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Applied Physiology Lab

Motor Unit Action Potential Amplitude During Low-Force, Fatiguing Muscle Actions Versus High Force, Non-Fatiguing Muscle Actions

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UCF Doctor of Physical Therapy Program

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Background

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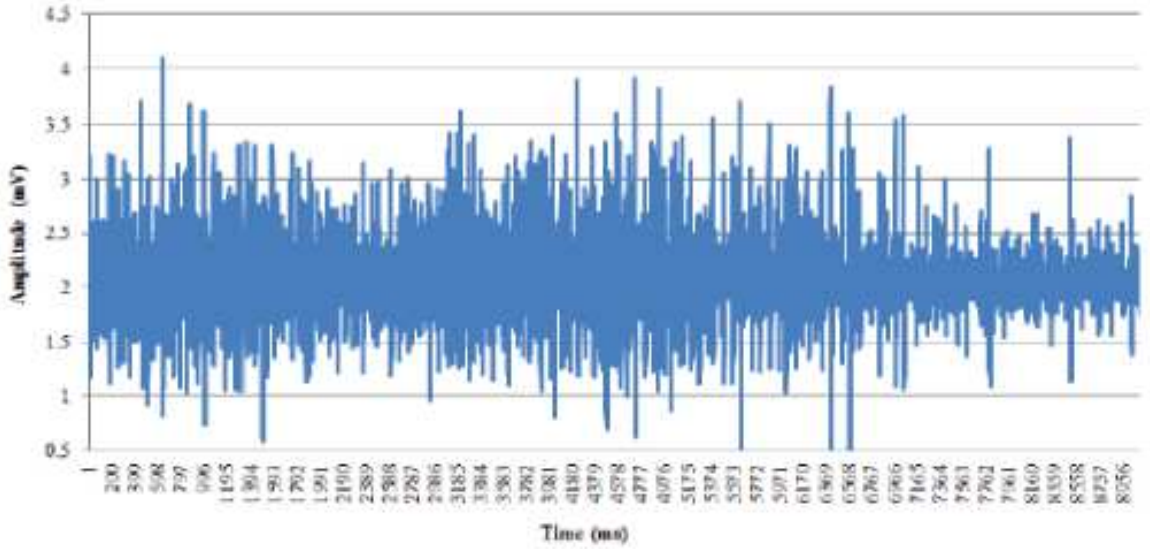
Type	%1RM	Reps	Rest Time
Endurance	67%	12 reps	30 secs
Hypertrophy	67-85%	6-12 reps	30-90 secs
Strength	85%	6 reps	2-5 mins

Purpose

- Compare sEMG amplitude of vastus lateralis during Low-Force, Fatiguing Muscle Actions Versus High Force, Non-Fatiguing Muscle Actions
  - 100% MVC
  - 50% MVC
  - 80% MVC
  - 30% MVC to fatigue
- Determine if as fatigue accumulated, neural drive increases to meet force demands comparable to higher force levels



