Spinning Strength in Seniors: Does Flywheel Squat Power Predict Performance?

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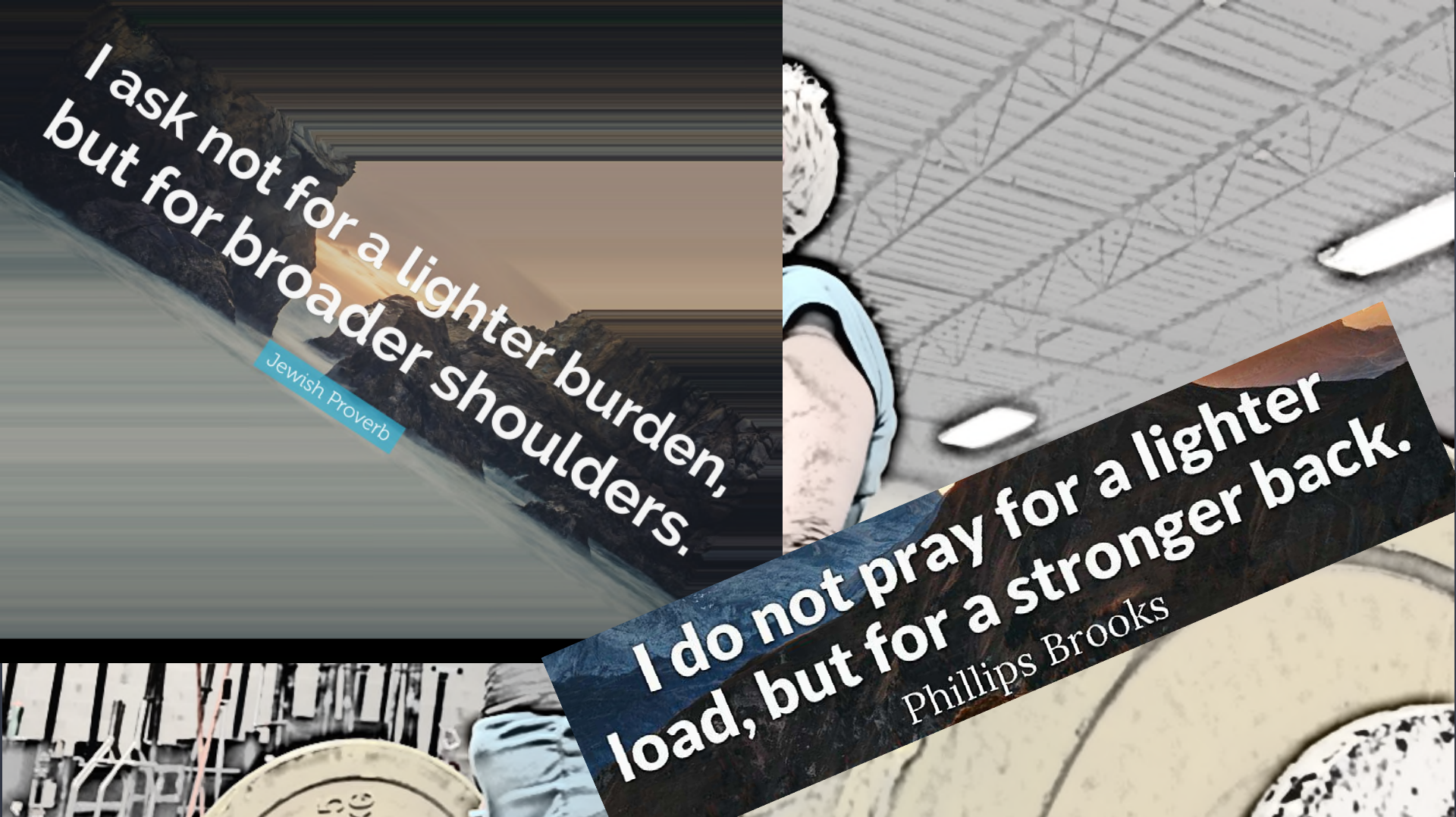
I ask not for a lighter burden,
but for broader shoulders.
Jewish Proverb
I do not pray for a lighter
load, but for a stronger back.
Phillips Brooks

frontiers in Physiology

MINI REVIEW
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Check for updates

Resistance Exercise Training as a Primary Countermeasure to Age-Related Chronic Disease

