The Effects of Aging on Healing

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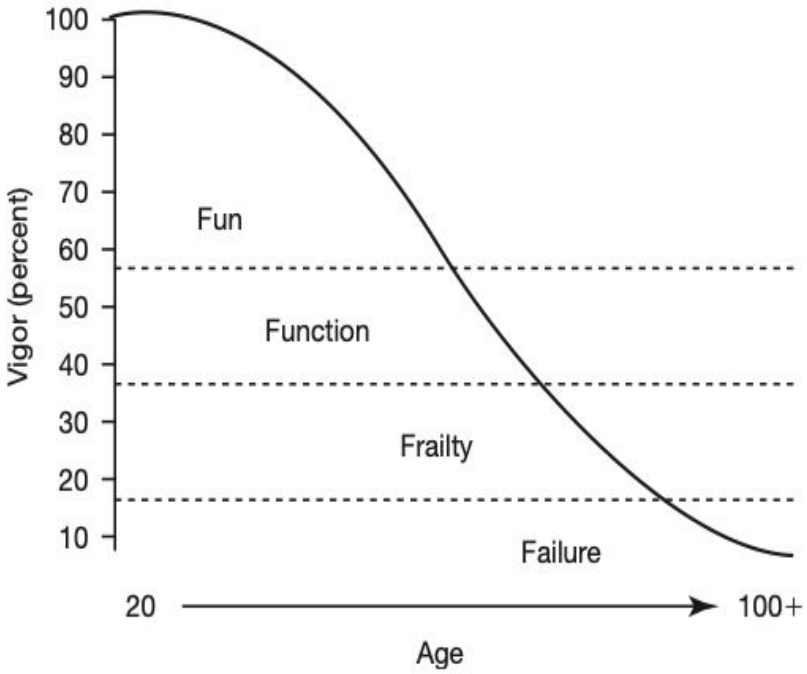
Objectives

1. Participants will be able to define the components of the “slippery slope of aging” and the relationship to an older patient’s recovery.
2. Participants will be able to relate sarcopenia and increased intramuscular adipose tissue (IMAT).
3. Participants will be able to identify the difference between older adult’s ability to heal wounds.
4. Participants will be able to explain the importance of promoting proper nutrition to older adults to maximize healing.

Slippery Slope of Aging

Slippery Slope of Aging



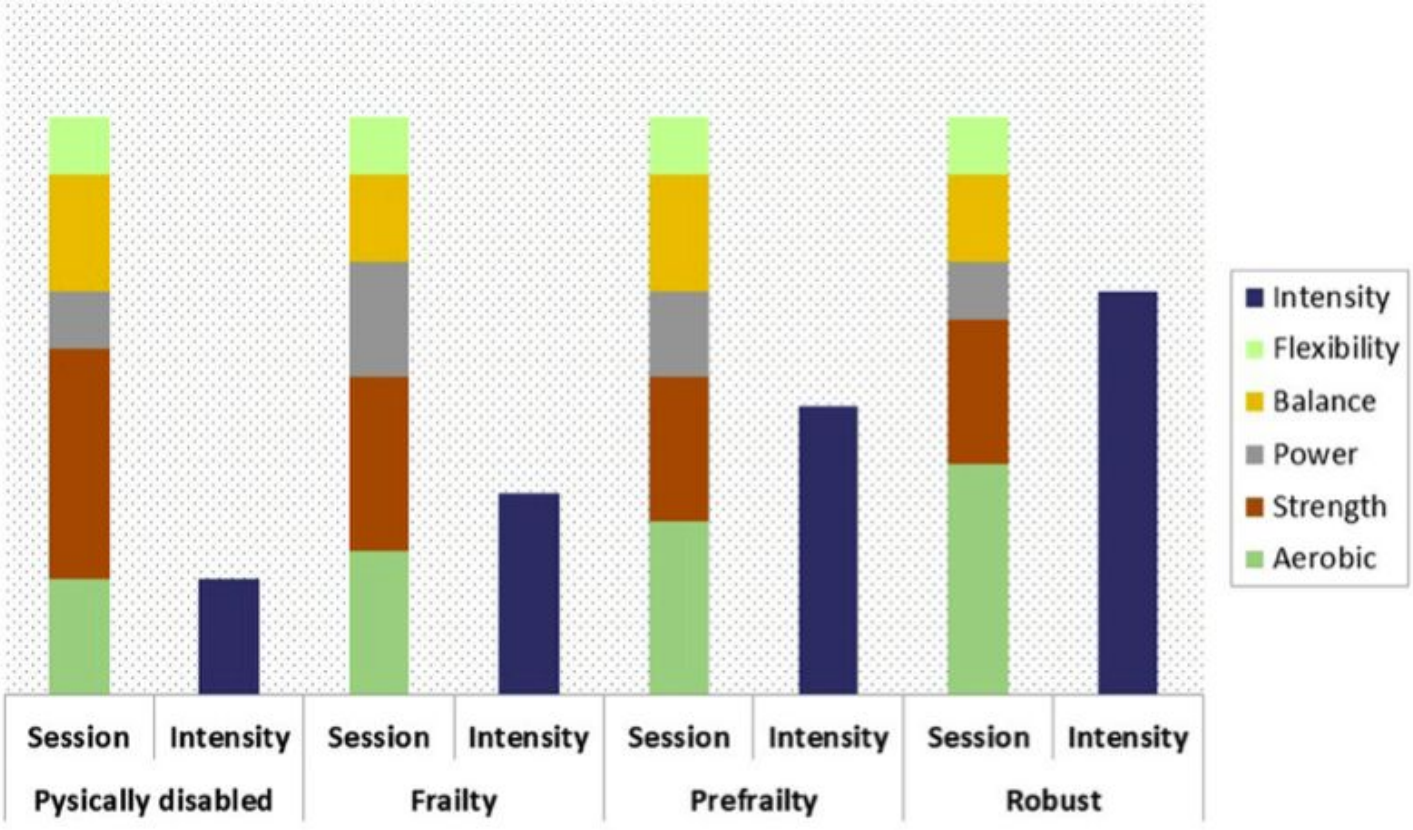
- Fun: Unrestricted participation in fun, work, home and leisure activities
- Function: May need to modify performance and will substantially self-restrict or adapt leisure activities (fun) because of declining physiological capacity
- Frailty: managing basic activities of daily living consumes a substantial portion of physiological capacity, with limitations in ability to participate in community activities and requiring outside assistance to accomplish many home or work activities
- Failure: Individual requires assistance with BADLs as well as instrumental daily activities and may be completely bedridden

