高雄醫學大學附設中和紀念醫院
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The Benefits of Therapeutic Exercise During Hematopoietic Stem Cell Transplantation: Literatures Review

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American Cancer Society Guidelines on Nutrition and Physical Activity for Cancer Survivors

- Achieve and maintain a **healthy weight**
  - If overweight or obese, limit consumption of high-calorie foods and beverages and increase physical activity to promote weight loss

- Engage in **regular physical activity**
  - Avoid inactivity and return to normal daily activities as soon as possible following diagnosis.
  - Aim to exercise at least 150 minutes per week.
  - Include strength training exercises at least 2 days per week.

Rock, C. L., Doyle, C., Demark-Wahnefried, W., Meyerhardt, J., Courneya, K. S., Schwartz, A. L., Bandera, E. V., Hamilton, K. K., Grant, B., McCullough, M., Byers, T., & Gansler, T. (2012). Nutrition and physical activity guidelines for cancer survivors. *CA: a cancer journal for clinicians*, *62*(4), 243–274.

FATIGUE

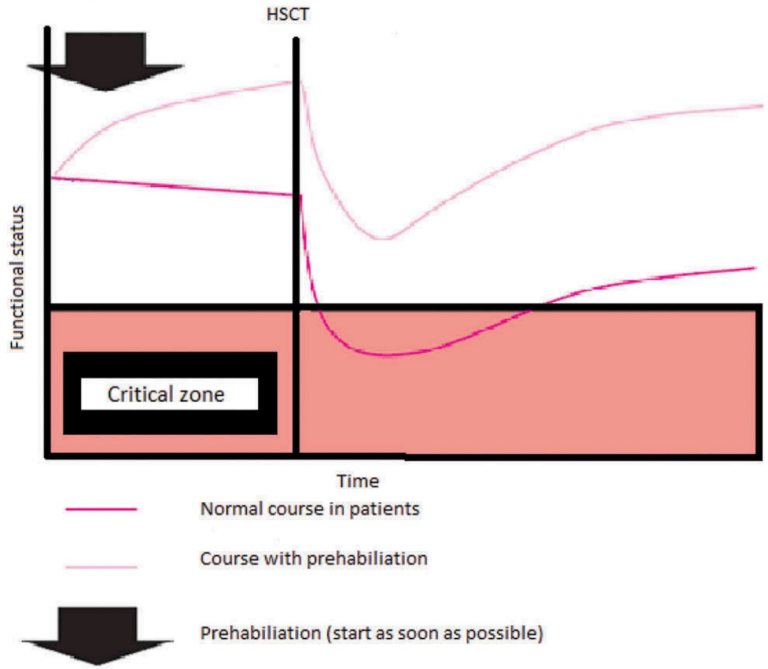


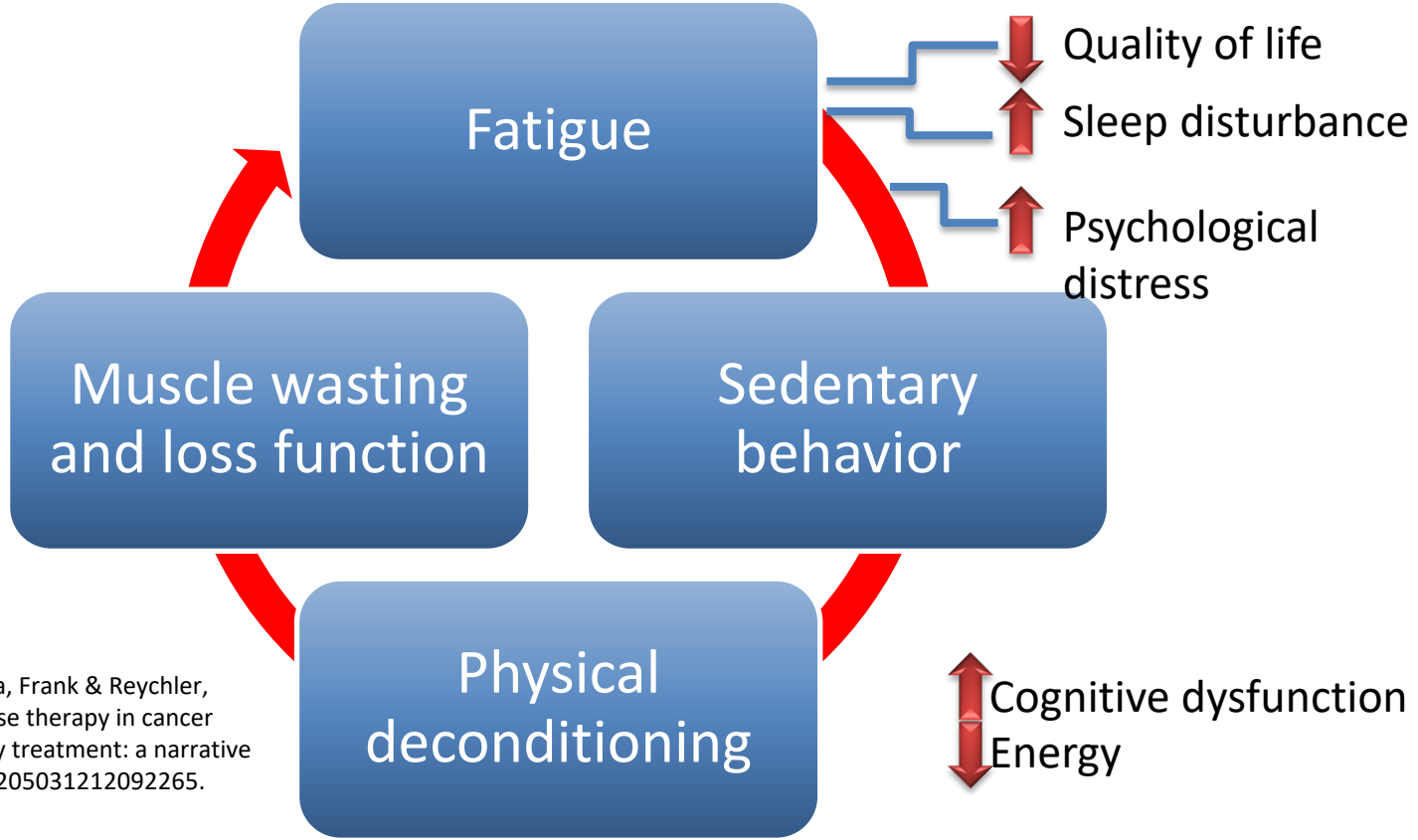
Figure 1. Theoretical model of prehabilitation in people undergoing HSCT (figure is adapted from Hulzebos and Van Meeteren, 2015).

FATIGUE

- **Fatigue** is a symptom associated with decreased physical function, as one of the most common complications of HSCT patients
  - 41% of patients had severe fatigue within five years of transplant
- Physiology affects psychology
  - Anxiety, worry and other mental disorders
- Affecting patients' quality of life (QOL) and recovery progress

Liang, Y., Zhou, M., Wang, F., & Wu, Z. (2018). Exercise for physical fitness, fatigue and quality of life of patients undergoing hematopoietic stem cell transplantation: a meta-analysis of randomized controlled trials. Japanese journal of clinical oncology, 48(12), 1046–1057.