*Jonathan C. Mcleod, Tanner Stokes and Stuart M. Phillips**

Department of Kinesiology, McMaster University, Hamilton, ON, Canada

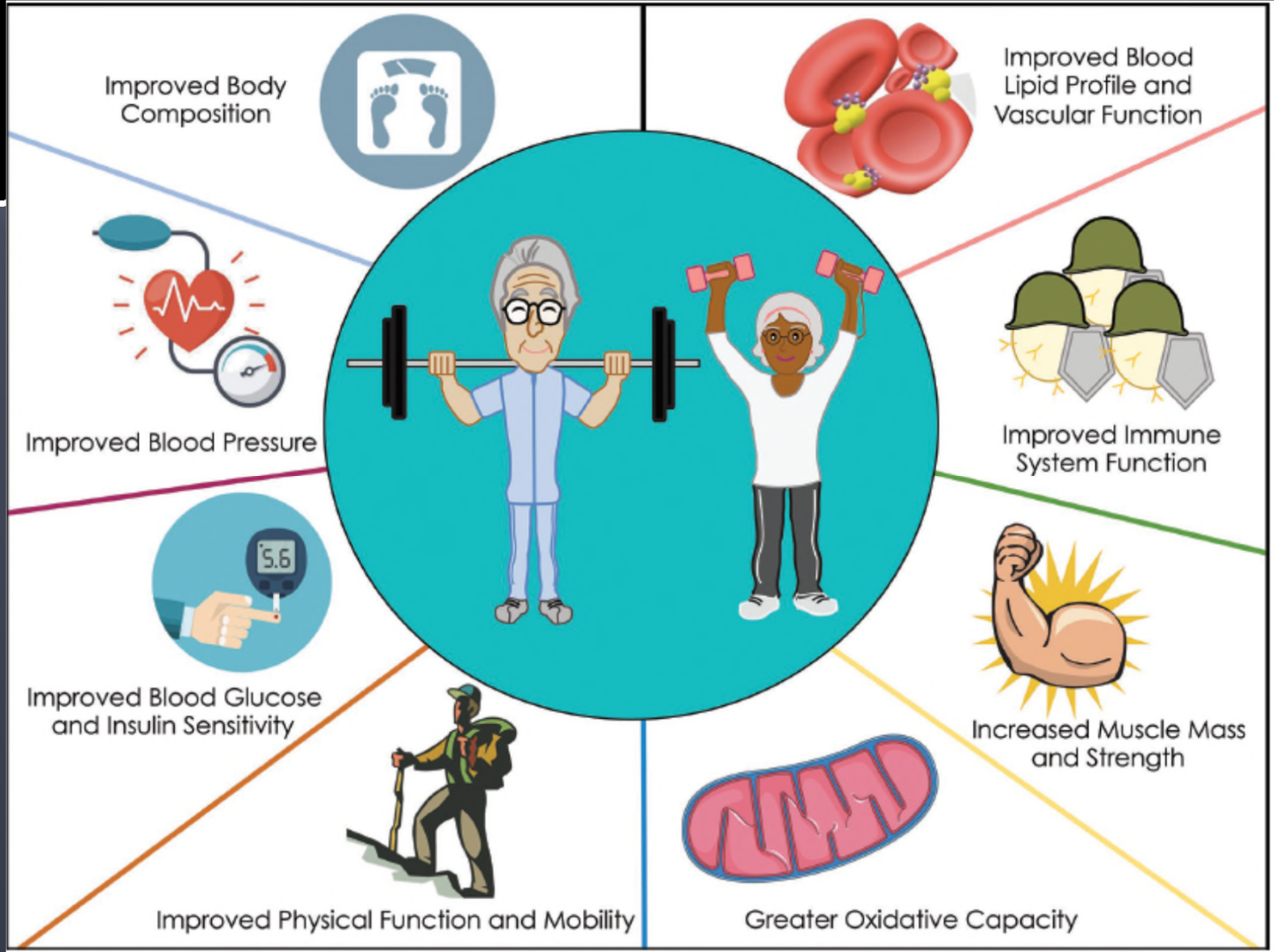
Improved Body Composition
Improved Blood Lipid Profile and Vascular Function
Improved Blood Pressure
Improved Immune System Function
5.6
Improved Blood Glucose and Insulin Sensitivity
Increased Muscle Mass and Strength
Improved Physical Function and Mobility
Greater Oxidative Capacity

TABLE 1 | Age-related changes in risk factors for chronic disease and the adaptive responses to aerobic exercise training and resistance exercise training.

