



Impact Of Physiotherapy Interventions On Physical Fitness In Breast Cancer Survivors: A Review

¹Komal Arora, ²Dr Suman Mehra, ³Dr.Nityasha, ⁴Sudha, ⁵Partiksha

¹MPT Scholar College of Physiotherapy, Pt. B. D. Sharma UHS, Rohtak, India

² Associate professor College of Physiotherapy, Pt. B. D. Sharma UHS, Rohtak, India

³ Senior professor Department of Surgery, Pt. B. D. Sharma UHS, Rohtak, India

⁴ MPT Scholar College of Physiotherapy, Pt. B. D. Sharma UHS, Rohtak, India

⁵MPT Scholar College of Physiotherapy, Pt. B. D. Sharma UHS, Rohtak, India

Abstract

Breast cancer is the most prevalent cancer among women worldwide. The survival rate has significantly improved due to advancements in early detection and treatment. However, the physical and psychosocial side effects of anti-cancer treatments often lead to long-term health challenges for survivors. Strategies to improve physical fitness has been shown to offer significant benefits to breast cancer survivors. This review aimed to evaluate the effectiveness of various physical fitness interventions in improving the overall health, physical function, and related quality of life of breast cancer survivors. In particular, we explore the contribution of health-related and skill-related fitness parameters, including cardiovascular endurance, muscular strength, flexibility, balance, coordination, and agility. The review also highlights the importance of women's health awareness and the barriers to exercise adherence.

Keywords: Breast cancer, physical fitness, strength training, breast cancer survivors

I. INTRODUCTION

Breast cancer has become the most commonly diagnosed cancer among women worldwide, with survival rates steadily improving due to advancements in early detection and treatment.¹ But Breast cancer and its treatment related side effects produce a variety of impairments including reduction in strength of upper and lower limb, reduced flexibility in upper quadrant, lymphedema, reduction in chest wall mobility, decrease in aerobic capacity, fatigue and postural abnormalities in upper quadrant, impairment in balance and coordination and reduction in agility, speed and reaction time.^{10, 15} All these impairments decrease physical fitness in patients with breast cancer. As survivorship increases, attention has shifted from merely prolonging life to enhancing the physical fitness and related quality of life among breast cancer survivors. One critical but often underemphasized aspect of survivorship care is physical fitness. Caspersen CJ et al (1985), has defined physical fitness as "the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits and to meet unforeseen emergencies".² The degree to which people have these attributes can be measured with specific tests. Physical fitness, which includes health-related fitness parameters (cardiovascular endurance, muscular strength, flexibility, body composition) and skill-related fitness parameters (balance, agility, coordination, speed). Strategies to improve physical fitness has been shown to enhance recovery, reduce the risk of cancer recurrence, and improve the quality of life for survivors.^{3, 4} Physical fitness, encompassing cardiovascular

endurance, muscular strength, flexibility, and body composition, plays a pivotal role in both recovery and long-term health outcomes for breast cancer survivors. Breast cancer survivors often face significant challenges following cancer treatment, including fatigue, reduced physical function, compromised mobility, and emotional distress. Despite the known benefits, adherence to exercise programs remains a challenge for many survivors due to physical limitations, psychological barriers, and lack of awareness.^{6,12} Numerous studies have demonstrated that physical activity and structured exercise can mitigate the adverse effects of cancer treatment, including fatigue, loss of muscle mass, decreased bone density, and reduced cardiopulmonary function.⁴⁻⁶ Moreover, higher levels of physical fitness have been associated with improved psychological well-being, reduced recurrence risk, and increased overall survival.^{3,5} Despite the growing body of literature, inconsistencies exist in how physical fitness is measured, and addressed and improved in breast cancer survivors. Variations in study design, population characteristics, and intervention protocols make it challenging to draw definitive conclusions or establish standardized guidelines.^{8,10}

This current review aimed to synthesize current evidence on physical fitness in breast cancer survivors, examining both objective measures of fitness and the impact of various interventions aimed at improving fitness outcomes, focusing on the impact of both health-related and skill-related fitness parameters. By providing a comprehensive overview, this review seeks to inform clinical practice, identify research gaps, and support the development of targeted rehabilitation programs tailored to the unique needs of this population.

Methodology: A systematic search of relevant studies was conducted in databases such as PubMed, Cochrane Library, and Google Scholar, focusing on randomized controlled trials (RCTs) and meta-analyses published between 2010 and 2024. The search terms included "physical fitness," "breast cancer survivors," "health-related fitness," "skill-related fitness,".