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Methods

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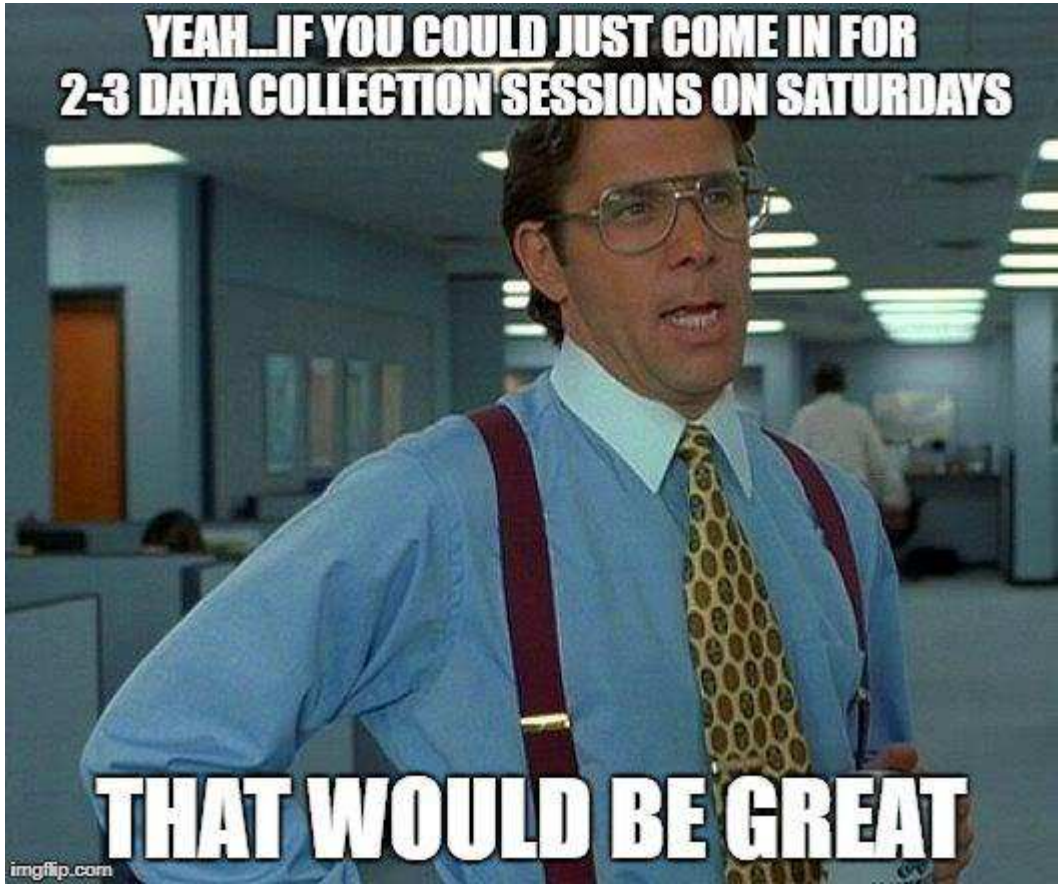
- Untrained Males
  - Ages 18-35
  - BMI <30
  - No history of MS injury in R leg
- 2-3 data collection sessions
  - 1st session for familiarization with testing procedures
- BioDex isokinetic dynamometer
- Delsys sEMG system



Methods

- Skin Prep
- Bipolar and 4-lead electrodes
  - 2/3 distance from ASIS to superior-lateral patella
  - Over vastus lateralis muscle belly
- Ground Electrode over patella

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Methods

- R LE fastened to BioDex system in 70 degrees knee flexion
- Subject secured to prevent compensatory movement
- Isometric knee extension MVC obtained
- Knee extensions performed at respective force levels + Fatigue Protocol