Adaptations	Aging	AET	RET
Whole-body adaptations			
Muscle strength	↓	↔ (Grgic et al., 2018)	↑↑ (Cadore et al., 2013)
Muscle mass	↓	↔ (Grgic et al., 2018)	↑↑ (Peterson et al., 2011)
Bone mineral density	↓	↔ (Villareal et al., 2017)	↑ (Villareal et al., 2017)
VO_{2peak}	↓	↑↑ (Bienso et al., 2015)	↑ (Bienso et al., 2015)
Physical function	↓	↑ (Jadczak et al., 2018)	↑ (Jadczak et al., 2018)
Type II diabetes			
Risk	↑	↓ (Knowler et al., 2002)	↓ (Grontved et al., 2012)
Glyce			
Insulir			
Oxida			
Cardi			
Risk			
Blood			013)
Blood			
High-(			
Low-(			
Chole			
Triglycerides	↑	↓ (Yang et al., 2014)	↓ (Yang et al., 2014)
Cancer			
Incident Risk	↑	↓ (Keum et al., 2016)	↓ (Keum et al., 2016)
Risk of recurrence	↑	↓ (Dieli-Conwright et al., 2018)	↓ (Dieli-Conwright et al., 2018)
Quality of life	N/A	↑ (Segal et al., 2009)	↑↑ (Segal et al., 2009)
Therapy completion rate	N/A	↔ (Courneya et al., 2007)	↑ (Courneya et al., 2007)
Immune function	↓	↑ (McTiernan, 2008)	↑ (Hagstrom et al., 2016)
Inflammation	↑	↓ (McTiernan, 2008)	↓ (Strasser et al., 2012)

↑ Indicates an increasing effect on the parameter, ↓ indicates a decreasing effect on the parameter, and ↔ indicates no effect on the parameter. The number of arrows denotes the magnitude of effect. Abbreviations: N/A, not available.

RESISTANCE EXERCISE TRAINING: FROM A SUPPORTING TO A STARRING ROLE?






OLYMPIC STANDARD BARBELL


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Editorial

Muscle Power Training: A Hallmark for Muscle Function Retaining in Frail Clinical Setting

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Review

Eccentric Overload Flywheel Training in Older Adults

Kelsi Kowalchuk [1] and Scotty Butcher [2,*]

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University of Saskatchewan

Associations between Eccentric Squat Loading, Isokinetic dynamometry, and Physical Function in Seniors

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Department of Health Sciences
Dr. Scotty Butcher, BScPT, MSc, PhD, ACSM-RCEP (Supervisor)

HUMAC NORM Isokinetic Dynamometer

Dynamometer:

- Quantify muscle function, joint performance, diagnose/treat musculoskeletal pathologies
- Measurements are effective, reliable, valid, safe, and reproducible
- Concentric, eccentric, and isometric evaluations

Limitations

- Economic Cost
- Size of Equipment
- Evaluation Movement

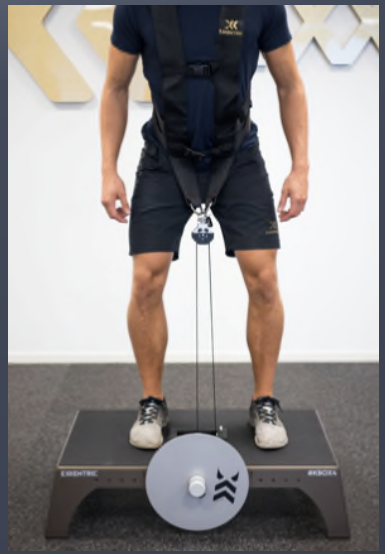
Alternate Flywheel kBox4

Features of the kBox:

- Four different inertia plates
- High and variable resistance through a complete ROM
- Eccentric Overload
- kMeter device of measurement

Overcomes Limitations

- Less costly
- Transportable
- Squatting Motion



Exxentric, AB, Sweden, 2019

Hypotheses

In strength trained older adults,

1. Flywheel squat power will correlate with power measured on knee extension isokinetic dynamometry (criterion validity)

2. Flywheel squat power will predict performance of select functional tasks better than knee extension isokinetic dynamometry

