EFFECT OF AN ISOINERTIAL POST-ACTIVATION POTENTIATION PROTOCOL ON COUNTERMOVEMENT JUMP KINETICS

Adam A. Burke, Tianyi Lu, Meghan K. Magee, and Margaret T. Jones

PRESENTER:
Adam Burke

GEORGE MASON UNIVERSITY

INTRODUCTION

- Acute bouts of isoinertial training can enhance muscle force production during subsequent plyometric exercise. Evidence supports flywheel isoinertial half squats as an effective lower-body preload activity.
- However, further research is necessary to determine the degree to which such post-activation potentiation (PAP) conditioning activities influence jump kinetics.
- PURPOSE: To compare countermovement jump (CMJ) performances following a traditional dynamic warmup (TDW) and flywheel (FW) warmup.

METHODS

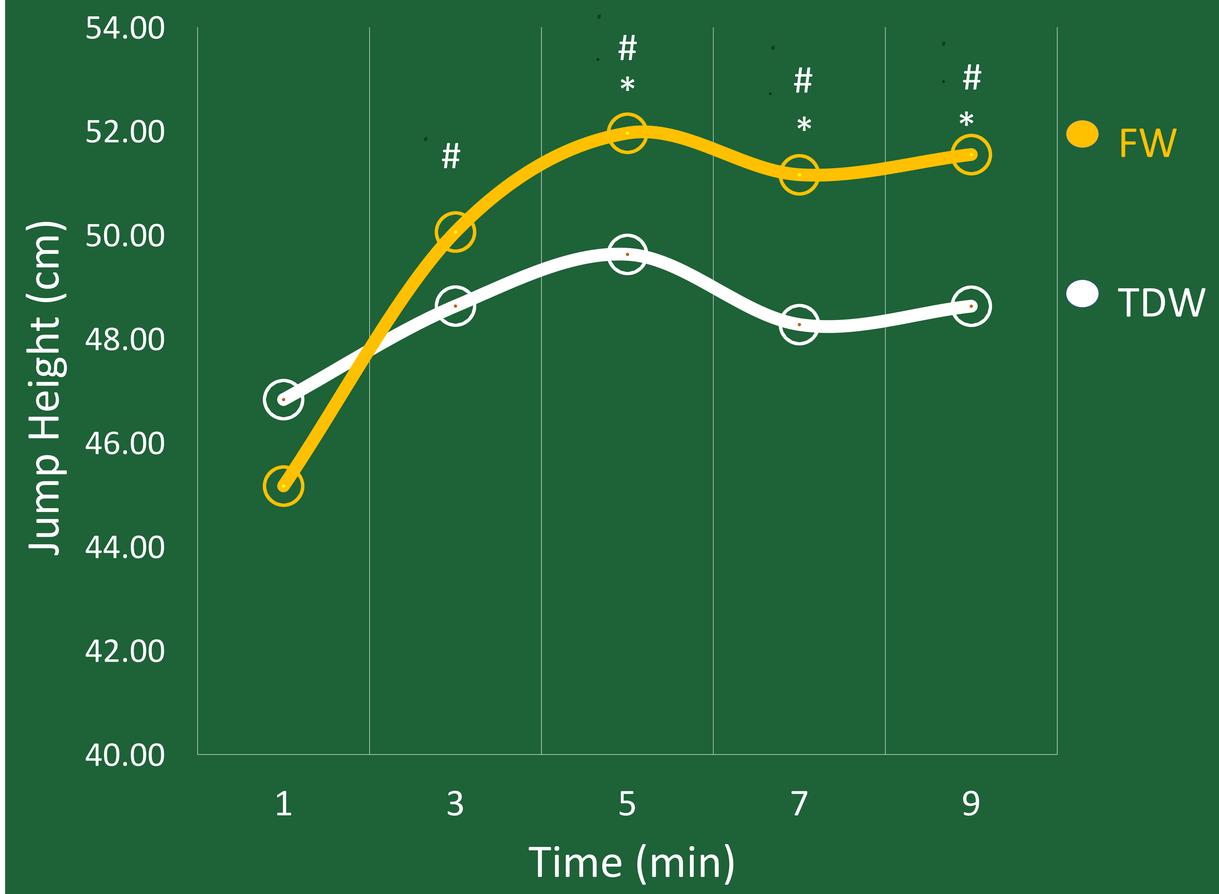
- College-aged students (9 men; 4 women; age: 23.38±3.10 yr; body mass: 78.49±14.48 kg; height: 172.78±8.59 cm; training age: 4.80±1.29 yr) volunteered to participate.
- Session 1 included anthropometric measurements, strength assessment, and familiarization with the flywheel (FW) half-squat (figure 2) and the traditional warm up (TDW). The strength assessment consisted of a 1.25x bodyweight back squat, and the FW half-squat protocol required subjects to have the crease of the hip parallel to the knee joint.
- Sessions 2 and 3 consisted of the randomized testing condition (FW or TDW). Prior to either conditions, participants completed 5 minutes (min) of treadmill walking (3.5 mph, 1.5% grade).
- In the TDW condition, participants completed 20 seconds of skipping, 20 bodyweight lunges, and 20 bodyweight squats, interspersed by 1 min of passive recovery. In the FW condition, participants completed 3 sets of 10 repetitions of bilateral half squats, interspersed by 2 min of passive recovery. Load used for the FW protocol was 1 large disk (mass = 4 kg; inertia = 0.050 kg·m2) and 1 medium disk (mass = 2.8 kg; inertia = 0.025 kg·m2).
- Upon completion of both conditions, participants completed a maximal CMJ at 1 min, 3 min, 5 min, 7 min, and 9 min post-intervention. Analyzed variables included CMJ height (cm), reactive strength index modified (RSImod) (m/s), braking force (N), and power relative to body mass (W/kg).
- Repeated measures analysis of variance (RMANOVA) 2 (condition; TDW or FW) x 5 (CMJ time point) were used to identify differences between FW and TDW conditions ($p<0.05$).

KEY FINDINGS

CMJ height was greater following the FW warm-up at 5 min (p=0.02), 7 min (p=0.04), and 9 min (p=0.03).

CMJ height at 3 min (p=0.02), 5 min (p=0.01), 7 min (p=0.02), and 9 min (p=0.01) were greater than at 1 min following the FW warm-up.

Figure 1. FW & TDW CMJ Height



FW: flywheel
TDW: traditional warm up
CMJ: countermovement jump
p <0.05, * FW > TDW
p<0.05, # Indicates significant difference compared to 1-min FW

RESULTS

- RSImod, braking force, and power relative to body mass did not differ between conditions.
- CMJ height had a significant condition x time interaction effect (p=0.039).
- Figure 1. CMJ height at 1-min,3-min,5-min,7-min, and 9-min following FW and TDW conditions
- Table 1. CMJ kinetics following FW and TDW conditions

Table 1. FW & TDW CMJ Kinetics

Measurement	FW	TDW
CMJ Height (cm)	51.40±10.36	51.03±11.58
Power Relative to Body Mass (W/kg)	31.06±6.19	30.51±5.72
Braking Force (N)	1800.19±375.31	1781.64±330.66
RSImod (m/s)	1.56±0.79	1.30±0.27

Figure 2. FW Half-Squat

CONCLUSIONS & PRACTICAL APPLICATIONS

- The utilization of a FW half squat protocol may enhance CMJ height.
- FW half squats can be used to improve lower-body explosiveness during the CMJ.
- Strength and conditioning professionals are recommended to incorporate FW half squats as a PAP preload activity prior to performing lower-body plyometric exercise.

MASON PATRIOTS