Isometric handgrip exercise and resting blood pressure: a meta-analysis of randomized controlled trials
Kelley GA, Kelley KS

CRD summary
This review concluded that Isometric handgrip exercise was efficacious for reducing resting systolic blood pressure and diastolic blood pressure in adults. This was a well-conducted review. The authors' conclusions appeared to reflect the limited available evidence. However, the small number and poor-quality of included studies mean the authors' conclusions should be treated with caution.

Authors' objectives
To examine the efficacy of isometric handgrip exercise for reducing resting systolic blood pressure (SBP) and diastolic blood pressure (DBP).

Searching
PubMed, Cochrane Central Register of Controlled Trials (CENTRAL), CINAHL, SPORTDiscus and Dissertation Abstracts International were searched from 1971 to February 2009 without language restrictions. Search terms were reported. Dissertations or masters theses were eligible for inclusion. The search was cross-referenced to identify additional studies.

Study selection
Randomised controlled trials (RCTs) that assessed isometric handgrip exercises over at least four weeks duration in adults were eligible for inclusion. Outcomes comprised changes in resting SBP and DBP. Patient age ranged from 20 to 80 years of age. Studies were undertaken in Canada and USA, predominantly in a university setting. Initial blood pressure status varied across studies and included patients who were normotensive, hypertensive and prehypertensive. Two studies used a similar isometric handgrip training protocol; one study limited training to the dominant arm. Intervention duration ranged from eight to 10 weeks with three sessions per week. Assessment of resting blood pressure varied across studies.

Two reviewers selected studies for inclusion in the review.

Assessment of study quality
Two reviewers independently assessed study quality using the Jadad scale of randomisation, blinding, withdrawals and drop-outs to give a maximum score of 5.

Data extraction
Two reviewers extracted changes in resting SBP and DBP with variances derived from standard deviations (SD) from the included trials; where change score standard deviations were missing they were calculated from pre- and post-standard deviation values. Disagreements were resolved through consensus.

Methods of synthesis
Change scores and their variances were pooled using random-effects models and nonparametric 95% bootstrap percentile confidence intervals (BCI). Treatment effects were weighted by the inverse of its variance. Post hoc fixed-effect models were used due to the small number of included studies. Statistical heterogeneity was assessed using the Q statistic and \( I^2 \) statistic. Sensitivity analysis was undertaken by removal of each study from the analysis. Publication bias was assessed using Duval and Tweedie's trim and fill method.

Results of the review
Three studies were included in the review (n=81, range 15 to 49). Study quality was 1 in two studies and 2 for one study; blinding was not undertaken in any of the studies. Publication bias was absent.
Resting SBP (-13.4 mmHg, 95% CI -15.3 to -11.0) and DBP (-7.8 mmHg, 95% BCI, -16.5 to -3.0) were significantly reduced in the isometric handgrip group compared with controls when random-effects models were used; heterogeneity was absent.

Significant reductions for SBP and DBP were observed when fixed-effects models were used; significant heterogeneity was present for these comparisons.

Removal of each study from the analysis yielded significant reductions for SBP and DBP that ranged from -3.3 to -10.3 mmHg.

Authors' conclusions
Isometric handgrip exercise was efficacious for reducing resting SBP and DBP in adults. The small number of studies gave the findings limited generalisability.

CRD commentary
This review addressed a clear question and was supported by appropriate inclusion criteria. Adequate attempts were made to identify relevant studies without language restrictions, which reduced potential for language and publication biases. The likelihood of publication bias was assessed and found to be absent, but this was based on only a small number of studies. Two reviewers independently undertook trial selection, data extraction and validity assessment, which reduced potential for reviewer bias and error. Validity was assessed with published criteria; all studies were of poor quality. It appeared that appropriate methods were used to pool the trials. Statistical heterogeneity was assessed. The authors acknowledged that the generalisability of the findings was limited given the small number of studies included.

This was a well-conducted review. The authors' conclusions appeared to reflect the limited available evidence. However, in light of the small number of included studies, all of which were of poor quality, the authors' conclusions should be treated with caution.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that large RCTs with multiple arms that compared a separate isometric handgrip group with other lifestyle interventions (such as relaxation therapy, alcohol restriction, sodium restriction) were required, as were studies that assessed the effects of isometric handgrip exercise in combination with lifestyle interventions for lowering of blood pressure. Such studies should utilise intention-to-treat analysis, report drop-outs adequately and use evaluations where the assessor is blinded.

Funding
None.

Bibliographic details

PubMedID
20009767

DOI
10.1097/HJH.0b013e3283357d16

Original Paper URL
Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Aged, 80 and over; Blood Pressure; Exercise; Female; Hand Strength; Humans; Male; Middle Aged; Randomized Controlled Trials as Topic

AccessionNumber
12010001763

Date bibliographic record published
23/06/2010

Date abstract record published
17/11/2010

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.