AUTHOR ,YEAR, COUNTRY	STUDY DESIGN	NO.OF PARTICIPANTS	MATERIAL & METHADODOLOGY	INTERVENTION	OUTCOME	OUTCOME MEASURES	RESULTS
Kerri M. Winters-Stone et al.2022, United States ⁷	RCT	N=114,	Early-stage, post-treatment breast cancer survivors (age ≥ 65, mean age 72), randomized into 3 groups: aerobic, resistance, and control. Supervised exercise for 12 months, followed by unsupervised home-based exercise for 6 months	1. Supervised aerobic training (n = 37) 2. Supervised resistance training (n = 39) 3. Stretching control group (n = 38)	1.Aerobic capacity 2.Muscle strength 3.Physical function 4.Self-reported function	1. 6-minute walk distance, 2.muscle strength by 1-RM for upper and lower body, 3.physical function via SPPB, 4.self-reported function by SF-36, LLFDI	All groups improved muscle strength and physical function after supervised training. Resistance group showed significantly higher gains in upper and lower body strength. Gains largely maintained in unsupervised phase, except for advanced lower extremity function (improved in resistance, declined in aerobic).

Eisuke Ochi et al.2022, Japan ⁸	RCT	50	Early-stage breast cancer survivors (age 20–59, stage I–IIa), post-treatment (except hormone therapy). Randomized into two groups: HIIT and control.	1. habit-B program group (n = 25): 12-week home-based HIIT supported by smartphone technology 2. Control group (n = 25): usual care	Primary: Change in peak oxygen uptake ($\dot{V}O_2$ peak) Secondary: Muscle strength, Aerobic endurance Resting heart rate, physical activity, fatigue, safety, quality of life	1. Peak Oxygen Uptake ($\dot{V}O_2$ peak) 2. 6-Minute Walk Test (6MWT) 4. Leg Press Strength (1 Repetition Maximum - 1RM) 5. Grip Strength (kg) 6. Chair Stand Test (seconds)	Significant improvement in $\dot{V}O_2$ peak and leg strength in the habit-B group compared to control (p<0.01). No significant differences in other outcomes
Alberto Soriano-Maldonado et al.2023, Spain ⁹	RCT	60	Female breast cancer survivors who completed core treatments within the past 10 years. Randomized into two groups: RTG and CG.	1. Resistance Training Group (RTG): Two supervised resistance training sessions per week for 12 weeks, plus instructions to undertake $\geq 10,000$ steps/day. 2. Control Group (CG): Instructions to undertake $\geq 10,000$ steps/day only.	Primary: Standardized full-body muscular strength score. Secondary: Cardiorespiratory fitness, shoulder mobility, cancer-related fatigue, depressive symptoms, health-related quality of life (HRQoL), life satisfaction.	Upper-body strength (bench press 1RM) Lower-body strength (leg press 1RM) $\dot{V}O_2$ max using a submaximal treadmill test Beck Depression Inventory-II (BDI-II) FACIT-F questionnaire Evaluated with EORTC QLQ-C30 Satisfaction With Life Scale (SWLS)	Significant increase in full-body muscular strength in RTG compared to CG. No significant differences in cardiorespiratory fitness, shoulder mobility, cancer-related fatigue, depressive symptoms, HRQoL, or life satisfaction between groups
Salvatore Ficarra et al., 2022, Italy ¹⁰	Systematic Review	22 RCTs	Comprehensive literature search in Medline and Scopus databases for RCTs on exercise interventions in breast cancer patients	Exercise interventions, including aerobic and resistance training (average duration: 19 weeks, frequency: 3 times per	Cardiorespiratory fitness (CRF), strength (ST), fatigue (F), health-related quality of life (HRQoL).	Quality of Life (QoL) Upper-Body Strength measured using a push-up test Heart Rate Variability	Exercise interventions effectively maintained or improved CRF, ST, F, and HRQoL in both patients and survivors. Combined aerobic and resistance