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Participants:

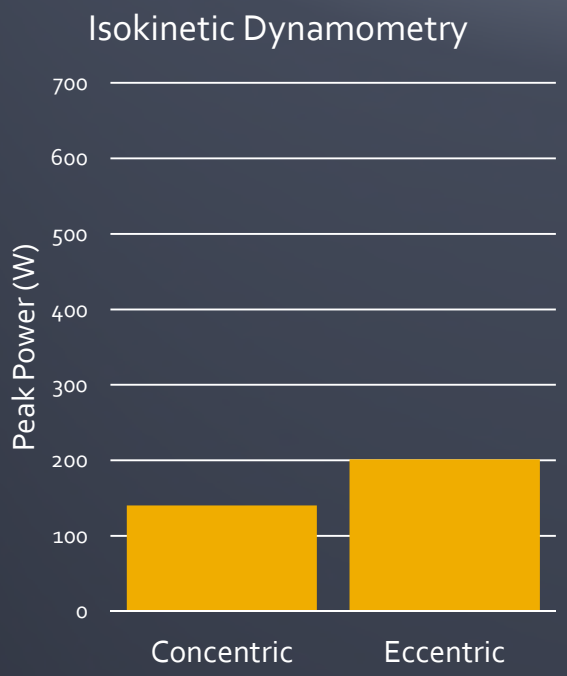
- 26 Strength-trained seniors (17 female, 9 male) with traditional resistance training experience
- Aged 62 ± 6.1 years old

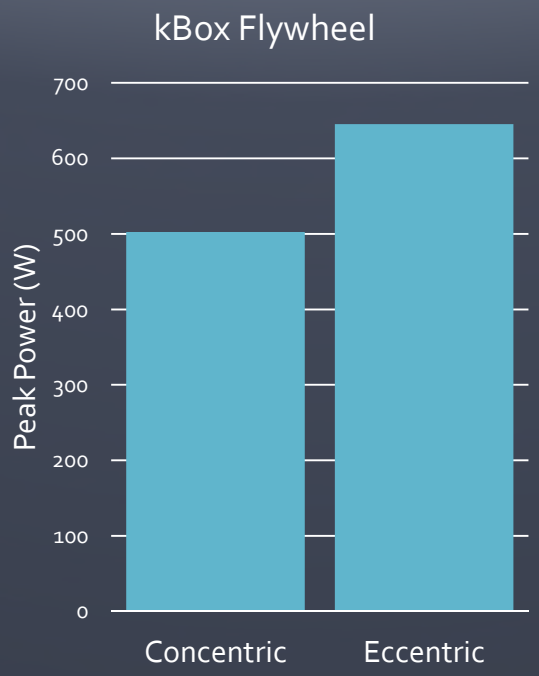
Design and Measurements:

- Cross-sectional within participant design
- Power measured on the kBox (kMeter) and the Humac NORM isokinetic dynamometer
- Functional performance tests including:
  - Sit to stand test (STS)
  - Time-up-and-go test (TUG)
  - Stair climb test (SCT)