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Data Collection

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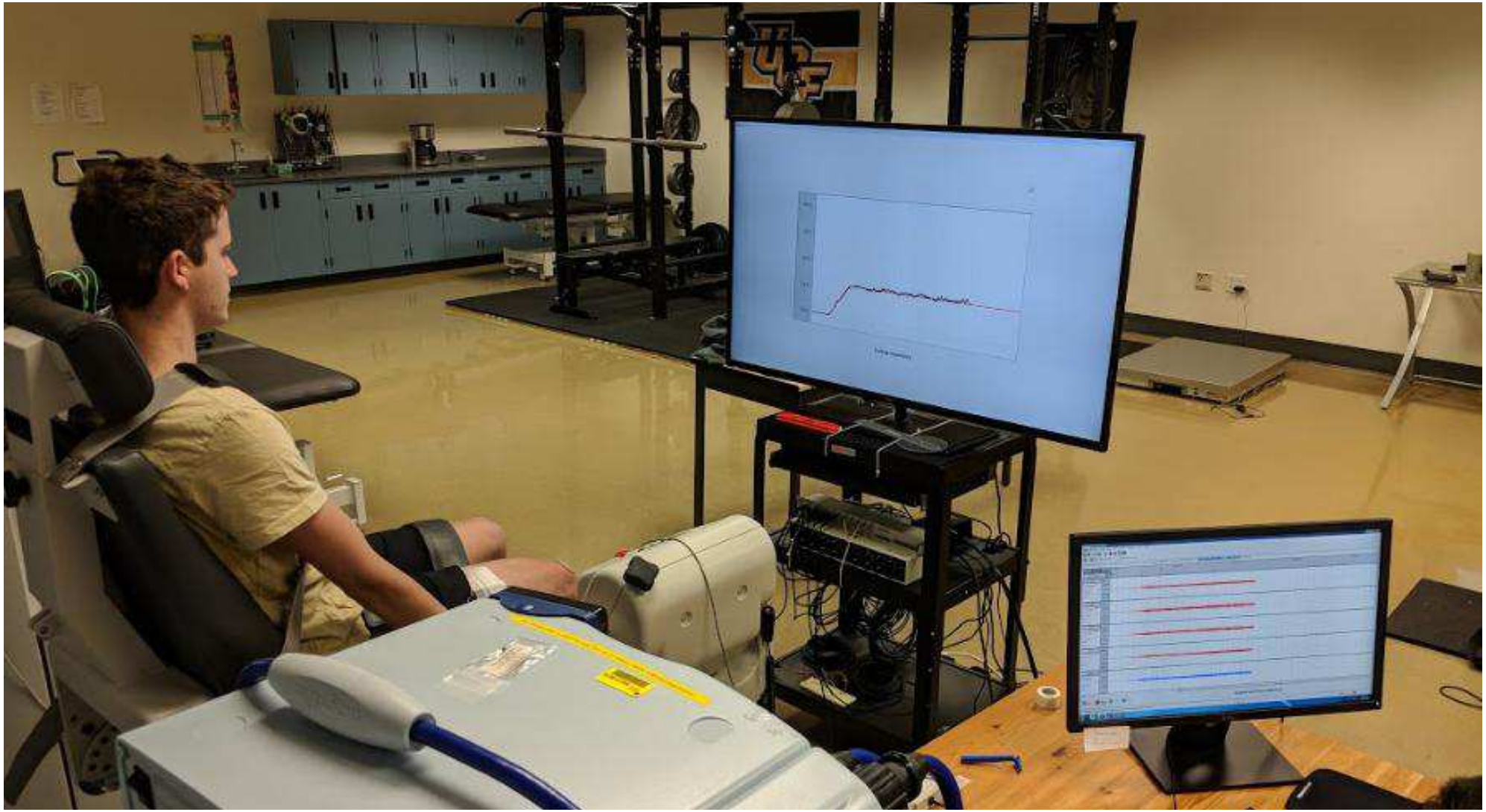

