

1

Exercise Programming is

THE ART and Science

2

Exercise Programming is

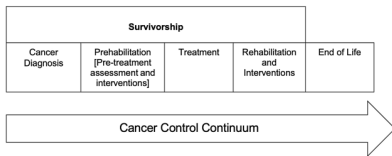
I've been hiding from exercise.

I'm in the fitness protection program.

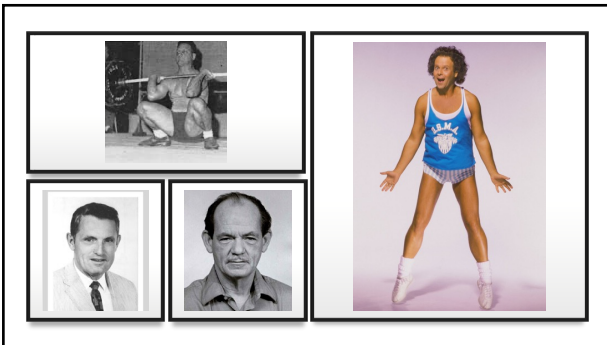
MAINTENANCE OVER TIME

3

Let's Look at the Evidence from the 3 Area's

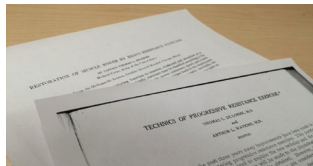
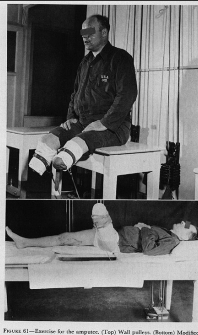


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Back in the Dinosaurs Era [i.e., John's @ 20 year old]



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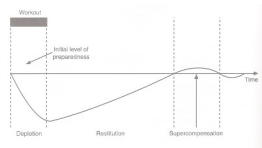
My area of interest

THE EXAMINATION OF RESISTANCE TRAINING VARIABLES AND THE APPLICATION TO MUSCULAR STRENGTH DEVELOPMENT: A SERIES OF SYSTEMATIC REVIEWS AND META-ANALYSES



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One-factor Theory (Supercompensation)



BRITISH MEDICAL JOURNAL

LONDON: SUBSCRIBED JUNE 17 1988

STRESS AND THE GENERAL ADAPTATION SYNDROME*

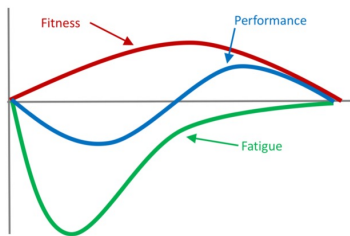
By S. Selye, M.D., Ph.D., F.R.S., F.A.C.S.

Professor of Biology at the University of Montreal, Canada, and Director of the Institute of Biomedical Sciences, Montreal, Canada.

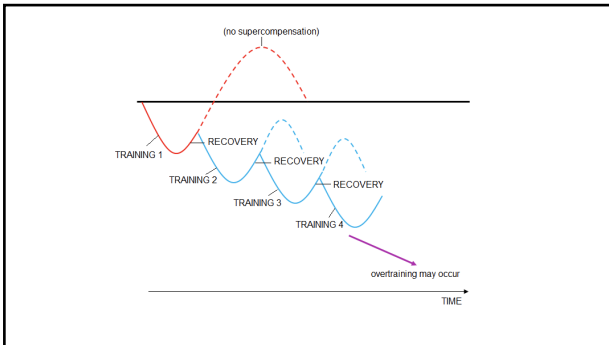
THE concept of the general adaptation syndrome (GAS) was first proposed by the author in 1936. It is a model of the response of the body to stress, and it is based on the observation that the body reacts to stress in a predictable way. The GAS is a non-specific response of the body to stress, and it is characterized by a sequence of three phases: alarm, resistance, and exhaustion. The alarm phase is the initial reaction to the stressor, and it is characterized by a surge of energy and a release of hormones. The resistance phase is the period during which the body attempts to adapt to the stressor, and it is characterized by a decrease in the intensity of the response. The exhaustion phase is the final stage of the GAS, and it is characterized by a complete breakdown of the body's ability to resist the stressor.

