

### Cancer & Exercise Programming



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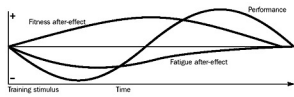
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### Exercise Programming is ....

**THE ART and Science**



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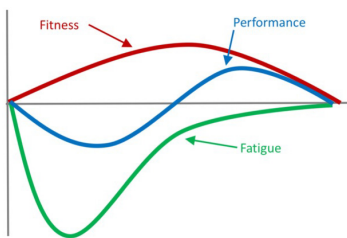
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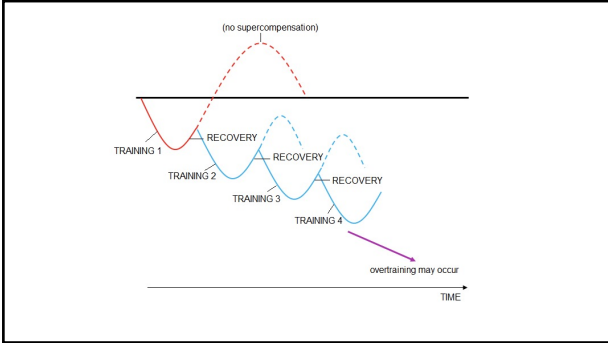
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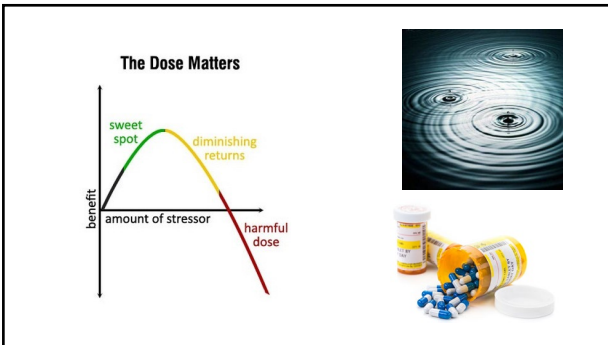
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Why do you prescribe exercise the way you do?

Survivorship				
Cancer Diagnosis	Prehabilitation (Pre-treatment assessment and interventions)	Treatment	Rehabilitation and Interventions	End of Life

Cancer Control Continuum

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### Cancer Related Fatigue

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graph TD; Illness --- Fatigue; Detraining --- Fatigue; Treatment --- Fatigue; Physical_Activity[Physical Activity] --- Fatigue; Inactive_Habits[Inactive Habits] --- Fatigue; Physical_Activity --- Diminished_Fatigue[Diminished Fatigue];
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### Effects of Exercise in Individuals with Cancer

- Exercise during and after treatment is an effective tool to improve:
  - Functional capacity
  - Strength
  - Functional mobility
  - Fatigue
  - Psychological well-being
  - Health-related QoL

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### Effects of Exercise in Individuals with Cancer

- However, the benefits of physical training may vary according to:
  - Type of cancer and treatment;
  - Stage of disease;
  - Mode, intensity, and duration of the exercise program;
  - Current lifestyle of the patient

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### Resistance Training Research [After Treatment]

Study	Type of Cancer	No. of patients, age	Duration (weeks)	Frequency	Exercise program	Intensity	Results
Herrero et al. 2007	Breast	16 W 50 years	8	3/week	Aerobic cycling	70-80% MHR	↑ VO <sub>2</sub> peak ↑ Lower body strength ↑ Functional mobility ↑ Muscle mass ↓ % body fat ↑ Quality of life
Ohira et al. 2006	Breast	79 W 53 years	24	2/week	RET 2-3 sets, 8-15 reps) RET Stretching	12- to 8RM Unspecified	↑ Upper strength ↑ Lean body mass ↑ Psychosocial ↑ Quality of life
McNelly et al. 2006	Head and neck carcinoma	52 M/W 32-76 years	12	2-3/week	RET 12 sets, 10-15 reps) Therapeutic exercise	25-70% 1RM	↑ Upper extremity strength and muscular endurance ↑ Shoulder gird ↑ Shoulder ROM

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### Resistance Training Research

- Studies of resistance training and combined aerobic and resistance intervention studies in cancer patients and survivors have also reported:
  - Lower incidence or recurrence of breast cancer–related lymphedema
  - Lower severity of breast cancer–related lymphedema
  - No delayed immunologic recovery
  - Improved chemotherapy completion rates