Frailty

- Frailty can be diagnosed by a PT
- A syndrome of decreased reserve and resistance to stressors, resulting from cumulative declines across multiple physiologic systems, and causing vulnerability to adverse outcomes
- Criteria:
  - Weight loss >10 lbs lost unintentionally in a year
  - Weakness: Grip strength < 30 kg for men or <18 kg for women
  - Exhaustion: Self reported exhaustion
  - Slowness: 6 MWT <1 m/s
  - Low Activity: < 383Kcals/wk for men <270 Kcals/wk for women

Frailty

- Addressing frailty early on can lead to a decreased chance of disability
- When to emphasize certain types of exercise:
  - Aerobic
    - Important to combat for patients with sedentary behavior, low gait speed, or low physical condition
  - Strength
    - Low knee strength, low grip strength, and poor STS as well as people with higher scores in the Brachial/Ankle Index (BAI) which could be compatible with peripheral artery disease
  - Power
    - patients with low gait speed, poor STS and balance test scores.
  - Flexibility
    - Important for all older patients
  - Balance
    - Patients with a low Romberg Test



Distribution of exercises in a session

Musculoskeletal Changes

Sarcopenia

- Sarcopenia
  - Age related, involuntary loss of skeletal muscle mass and strength
  - 25% of people under the age of 70 years and 40 % of those over the age of 80 years are sarcopenic
  - Causes:
    - Declines in hormones and numbers of neuromuscular junctions, increased inflammation, declines in activity, and inadequate nutrition
  - Consequences:
    - Strength and functional declines associated with sarcopenia can in turn contribute to a number of adverse health outcomes, including loss of function and disability
  - Loss of muscle mass is a key hallmark of being diagnosed with frailty

Intramuscular Adipose Tissue (IMAT)

- As a patient's IMAT increases this can progress the rates of sarcopenia
- Increased levels of IMAT are associated with decreased six-minute walk distance, decreased gait speed, decreased physical performance , difficulty with repeated chair stands, and slower stair descent and timed up and go tests
- Increased quad IMAT can be a predictor of decreased recovery of ADLs
- One study found that in addition to decreased elastin, increased IMAT lead to alterations in contractile fiber pennation angle leading to reduced force production