			and survivors.	week, intensity: moderate).		(HRV) Metrics – Mean RR interval RMSSD Mean heart rate	training showed the most positive outcomes.
Christina M. Dieli-Conwright et al., 2018, United States ¹¹	RCT	Eligible survivors of breast cancer (N = 100)	Breast cancer survivors (within 6 months of completing adjuvant treatment), physically inactive, overweight or obese. Randomized into two groups: exercise and control.	1. Exercise Group: 16-week supervised aerobic and resistance exercise (3 times per week). 2. Control Group: Usual care, no structured exercise program.	Patient Reported Outcome (QOL, fatigue, depression), Physical fitness (VO ₂ max, strength), Bone biomarkers (osteocalcin, BSAP), BMD.	Breast (FACT-B) for QOL Fatigue Symptom Inventory (FSI) for fatigue Center for Epidemiologic Studies Depression Scale (CES-D) VO ₂ max via submaximal treadmill exercise test. 1-repetition maximum (1-RM) for strength testing Dual-Energy X-ray Absorptiometry (DEXA) for BMD	Significant improvement in physical fitness, increased muscular strength, positive changes in bone health indicators, enhanced quality of life. Benefits sustained at 3-month follow-up
Colin E. Champ et al. 2024, United States ¹²	Pilot Study	40	Breast cancer survivors (stage 0–2), post-treatment. Median age 57 (range 27–74). 3-month supervised, dose-escalated resistance training.	High-intensity compound exercises (3 times per week), supervised, progressive overload.	1. Safety and feasibility 2. body composition 3. functional mobility 4. Strength and load 5. Grip Strength 6. quality of life	1. Adverse events, session adherence 2. % body fat, % muscle mass 3. FMS score, Y-Balance Test 4. Composite load across lifts 5. Jamar dynamometer measure 6. Godin Leisure-Time Exercise Questionnaire	Safe and feasible regimen with high adherence. Improved body composition (decreased fat, increased muscle), strength, mobility, balance, and quality of life. No injuries or adverse events reported.
kathryn H. Schmitz et	RCT	141 women	Participants were	Progressive, twice-	Incidence of	≥10% increase in	Weight lifting did

al., 2010, Philadelphia, USA ¹³		with ≥ 2 lymph nodes removed for breast cancer	post-treatment breast cancer survivors at risk for lymphedema. Randomized to either a progressive weight-lifting group or control (no exercise). Weight training was supervised and progressed gradually over 1 year.	weekly weight lifting (supervised, then unsupervised), upper and lower body, 1 year duration	lymphedema flare-ups, limb swelling, arm strength, and quality of life (QOL)	inter limb arm volume difference compared to baseline measured via water displacement volumetry Strength measured using 1-repetition maximum (1-RM) tests for Bench press and leg press QOL measured via questionnaires SF-36 and FACT-B	not increase the risk of lymphedema and significantly reduced symptoms (e.g., arm swelling) in those with existing lymphedema. Improved upper body strength and quality of life. Supported safe resistance training for women at risk of BCRL
Ana L. Mulero Portela et al., 2024, Puerto Rico, USA ¹⁴	RCT	101 women (aged 50+ years)	Participants were post-primary treatment for stage 0 to III breast cancer. They were randomly assigned to a 6-month low-intensity (LIG) or moderate-intensity (MIG) exercise group. Both groups were instructed to walk (low- or moderate-intensity) for 30 minutes	Low-intensity and moderate-intensity endurance exercise programs, including walking, flexibility, strengthening, and balance exercises	Physical functioning assessed via PROMIS Physical Functioning, PROMIS Global Health, and 6MWT.	Primary Outcome Measures PROMIS Physical Functioning T-score PROMIS Global Health – Physical Health subscale Six-Minute Walk Test (6MWT)	Both LIG and MIG groups showed significant within-group improvements in physical functioning measures. No statistically significant differences were found between the two groups at post-intervention or at 12 months. The study concluded that both low and moderate-intensity exercise led to significant improvements in physical

			five days a week, followed by flexibility exercises, and to perform strengthening and balance exercises twice weekly. Exercise adherence was supported with seven individual counseling sessions over six months and a Theory of Planned Behavior-based booklet. Assessments occurred at baseline, 6 months (post-intervention), and 12 months.				functioning among breast cancer survivors, suggesting that prescribing low-intensity exercise can yield important benefits when feasible and acceptable.
Şeyda Toprak Celenay et al., 2023, Turkey ¹⁵	Case-Control Study	86 women (43 with BCRL, 43 healthy controls)	Compared 30 women with unilateral breast cancer-related lymphedema (BCRL) to 32 healthy controls.	No therapeutic intervention; observational	Cardiorespiratory fitness, muscular strength, trunk muscle endurance, flexibility, body composition.	Assessed cardiorespiratory fitness using the UKK 2-km walk test, grip strength with a hand dynamometer, trunk muscle endurance with McGill tests, flexibility with the sit-and-reach test, and body composition with a body composition analyzer	Women with BCRL exhibited significantly lower cardiorespiratory fitness, muscular strength, trunk muscle endurance, and flexibility compared to healthy controls.

