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The Effect of Exercise on the Quality of Life of Breast Cancer Patients

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Abstract

Introduction: *Breast cancer is one of the most prevalent cancers among women, significantly affecting their quality of life (QoL) through physical and psychological challenges. Exercise has emerged as a beneficial intervention to mitigate these adverse effects and improve overall well-being.*

Method: *A comprehensive literature search was conducted using databases such as PubMed, MEDLINE, and Cochrane Library, identifying peer-reviewed articles published in reputable medical journals. The inclusion criteria focused on studies examining the effects of exercise interventions on the QoL of breast cancer patients. Data were extracted and synthesized qualitatively and quantitatively, with a focus on physical and psychological outcomes.*

Background: *The background of this review highlights the adverse effects of breast cancer treatments, including surgery, chemotherapy, radiation therapy, and hormone therapy, which often impair cardiovascular fitness, muscle strength, and mental health. Exercise is proposed as a complementary intervention to address these issues and enhance patients' QoL.*

Body: *The review explores various types of exercise interventions, including aerobic exercise, resistance training, and flexibility and balance exercises. The recommended exercise regimen typically involves moderate-intensity activity 2-3 times per week for 30-60 minutes per session. The mechanisms through which exercise improves QoL include enhanced immune function, reduced inflammation, better hormonal regulation, improved cardiovascular health, and better body composition.*

Results: *The findings indicate that exercise significantly improves cardiovascular fitness, reduces fatigue, and enhances muscle strength and physical function in breast cancer patients. Psychologically, exercise reduces anxiety, depression, and stress, contributing to better overall mental health. Although there are risks such as lymphedema and musculoskeletal injuries, these can be managed with properly supervised and individualized exercise programs.*

Conclusion: *Exercise is a valuable intervention for improving the QoL of breast cancer patients, providing significant physical and psychological benefits with manageable risks. However, current research is limited by small sample sizes, short follow-up periods, and variability in exercise protocols. Addressing these gaps will enhance our understanding and improve exercise recommendations for breast cancer patients, ultimately optimizing their care and recovery.*

Introduction

Breast cancer is one of the most common cancers affecting women worldwide, with significant impacts on physical and psychological health. Treatments for breast cancer, including surgery, chemotherapy, radiation therapy, and hormone therapy, often result in various adverse effects that can diminish patients' quality of life (QoL). Exercise has emerged as a beneficial intervention that can be used in adjunct with the existing therapies to mitigate these adverse effects and improve overall well-being. This review aims to examine the impact of exercise on the QoL of breast cancer patients, exploring the specific benefits, types of exercise interventions, potential mechanisms of improvement, associated risks, and gaps in current research.

Methodology

Literature Search

A comprehensive literature search was conducted to identify relevant studies examining the impact of exercise on the quality of life (QoL) in breast cancer patients. The search was performed using several electronic databases, including PubMed, MEDLINE, and Cochrane Library, from their inception to June

2024. Keywords used in the search included "breast cancer," "exercise," "quality of life," "QoL," "aerobic exercise," "resistance training," "psychological benefits," "physical benefits," "immune function," "inflammation," "hormonal regulation," "cardiovascular health," and "body composition."

Inclusion and Exclusion Criteria

Inclusion Criteria Included:

- Peer-reviewed articles published in reputable medical journals.
- Studies focusing on adult female breast cancer patients.
- Research examining the effects of exercise interventions (aerobic, resistance, flexibility, or combined) on QoL, including physical and psychological outcomes.
- Randomized controlled trials (RCTs), cohort studies, and systematic reviews/meta-analyses.

Exclusion Criteria Included:

- Non-English language publications.
- Studies focusing on other types of cancer.
- Articles not providing specific data on QoL outcomes.
- Case reports, editorials, and letters.

Data Extraction

Data extraction was performed independently by two reviewers to ensure accuracy and consistency. The following information was extracted from each included study:

- Study design (RCT, cohort, or systematic review/meta-analysis).
- Sample size and characteristics (age, stage of cancer, treatment status).
- Type and description of exercise intervention (aerobic, resistance, flexibility, duration, frequency, intensity).
- Outcome measures related to QoL, including physical (fatigue, pain, physical function) and psychological (anxiety, depression, stress) outcomes.
- Key findings and conclusions.

Quality Assessment

The quality of the included studies was assessed using the following criteria:

- Methodological quality and risk of bias were evaluated using tools appropriate for each study design, such as the Cochrane Risk of Bias Tool for RCTs and the Newcastle-Ottawa Scale for cohort studies.
- Studies were rated as high, moderate, or low quality based on their adherence to methodological rigor, including randomization, blinding, control of confounding factors, and completeness of outcome data.

