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# The Effects and Efficacy of Exercise in Lung Cancer Patients: An Overview

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## Abstract

Lung cancer accounted for approximately 13% of new cancer cases, and over a quarter of all cancer-related deaths last year. This sample of literature supports the assertion that exercise has a positive impact on lung cancer prognosis. The multitude of factors affecting lung cancer patients, including cancer stage, treatment and secondary effects of cancer and treatment, indicate that a supervised, individualized program of exercise is most effective in working with lung cancer patients.

**Keywords:** Cancer; Exercise; Lung cancer; Chemotherapy; Quality of life

## Introduction

Lung cancer is one of the most prevalent cancers in the United States, second only to breast cancer. According to recent data compiled by Siegel et al. [1], lung cancer accounted for approximately 13% of new cancer cases, and over a quarter of all cancer-related deaths last year. This disproportionately high fatality rate observed in lung cancer patients is attributed to the finding that lung cancer is often detected after it has progressed to later stages. This trend has led to a decrease in the 5-year survival rate to approximately 18% [1].

Lung cancer treatments vary depending on the stage and the grade of cancer. Treatment for early-stage lung cancer is often a lobectomy, whereby the affected lobe is surgically removed. This has been found to have the best long-term prognoses for early-stage lung cancer patients [2]. Common treatments for later stages of lung cancer include non-invasive treatments such as chemotherapy and radiation. These treatments tend to have lower 5-year survival rates and more severe treatment-related side effects.

In recent decades, exercise has emerged as a safe and effective way to combat and manage the symptoms of lung cancer. Exercise can also attenuate the severity of treatment-

related side effects, as well as improve quality of life and functional capacity. Exercise is a readily accessible form of therapy patients can implement at any point in the cancer trajectory with positive outcomes. As such, the purpose of this paper is to review recent, relevant literature pertaining to exercise and its effect on lung cancer prognosis.

## The necessity of exercise

Leading experts accept exercise as an important component to a healthy lifestyle. Unfortunately, many Americans fail to meet the Surgeon General's recommended 150 minutes of physical activity each week. This is supported by data that indicates that with increasing age comes the increased likelihood of a sedentary lifestyle [3]. This is problematic, as many studies have linked physical inactivity to an increased risk of cancer diagnosis and cancer mortality for certain forms of cancer [4]. Further, individuals with lung cancer are often at an increased risk for comorbid conditions, including dyspnea, depression and fatigue. A sedentary lifestyle can exacerbate many of these conditions. However, participation in a regular exercise program can attenuate many of these untoward effects. Research has demonstrated a link between exercise and hormone stabilization, decreased inflammation and improved immune response [5]. Therefore, experts consider exercise to be an integral element of cancer recovery.

## Exercise across the lung cancer spectrum

Exercise programs for lung cancer patients should be individualized to meet the needs of each patient. Bade et al. [6] conducted a systematic review of literature that concluded physical activity was beneficial at all stages of diagnosis. Moreover, a study conducted by Henke et al. [7] examined the effects of an individualized exercise program on late-stage lung cancer patients. Using a control group to compare final data, the participants in the experimental group participated in a supervised, individualized exercise program consisting of cardiovascular exercise, strength training and breathing techniques to combat bouts of dyspnea, which are common among lung cancer patients. At the end of the study, the experimental group performed considerably better on post-tests than the control group, including the six-minute walk

test, muscular strength, and overall quality of life. In a similar study involving late-stage lung cancer patients, Temel et al. [8] reported improvements in cardiovascular and muscular strength following an eight-week individualized exercise program. Finally, Kuehr et al. [9] reported improved muscular strength and cardiorespiratory fitness following a supervised strength and cardiovascular exercise program.

Similar results have been reported in early stage lung cancers, as well. In a pilot study, Jones et al. [10] examined the effects of a moderate to high-intensity aerobic training program on post-surgery, early stage lung cancer patients. These researchers reported increases in overall quality of life,  $VO_{2peak}$ , and overall cardiovascular health, concluding that exercise was beneficial in this population. In a similar study, Nagamatsu et al. [11] examined the effects of exercise on pulmonary recovery after a lobectomy in early stage lung cancer. Despite having a reduced pulmonary surface area due to surgery, the patients in the study were had recovery rates of 8-95% of their pre-operative pulmonary function and enhanced exercise capacity.

Increases in  $VO_{2peak}$  and 6-minute walk distance are associated with positive post-surgery and post-treatment outcomes-including recovery time and symptom burden [12]. As such, a pre-surgery exercise program may reduce hospital stays, decrease symptom burden and increase quality of life in surgically-treated lung cancer patients. In addition, exercise seems to have a positive impact on surgically treated patients. However, different surgeries may require different approaches regarding preoperative and postoperative exercise. This is why an individualized approach to exercise is ideal. In a study conducted by Nezu et al. [13], postoperative differences in recovery and exercise capacity in lobectomy and pneumectomy patients were compared. The participants in the pneumectomy group experienced a greater decline in exercise capacity, due to the removal of the entire lung. Although exercise capacity also declined in the lobectomy group, most of it had returned after approximately 6 months of training, while the pneumectomy group saw little to no recovery. This highlights the importance of preoperative exercise for pneumectomy patients, in particular. The inability to regain exercise capacity postoperatively means strengthening preoperative exercise capacity could lead to a healthier, albeit reduced, capacity postoperatively.

In an observational study, Agostini et al. [14] found that patients with recent lung surgery, who remained active, had shorter hospital stays, as well as less pain following the surgery than their sedentary counterparts [15].

## Conclusion

This sample of literature supports the assertion that exercise has a positive impact on lung cancer prognosis. Though this research is promising, future studies should look into specific exercise regimens and their effects on the different stages of lung cancer.

The multitude of factors affecting lung cancer patients, including cancer stage, treatment and secondary effects of cancer and treatment, indicate that a supervised, individualized program of exercise is most effective in working with lung cancer patients.

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