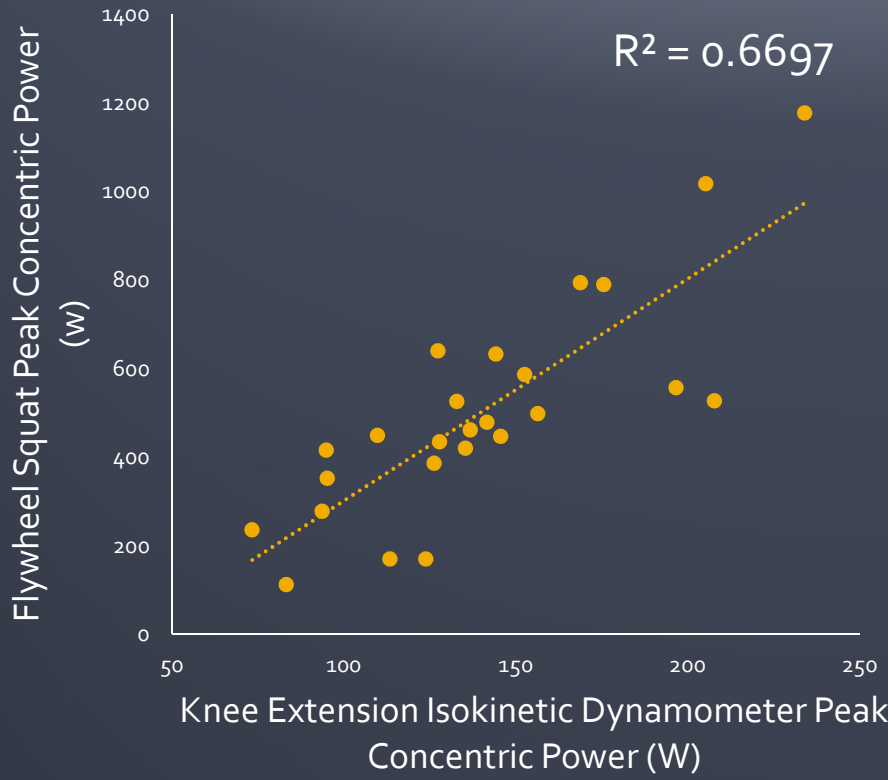
http://www.csmisolutions.com/products/isokinetic-extremity-systems/humac-norm

