Efficacy of exercise interventions in modulating cancer-related fatigue among adult cancer survivors: a meta-analysis


CRD summary
The authors concluded that exercise reduced cancer-related fatigue especially in programmes that involved moderate-intensity resistance exercise among older cancer survivors and in programmes that were guided by theory. The authors' conclusions reflect the evidence presented and are likely to be reliable.

Authors' objectives
To evaluate the efficacy of exercise as a nonpharmacologic intervention to reduce cancer-related fatigue among adult cancer patients.

Searching
CINAHL, MEDLINE, EMBASE and Scopus were searched to February 2010. Search terms were reported. OregonPDF in Health and Performance and Proquest Dissertations and Theses were searched for unpublished literature. Reference lists of retrieved studies and previous systematic reviews were scanned for additional studies.

Study selection
Randomised controlled trials that evaluated the effects of exercise on cancer-related fatigue in adult patients (18 years or older) diagnosed with any type of cancer at any stage of diagnosis and type or stage of treatment (including those who had completed treatment) were eligible for inclusion. The primary outcome of interest was patient-reported cancer-related fatigue.

One half of the included studies included aerobic exercise only; other studies included resistance training only, combination aerobic/resistance training and neuromuscular exercise (tai chi or yoga). The average length of exercise was 11.5 weeks. Participants had breast cancer, prostate cancer, lymphoma, leukaemia or colorectal cancer. Some studies included mixed groups. The mean age of participants was 53.8 years. Patients were on average 6.7 months post diagnosis. Most of the included participants were women (86%). Just under half of the participants were treated with primary pharmacologic therapy during the exercise intervention. Three quarters of participants were treated with a combination of chemotherapy and radiotherapy; others were treated with chemotherapy, radiotherapy or hormone therapy only.

The authors did not state how many authors performed the study selection.

Assessment of study quality
Validity was assessed using PEDro guidelines. Criteria included randomisation, allocation concealment, similarity of baseline groups, blinding, percentage of outcome measures, analysis by intention-to-treat, between-group statistical comparisons and point and variability measures. The maximum possible score was 11 points. Studies were scored as high quality (6 to 11 points), fair (4 to 5 points) and poor (less than 4 points).

Two reviewers independently assessed validity. Disagreements were resolved through discussion.

Data extraction
Two reviewers independently extracted data to calculate mean differences. Disagreements were resolved through discussion. The intensity of exercise was estimated using metabolic equivalent units (MET) (one MET=3.5mL O$_2$ kg$^{-1}$ min$^{-1}$). Corresponding MET values were coded from the compendium of physical activity. Intensity levels included low (less than three METs), moderate (three to six or more METS) and vigorous (more than six METs).

Methods of synthesis
Data were pooled and standardised mean differences were calculated and used to produce weighted mean effect sizes (d). Bivariate analyses were conducted using a fixed-effect model. Multi-moderator analyses were conducted using a
random-effects model. Heterogeneity was assessed using Q and $I^2$ statistics. Multiple effect sizes were calculated from individual studies where more than one exercise intervention group was included. Sensitivity analyses were conducted to confirm the dependence did not influence mean estimates. Modified least-squares regression analyses were used to examine variability. Publication bias was assessed using methods by Begg and Egger. The trim-and-fill technique was used.

**Results of the review**

Forty-four RCTs (3,254 participants) were included in the review. The mean methodological quality score was 6.8 (range 3 to 10) out of a maximum of 11 points.

Exercise interventions reduced cancer-related fatigue levels in cancer patients more than in usual care controls ($d=0.31$, 95% CI 0.22 to 0.40; 44 RCTs, $I^2=50\%$). Results remained significant for breast cancer (25 RCTs, $I^2=42\%$) and prostate cancer (four RCTs), but not for lymphoma (four RCTs), colorectal cancer (one RCT) one leukaemia (one RCT). There was evidence of heterogeneity for the overall analysis and for breast cancer.

Cancer-related fatigue levels reduced to a greater extent when interventions were theoretically driven ($p<0.001$) than when they were not and when cancer survivors were older rather than younger ($p=0.04$). Cancer-related fatigue levels reduced more than controls when moderate-intensity resistance exercise was used compared with lower intensity or aerobic exercises of any level of physical exertion, particularly for higher quality interventions ($p<0.05$). Time since diagnosis, aerobic exercise, flexibility exercise or supervision of exercise sessions did not moderate the results.

There was no evidence of publication bias.

**Authors’ conclusions**

Exercise reduced cancer-related fatigue, especially in programmes that involved moderate-intensity resistance exercise among older cancer survivors and in programmes that were guided by theory.

**CRD commentary**

The review question was clear. Inclusion criteria were appropriate. Several relevant sources were searched. Efforts were made to locate unpublished literature, which reduced potential for publication bias. Formal assessment found no evidence of publication bias. Appropriate methods to reduce reviewer error and bias were conducted for validity assessment and data extraction; whether similar methods were used for study selection was unclear.

Validity was assessed using an appropriate tool and results of the assessment were reported adequately. Combining studies in a meta-analysis appeared appropriate. Analysis of heterogeneity was undertaken. The authors commented that women with breast cancer were most targeted by the interventions and this may have limited the generalisability of the results.

The authors’ conclusions reflect the evidence presented and are likely to be reliable.

**Implications of the review for practice and research**

**Practice:** The authors stated that exercise interventions for adult cancer patients should be individualised based on targeted health outcomes and possibly cancer type. Exercise interventions should be multi-dimensional and combine sound exercise as well as behavioural sciences.

**Research:** The authors did not state any implications for research.

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**Bibliographic details**

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.