

## Exercise as a Treatment to Improve Quality Of Life in Patients with Cancer (A Review of the Literature)

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**Introduction:** Improvement in cancer care increases life expectancy of cancer patients, most of whom have experienced prolonged episodes of fatigue during and after their treatment. This has been found to reduce the quality of life and increase morbidity and mortality of such patients. Therefore, additional interventions are beneficial to improve overall quality of life as well as longevity. There is growing evidence that exercise is beneficial to cancer patients through improvements in their physical and physiological abilities and functions.

**Objectives:** The purpose of the present article was to evaluate the current evidence to determine if exercise could be used as a safe and effective method to reduce fatigue and improve quality of life in these patients. The Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE and CINAHL search engines were electronically searched and 21 empirical studies published between 1995 and 2009 were found.

**Conclusion:** There is accumulative data in the literature supporting the effectiveness of exercise interventions on the physical and psychological wellbeing of patients with cancer. Exercise can improve muscle mass and strength and whole body oxygen uptake which are reduced during bed rest, infection and cancer treatments. Growing evidence is now supporting the effectiveness of exercise on specific populations such as women suffering from breast cancer. However, the effect of exercise on other populations such as children and patients suffering from other types of cancers is vague. Therefore, more research is needed to define scientific evidence-based rehabilitation protocols for patients with different types of cancer.

**Keywords:** Cancer, Exercise, Quality of life, Fatigue, Rehabilitation

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### Introduction

Fatigue is a normal response in the body which any individual can experience. Prolonged and chronic fatigue however could be a symptom of various diseases such as heart failure, HIV/AIDS, multiple sclerosis and cancer (1). Cancer related fatigue is very common. It is suggested that 80% of patients suffering from cancer have experienced episodes of fatigue during and after their treatment (2). The fatigue induced by cancer and/or its treatments not only decreases the quality of life, but also contributes to the morbidity and mortality resulting from the disease (3). There is evidence suggesting that severe and prolonged fatigue in oncology patients might be partly responsible for the poor

prognosis and high rates of mortality of the disease (4). The severity of the fatigue could also be related to the type of cancer therapy being used. Moreover, biologic response modifiers including  $\alpha$ -interferon and interleukins can cause severe fatigue following treatment (5).

The multi-dimensional nature of fatigue makes its definition difficult due to subjectivity (6). It can be described in terms of its characteristics such as severity, distress, temporal features, or specific impairments like lack of energy, depression, weakness, somnolence and difficulty in concentration. Therefore, it has recently been defined as a "multidimensional phenomenon that develops over time which diminishes the energy, mental capacity, and the psychological

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condition of patients". These are particularly experienced following treatments such as radiotherapy, chemotherapy and immunotherapy. The symptoms could be due to increased energy requirements due to the disease itself, as a result of the tumour growth, infection, and fever, or due to increased levels of substances that impair the metabolism or normal functioning of muscles such as cytokines or antibodies. However, there is no current evidence suggesting the exact mechanism underlying such conditions (2).

An important factor contributing to the weakness and decrease in physical performance is the lack of muscular activity attributable to bed rest in such patients. It is well established that prolonged bed rest could result in loss of muscle mass which in turn could lead to several metabolic abnormalities. This might be accelerated in the presence of cytokines and other inflammatory mediators (7, 8).

Over the past 20 years improvements in treatment protocols have resulted in a substantial number of cancer survivors with an increased life expectancy. Hence, care is directed towards interventions improving the quality of life as well as survival (9). Exercise is widely used in the management and rehabilitation of various chronic diseases such as cardiovascular and pulmonary disorders (10). The positive effects of physical activity on mood, anxiety, and general well-being of patients with chronic fatigue syndrome and depression are also well established (11). Although the exact molecular mechanism of the effect of exercise in such conditions is not well understood, its potential benefits are appreciated. It can help restore cardiopulmonary function, muscle mass, strength, and range of movement. Moreover, it can induce metabolic adaptations by altering body composition and endocrine secretions (12). There is growing evidence that exercise is beneficial to cancer patients through improvements in physical, psychological and physiological abilities and functions, which increase quality of life as well as longevity (13). There are several reviews supporting the beneficial effects of exercise in the literature. However, exercise rehabilitation is still not well integrated into the general cancer care plan as the underlying risks and contraindications are not well outlined (9, 14).

The aim of this study was to examine the strength and weakness of the current evidence to determine if exercise could be used as a safe and effective method to improve quality of life in patients with cancer. The Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE and CINAHL search

engines were electronically searched and 21 empirical studies published between 1995 and 2009 were found and reviewed.

## Discussion

As mentioned above, fatigue is the most common symptom seen in cancer and in its treatment. Exercise is a potentially useful intervention. However, most oncologists dispute the significance of fatigue with regard to cancer. That is why exercise rehabilitation may not necessarily be included in the treatment program. Several types of exercise interventions have been used in a variety of patient trials to measure differences in cardiopulmonary fitness, strength, weight, body composition, insulin sensitivity, fatigue and quality of life. In a study by Curneya et al. on post-menopausal breast cancer survivors, they found that moderate aerobic exercise on a bicycle thrice a week, for 15 weeks, significantly increased cardiovascular fitness and quality of life in the exercise group compared to controls (15). They also found a correlation between change in peak oxygen consumption and overall change in quality of life. Thus, the results of this study suggest that supervised aerobic exercise is a useful intervention in increasing cardiovascular and psychological fitness of patients.

