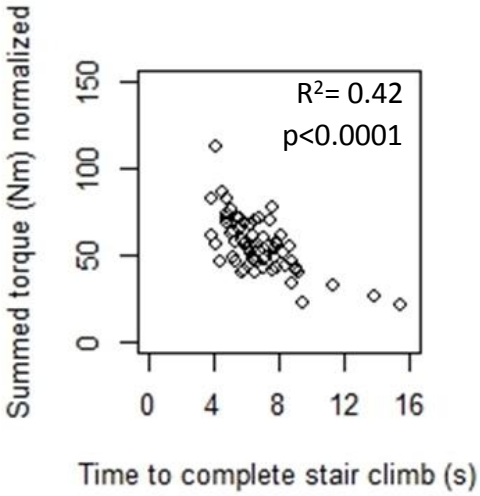
Summed Torque

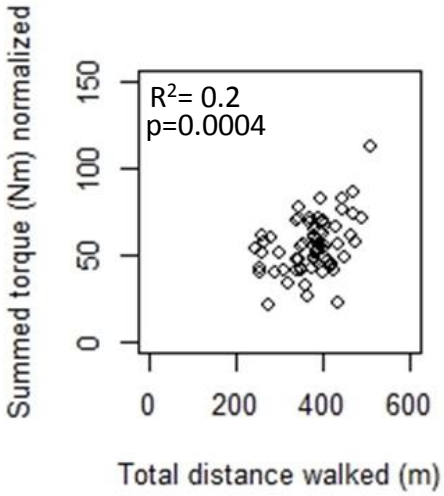


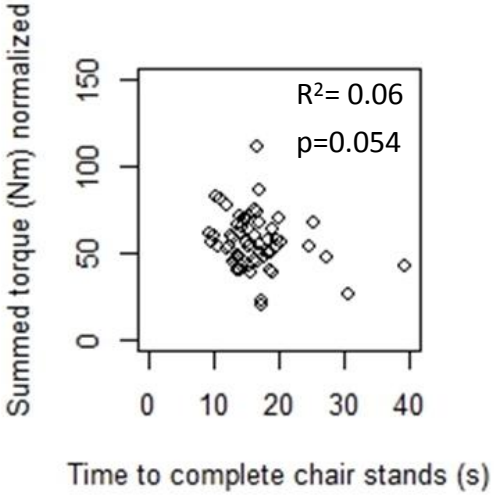
Treatment effect: 466.19 Nm,
95% CI: 138.4 - 793.97

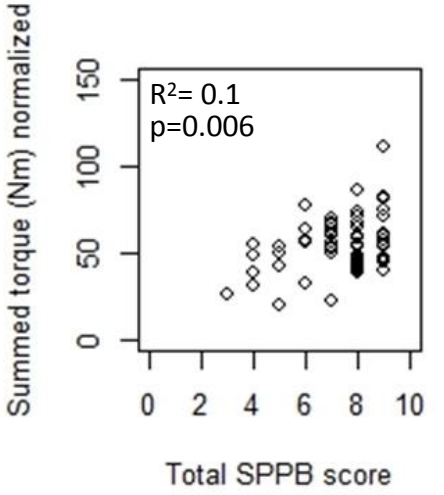
Absolute change (±SE) in summed torque in the PRT and FLEX groups. *Significant change between groups: P = 0.006.

Normalized Summed Torque (Nm/kg)









Current FAC Developmental Project:

Marcia A. Testa, MPH, PhD: The impact of NMN treatment on self-reported function and well being in older men with functional limitations.

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