

The influence of loaded countermovement jump exercises, with and without elastic band resistance, on subsequent jump performance

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Introduction

Performing voluntary muscle actions using elastic bands (EB) to precondition the muscle in combination with free-weight (FW) resistance can alter the loading characteristics of these actions to impose a greater mechanical stimulus and increase subsequent performance (1). However, limited warm-up is commonly utilised in these studies (1, 2), which could invalidate the potentiation often reported. Thus, the aim of the present study was to examine the influence of EB resistance following a comprehensive warm-up on subsequent countermovement jump (CMJ) performance.

Methods

Fifteen active men (age = 21.7 ± 1.1 y, height = 1.8 ± 0.1 m, mass = 77.6 ± 2.6 kg) volunteered for the study. On two separate occasions, following a comprehensive warm-up consisting of 5 min cycling, 10 continuous unloaded squats, 5 continuous CMJs at $\sim 70\%$ of maximum, then maximal jumps every 30 s until 3 jumps were within 3% of maximum jump height, participants performed 5 repetitions of either EB- or FW-loaded CMJs at 50% 1-RM (35% of load generated from elastic resistance during EB). CMJs were then performed 30 s, 4 min, 8 min, and 12 min later, with jump height and electromyograms (EMG) of the vastus lateralis (VL), vastus medialis (VM), gluteus maximus (Glut) and gastrocnemius medialis (GM) recorded.

Results

Compared to baseline, no significant ($P \geq 0.05$) changes in CMJ height (0.3-2.7%) or EMG activity (VL = 0.6-7.1%; VM = 0.8-1.6%; Glut = 3.1-8.7%; GM = 0.6-6.4%) were observed in the FW condition. Significant increases in CMJ height (4.6-8.0% [Figure 1]) and peak concentric VL EMG activity (10.3-18.8% [Figure 2]) were found at 30 s and 4 min in the EB condition; no changes in jump height (0.3-0.9%) or EMG activity (VL = 6.0-7.9%; VM = 2.1-4.4%; Glut = 3.2-5.3%; GM = 1.8-7.1%) were found at 8 min or 12 min.

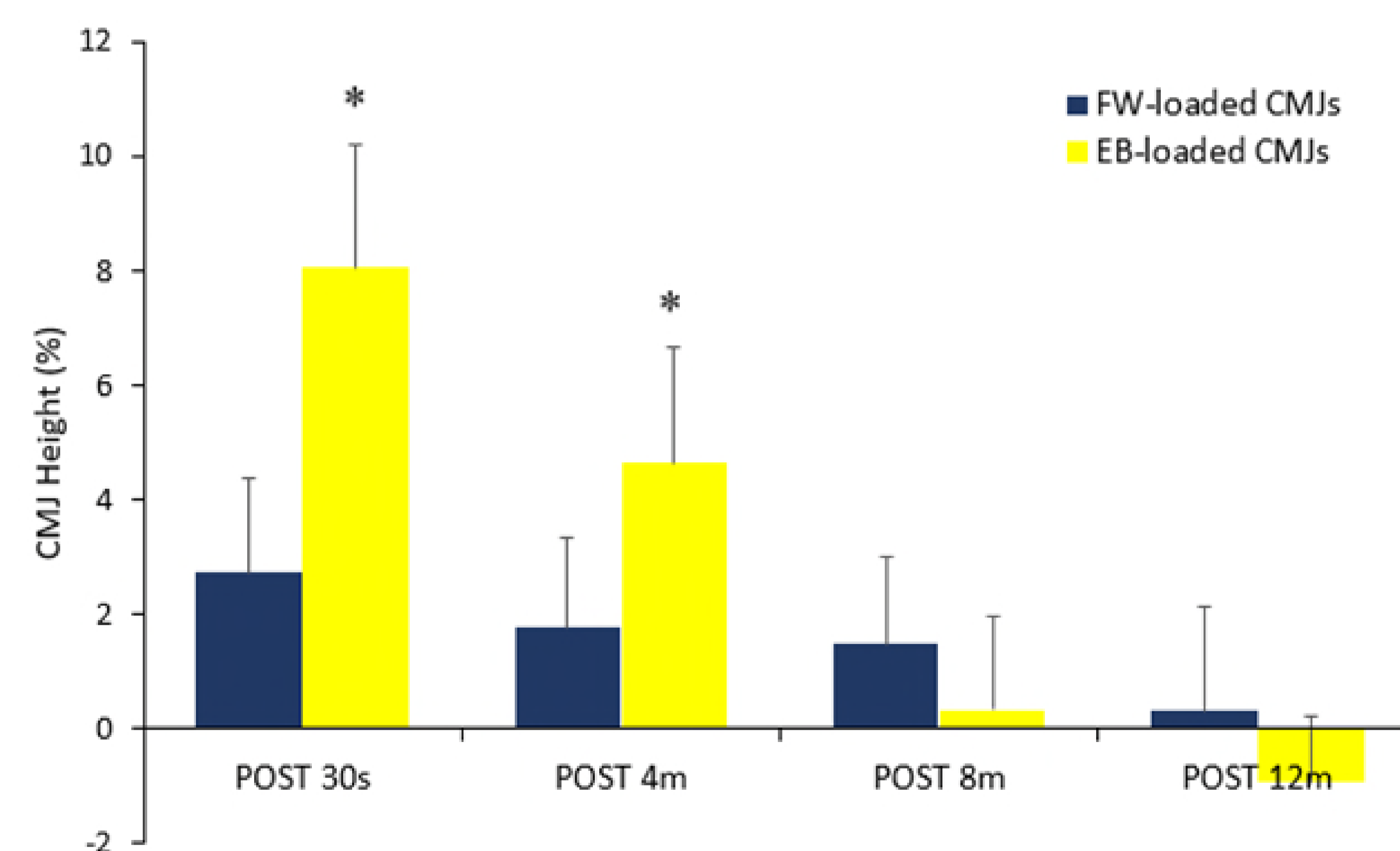


Figure 1. Change in CMJ height (%) following FW- and EB-loaded CMJs. *Significant increase ($p < 0.05$). CMJ, countermovement jump; FW, free-weight; EB, elastic bands.

