

# The BASES Expert Statement on Exercise and Cancer Survivorship

Produced on behalf of the British Association of Sport and Exercise Sciences by Dr Anna Campbell, Dr Clare Stevinson and Dr Helen Crank

This statement provides an overview of the evidence on the benefits of staying active after a cancer diagnosis and the current guidelines for exercise prescription in this population.



Above: The Paddlers for Life dragon boat teams in action, made up of cancer survivors and their supporters  
Courtesy Dr Helen Crank

## Introduction

Currently, there are at least 2 million people living in the UK following a cancer diagnosis. Due to factors such as an ageing population, earlier detection of cancer and continued improvements in cancer treatments, this number is predicted to rise by more than 3% each year (Maddams *et al.*, 2009). The most prevalent types of cancer are those with relatively high incidence and good prognosis. In the UK the most common cancer sites are breast and prostate, accounting for 46% and 31% of all female and male cases respectively. Even after successful treatment, cancer survivors can face additional challenges such as increased risk for recurrent cancer and other chronic diseases, and persistent adverse effects on physical functioning and quality of life. Some of the chronic and late-appearing problems experienced by cancer survivors include fatigue, pain, depression, anxiety, lymphoedema, menopausal symptoms and impotence. An emerging body of research has led to growing awareness among cancer survivors and medical staff of the potential value of exercise in preventing and managing some of these problems. Consequently, the subject of exercise within cancer survivorship has become one of increasing importance and interest for sport and exercise scientists.

## Background

Although adequate rest is vital at the time of cancer treatment and during recovery, an overemphasis on energy conservation can be problematic. Insufficient activity over time leads to loss of physical conditioning and muscular strength, making it difficult to perform even basic activities of daily living. This was demonstrated in a study comparing the physical performance

limitations of 279 short-term (<5 years) and 434 long-term (≥5 years) cancer survivors with 9,370 individuals without a history of cancer (Ness *et al.*, 2006). Over half of the cancer survivors (54% short-term and 53% long-term) reported performance limitations, versus 21% of the sample with no cancer history. The most common difficulties (crouching/kneeling, standing for 2 hours, lifting/carrying 10 pounds and walking quarter of a mile) were all ones essential for performing usual daily activities.

## Evidence from intervention trials

Evidence on the effects of exercise during and after cancer treatment has been accumulating since the 1980s. In a 2010 systematic review of controlled intervention trials (Speck *et al.*, 2010), data from 66 high-quality studies were synthesised. For exercise performed after treatment completion, significant small to moderate improvements were indicated for aerobic fitness, body weight and body fat, quality of life and fatigue, and large effects for muscular strength (see Table 1 for details). The wide confidence intervals and high heterogeneity for some outcomes reflect the overall inconsistency in findings and methodological aspects within the developing body of evidence. Nonetheless the indications are that exercise post-treatment has overall positive effects on functional and wellbeing outcomes.

Table 1. Meta-analysis results for effects of exercise interventions performed post-treatment (Speck *et al.*, 2010)

Outcome	Trials pooled	Effect size*	95% confidence interval	Heterogeneity
Aerobic fitness	14	0.32	0.04 to 0.59	Medium
Upper body strength	6	0.99	0.67 to 1.32	Low
Lower body strength	7	0.90	0.12 to 1.68	High
Body weight	14	-0.18	-0.31 to 0.06	Low
Body fat percentage	15	-0.18	-0.31 to -0.05	Low
Quality of life	16	0.29	0.03 to 0.54	High
Fatigue	14	-0.54	-0.90 to -0.19	High
Depression	10	-0.30	-0.65 to 0.05	Medium
Anxiety	7	-0.43	-0.88 to 0.03	Medium

\*Effect sizes are conventionally interpreted as 0.2=small, 0.5=moderate, 0.8=large  
For exercise performed during cancer treatment (typically chemotherapy, radiotherapy or hormonal therapy), significant small to moderate beneficial effects were indicated for aerobic fitness, muscular strength, body fat percentage and anxiety. Although promising results

have been reported from trials for several other important outcomes during and after treatment (e.g., bone health, immune function, pain) the number of studies and consistency of results are currently insufficient to represent conclusive evidence.