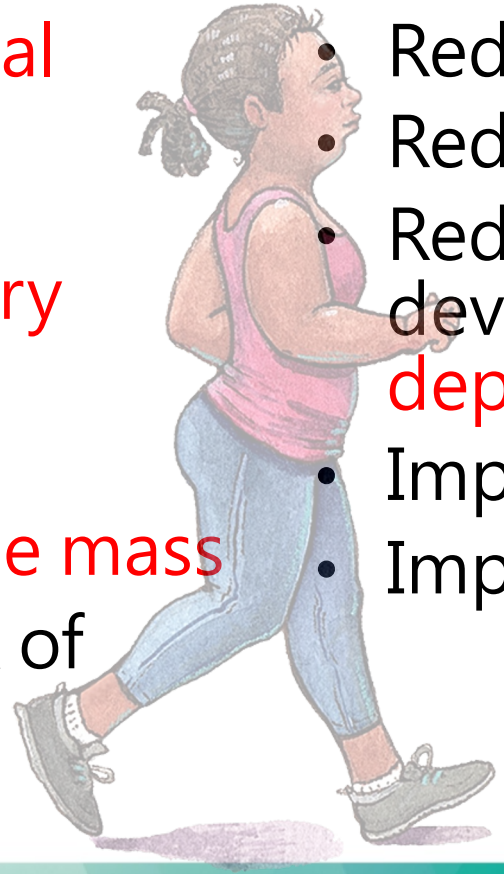
Vicious Cycle of Fatigue



Elise, Piraux & Caty, Gilles & Nana, Frank & Reychler, Gregory. (2020). Effects of exercise therapy in cancer patients undergoing radiotherapy treatment: a narrative review. SAGE Open Medicine. 8. 205031212092265. 10.1177/2050312120922657.

Benefits of Exercise for Transplant Patients

- Improve physical fitness
- Enhance cardiorespiratory function
- Weight control
- Maintain muscle mass
- Reduce the risk of osteoporosis



- Reduce fatigue
- Reduce nausea
- Reduce the risk of developing anxiety or depression
- Improve self-esteem
- Improve quality of life

Benefits of Exercise for Transplant Patients

- post-HSCT leg extension torque and peak VO2 were **strongly associated** with each of their pre-HSCT variables
  - the higher the physical function before HSCT, the higher the physical function after HSCT
  - maximizing physical capacity before HSCT could lead to better functional outcomes, as well as reduce the length of hospital stay and mortality risk.

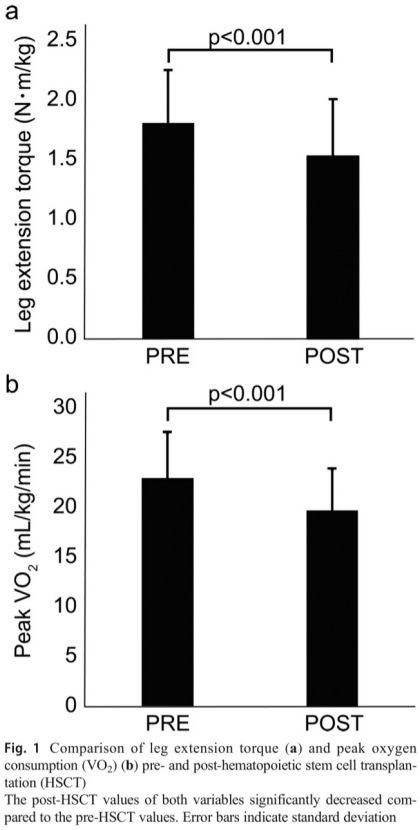
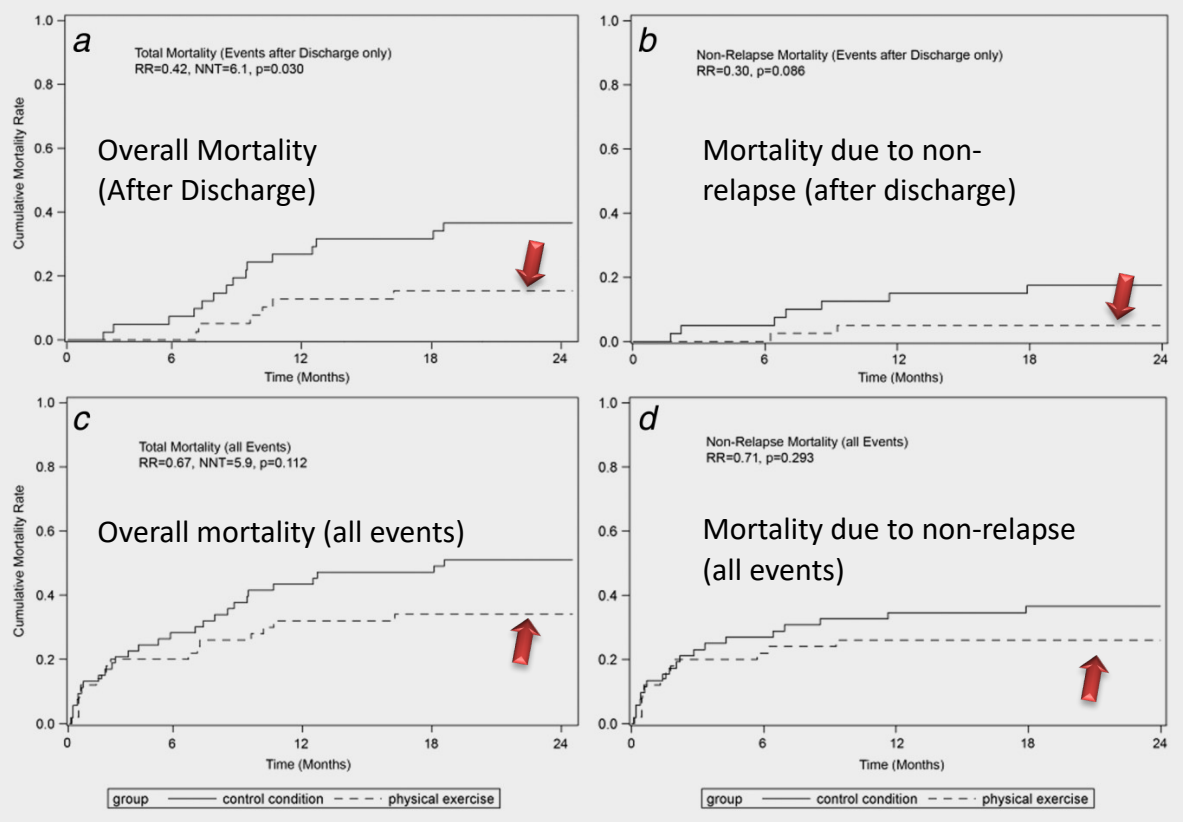