- Uses a depletion model
- Accounts for athletic preparedness
- Muscle glycogen depletion?
- In **Restoration** the level returns to normal
- **Supercompensation** is the increase over normal
- Rest is the forgotten variable

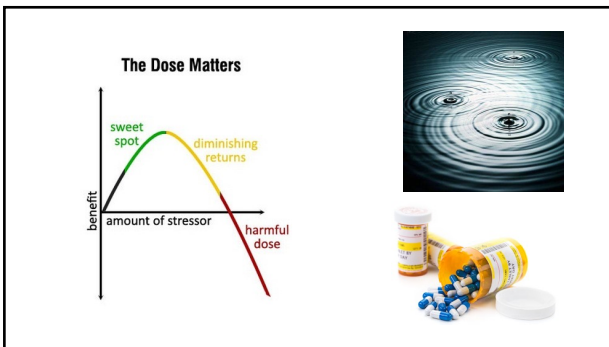
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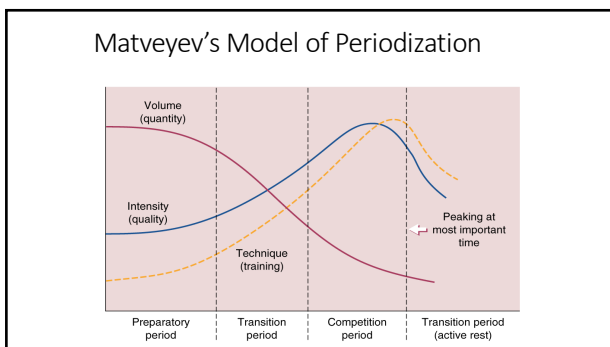
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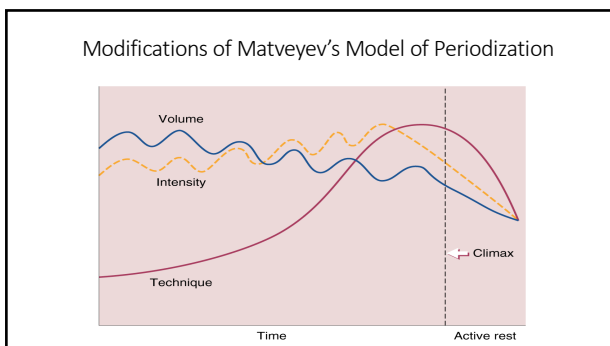
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Why do you prescribe exercise the way you do?


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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

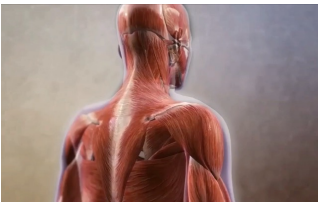
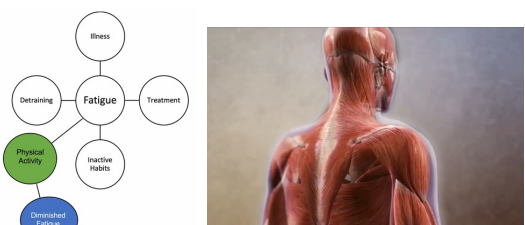
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Effects of Exercise in Individuals with Cancer

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Cancer Related 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
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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 _{2peak} ↑ Lean 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) REF stretching	12- to 8RM Unspecified	↑ Upper strength ↑ Lean body mass ↑ Psychological ↑ Quality of life
McInelly et al. 2008	Head and neck carcinoma	52 M/W 52-76 years	12	2-3/week	RET (2 sets, 10-15 reps) Therapeutic exercise	25-70% 1RM	↑ Upper extremity strength and muscular endurance ↓ Shoulder pain ↑ Shoulder ROM

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Resistance Training Research

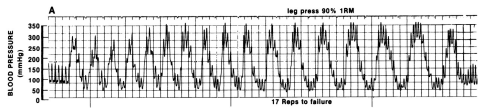
- Studies of resistance training and combined aerobic and resistance intervention studies in cancer patients and survivors have also reported:
 - Lower incidence or recurrence of breast cancer-related lymphedema
 - Lower severity of breast cancer-related lymphedema
 - No delayed immunologic recovery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

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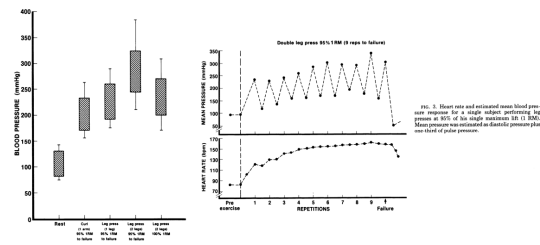
Breathe Holding?