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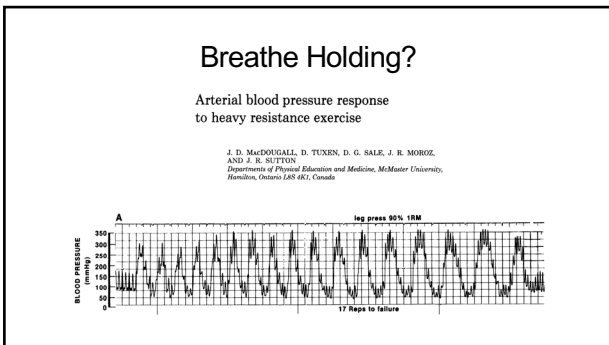
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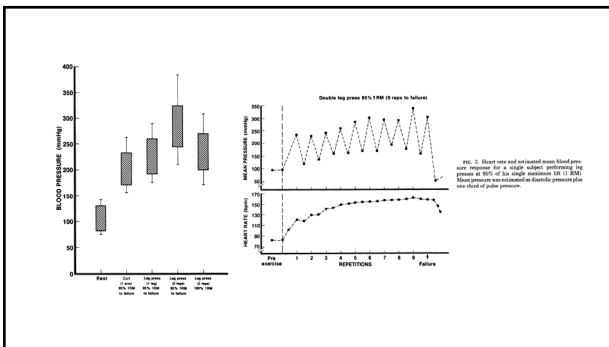
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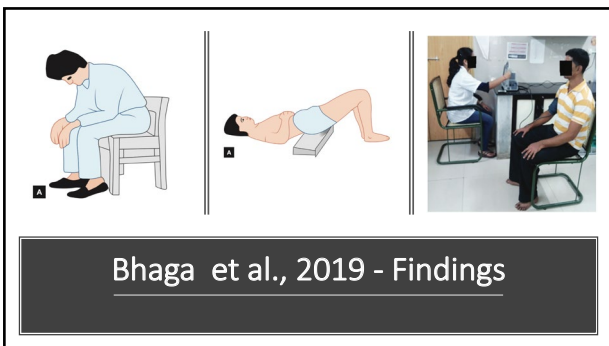
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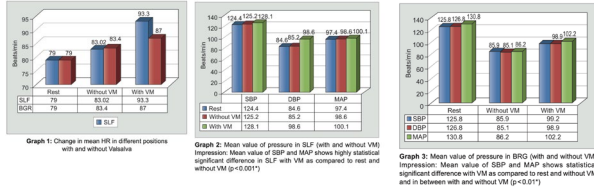
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### Bhaga et al., 2019 - Findings



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### Aerobic Training Research

Study	Type of cancer	No. of patients, age	Duration (weeks)	Frequency	Exercise program	Intensity	Results
Yang et al. 2015	Breast	47 W, 50 years	6	3/week	Aerobic walking	40-65% MHR	↓ Fatigue
Alibhai et al. 2015	Myeloid leukemia	63 M&W, 59 years	4-6	4-5/week	Mixed modalities	50-75% HRR	↑ Quality of life ↓ Fatigue ↑ Aerobic fitness ↑ Lower body strength ↑ Grip strength
Jones et al. 2014	Prostate	46 M, 59 years	24	3-5/week	Aerobic walking	55-65% VO <sub>2</sub> peak	↑ 9% VO <sub>2</sub> peak
Windauer et al. 2004	Prostate	65 M, 69 years	4	3+/week	Aerobic walking	60-70% MHR	No ↑ fatigues from radiotherapy ↑ Physical functioning ↑ Distance walked
Dimeo et al. 1998	Bronchial, breast	5 M&W 18-55 years	6	5/week	Aerobic walking	3 mmol/L (L) 80% MHR	↑ MAP ↓ Lactate concentration

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### Aerobic Training Research

