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Impact of Lower Body Strength Training on Athletic Vertical and Horizontal Performance

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Abstract

Background

The methodologies of strength training in sports performances have progressed from conventional resistance programs to include elements of stability, mobility, and dynamic balance. Although Traditional Strength Training (TST) is recognised for enhancing lower body strength and power, the relative impacts of Complex Functional Strength Training (CFST), Functional Strength Training (FST), and TST in highly trained athletes (HTA) have not been thoroughly investigated. This study aimed to identify the training modality that most successfully improves lower body power, strength, and functional mobility.

Methods

Seventy-two Malaysian individuals engaged in high-intensity training (aged 20–26, with 3–5 years of strength training experience) were randomly allocated to either the CFST, TST, FST, or control group (n=18 per group) in an 8-week randomised controlled study. Training occurred biweekly. Performance outcomes were assessed before and after the intervention utilising the Y-Balance Test (YBL) for dynamic balance, the Countermovement Jump (CMJ) for vertical explosive power, the Standing Broad Jump Test (SBJT) for horizontal power, and the Isometric Mid-Thigh Pull at 100–200 kg (FORCE100, FORCE150, FORCE200) for isometric force production. The data satisfied the requirements of normality and homogeneity of variance, permitting the application of one-way ANOVA and MANOVA with further post hoc analyses.

Results

Significant group effects were seen for CMJ ($p=.005$, $\eta^2=.17$), YBL ($p=.034$, $\eta^2=.12$), FORCE150 ($p=.034$, $\eta^2=.12$), and FORCE200 ($p=.016$, $\eta^2=.14$). No notable changes were detected for SBJT ($p=.715$) or FORCE100 ($p=.063$). Post hoc analysis revealed that CFST and TST greatly surpassed FST and the control group in CMJ performance. CFST demonstrated superior YBL enhancements compared to FST. Inter-group disparities accounted for 10–17% of the variance in important outcomes.

Discussion

Both CFST and TST enhanced vertical explosive power, with CFST providing supplementary improvements in dynamic balance. These findings indicate that CFST's multi-planar and stability-focused methodology promotes functional mobility, augmenting the maximal strength gains achieved with TST. The lack of significant SBJT variations indicates that the intervention effects were predominantly related to vertical and lateral force generation rather than horizontal propulsion.

Conclusion:

The merging of traditional resistance training with complex functional, balance, and stability components offers a constructive approach for augmenting lower body performance in elite athletes. CFST provides enhanced performance advantages, but dependence solely on FST may be inadequate for significant power and strength improvements in HTA.

Keywords

- Complex Functional Strength Training
- Traditional Strength Training
- Functional Strength Training
- Lower Body Strength and Power

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