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## Exercise & Cancer: Defining the New Normal

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### THE MANY FACES OF CANCER

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### MOVEMENT (BOTH EXERCISE & LESS SEDENTARY TIME IS IMPORTANT

MOVEMENT  
(BOTH EXERCISE AND DECREASING SEDENTARY BEHAVIOR)  
AFFECTS MANY ASPECTS OF  
CANCER SURVIVORSHIP

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**Side effects**

- Hot Flashes
- Sexual Dysfunction
- Enlarged/tender breasts
- Weakened bones
- GI symptoms
- Fatigue
- Mood Changes

**HORMONE THERAPIES TO TREAT CANCER**

~ Used to slow or stop cancer growth for tumors that use hormones to grow

~ Can be used as adjunct to reduce or prevent symptoms in some cancers

National Cancer Institute

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**Side Effects**

- Pain
- Swelling
- Soreness
- Redness
- Itchiness
- Rash
- Flu like symptoms

**IMMUNOTHERAPIES TO TREAT CANCER**

~ Type of biological therapy

~ Enhances own immune system to fight cancer

~ Types:

- ~ Checkpoint Inhibitors
- ~ Adoptive Cell transfer
- ~ Monoclonal Antibodies

National Cancer Institute

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**CHEMOTHERAPY AFFECTS OUR BODY IN MANY WAYS**

National Cancer Institute

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**CANCER SURVIORSHIP:  
SIDE EFFECTS**

Anemia	Memory/Concentration Problems
Appetite Loss	Mouth & Throat Problems
Bleeding & Bruising	Nausea & Vomiting
Constipation	Nerve Problems (Peripheral Neuropathy)
Delirium	Pain
Diarrhea	Sexual Health
Edema	Skin & Nails Changes
Fatigue	Sleep Problems
Fertility issues	Urinary & Bladder Problems
Hair Loss	
Infection & Neutropenia	
Lymphedema	

National Cancer Institute, 2018

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Cognitive Change	Insomnia
Bone Health Issues	Chemo-induced Neuropathy
Risk for secondary cancers	Body disfiguration
Metabolic dysfunction	Body image change
Cardiac dysfunction	Anxiety/Depression
Chronic Fatigue	

**CANCER SURVIORSHIP:  
LONG TERM & LATE EFFECT SIDE EFFECTS**

Ahles, & Root, 2018; Shapiro, 2018; Treanor, & Donnelly, 2016)

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**EXERCISE AFFECTS  
OUR SURVIORSHIP  
IN MANY WAYS**

- Prolonged inactivity has a negative impact on overall health
- Fatigue & Depression are lowered with a more active lifestyle
- Quality of life is higher with a more active lifestyle
- Movement interventions need to be tailored to individuals goals
- Movement interventions need to be accessible in the community outside of the clinical settings

Aguilaga et al, 2018; Walker & Fredson, 2017

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EMERGING RESEARCH IS LOOKING AT HOW EXERCISE EFFECTS CANCER CELLS MICROENVIRONMENT

RESEARCH ARTICLE

Effects of exercise on circulating tumor cells among patients with resected stage I-III colon cancer

Justin C. Brown<sup>1\*</sup>, Andrew D. Rhim<sup>2</sup>, Sara L. Manning<sup>3</sup>, Luke Brennan<sup>3</sup>, Alexandra I. Mansour<sup>4</sup>, Anil K. Rustgi<sup>1</sup>, Nevena Damjanov<sup>4</sup>, Andrea B. Troxel<sup>5</sup>, Michael R. Ricketts<sup>6</sup>, Bonnie Ky<sup>7</sup>, Babette S. Zemel<sup>8\*</sup>, Kerry S. Courneya<sup>9</sup>, Kathryn H. Schmitz<sup>2</sup>

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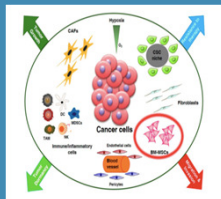
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- CANCER CELLS LIVE IN AN ENVIRONMENT. (E.G. GRASS SEED IN A FIELD)
- THEY ARE SURROUNDED BY OTHER BY
- CELLS FUNCTIONS TO PROMOTE A HEALTHY ENVIRONMENT. (E.G. APOPTOSIS)

WHAT IS A MICROENVIRONMENT




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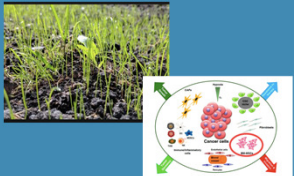
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EXERCISE HAS THE POTENTIAL TO IMPACT THE WAY CANCER CELLS FUNCTION...MORE RESEARCH IS NEEDED