Other studies that looked at the effects of aerobic exercise in one group and stretching in another control group following radiation therapy found that the exercise group showed significant improvements in cardiovascular function and decreases in body mass index (BMI) and fat mass. Fatigue and mood improved in both control and exercise groups with no difference between them (16). Studies have found that Tai chi can also lessen fatigue and improve quality of life. Hence, the improvement in fatigue and mood in this study might be attributed to the stretching exercises done by the control group (17). Therefore, more studies are needed to compare exercise and bed rest especially during the treatment period.

As aerobic exercise alone might not improve muscle mass and power, some studies have used "mixed aerobic and resistance exercises" as their intervention. Wall et al. suggested that by implementing this type of intervention patients could improve strength, power output and BMI as well as aerobic fitness. They also mentioned that as there is a correlation between 'hope' and power, increasing power through such interventions could result in increased levels of hope in such patients (18).

However, the positive effects on fatigue were not well explained in their study. Reduction in cancer related fatigue is reported in several studies following mixed exercise. Nevertheless, it seems that different populations may have different outcomes in response to exercise. Studies that recruited only patients with breast cancer could establish the effect of exercise on fatigue whereas trials that recruited patients with other types of cancer were unable to do the same (14).

Flexibility and simplicity of the exercises are very important as well. Exercises which might need special equipment or are difficult to execute might not be suitable for patients with fatigue and depression due to low compliance rates (11). Moreover, as most patients are treated in out-patient clinics, they might not attend the supervised exercise sessions. Therefore it seems that home based programs could be more useful for rehabilitation of these patients. This is in agreement with a study which designed a home based mixed resistance-aerobic exercise program for patients with multiple myeloma and bone lesions who were receiving high dose chemotherapy and stem cell transplantation. They found that this type of exercise could efficiently improve their symptoms (19). Moreover, a study examining quality of life, psychological well-being, physical fitness and time of hospitalization found that exercise could significantly improve physical fitness and quality of life in those patients.

Elsewhere, Curneya et al. (2003) used exercise following high dose chemotherapy and bone marrow transplantation. Patients had to perform exercises in isolated rooms due to their weak immune system. They concluded that exercise could increase quality of life and reduce the period of hospitalization (15). Findings from this study could be highly beneficial as these patients experienced moderate fatigue symptoms during their treatment. More research in this field is however needed to support their findings as the outcomes of this study cannot be generalized owing to the selection bias of their samples; patients who had experienced more severe medical complications were recruited in their study. The small sample size and bias in data collection were two other limitations of the study.

One common weakness of the aforementioned studies is that they have not used intention-to-treat analysis to interpret their results (14). Only one recent study by Dimeo et al. (1997) used this analysis. During this study patients performed 30 minutes of exercise daily on a bed ergometer with a mean work load of 32 Watts. The results of this

study differed from findings of previous data. These authors showed that exercise could not reduce fatigue symptoms after high dose chemotherapy which is in contrast to previous findings. However, due to the specific sample and protocol of the study more studies are needed to disregard the positive effect of exercise on lessening fatigue (8).

There is also very limited data in the literature on the paediatric population. Since children suffer from different types of cancers their complications might be different from adults. Therefore, the data achieved from adult studies cannot be applied to the paediatric population. However, it has been suggested that intra-hospital rehabilitation programs can improve quality of life and physical fitness in children (20). Moreover, as the definition of fatigue is subjective, the results of the studies investigating fatigue in children could be biased because the fatigue questionnaires are usually filled by parents. Children's commitment to the rehabilitation program is also very important. In a study examining the feasibility and efficacy of a rehabilitation program it was found that less than half of the recruited subjects had completed the program. They therefore suggested that when designing rehabilitation programs for children, not only are age, gender, stage of disease and variety of exercises important, but, parents motivation and education are important too (21).

### **Conclusions**

There is accumulative data in the literature supporting the effectiveness of exercise interventions on the physical and psychological wellbeing of patients with cancer. As mentioned above, oncology patients face multiple difficulties, especially physical weakness and fatigue during treatment, which could decrease their quality of life and increase their morbidity and mortality. Exercise can improve muscle mass and strength and whole body oxygen uptake which are reduced during bed rest, infection and cancer treatments. The psychological effect of exercise is however not well established. This might be related to the confounding factors that affect the results of these studies. Growing evidence is now supporting the effectiveness of exercise on women suffering from breast cancer. It is now well established that rehabilitation can be effective during and after their treatment period. This however, might not be the case with findings from other populations such as children and patients suffering from other types of

cancers. Although the efficiency of exercise in improving physical fitness is shown in these populations, its effect on fatigue and quality of life of these patients is not yet well understood.

While exercise is found to be beneficial, it can increase the risk of several other issues in patients. More research is needed to define the risks and contraindications of exercise in oncology patients, such as, over training which could increase fatigue and exhaustion in these patients. Moreover, exercise should be performed in hygienic areas after specific treatments like bone marrow transplants. This could prevent patients from exercising in public places such as gyms and fitness classes. Exercises are also needed to be specifically well designed for the target population in terms of duration, intensity and type. This is highlighted amongst children, as exercises should be feasible, interesting and well tolerated for this population.

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Therefore, with regard to whether exercise might be considered an efficient and practical intervention to improve quality of life of oncology patients, more research is needed to define scientific protocols for their rehabilitation.

## Clinical Messages

- Exercise can be considered a type of treatment for chronic diseases.
- Exercise in cancer subjects focuses on treating fatigue.
- More research is needed to clarify the intensity and duration of exercise.

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