Skeletal muscle functional and structural adaptations after eccentric overload flywheel resistance training: A systematic review and meta-analysis

Abstract and Figures

Background Although free weights and weight-stack devices are the most popular modes of resistance training, flywheel (FW) devices have gained attention in the last years, becoming an important component of strength and conditioning programs. Objective The purpose of this metaanalysis was to examine the effect of FW resistance training with Eccentric Overload (FW-EOT) on muscle size and functional capacities (i.e. strength and power) in athletes and healthy subjects, and to compare FW-induced adaptations with those triggered by traditional resistance exercise interventions. Methods A search of electronic databases [PubMed, MEDLINE (SPORTDiscus), Web of Science, Scopus and PEDro] was conducted to identify all publications employing FWEOT up to April 30, 2016. Outcomes were analyzed as continuous outcomes using a random effects model to calculate a standardized mean difference (SMD) and 95% CI. A total of 9 studies with 276 subjects and 92 effect sizes met the inclusion criteria and were included in the statistical analyses. Results The overall pooled estimate from the main effects analysis was 0.63 (95% Cl 0.49 to 0.76) with a significant (p<0.001) Z overall effect of 9.17. No significant heterogeneity (p value = 0.78) was found. The meta-analysis showed significant differences between FW-EOT vs. conventional resistance training in concentric and eccentric strength, muscle power, muscle hypertrophy, vertical jump height and running speed, favoring FW-EOT. Conclusion This meta-analysis provides evidence supporting the superiority of FW-EOT, compared with traditional weight-stack exercise, to promote skeletal muscle adaptations in terms of strength, power and size in healthy subjects and athletes.

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Characteristics of the studies included....



Flow chart illustrating the different phases of the search and selection of the studies included in the review (PRISMA).



Forest plot with meta-analysis of standardized mean difference showing comparison of eccentric overload training versus control/weight training on strength (N), muscle power (W), muscle hypertrophy (cm 3, mm or kg), jump height (cm) and running speed (s).

Read full report here.