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### MOVEMENT PATTERN RECOMMENDATION

Sedentary Behavior Research Network (SBRN) - Terminology  
Consensus Project process and outcome

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### EXERCISE AND BODY SYSTEMS

- Cardiovascular
- Respiratory
- Musculoskeletal
- Nervous
- Renal
- Metabolic
- Endocrine
- Immune
- Cognitive Health
- Psychological Health

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### BENEFITS OF EXERCISE BY SYSTEM

<ul style="list-style-type: none"> <li>• Cardiovascular                             <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Increased ability to do work</li> <li><input checked="" type="checkbox"/> Decreased heart rate and blood pressure</li> <li><input checked="" type="checkbox"/> Increased capillary density in muscle</li> <li><input checked="" type="checkbox"/> Decreased inflammation</li> </ul> </li> <li>• Musculoskeletal                             <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Increase bone mass</li> <li><input checked="" type="checkbox"/> Increase muscle mass</li> <li><input checked="" type="checkbox"/> Keep joints moving and healthy</li> <li><input checked="" type="checkbox"/> Decreased inflammation</li> <li><input checked="" type="checkbox"/> Decreased risk of falls</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Nervous                             <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Increased neuroplasticity</li> <li><input checked="" type="checkbox"/> Messages get to where they need to go</li> <li><input checked="" type="checkbox"/> May decrease pain from damaged nerves</li> <li><input checked="" type="checkbox"/> Generate new brain cells</li> <li><input checked="" type="checkbox"/> Improved sleep</li> </ul> </li> <li>• Renal                             <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Regulate bp and cholesterol</li> <li><input checked="" type="checkbox"/> Decreases stress on kidneys</li> <li><input checked="" type="checkbox"/> Helps to regulate better removal?</li> </ul> </li> <li>• Respiratory                             <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Increased oxygen uptake</li> </ul> </li> </ul>
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- Metabolic
  - Improved glucose uptake and insulin sensitivity
  - Controls diabetes, may clear
  - Decreases body weight and body fat
- Endocrine
  - Promote hormone production
  - Regulate temperature
  - Regulate blood pressure, heart rate
  - Impact metabolism with regulation
- Immune
  - Helps fight infection with increase of WBC
  - Keeps stress hormones under control so they don't weaken system
- Cognitive
  - Increased learning, memory, executive function
  - May reduce risk of dementia
  - Increased feelings of well-being
  - Decreased risk of fall

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- Psychological Health
    - Decrease risk of depression and anxiety
  - Other Benefits:
    - Enhanced physical function
    - Increased quality of life
    - Expanded independence
    - Assist with chronic disease
- AND MAYBE MORE!!!!**

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- EXERCISE SPECIFIC TARGETS FOR POST CANCER RECOVERY**
- Increase bone mass
  - Increase muscle
  - Increase flexibility
  - Increase cardiorespiratory function
  - Increase neuroplasticity
  - Increase self-esteem
  - Decrease depression
  - Decrease fatigue/improved sleep
  - Reduce rate of recurrence

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### GENERAL POPULATION EXERCISE PRESCRIPTION

- **Aerobic Training**
  - 3-5x's/wk
  - Moderate/vigorous intensity
  - 150-300 mins/wk
- **Resistance Training**
  - 2-3x's/wk
  - 8-12 reps
  - 2-4 sets
- **Flexibility**
  - 2-3 days/wk
  - Hold 10-30s
  - Point of tightness not pain

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**Aerobic Training**  
3-5x's/wk  
Moderate intensity  
150 mins/wk

**Resistance Training**  
2-3x'/wk  
8-12 reps  
Start slow & low

**Flexibility**  
2-3 days/wk  
Hold 10-30s  
Point of tightness not pain

### EXERCISE PRESCRIPTION FOR CANCER SURVIVOR

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### SPECIAL CONSIDERATIONS

- Types of treatment
  - What are they are risk for?
  - Chemo
    - Decreased Bone/Muscle, Brain function
    - Heart rhythms
    - Neuropathy
  - Special training due to treatment effects
- Radiation
  - Heart disease
  - Skin burns, decreased flexibility
  - Sores
- Immune system
  - fevers, low blood counts, bruises
  - public places may be difficult due to germs
  - extra cleaning, PPE
- Nutrition
  - Watch for Lymphedema
  - 2 hour rule
- \*\*Get a medical clearance for specific activity



