

The Effect of Beetroot Juice Supplementation on Muscle Fatigue in Healthy Adults: A Meta-Analysis

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ABSTRACT

Dietary supplementation with beetroot juice has been reported its positive effects on diverse 5 aspects of sports performance, but its effect on muscle fatigue remains unclear. **PURPOSE:** The 6 purpose of this meta-analysis is to investigate the effect of beetroot juice supplement on muscle 7 fatigue assessed by changes in strength or power outputs. **METHODS:** The meta-analysis 8 followed Preferred Reporting Items for Systematic Review and Meta-Analyses guidelines. 9 Through the comprehensive search using major databases including Science Direct, PubMed 10 (MEDLINE), SPORTDiscus, Web of Science, and Academic Search Complete, 215 relevant 11 studies were identified. Three search terms were used to identify a potentially relevant article; 12 "Beetroot" AND "Exercise" AND "Fatigue." The inclusion criteria for the search included: 1) 13 human subjects, 2) exercise type (Strength and Power), 3) the peer-reviewed journals published 14 in English. Out of 215, data from the 30 trials were extracted for inclusion in the meta-analysis. 15 Comprehensive meta-analysis v.3 software was used to compute the standardized mean 16 difference effect sizes based on a random effects model. Several moderator analyses were 17 conducted to examine the effect of dosage, timing of supplementation, type of measure, gender, 18 and participation on the overall effect size. The Egger's test was used to evaluate for no 19 evidence of publication bias. **RESULTS:** The results showed a significant positive effect of 20 beetroot juice supplementation on muscle fatigue: the overall strength of ESs (Hedges' g) 21 was .334 (95% CI = .149, .520, $p < .001$; moderate effects; cf., Cohen's criteria). The prediction 22 interval was -.925 to 1.593, indicating that there are some populations where the impact of 23 beetroot juice on fatigue would be negative. There was no significant effect of moderators (participation (athletes vs. non-athletes), duration of supplement consumption, NO₃ - 24 25 concentration, gender, and type of measurement (power vs. strength)) on the size of the effect. 26 **CONCLUSION:** This study shows that dietary supplementation with beetroot juice significantly 27 reduces fatigue indicated by reducing strength and power outputs.