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Data Collection

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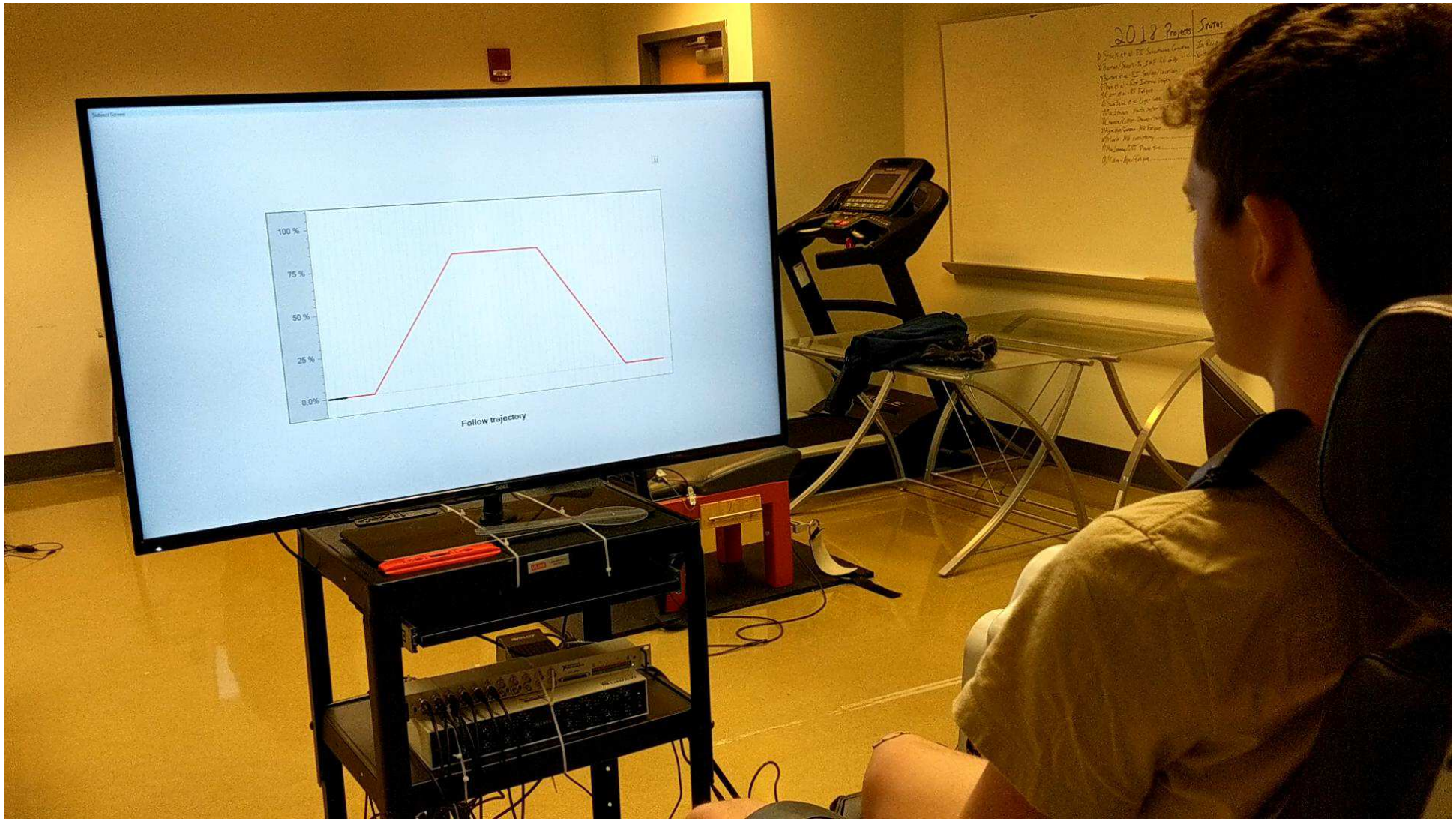