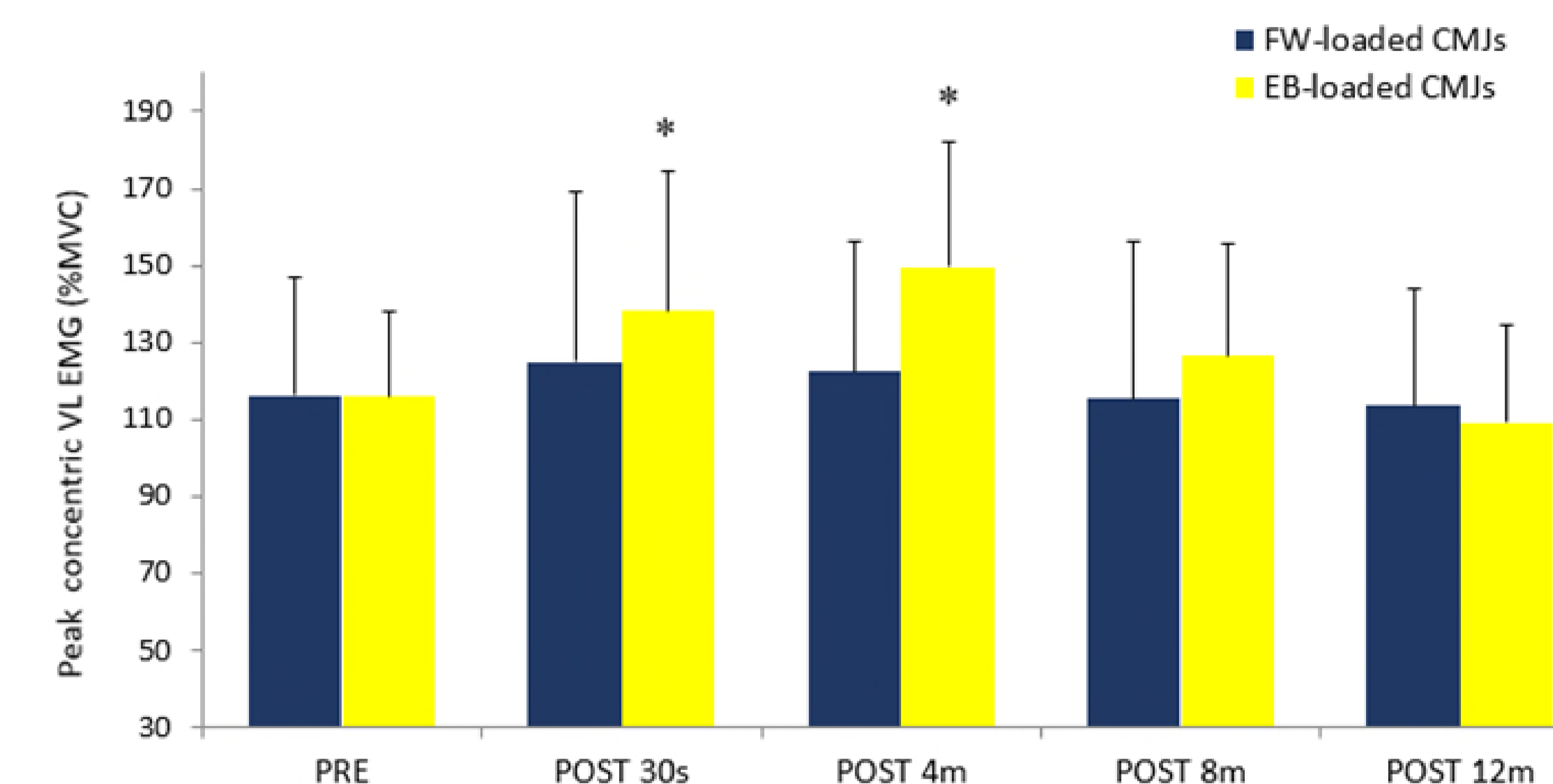


Figure 2. Peak VL EMG (%MVC) following FW- and EB-loaded CMJs. *Significant increase ($p < 0.05$). VL, Vastus Lateralis; EMG, electromyography; MVC, maximal voluntary contraction; FW, free-weight; EB, elastic bands; CMJ, countermovement jump

Discussion & Conclusion

The lack of change in CMJ performance in the FW condition is consistent with previous research (1) and indicative that the comprehensive warm-up eliminated the potential for further improvements. However, improvements in the EB condition at 30 s and 4 min is indicative of further potentiation through alteration of the motor control strategy to improve jump performance; data indicative of a superior warm-up protocol providing short-term improvements in strength and power performance under some conditions.

References

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