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### WHERE TO START WITH EXERCISE

- Let client set goal
- Function vs. reps
- Start slow and low, let progression happen naturally
- Be aware of tolerance
- ADLs should be priority

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### ORDER OF TYPICAL NEED

- Strength and endurance
- Flexibility
- Cardiovascular

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### STRENGTH EXERCISES

- BANDS
- HIP CIRCLES
- KETTLE BELLS

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FLEXIBILITY

- SITTING
- STANDING
- LYING

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CARDIOVASCULAR EXERCISE

- Walking
- Cycle
- Elliptical
- \*\*Swimming
- Dance

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HIPPOTHERAPY

- Strength and balance improvements
- Reduce risks of falls
- Increase ADLs
- Spinal stability
- balance
- Grip strength
- Overall strength correlation
- General well-being



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### RESOURCE AND PARTNERSHIP

- LIVESTRONG at the YMCA
- Most Y's nationally have this program
- Specific Trainers
  - ACSM Cancer Exercise Trainer
  - ACE Cancer Exercise Specialist
- LIVESTRONG.com
- www.cancer.org
- <https://www.cancerwa.asn.au/resources/2016-06-08-Exercise-for-people-living-with-cancer.pdf>

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### CASE STUDY

42 year old female, breast cancer survivor  
 Surgery (double mastectomy)  
 4 months chemo  
 21 days radiation  
 Claims weakness, fatigue, depression  
 Medical clearance  
 Strength training, walking  
 Get her on a horse!  
 Watch bruises, bones, fever, assess 2 hours after

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### SUMMARY

- Movement patterns involve BOTH sedentary patterns and physical activity patterns
- ↑ in survivorship poses new patient- centered questions that need to be addressed:
  - how is health-related quality of life (HRQoL) and symptom burden?
  - how can we as care providers assist in HRQoL and symptom burden?
  - What is the relationship HRQoL, symptom burden and movement patterns?
- Many treatment options each with own side-effects
- Exercise has potential to impact cellular microenvironment
- Movement patterns impact survivorship and NEED to be part of assessment & intervention plan in survivorship care plans

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## REFERENCES

- ACSM's Guidelines for Exercise Testing and Prescription, 10<sup>th</sup> edition, Wolters Kluwer, 2018.
- Ahles, T.A., & Root, J. C. (2018). Cognitive Effects of Cancer and Cancer Treatments. *Annual Review of Clinical Psychology*, 14, 425–451.
- Aquilina, S., Ehlers, D.K., Cozman, J., Severson, J., Kramer, A.F., & McAuley, E. (2018). Effects of physical activity on psychological well-being outcomes in breast cancer survivors from pre-diagnosis to posttreatment survivorship. *Psycho-Oncology*, 8(5), 1987.
- McFarland, D. C. (2019). New lung cancer treatments (immunotherapy and targeted therapies) and their associations with depression and other psychological side effects as compared to chemotherapy. *General Hospital Psychiatry*. doi: 10.1016/j.genhosppych.2019.04.001
- National Cancer Institute. (2018). *Side Effects of Cancer Treatment*. Retrieved from <https://www.cancer.gov/about-cancer/treatment/side-effects>
- National Cancer Institute (n.d.). Types of cancer treatment. Retrieved from <https://www.cancer.gov/about-cancer/treatment/types> on 4/24/19.
- Pelagalli, A., Nardelli, A., Fontanella, R., & Zannetti, A. (2016). Inhibition of AQP1 Hampers Osteosarcoma and Hepatocellular Carcinoma Progression Mediated by Bone Marrow-Derived Mesenchymal Stem Cells. *International Journal of Molecular Sciences*, 17(7). doi:10.3390/ijms17071102
- Schirmacher, V. (2019). From chemotherapy to biological therapy: A review of novel concepts to reduce the side effects of systemic cancer treatment (Review). *International Journal of Oncology*, 2(2), 407
- Shapiro, C. L. (2018). Cancer Survivorship. *The New England Journal Of Medicine*, 379(25), 2438–2450
- Treanor, C., & Donnelly, M. (2016). Late effects of cancer and cancer treatment—the perspective of the patient. *Supportive Care in Cancer*, 24(1), 337–346.
- Walker, R.K., & Freedson, P.S. (2017). Translation of an aging-in-place intervention to reduce disability and sedentarism among rural cancer survivors: 3170 Board #75 June 2 2:00 PM - 3:30 PM. *Medicine & Science in Sports & Exercise*, 55(Suppl 1), 896.

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