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Force Output vs. sEMG

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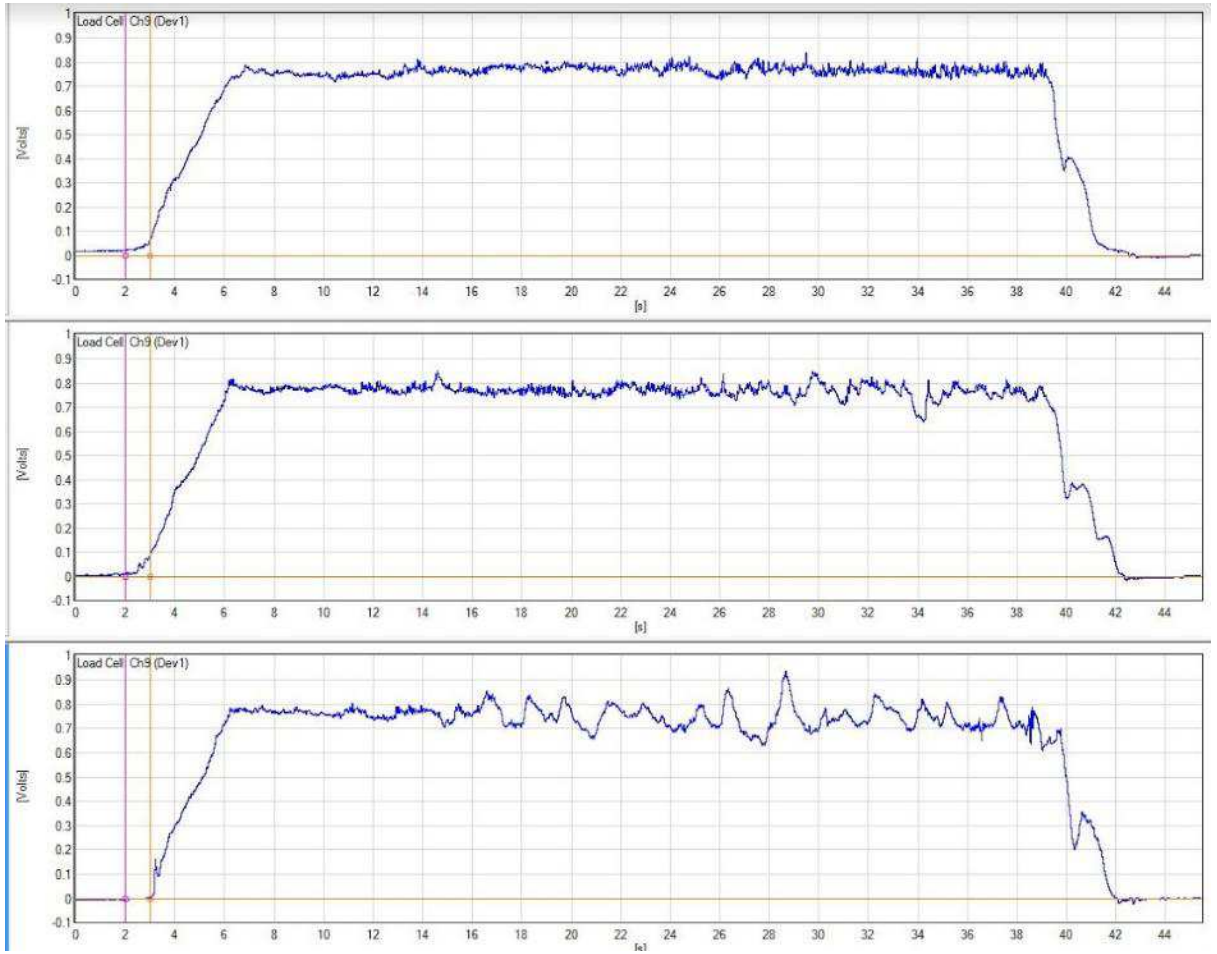
