



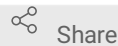
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# Effects of the ketogenic diet on muscle hypertrophy in re-sistance-trained men and women: a systematic review & me-ta-analysis

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## ABSTRACT

Reviews focused on the ketogenic diet (KD) based on the increase in fat-free mass (FFM) have been carried out with pathological populations or, failing that, without population differentiation. The aim of this review and meta-analysis was to verify whether a ketogenic diet without programmed energy restriction generates increases in fat-free mass (FFM) in resistance-trained participants. We evaluated the effect of the ketogenic diet, in conjunction with resistance training, on fat-free mass in trained participants. Boolean algorithms from various databases (PubMed, Scopus and Web of Science).

## DOI

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### Review Question

PICO (S) asks: "Population" resistance-trained male participants "Intervention": "training protocol and ketogenic diets; "Control" "Group that did not ketogenic diet". Results: "increased fat free mass or muscle thickness; "Studies": "randomized controlled studies".

### Searches

The scientific literature search was performed in electronic databases PubMed, Web of Sciences(WOS) and SCOPUS.

The search consisted of keywords related ("ketogenic diet" OR "Ketogenic dieting" OR "Low carbohydrate diet") AND ("Body composition" OR "fat free mass" OR "lean body mass" OR "LBM" OR "ultrasound") AND ("resistance training" OR "Strength training" OR "muscle" OR "muscle mass" OR "hypertrophy" OR "training hypertrophy" OR "trained men" OR "training males" OR "trained women")

### Types of study

Systematic review & meta-analysis

### Condition or domain being studied

Impact on muscle hypertrophy by the application of the ketogenic diets in resistance trained participants

### Participants/Populations

Resistance-trained participants (men and women)

### Intervention (s)/exposure

Application of ketogenic diets with resistance-training

**Comparator (s)/Control**

Control group performs the same physical exercise and consumes the same calories, however, does not restrict carbohydrates

**Context**

Advanced participants with application of ketogenic diet and resistance training simultaneously

**Main (Outcome)**

Maintenance or increase of fat-free mass

**Measure of effect**

Not applicable

**Additional outcomes**

None

**Measures of effect**

Not applicable

**Data extraction (selection and coding)**

Studies were searched and analyzed by two independent reviewers (S.V.M and J.B.P). The articles found were coded using the Endnote reference manager, and discrepancies regarding the interpretation of the extracted data were discussed by both researchers. In addition, the articles were filtered using the inclusion criteria: a) randomized trials, with a minimum duration of 8 weeks; b) the use of a KD in resistance-trained participants, competitors or elite athletes; c) evaluation of body composition by means of DXA, bioimpedance or ultrasound; d) data presented as means and standard deviations; e) no interventions using nutritional or dietary supplements; and f) the text was in English and available in full.

The articles were selected according to their title and abstract. Articles that did not meet the inclusion criteria were discarded. In the second phase, the entire article was read and analyzed. Information was extracted from the articles on the number of participants, the type and duration of interventions, and characteristics of the population.

**Risk of bias (quality) assessment**

The risk of bias assessment will be carried out following the recommendations of the Cochrane Collaboration. For each study, seven domains were scored with high, low or unclear risk of bias. These domains were: sequence generation, allocation concealment, blinding of participants and staff, blinding of outcome assessment, incomplete outcome data, selective outcome reporting, and other issues considered.

**Strategy for data synthesis**

To perform this meta-analysis, the effect of the ketogenic and non-ketogenic diet was analyzed as a control group. Both groups performed strength exercises. Data were extracted using the

mean and standard deviation (numerical values) presented after the intervention.

The results of this meta-analysis were presented with mean differences (MD) and 95% confidence interval (CI). Heterogeneity was also present, estimated by measuring its extent by the I<sup>2</sup> index. The authors examined the P value for this statistics and noted the presence of heterogeneity when  $P < 0.05$ , compromising the validity of the pooled estimates. In addition, the I<sup>2</sup> index considered low heterogeneity (0-40%), moderate (30-60%), considerable (50-90%) or substantial (75-100%).

### **Review team members and their organisational affiliations**

Salvador Vargas Molina (EADE-University of Wales Trinity Saint David, Málaga Spain; University of Malaga, Málaga, Spain). José Luis Gómez Urquiza (University of Granada, Granada, Spain). Jerónimo García-Romero (University of Malaga, Málaga, Spain). Javier Benítez-Porres (University of Malaga, Málaga, Spain).

### **Type and method of review**

Meta-analysis, Systematic review

### **Anticipated or actual start date**

15 August 2022

### **Anticipated completion date**

30 September 2022

### **Funding sources/sponsors**

No funding

### **Conflicts of interest**

There are not conflicts of interest

### **Language**

English

### **Country**

Spain

### **Stage of review**

Review ongoing

