

The AGAINER Ski Exoskeleton reduces quadriceps muscle activity by 40%.



Passive Knee Exoskeleton Reduces Quadriceps Muscle Activation During Downhill Skiing: A Pilot Study

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INTRODUCTION

- Passive knee exoskeleton with adjustable gas springs
- Assists in maintaining squat-like position through knee extension moment
- Tested effect of exoskeleton assistance on thigh muscle activity during squats and skiing

METHODS

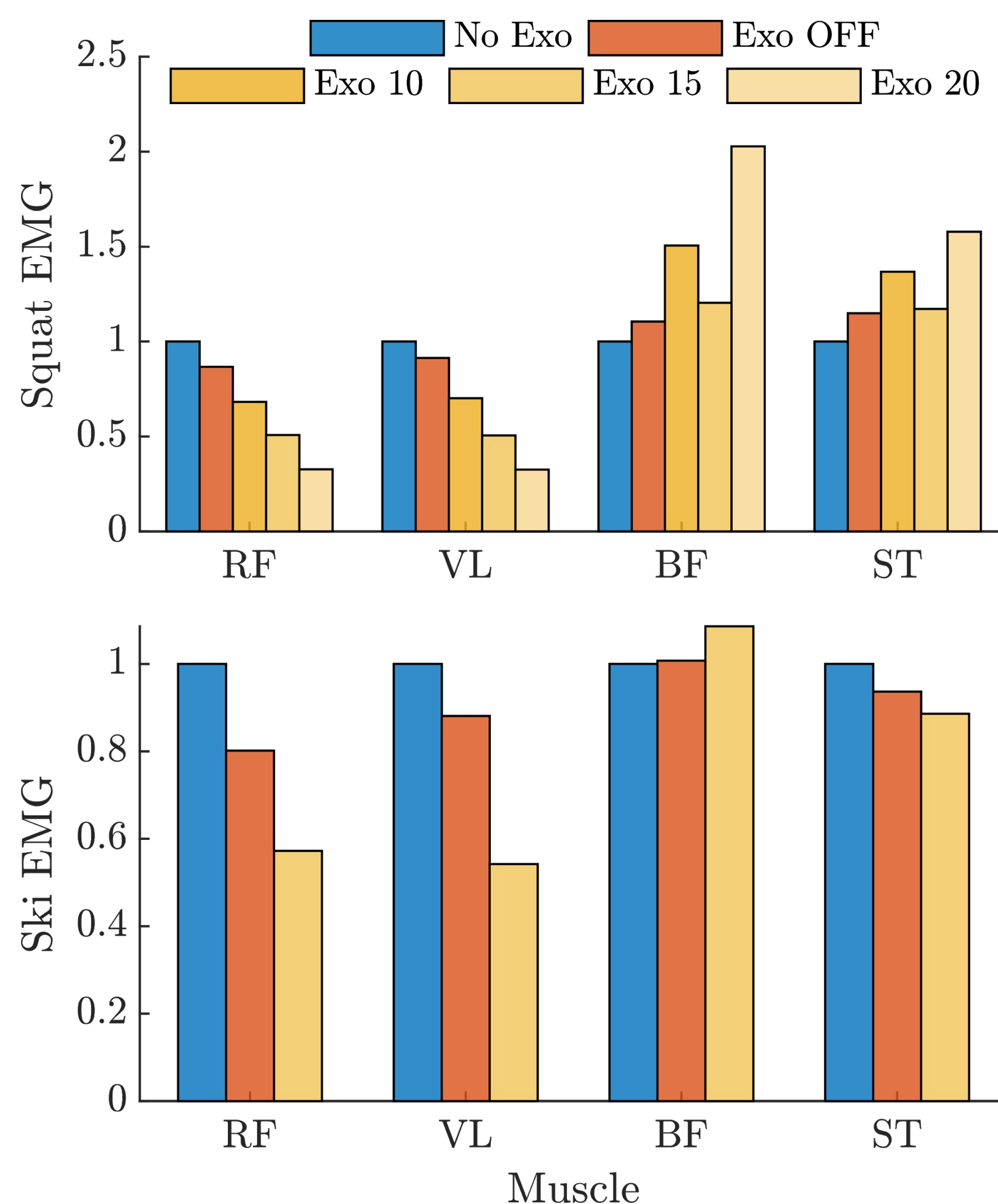
Squat Experiment

- Subject performed squats under the following conditions:
 - No Exo
 - Exo OFF (no assistance)
 - Exo 10 (pressure: 10 bar)
 - Exo 15 (pressure: 15 bar)
 - Exo 20 (pressure: 20 bar)

Ski Experiment

- Subject skied through slalom-style course (requiring 3 turns in each direction):
 - No Exo
 - Exo OFF
 - Exo 15

RESULTS



DISCUSSION

- Quadriceps activity reduced by up to 40%
- Quadriceps activity decreased with increasing exoskeleton pressure
- No effect on hamstrings activity
- Limitations- limited sample size, trials per subject, and testing conditions



Muscles Tested

- Rectus femoris (RF)
- Vastus lateralis (VL)
- Biceps femoris (BF)
- Semitendinosus (ST)

Electromyography (EMG) Data Processing

1. High-pass filtered (20 Hz, 4th order)
2. Full-wave rectified
3. Low-pass filtered (6 Hz, 2nd order)
4. EMG averaged across trials and normalized by the average EMG from No Exo