Arterial blood pressure response to heavy resistance exercise

J. D. MacPOUGALL, D. TUXEN, D. G. SALE, J. R. MORROW, AND J. E. SUTTON
Department of Physical Education and Medicine, McMaster University, Hamilton, Ontario L8S 4K1, Canada



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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	65 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 ₂ peak	↑ 9% VO ₂ peak
Windor et al. 2004	Prostate	65 M 69 years	4	3+/week	Aerobic walking	60-70% MHR	No ↑ in fatigue from radiotherapy ↑ Physical functioning ↑ Distance walked
Dimeo et al. 1998	Breast, breast	5 M/W 18-55 years	6	5/week	Aerobic walking	3 meso/L (LC) 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	VT-1 to VT-2 ~20 Watts	↑ VO ₂ peak ↑ Power at VT-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 ₂ max ↓ Fatigue
Courney et al. 2003	Breast	52 W 59 years	15	3/week	Aerobic cycling	70-75% VO ₂ peak	↑ VO ₂ peak ↑ Quality of life ↑ Body weight and composition

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Current Recommendations and Considerations



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ACSM (2021) Exercise Recommendations

	Aerobic	Resistance	Flexibility
Frequency	3-5 d/week	2-3 d/week with a minimum of 48 h between sessions	2-3 d/week up to daily
Intensity	40%–60% VO2R or HRR. Survivors may find RPE useful to gauge exercise intensity.	60%–80% 1-RM or allow for 8–15 repetitions. Increase weight as tolerated and when repetitions > 15. RPE is correlated with % 1-RM in cancer survivors (83).	Stretch within limits of pain to the point of lightness or slight discomfort
Time	≥30 min/d. No lower limit on bout length. During treatment, exercise length may need to be modified due to chemotherapy or radiation-related toxicities.	≥1 set/28 repetitions per set; ≥60 s rest between sets	Hold each stretch for 10–30 s.
Type	Walking, cycling, swimming. Swimming should not be prescribed for survivors with central lines, those with ostomies, those in an immunocompromised state or who are currently receiving radiation therapy.	8–10 exercises of major muscle groups; machines or free weights	Static stretches (passive and/or active), for all major muscle-tendon groups. Tai chi and yoga may be preferred.

1-RM, one repetition maximum; HRR, heart rate reserve; RPE, rating of perceived exertion; VO2R, oxygen uptake reserve.

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NSCA 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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Exercise Recommendations?????



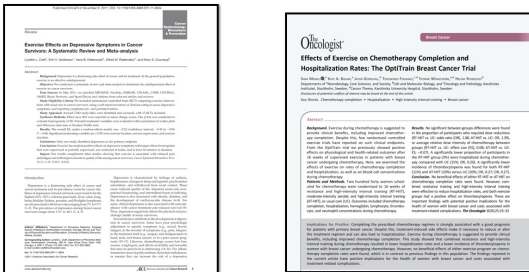
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Prehab



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Rehab



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Special Considerations in Cancer Training Prescription

Pathology or condition	Precaution
<ul style="list-style-type: none"> Fever (temperature >104°F / >40°C) Severe anemia (hemoglobin <8 g/dl) Severe neutropenia (neutrophil count <0.5 × 10⁹/L) Severe thrombocytopenia (platelet count <50 × 10⁹/L) Severe cachexia (loss of over 35% pre-morbid weight) Cardiotoxicity induced by anthracyclines 	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"> Fever (temperature >102.4°F / >38°C) Low to moderate anemia Low to moderate cachexia 	Avoid intense and strenuous exercise (i.e., high intensity). Do light-intensity and progressive exercise.
<ul style="list-style-type: none"> Primary or metastatic bone cancer (increased risk of bone fractures) Low to moderate thrombocytopenia (increased risk of hemorrhage) 	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"> Low to moderate neutropenia (increased risk of bacterial infection) Patients with nephrostomy tubes, central venous access or urinary bladder catheters 	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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