Fig. 1 Comparison of leg extension torque (**a**) and peak oxygen consumption (VO_2) (**b**) pre- and post-hematopoietic stem cell transplantation (HSCT)
The post-HSCT values of both variables significantly decreased compared to the pre-HSCT values. Error bars indicate standard deviation

Ishikawa, A., Otaka, Y., Kamisako, M., Suzuki, T., Miyata, C., Tsuji, T., Matsumoto, H., Kato, J., Mori, T., Okamoto, S., & Liu, M. (2019). Factors affecting lower limb muscle strength and cardiopulmonary fitness after allogeneic hematopoietic stem cell transplantation. *Supportive care in cancer : official journal of the Multinational Association of Supportive Care in Cancer*, *27*(5), 1793–1800.

Exercise on Survival of Transplant Patients



Wiskemann, J., Kleindienst, N., Kuehl, R., Dreger, P., Schwerdtfeger, R., & Bohus, M. (2015). Effects of physical exercise on survival after allogeneic stem cell transplantation. *International journal of cancer*, *137*(11), 2749–2756.

Exercise: Aerobic Exercise

component	Aerobic
Frequency	3-7x/week
Intensity	60%-80% of max HR, or 40%-60% of HR reserve or oxygen uptake service
Mode	Walking or stationary bike
Duration	Start with 5-20 minutes depending on exercise tolerance Goal is 20-60 minutes of continuous exercise
Progression	Duration > frequency > intensity > mode
Patient monitor	HR, BP, O_2 sat, RPE and pain

Exercises: Strength Training

component	Strength training
Frequency	At least 2-3x/week
Intensity	40%-60% of 1RM or 6-12 repetitions
Mode	• 8-10 dynamic exercise, functional task training, weight machines or free weights, TheraBand resistance • Target muscle: major muscle group, concentric and eccentric contractions in supine, sitting and standing
Duration	Start with 1 set of 8-12 repetitions Goal is 1-3 sets of 8-15 repetitions
Progression	Frequency > intensity Add TheraBand only if no additional hematologic or orthopedic precautions are present
Patient monitor	HR, BP, O_2 sat, RPE, DOE and pain

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THANK YOU

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