CONCLUSION

The present review highlights the significant role of physiotherapy interventions in enhancing the physical fitness and quality of life of breast cancer survivors and concludes that physiotherapy interventions, especially structured exercise programs combining resistance and aerobic components, significantly enhance physical fitness and quality of life in breast cancer survivors. The review reveals that both supervised and home-based programs are effective, particularly when they incorporate diverse physical fitness parameters such as cardiovascular endurance, muscular strength, flexibility, and balance. Continued research into patient-specific needs and adherence strategies is essential to optimize rehabilitation outcomes and support long-term well-being.

REFERENCES

1. **Sung H**, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2021;71(3):209–49.
2. **Caspersen CJ**, Powell KE, Christenson GM. Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public Health Rep*. 1985;100(2):126–31.
3. **Schmitz KH**, Courneya KS, Matthews C, Demark-Wahnefried W, Galvão DA, Pinto BM, et al. American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. *Med Sci Sports Exerc*. 2010;42(7):1409–26.
4. **Schmitz KH**, Ahmed RL, Troxel A, Cheville A, Smith R, Lewis-Grant L, et al. Weight lifting for women at risk for breast cancer–related lymphedema: a randomized trial. *JAMA*. 2010;304(24):2699–705.
5. **McNeely ML**, Campbell KL, Rowe BH, Klassen TP, Mackey JR, Courneya KS. Effects of exercise on breast cancer patients and survivors: a systematic review and meta-analysis. *CMAJ*. 2006;175(1):34–41.
6. **Speck RM**, Courneya KS, Mâsse LC, Duval S, Schmitz KH. An update of controlled physical activity trials in cancer survivors: a systematic review and meta-analysis. *J Cancer Surviv*. 2010;4(2):87–100.
7. **Winters-Stone KM**, Leo MC, Nguyen H, Bowman CM, Misra M, Nail LM. Comparison of aerobic vs resistance exercise effects on physical function in older breast cancer survivors: A randomized controlled trial. *J Cancer Surviv*. 2022;16(6):1115–25.
8. **Ochi E**, Yokoyama R, Aikawa R, Yamagami A, Yamashita K. High-intensity interval training using a smartphone application in breast cancer survivors: A randomized controlled trial. *Support Care Cancer*. 2022;30(1):105–13.
9. **Soriano-Maldonado A**, Fernández-Lao C, Galiano-Castillo N, Ariza-García A, Cantarero-Villanueva I, Arroyo-Morales M. Resistance training improves muscular strength in breast cancer survivors: A randomized controlled trial. *Eur J Cancer Care (Engl)*. 2023;32(1):e13767.
10. **Ficarra S**, Zanghì M, Giustino V, Messina G, Pugliese L. Effects of exercise interventions on breast cancer patients and survivors: A systematic review of randomized controlled trials. *Support Care Cancer*. 2022;30(5):4037–48.
11. **Dieli-Conwright CM**, Courneya KS, Demark-Wahnefried W, Sami N, Lee K, Buchanan TA, et al. Aerobic and resistance exercise improves physical fitness and bone health in breast cancer survivors: A randomized controlled trial. *Breast Cancer Res*. 2018;20(1):124.
12. **Champ CE**, Siglin J, Mishra MV, Showalter TN, Ohri N, Zhou XK, et al. Dose-escalated resistance training in breast cancer survivors: A pilot study. *J Natl Compr Canc Netw*. 2024;22(1):25–32.
13. **Schmitz KH**, Ahmed RL, Troxel A, Cheville A, Lewis-Grant L, Smith R, et al. Weight lifting for women at risk for breast cancer–related lymphedema: A randomized trial. *JAMA*. 2010;304(24):2699–705.
14. **Mulero-Portela AL**, Miranda-Díaz C, Torres-Cintrón CR, Rodríguez-Ruiz CM, Pérez-Torres K, Berrios-Rivera MI, et al. Effects of low- and moderate-intensity endurance exercise in breast cancer survivors: A randomized controlled trial. *J Geriatr Oncol*. 2024;15(2):101518.
15. **Toprak Celenay S**, Barut O, Bayramoglu Demirdogen E, Cigdem Karacay B, Ozer Kaya D. Health-related physical fitness parameters in women with breast cancer-related lymphedema: a case-control study. *Support Care Cancer*. 2023;31(12):667. doi:10.1007/s00520-023-08139-x. PMID: 37921928.