

Muscle Recruitment Responses To Incremental Exercise In Flywheel-Based Inertial Training (FIT) Squats

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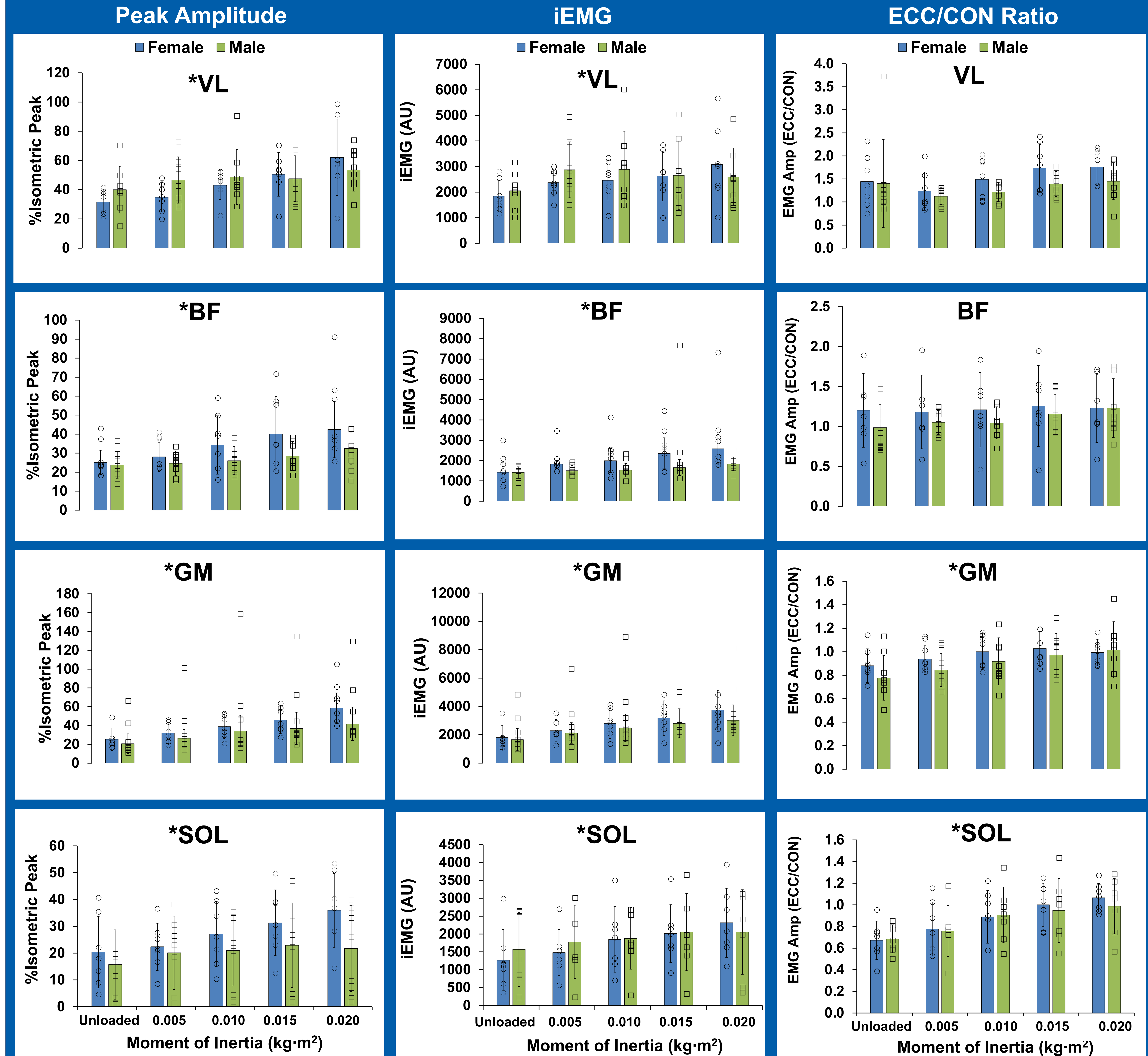
INTRODUCTION

Flywheel-based inertial training (FIT) elicits rapid and robust muscle hypertrophy and improved performance which is thought to arise from eccentric overload. We aimed to characterize muscle recruitment responses to submaximal-effort FIT with varying moments of inertia (MOI).

METHODS

- 20 healthy, physically active participants (10M, 10F; age 19-39y) completed FIT squats (Exxentric Kbox 4Pro).
- Testing entailed quarter-squats (60° knee flexion) with increasing MOI increments of 0.005 kg·m² until volitional fatigue.
- Squat depth was monitored in real-time by electrogoniometer and synchronized to surface electromyography (sEMG) of the vastus lateralis (VL), biceps femoris (BF), gluteus maximus (GM), and soleus (SOL).
- EMG data were normalized to peak activity during an isometric squat.
- Peak EMG amplitude, integrated EMG (iEMG) amplitude, mean amplitude of concentric (CON) and eccentric (ECC) phases and ECC/CON ratio were examined
- Mixed model 2x2 ANOVAs assessed muscle recruitment responses for the VL, BF, GM, and SOL to MOI (within subjects) for both sexes (between subjects).

RESULTS



CONCLUSIONS

1. Increasing MOI during submaximal FIT quarter squats increases EMG amplitude of muscle involved in triple extension exercise
2. Increasing MOI shifts muscle recruitment of hip extensors and plantar flexors is preferentially increased, but eccentric overload is only achieved in the knee extensors.
3. ECC overload may be achieved during submaximal FIT quarter squats for the VL (any MOI) and SOL (MOI ≥ 0.015 kg·m²)

PRACTICAL APPLICATIONS

1. Increasing MOI during submaximal FIT quarter squats increases EMG activity of ankle, hip, and knee extensors.
2. Increasing MOI preferentially increases EMG activity of hip extensors and plantar flexors
3. During submaximal FIT squats eccentric overload is only achieved in the knee extensors.