Cancer-related fatigue has been identified as one of the most common and distressing symptoms reported by patients, and also one of the most difficult to treat. Contrary to the concerns of some patients and caregivers that exercise may cause or exacerbate existing fatigue, a systematic review of 28 exercise intervention trials reported significant small effect sizes for reducing fatigue during (-0.18) and after (-0.37) cancer treatment (Cramp & Daniel, 2008). This supports the argument that regular exercise helps patients to avoid becoming trapped in a perpetuating cycle of deteriorating physical function and increasing fatigue.

## Evidence on survival

There is preliminary evidence that in addition to functional and quality of life benefits, physical activity performed post-diagnosis may be associated with improved survival. A small number of epidemiological studies involving breast, colorectal and prostate cancer survivors have suggested that risk of cancer recurrence, cancer-specific mortality and all-cause mortality is approximately 40-50% lower in physically active than inactive individuals. However, due to the small body of data and inconsistencies in study results, no firm conclusions can be drawn at this stage about the relationship between physical activity and survival after cancer diagnosis. Similarly, the precise mechanisms through which physical activity may influence cancer recurrence and mortality have not been established, but areas of ongoing research include the role of adiposity, metabolic and sex hormones, growth factors, immunological processes and chronic inflammation.

## Evidence on adverse effects

Few adverse events associated with exercise have been reported from trials with cancer populations. However, most trials screen out participants deemed at risk. For patients receiving current or recent treatment, general concerns relate to immunosuppression, falls, bone fractures, exacerbation of pain and other symptoms, and complications of cardiotoxic treatments. Key precautions and suggested modifications to exercise interventions to minimise risks have been published (Schmitz *et al.*, 2010). A particular concern for cancer survivors who have undergone removal of lymph nodes is the risk of causing or exacerbating limb lymphoedema through repetitive exercise. To date, preliminary studies and one adequately-powered randomised trial have reported no increase in lymphoedema risk in breast cancer survivors participating in progressive resistance training. Nonetheless, continued caution when performing vigorous repetitive exercise is advised. Overall, when considering the risks of exercise, it is important to weigh up the potential harm to cancer survivors

of remaining inactive in terms of the increased risk of other chronic conditions such as obesity, diabetes, cardiovascular disease and osteoporosis.

## Guidelines for exercise prescription

There is insufficient evidence in the literature regarding the optimal components of exercise prescription for each cancer type. However, current guidelines on exercise testing and prescription have recently been published by the American College of Sports Medicine for patients with cancer (ACSM, 2010). These are compatible with the American Cancer Society's recommendation of 30 to 60 minutes of moderate- to vigorous-intensity physical activity at least five days per week for survivors who are otherwise healthy. To date, no formal guidelines for cancer survivors have been published in the UK. However, health-related physical activity guidelines for the general population are appropriate for most cancer survivors. For those with cancer complications or co-morbidities that prohibit moderate-intensity exercise, avoidance of total inactivity is nonetheless advised.

## Future research

There is a need for greater understanding about the potential effects of different modes of exercise (aerobic, resistance and flexibility) performed during and after cancer treatment on specific short- and long-term health-related outcomes. In particular, the relationship between physical activity and disease-related and survival endpoints requires further investigation in both epidemiological studies and intervention biomarker trials. The majority of the studies have involved women with early-stage breast cancer, and future research should be aimed at other populations (e.g., young people, older adults, ethnic minorities, less common cancer diagnoses, advanced disease).

## Conclusions and recommendations

- There is consistent evidence confirming that exercise can be safely performed during and after cancer treatment, provided that individual limitations and specific side effects associated with cancer therapies are considered and monitored.
- Based on research in survivors of the most common cancers, improvements in aerobic and muscular fitness, quality of life and fatigue can be expected through exercise training.
- Unless advised otherwise, cancer survivors should follow the health-related physical activity guidelines provided for the general UK population.
- All cancer survivors including those with existing disease or who are undergoing difficult treatments should be encouraged, as a minimum, to avoid being sedentary. ■

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