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Effects of hip extension training performed with full versus partial range of motion at long muscle lengths on muscle hypertrophy and sprint performance

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INTRODUCTION:
The hip extensors appear to play an important role in sprint running performance (Miller et al., 2021; 2022). However, it is unknown whether hip extension training improves sprint performance. Growing evidence suggests that training at long muscle lengths produces greater hypertrophy than training at short muscle lengths (Maeo et al., 2021; 2022). Although resistance training guidelines generally recommend wide or full range of motion (ROM) (ACSM, 2011; Schoenfeld & Grgic, 2020), training with partial ROM at long muscle lengths may be superior for muscle hypertrophy and consequently also sprint performance. Thus, we examined the effects of hip extension training performed with either full ROM versus partial ROM at long muscle lengths, on muscle hypertrophy and sprint performance.
METHODS:
Thirty-four healthy young adults were allocated to a full (FULL: n = 18) or partial (PART: n = 16) group, and they completed the study. The participants conducted unilateral hip extension training in a standing position either with full ROM (hip 90°-flexed to 0°) or partial ROM at long muscle lengths (hip 90°-flexed to 45°-flexed), as allocated, with the knee kept straight. Each leg performed 5 sets of 10 repetitions (2 s for each of the concentric/eccentric phases) at 70% of one repetition maximum (specific to FULL/PART) during each training session, and 2 sessions/week for 12 weeks. Before and after the intervention, T1-weighted axial 3-T MRI scans (FOV: 200*200 mm, slice thickness & gap: 5 mm) were obtained to assess muscle volume of the hip extensors (the gluteus maximus and hamstrings), and 60-m sprint time was also assessed.
RESULTS:
After the intervention, muscle volume significantly increased in all hip extensors for both groups ($P \leq 0.006$). The changes in muscle volume were greater for PART than FULL in the gluteus maximus (+6.1 vs +2.4%, $P = 0.038$, Cohens'd = 0.90) and biceps femoris long head (+9.4% vs +4.2%, $P = 0.014$, Cohens'd = 1.04), but statistically not different between groups in the semitendinosus (+7.3 vs +4.6%, $P = 0.891$, Cohens'd = 0.37) and semimembranosus (+7.2% vs +3.9%, $P = 0.109$, Cohens'd = 0.75). Consequently, the change in muscle volume of the whole hip extensors was greater for PART than FULL (+6.8 vs +3.1%, $P = 0.025$, Cohens'd = 0.96). 60-m sprint performance significantly increased (i.e. shorter/faster time) in both PART and FULL without a significant difference between groups (-2.5% vs -1.1%, $P = 0.108$, Cohens'd = 0.79).
CONCLUSION:
Hip extensor hypertrophy was greater after hip extension training performed with partial ROM at long muscle lengths compared to full ROM, while both types of training improved sprint performance similarly.

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