CAPS: Increasing Muscle Capillarization to Enhance Responses to Strength Training in Sarcopenia

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Science, Discovery, and the Universe
Philosophy Major

What is Sarcopenia?

- Sarcopenia, defined as the loss of skeletal muscle mass and function,
- more prevalent among older[1,2,3] individuals, >60.
- May be an underestimate since it is underdiagnosed [4]
- It is clinically identified by low muscle mass and low gait speed [2,3,4]
- It is diagnosed using a dual energy x-ray absorptiometry (DEXA) [4,5]
- Current standard of care is physical activity, nutritional intervention, hormone and vitamin supplements [5]
- in some cases anabolic steroids or angiotensin-converting enzyme (ACE) inhibitors [3,5]

Why is it important?

- Sarcopenia is present in 5-13% of people age 60-70 and 11-50% of people over age 80 [3,5]
- loss of muscle mass reduces physical function and overall quality of life [4]
- Sarcopenia is also a predictor of disability and risk of injuries [4]
- In addition treatment and care for sarcopenic patients is costly at $18.5B (2000-2001) accounting for 1.5% of healthcare spending [6]

Figure 1: Study Protocol

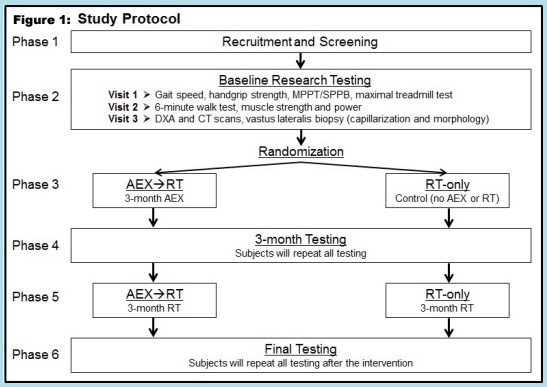
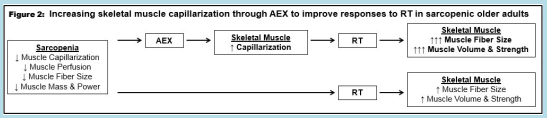
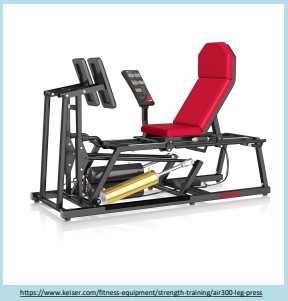


Figure 2: Increasing skeletal muscle capillarization through AEX to improve responses to RT in sarcopenic older adults





https://www.keiser.com/fitness-equipment/strength-training/air300-leg-press

Resistance Training Equipment

Biodex

https://www.biodex.com/physical-medicine/products/dynamometers/system-4-pro

Figure 3: Expected Outcomes

	Aim 1: Primary Outcomes		Aim 2: Primary Outcomes	
	Muscle CFPE	Muscle Fiber CSA	Thigh Muscle Volume	Muscle Strength
RT	↔	↑	↑	↑
AEX→RT	↑↑↑	↑↑↑	↑↑↑	↑↑↑

Proposal

- study aims: to test whether aerobic training followed by resistance training is more effective than resistance training alone.
- Eligible participants will be age 65-88, normal to overweight (BMI 18-29.9), non-smoker
- Subjects with chronic medical conditions , such as diabetes, COPD, cancer, renal disease, cardiac disease
- In addition, participants who are either non-ambulatory or perform regular vigorous exercise will be excluded to avoid confounding the study data.
- Measurements of skeletal muscle morphology, volume, and strength will be assessed at the Veterans Affair Hospital Baltimore.

Expected Outcomes

- Blood flow is critical for increasing and maintaining muscle mass [7,8]
- Sarcopenic subjects have lower capillarization, i.e. less blood flow, smaller muscle fiber size [7,8]
- The experimental group will undergo 3 months of aerobic training aimed to increase capillarization, leading to increase in muscle mass.
- We expect that the group that had aerobic training along with resistance training will show greater benefit than the group who have resistance training alone [7]
- Hopefully this will translate to a better treatment for sarcopenia.

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