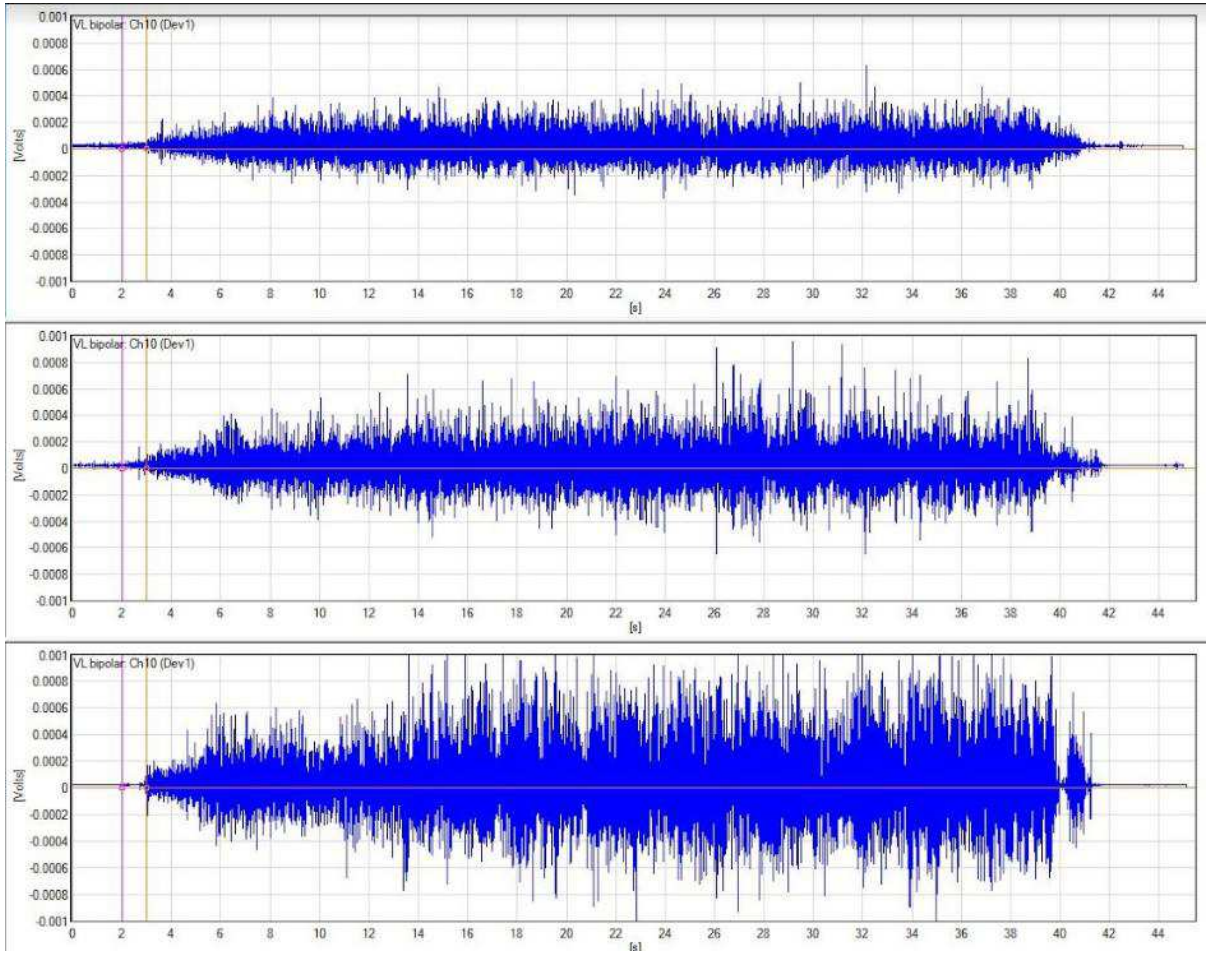
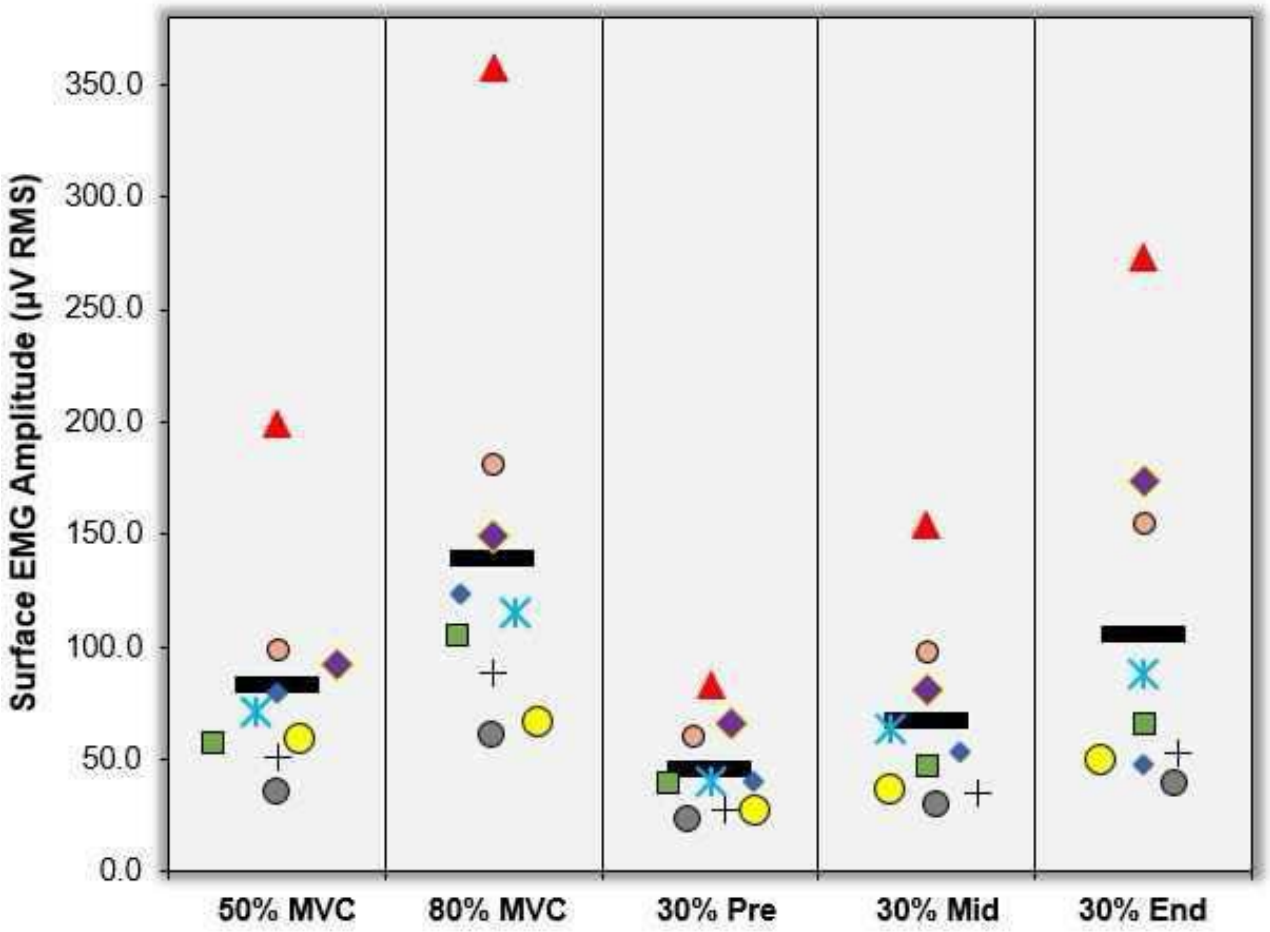