Preliminary Results

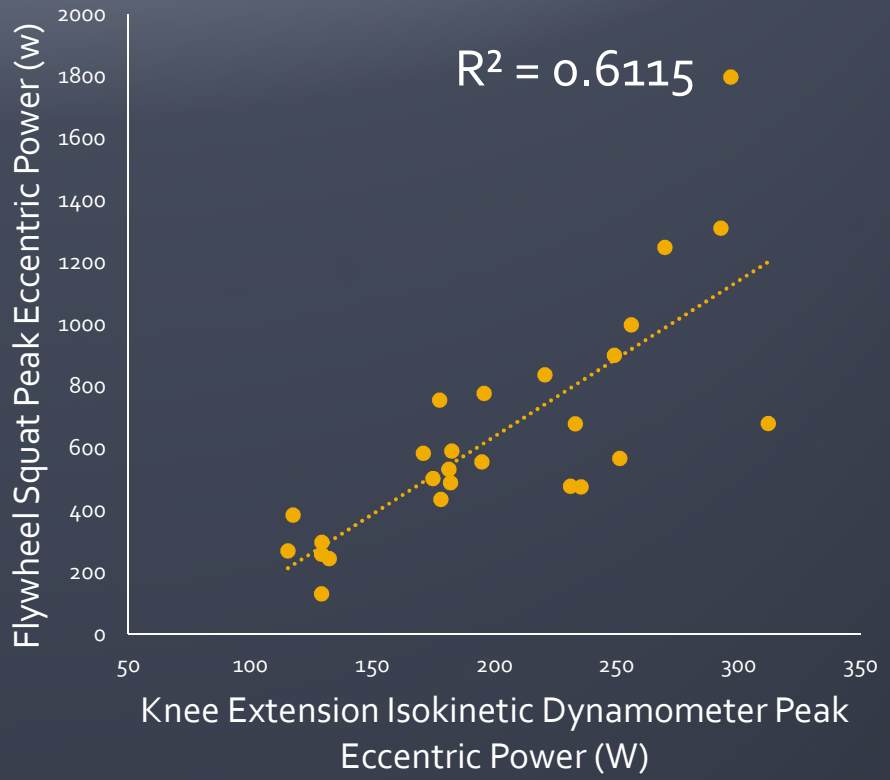




Concentric Power

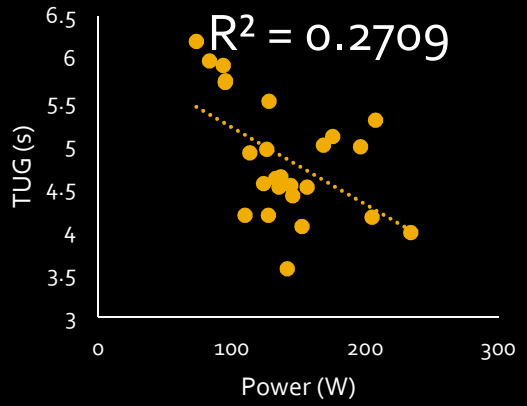


Eccentric Power

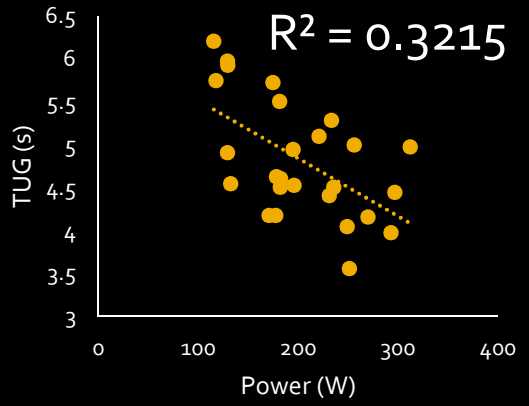


TUG

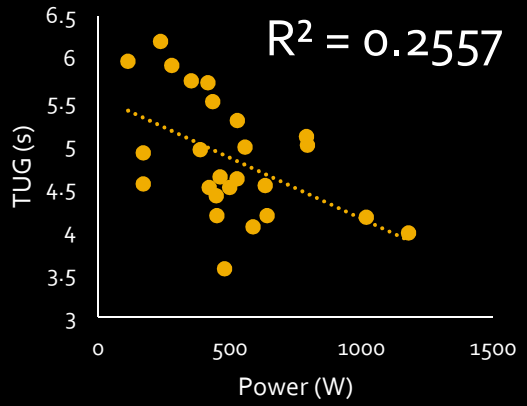
Dynamometer Concentric



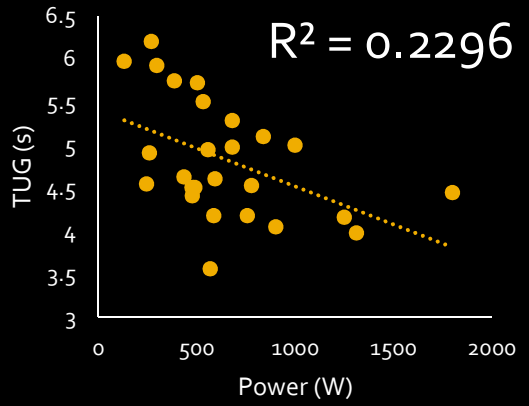
Dynamometer Eccentric



kBox Concentric

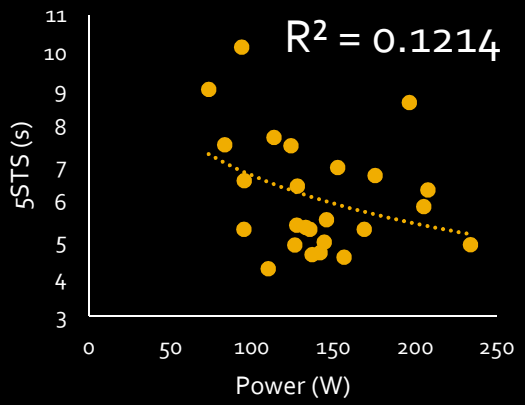


kBox Eccentric

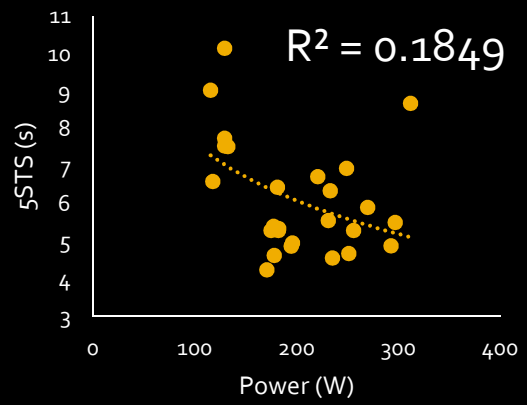


5STS

Dynamometer Concentric



Dynamometer Eccentric



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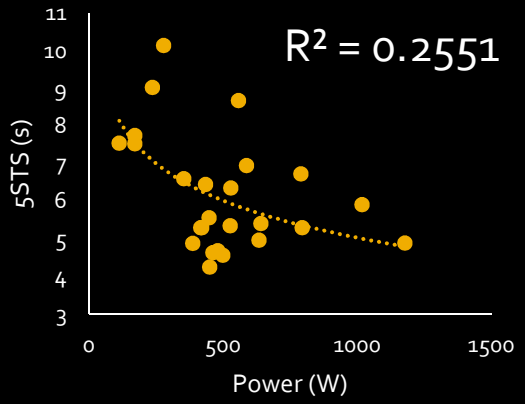

