

**Citation:**

Sabaté J, Cordero-Macintyre Z, Siapco G, Torabian S, Haddad E. Does regular walnut consumption lead to weight gain? *Br J Nutr*. 2005 Nov; 94 (5): 859-864.

**PubMed ID:** [16277792](#)

**Study Design:**

Randomized crossover trial

**Class:**

A - [Click here](#) for explanation of classification scheme.

**Research Design and Implementation Rating:**

POSITIVE: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

To determine the potential changes in body weight and body composition, when free-living subjects, who are not given additional dietary advice incorporate moderate amounts of walnuts (28 to 56 g, approximately 12% of dietary intake) into their diet for six months.

**Inclusion Criteria:**

- Weight change of less than 1.0kg during the previous six months
- BMI less than 35kg/m<sup>2</sup>
- Habitual diet includes nuts less than once per week.

**Exclusion Criteria:**

- A diagnosed medical disorder that affects weight (diabetes, hypothyroidism)
- Aversion or known allergy to nuts.

**Description of Study Protocol:****Recruitment**

Individuals who responded to recruitment advertisements were recruited from various Southeast California communities and underwent a selection process that included two telephone screenings, an informational meeting and a personal interview.

**Design**

Randomized crossover trial that included two six-month periods, a control diet and a walnut-supplemented diet. Subjects underwent one diet for six consecutive months, then switched to the other diet for the next six consecutive months. At baseline participants were randomly

assigned to the two treatment groups:

- Walnut-supplemented-to-control group (walnut-control)
- Control-to-walnut-supplemented group (control-walnut).

### **Intervention**

- Participants were asked to follow their usual diet
- While on the walnut-supplemented diet, the participants were provided with walnuts that provided approximately 12% of their daily energy intake
- When on the control diet the participants were asked to refrain from eating nuts
- Participants were asked not to change their physical activity habits and not to attempt to lose weight while in the study
- No other guidance was given
- Participants were unaware that weight and body composition were the focus of the study.

### **Statistical Analysis**

- Descriptive statistics were calculated for subject characteristics and outcome variables at baseline
- Tests for significant differences between treatment sequences were conducted by using two-sample T-tests except for gender, for which  $\chi^2$  test was used
- Outcome variables were weight, BMI, fat mass, percentage body fat, fat-free mass and total body water
- Tests for significant differences in outcome variables for each treatment sequence and for a significant sequence effect were conducted by using mixed linear models that included a random term for subjects and fixed terms for diet, period and their interaction
- Paired T-tests to compare within-subject differences in walnut intake, total energy and energy from walnut intakes, percentage dietary compliance and physical exercise were performed for both treatment sequence groups and all participants
- All analyses were done using SAS.

### **Data Collection Summary:**

#### **Timing of Measurements**

- 24-hour recalls were collected by research nutritionists through telephone interviews collected seven times during each diet period. Telephone interviews were unannounced and administered non-consecutively to reduce the possibility that subjects would change their intake. To capture daily variations in intake, all days of the week were covered by the seven recalls
- Anthropometric measures were taken at each clinic visit, including at baseline and every two months up to 12 months
- An exercise questionnaire used previously by the study institution was completed by each participant at each clinic visit. Frequency of exercise and amount of time spent per session was collected in various physical activity categories.

#### **Dependent Variables**

- Body weight
- BMI
- Fat mass

- Percentage body fat
- Fat-free mass
- Total body water.

### Independent Variables

- Normal diet
- Walnut supplemented diet.

### Description of Actual Data Sample:

- *Initial N*: 94 subjects
- *Attrition (final N)*: 90; 41 in the control-walnut group and 49 in the walnut-control group
- *Age*:
  - Control-walnut group: 53.1 years (11.4 SD)
  - Walnut-control group: 55.5 years (9.9 SD)
- *Anthropometrics*: The two sequence groups were similar for mean age, height, body weight, BMI, body composition parameters and gender
- *Location*: United States.

### Summary of Results:

#### Key Findings

- The walnut-supplemented diet resulted in greater daily energy intake (133kcal)
- For all participants, walnut supplementation increased weight [0.4kg (SE 0.1kg)], BMI [0.2kg/m<sup>2</sup> (SE 0.1kg/m<sup>2</sup>)], fat mass [0.2kg (SE 0.1kg)] and lean mass [0.2kg (SE 0.1kg)]
- After adjusting for energy differences between the control and walnut-supplemented diet, no significant differences were seen for body weight or body composition, except for BMI.

### Author Conclusion:

Regular walnut intake resulted in weight gain much lower than expected, which became non-significant after controlling for differences in energy intake.

### Reviewer Comments:

- *A training effect due to increased awareness of one's diet might contribute to weight difference. Participants may have displaced other foods when they were on the walnut diet. The different effects on weight between the two diet sequences illustrate the potential limitations of crossover designs on behavioral treatments*
- *Hydration status will affect total body water.*

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### Research Design and Implementation Criteria Checklist: Primary Research

#### Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

### Validity Questions

<b>1.</b>	<b>Was the research question clearly stated?</b>	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
<b>2.</b>	<b>Was the selection of study subjects/patients free from bias?</b>	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
<b>3.</b>	<b>Were study groups comparable?</b>	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A

3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
<b>4.</b>	<b>Was method of handling withdrawals described?</b>	<b>Yes</b>
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
<b>5.</b>	<b>Was blinding used to prevent introduction of bias?</b>	<b>Yes</b>
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	No
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
<b>6.</b>	<b>Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?</b>	<b>Yes</b>
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	Yes
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes

6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	Yes
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
<b>7.</b>	<b>Were outcomes clearly defined and the measurements valid and reliable?</b>	<b>Yes</b>
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
<b>8.</b>	<b>Was the statistical analysis appropriate for the study design and type of outcome indicators?</b>	<b>Yes</b>
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
<b>9.</b>	<b>Are conclusions supported by results with biases and limitations taken into consideration?</b>	<b>Yes</b>
9.1.	Is there a discussion of findings?	Yes

9.2.	Are biases and study limitations identified and discussed?	Yes
<b>10.</b>	<b>Is bias due to study's funding or sponsorship unlikely?</b>	???
10.1.	Were sources of funding and investigators' affiliations described?	No
10.2.	Was the study free from apparent conflict of interest?	???

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