Statistical Analyses

- Surface EMG amplitude (μV root-mean-squared) determined for two second intervals
  - 50%, 80%, 30% beginning, 30% mid, 30% end
- Repeated measures analysis of variance
  - Bonferroni post-hoc
  - Alpha level of $p \leq 0.05$

Results



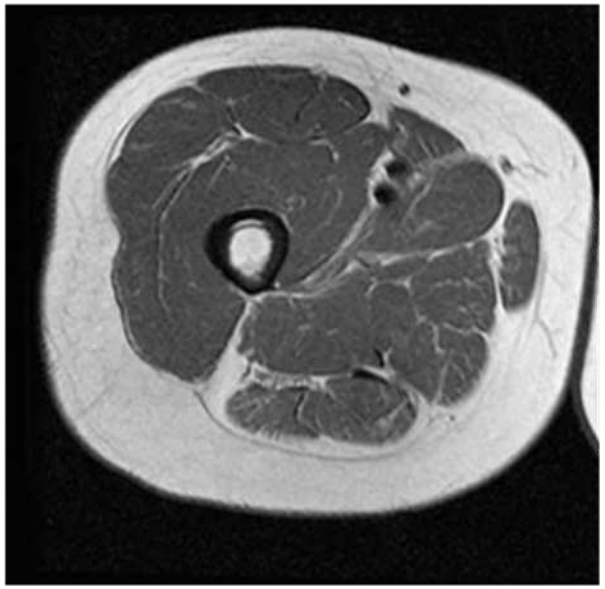
- Linear relationship between force and sEMG amplitude
- **No statistically significant difference between**
  - 50% MVC vs 30% MVC Begin, Middle, End of Fatigue Protocol
  - 80% MVC vs 30% MVC End of Fatigue Protocol

Discussion

- Post-op patient
- Any patient who is unable to tolerate higher loads
- Ex: s/p TKA patient performing TKEs with light resistance to absolute failure at end of therapy session

Discussion

Age 25



Age 63

- Older adults
- Sarcopenia
  - Type II muscle fiber atrophy
- Muscular Strength/Power
  - Rate of Force Development
- Falls Risk

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Where do we go from here?

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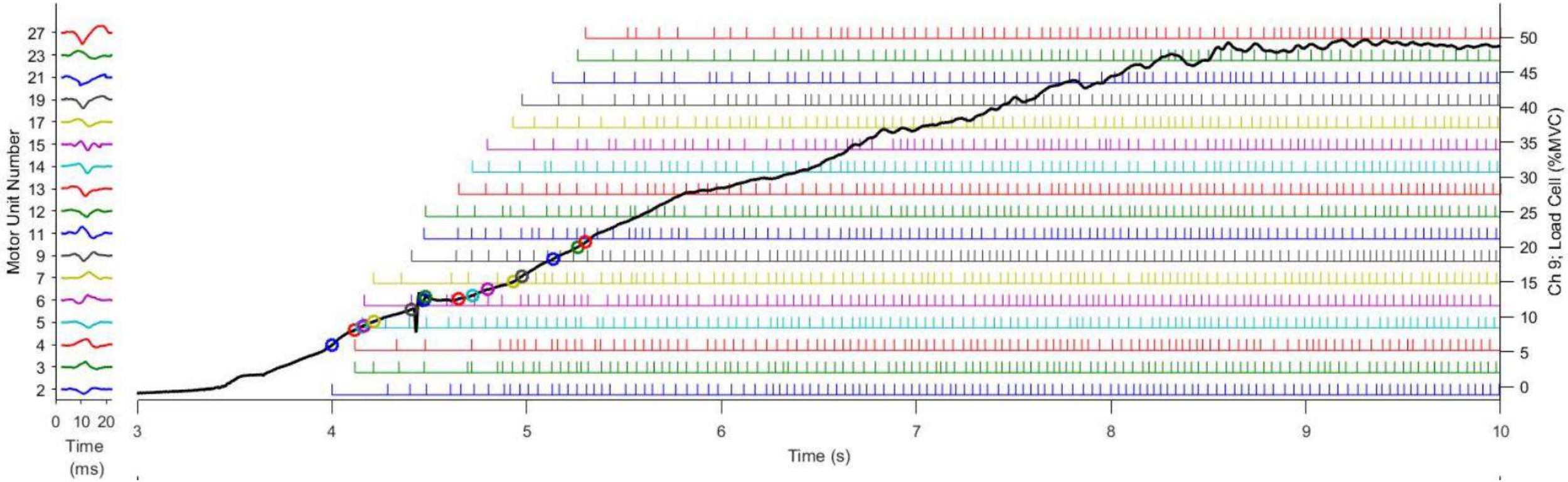

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QUESTIONS?