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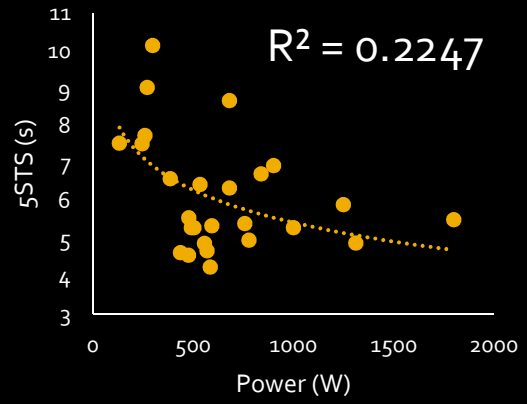
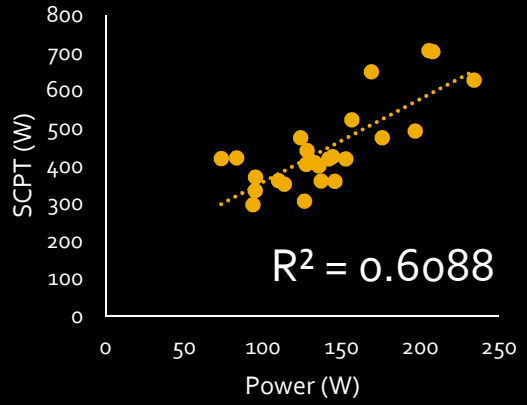
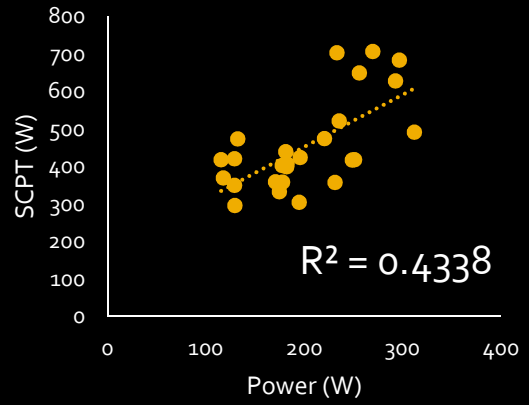


SCPT

Dynamometer Concentric



Dynamometer Eccentric



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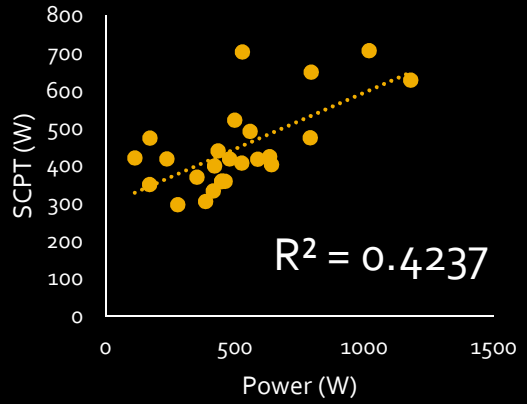
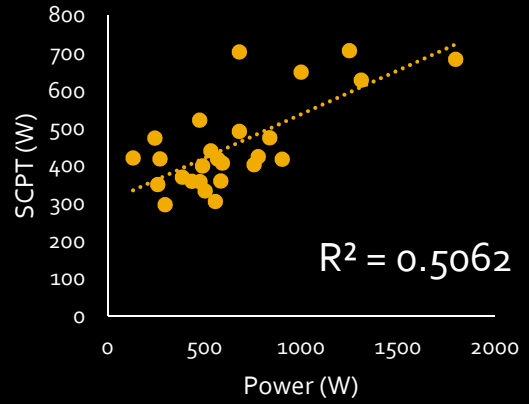


kBox Eccentric



Preliminary Conclusions

- Preliminary evidence of criterion validity for the kBox squat power compared to isokinetic dynamometry in strength trained seniors
- Early analysis indicates similarly moderate prediction ability of isokinetic dynamometry and kBox squat power, but this
  - a) likely depends on the functional test, and
  - b) requires further regression analysis,
  - c) can only be generalized to strength-trained, high functioning seniors
- QUESTIONS?