Background

There is no doubt in the fact that breast cancer is a pathology that impacts not only the life of a patient but the health care system heavily. In 2022 alone there were 670,000 deaths globally due to breast cancer alone. Half of those affected do not have any specific risk factors except that they were older women [1]. Although this number has diminished by a huge margin since 1980, this condition still however, is one of the leading cancers world-wide [2].

Treatment Modalities

Breast cancer treatment typically involves several modalities, each with distinct approaches and associated side effects

Surgery

Coming to one of the most common treatments employed in most cancers, surgery is a primary treatment modality for breast cancer and includes options such as lumpectomy, mastectomy, and lymph node dissection. These procedures aim to remove cancerous tissues from the breast and nearby lymph nodes.

Side Effects and Impact on QoL

- **Physical Side Effects:** Pain, swelling, and risk of lymphedema, especially after lymph node removal.
- **Psychosocial Impact:** Significant impact on body image and sexual functioning, particularly following mastectomy. Some patients may experience long-term changes in their physical appearance, leading to issues with self-esteem and intimacy [3,4].

Chemotherapy

Chemotherapy uses cytotoxic drugs to target and kill rapidly dividing cancer cells. It is often used in conjunction with other treatments.

Side Effects and Impact on QoL

- **Physical Side Effects:** Nausea, vomiting, hair loss, fatigue, neutropenia, and increased risk of infections. Long-term side effects may include cardiotoxicity and cognitive impairments (often termed "chemo brain").
- **Psychosocial Impact:** Emotional and psychological distress due to the aggressive nature of the treatment and its side effects. Patients often report reduced quality of life during and shortly after chemotherapy due to the cumulative burden of these side effects [3,5].

Radiation Therapy

- Radiation therapy involves the use of high-energy radiation to kill cancer cells and shrink tumors. It is commonly used after surgery to eliminate residual cancer cells.

Side Effects and Impact on QoL

- **Physical Side Effects:** Skin irritation, fatigue, and localized pain. Long-term risks include fibrosis and secondary cancers.
- **Psychosocial Impact:** While generally well-tolerated compared to chemotherapy, the daily treatment schedule can be taxing. There may be ongoing anxiety about the side effects and their impact on daily life [3,5].

Hormone Therapy

Hormone therapy is used for hormone receptor-positive breast cancers to block the body's natural hormones that can promote cancer growth. Common agents include tamoxifen and aro-

matase inhibitors.

Side Effects and Impact on QoL

- **Physical Side Effects:** Hot flashes, joint pain, bone thinning, and increased risk of thromboembolic events. Vaginal dryness and sexual dysfunction are also common.
- **Psychosocial Impact:** Hormone therapy can lead to significant menopausal symptoms, affecting daily activities and overall well-being. Patients may experience a decline in sexual health and an increased risk of osteoporosis, impacting long-term quality of life [3,4].

General Overview of Exercise

Benefits of Exercise for Cancer Patients, Particularly Those with Breast Cancer

Specific Benefits of Exercise: Exercise offers numerous benefits for breast cancer patients, including improved cardiorespiratory fitness, muscle strength, and overall health-related quality of life (HRQoL) [6,7].

Physical Symptoms:

- **Fatigue:** Regular exercise, especially aerobic and resistance training, significantly reduces cancer-related fatigue [7,8].
- **Pain and Physical Function:** Exercise helps manage pain and enhances physical function, including range of motion and muscle strength [6,8].

Psychological Symptoms

- **Anxiety, Depression and Stress:** Exercise have shown to be effective in reducing anxiety, depression, and stress levels in breast cancer patients, contributing to better mental health and subsequently leading to a better treatment journey [6,7].

Types of Exercise Interventions Studied in Breast Cancer Patients Forms of Exercise

- **Aerobic Exercise:** Includes activities like walking, jogging, and cycling.
- **Resistance Training:** Focuses on building muscle strength using weights or resistance bands.
- **Flexibility and Balance Exercises:** Such as yoga and Pilates [6,8].

Recommended Frequency, Intensity, and Duration

- **Frequency:** Typically, 2-3 times per week.
- **Intensity:** Moderate intensity, around 50-80% of maximal heart rate.
- **Duration:** Sessions lasting 30-60 minutes [7,8].

Mechanisms through Which Exercise Improves QoL in Breast Cancer Patients

Immune Function, Inflammation, and Hormonal Levels: Exercise modulates immune function and reduces inflammation, which can help mitigate some of the adverse effects of cancer and its treatments. It also helps regulate hormonal levels, which can be beneficial given the hormonal nature of many breast cancers [6,8].

Cardiovascular Health and Body Composition: Regular exercise improves cardiovascular health and helps maintain a healthy body composition by reducing body fat and preserving lean muscle mass [6,7].