Study	Type of cancer	No. of patients, age	Duration (weeks)	Frequency	Exercise program	Intensity	Results
Daley et al. 2007	Breast	108 W, 51 years	8	3/week	Aerobic walking	65-85% MHR	↑ Quality of life ↑ Aerobic fitness
Carlson et al. 2006	Post allogeneic hematopoietic stem cell transplant	12 M&W, 28-55 years	12	3/week	Aerobic cycling	V1.1 to V1.2 +20 Watts	↑ VO <sub>2</sub> peak ↑ Power at V1.2 ↓ Fatigue
Thorsen et al. 2005	Lymphomas or breast, gynecologic, or testicular cancer	111 M&W, 39 years	14	2+/week	Aerobic walking, cycling, aerobics, skiing	RPE 13-15 or 60-70% MHR	↑ VO <sub>2</sub> max ↓ Fatigue
Courneya et al. 2003	Breast	52 W, 59 years	15	3/week	Aerobic cycling	70-75% VO <sub>2</sub> peak	↑ VO <sub>2</sub> peak ↑ Quality of life ↑ Body weight and composition

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### Current Recommendations and Considerations




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### Exercise Recommendations

Exercise	Intensity	Frequency	Volume	Dosage
Aerobic exercise	Begin at a self-selected intensity (e.g., talk test) and increase intensity over time as tolerated (e.g., RPE of 3-5 on a 1-10 scale)	4-5/week	Any duration (as tolerated) and progress to 40 min	Begin with walking and progress to include other large muscle group activities
Resistance exercise	30-80% 1RM	2-3/week	8-10 exercises for major muscle groups 1-3 sets per muscle group	15- to 8RM Rest 1-3 min between exercises and sets
Flexibility exercise	Lower than discomfort level	≥3/week	2-4 sets per muscle area	10-30 s

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### Special Considerations in Cancer Training Prescription

Pathology or condition	Precaution
<ul style="list-style-type: none"> <li>Fever (temperature &gt;104°F / &gt;40°C)</li> <li>Severe anemia (hemoglobin &lt;8 g/dl)</li> <li>Severe neutropenia (neutrophil count &lt;0.5 × 10<sup>9</sup>/L)</li> <li>Severe thrombocytopenia (platelet count &lt;50 × 10<sup>9</sup>/L)</li> <li>Severe cachexia (loss of over 35% pre-morbid weight)</li> <li>Cardiotoxicity induced by antineoplastic agents</li> </ul>	Avoid all types of exercise but not activities of daily living. Avoid sedentary behavior during the day as much as possible.
<ul style="list-style-type: none"> <li>Fever (temperature &gt;100.4°F / &gt;38°C)</li> <li>Low to moderate anemia</li> <li>Low to moderate cachexia</li> </ul>	Avoid intense and strenuous exercise (i.e., high intensity). Do light-intensity and progressive exercise.
<ul style="list-style-type: none"> <li>Primary or metastatic bone cancer (increased risk of bone fracture)</li> <li>Low to moderate thrombocytopenia (increased risk of hemorrhage)</li> </ul>	Avoid high-impact exercise, contact sports, activities that have high risk of impact and falls. Use a controlled quilted environment with soft material (i.e., soft balls).
<ul style="list-style-type: none"> <li>Low to moderate neutropenia (increased risk of bacterial infection)</li> <li>Patients with nephrostomy tubes, central venous access or urinary bladder catheters</li> </ul>	Avoid swimming Aseptic environment. Do light-intensity and progressive exercise.

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### Special Considerations in Cancer Training Prescription

Patients with ataxia, dizziness, or peripheral neuropathy (impaired balance and coordination and increased risk of falls)

Avoid high-impact exercise, contact sports, activities that have high risk of impact and falls, or that require additional balance and coordination (e.g., treadmill walking, outdoor cycling). Use controlled quilted environment with soft material (i.e., soft balls). Walk re-education and physical therapy treatment of neuropathy are recommended.

Breast cancer survivors

Be aware of increased risk for fracture. Watch for arm or shoulder symptoms and lymphedema.

Prostate cancer survivors

Be aware of increased risk for fracture. Pelvic floor exercises are recommended for patients with radical prostatectomy.

Colon cancer survivors with an ostomy

Resistance exercise: Start with low intensity and progress the resistance in small increments to avoid herniation in the stoma.  
Contact sports: Physician permission is recommended (due to the risk of a blow to the stoma site), and modifications may be needed (e.g., additional protection such as a stoma guard).  
Swimming: modifications may be needed (e.g., a stoma cap or a mini drainable pouch).

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