Risks or Contraindications Associated with Exercise in Breast Cancer Patients

Safety Concerns: Potential risks include lymphedema, musculoskeletal injuries, and exacerbation of treatment-related side effects. However, these risks can be mitigated with properly supervised and tailored exercise programs [7,8].

Tailoring Exercise Programs: Exercise programs should be individualized based on each patient's health status, treatment history, and current physical capabilities. This approach ensures safety and maximizes the benefits of exercise [7,8].

Gaps in Current Research on Exercise and QoL in Breast Cancer Patients

Limitations of Existing Studies: Many studies have small sample sizes, short follow-up periods, and lack long-term outcome data. There is also variability in the exercise protocols used, making it difficult to generalize findings [6,8].

Areas Needing Further Investigation: More research is needed on the long-term effects of different types and intensities of exercise, the optimal timing of exercise interventions in relation to cancer treatment, and the mechanisms through which exercise influences cancer progression and patient outcomes [6,8].

Body

Exercise offers a multitude of benefits for breast cancer patients, spanning both physical and psychological domains. Physically, regular exercise significantly improves cardiovascular health, enhances muscle strength, and boosts overall physical function. These improvements help mitigate the adverse effects of cancer treatments like chemotherapy and radiation therapy, which often impair cardiovascular fitness and muscle strength [6-8]. Additionally, exercise is effective in reducing cancer-related fatigue, one of the most common and debilitating symptoms experienced by breast cancer patients [8].

Psychologically, exercise plays a crucial role in reducing anxiety, depression, and stress levels among breast cancer patients. Engaging in physical activity helps to elevate mood and improve emotional well-being, which is essential for patients coping with the psychological burden of a cancer diagnosis and treatment [7,8]. Overall, the integration of exercise into the care plan of breast cancer patients significantly enhances their health-related quality of life (HRQoL).

Various forms of exercise have been studied in breast cancer patients, including aerobic exercise, resistance training, and flexibility and balance exercises. Aerobic exercises, such as walking, cycling, and swimming, are commonly prescribed to improve

cardiovascular endurance and reduce fatigue [7]. Resistance training, which involves the use of weights or resistance bands, focuses on building muscle strength and endurance [8]. Additionally, flexibility and balance exercises like yoga and Pilates are included to enhance flexibility, balance, and coordination, contributing to overall physical function [7].

The recommended frequency, intensity, and duration of exercise for breast cancer patients typically involve exercising 2-3 times per week at moderate intensity, which is about 50-80% of maximal heart rate, for sessions lasting 30-60 minutes [8]. These guidelines ensure that the exercise is effective while being safe and manageable for patients undergoing cancer treatment.

Exercise improves the quality of life (QoL) in breast cancer patients through several physiological and psychological mechanisms. It positively influences immune function by boosting the activity of immune cells, which can help the body defend against cancer cells [6]. Additionally, exercise reduces systemic inflammation, often elevated in cancer patients and associated with poorer outcomes [8]. Regular physical activity also helps regulate hormonal levels, such as estrogen, which is significant given the hormonal nature of many breast cancers [7].

In terms of cardiovascular health and body composition, exercise improves heart health and reduces the risk of cardiovascular disease, a concern for many cancer patients due to the cardiotoxic effects of certain treatments [8]. Furthermore, it helps maintain a healthy body weight, reducing fat mass and preserving lean muscle mass, which are important for overall health and recovery [6,7].

While exercise is generally safe for breast cancer patients, certain risks and contraindications need to be considered. One potential risk is the development or exacerbation of lymphedema, particularly following surgeries involving lymph node removal. However, studies have shown that with proper supervision and tailored exercise programs, the risk of lymphedema can be minimized [7,8]. Musculoskeletal injuries are another concern, especially if exercises are performed incorrectly or if the intensity is too high. These risks can be mitigated through supervised exercise sessions and individualized exercise plans tailored to each patient's health status, treatment history, and physical capabilities [7,8].

To ensure safety, exercise programs for breast cancer patients should be individualized. For instance, patients with bone metastases may need modified exercise plans to avoid high-impact activities. Supervision by trained professionals can help ensure proper technique, appropriate progression of exercise intensity, and timely adjustments to the exercise regimen based on the patient's response and any side effects [7,8].

Despite the established benefits of exercise for breast cancer patients, there are several gaps in current research that need to be addressed. One major limitation of existing studies is the small sample sizes, which limit the generalizability of their findings [6,7]. Additionally, many studies have short follow-up periods, making it difficult to assess the long-term benefits and risks of exercise interventions [6,8]. There is also considerable variability in the exercise protocols used in different studies, including differences in types, intensities, and durations of exercise, making it challenging to draw consistent conclusions [6,8].

Future research should focus on understanding the long-term effects of various exercise interventions, determining the optimal timing of exercise in relation to cancer treatment, and elucidating the underlying mechanisms through which exercise influences cancer progression and patient outcomes [6,8]. Addressing these gaps will help develop more effective and personalized exercise programs for breast cancer patients, ultimately improving their quality of life.

Results

The results from multiple studies confirm the significant benefits of exercise for breast cancer patients. These benefits span physical improvements such as enhanced cardiovascular fitness, reduced fatigue, and better muscle strength and flexibility. Aerobic and resistance training were particularly effective in reducing cancer-related fatigue and improving physical function [7,8]. Additionally, exercise was found to improve psychological outcomes, reducing anxiety, depression, and stress, thus contributing to better mental health and overall quality of life [7,8].

Various forms of exercise interventions have been studied, including aerobic exercises, resistance training, and flexibility and balance exercises. These interventions generally recommend exercising 2-3 times per week at moderate intensity for 30-60 minutes per session, which was effective in improving both physical and psychological outcomes [7,8].

The mechanisms through which exercise improves quality of life in breast cancer patients include enhancements in immune function, reductions in systemic inflammation, and better regulation of hormonal levels. Exercise also improves cardiovascular health and body composition, which are crucial for the overall well-being and recovery of breast cancer patients [6,8].

Despite the clear benefits, some risks are associated with exercise in breast cancer patients, such as lymphedema and musculoskeletal injuries. However, these risks can be managed with properly supervised and individualized exercise programs. Tailoring exercise interventions based on each patient's health status and treatment history ensures safety and maximizes benefits [7,8].

Finally, the current research gaps, including small sample sizes, short follow-up periods, and variability in exercise protocols, highlight the need for further studies. Future research should focus on understanding the long-term effects of various exercise interventions, the optimal timing of exercise relative to cancer treatment, and the mechanisms through which exercise benefits cancer patients. Addressing these gaps will enhance the development of more effective and personalized exercise programs for breast cancer patients [6,8].

The Different Exercises and their Benefits have been Summarized in Table 1

Type of Exercise	Frequency	Intensity	Duration	PhysicalBenefits	Psychological Benefits
Aerobic Exercise	2-3 times/week	Moderate	30-60 minutes	Improves cardiovascular health, reduces fatigue, enhances endurance	Reduces anxiety, depression, and stress
Resistance Training	2-3 times/week	Moderate	30-60 minutes	Improves muscle strength, endurance, and physical function	Boosts mood and reduces depressive symptoms
Flexibility/Balance Exercise	2-3 times/week	Low to Moderate	30-60 minutes	Enhances flexibility, balance, and coordination	Improves mental clarity and reduces stress

Discussion

The findings from this review highlight the multifaceted benefits of exercise for breast cancer patients. Regular physical activity has been shown to enhance cardiovascular health, reduce cancer-related fatigue, and improve muscle strength and physical function. Aerobic exercises, such as walking and cycling, and resistance training have been particularly effective in these areas [6-8]. Moreover, exercise has a significant positive impact on psychological well-being, reducing anxiety, depression, and stress levels, which are common among breast cancer patients [7,8].

The mechanisms through which exercise improves QoL include enhanced immune function, reduced systemic inflammation, and better hormonal regulation. Exercise-induced improvements in immune function help the body's defense against cancer cells, while reductions in inflammation and better hormonal balance contribute to overall health [6,8]. Additionally, exercise promotes cardiovascular health and maintains a healthy body composition, reducing fat mass and preserving lean muscle mass [6,7].

Despite the clear benefits, there are risks associated with exercise, such as lymphedema and musculoskeletal injuries. However, these risks can be effectively managed with properly supervised and individualized exercise programs tailored to each patient's health status and treatment history [7,8]. It is crucial for exercise programs to be designed and monitored by healthcare professionals to ensure safety and maximize benefits.

Current research, although supportive of the benefits of exercise, has several limitations. Many studies have small sample sizes, short follow-up periods, and variability in exercise protocols, making it challenging to draw consistent conclusions [6,7].

Future research should focus on large-scale studies with long-term follow-up to better understand the sustained effects of exercise on QoL in breast cancer patients. Additionally, exploring the optimal timing of exercise interventions relative to cancer treatment and elucidating the specific biological mechanisms through which exercise exerts its benefits will further enhance our understanding and improve clinical recommendations.

Conclusion

In conclusion, the evidence strongly supports the integration of exercise into the care plan for breast cancer patients due to its significant physical and psychological benefits. Regular physical activity improves cardiovascular fitness, reduces fatigue, and enhances muscle strength and flexibility. It also effectively reduces anxiety, depression, and stress, contributing to better overall quality of life. While certain risks and contraindications exist, these can be managed with properly supervised and individualized exercise programs. Addressing the current research gaps will further refine exercise recommendations and improve the quality of life for breast cancer patients.

Declaration

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The Authors state that there is no conflict of interest for any of the researchers involved.

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