Interventions

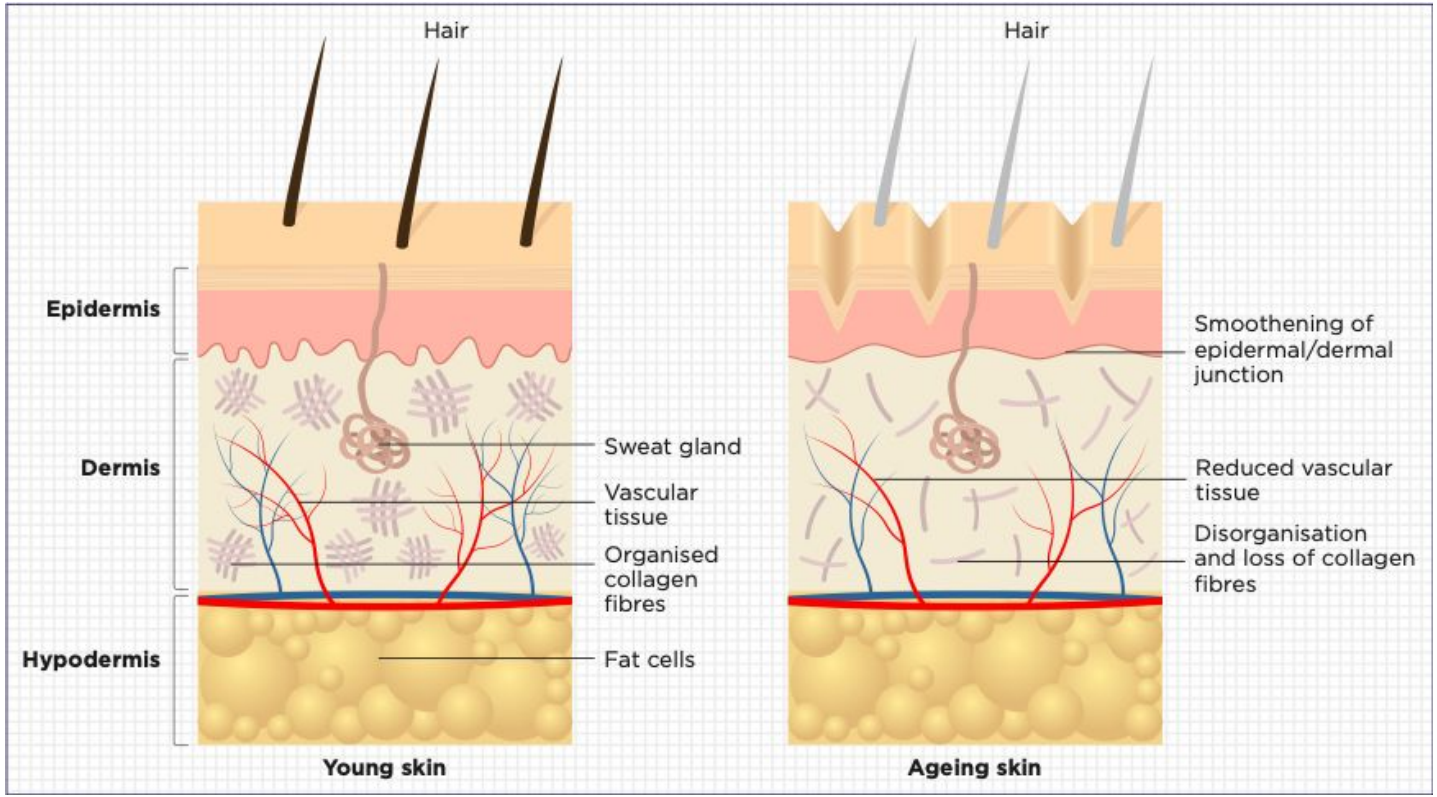
- Multiple studies found that resistance training is beneficial with not only delaying but even counteracting some of the effects of sarcopenia
  - Strong stimulus for muscle metabolism and increases the contractile machinery of muscles
- Another study found that resistance training and mixed training (combining resistance with balance, endurance and aerobic exercises) to be beneficial in increasing knee extension strength and grip strength
  - Increase oxidative capacity within muscles which leads to faster regeneration of skeletal muscles

Wound Healing

Wound Healing

- Epidermis thinning
  - Flattening of the dermal-epidermal junction proliferative capacity of the epidermal cells and results in fragility
  - Increased susceptibility to infection due to increased chance of tearing the skin

- Dermis has decrease amount of fibroblasts
  - Fibroblasts create collagen which help with forming granulation tissue → delayed wound healing
  - Collagen is more in straight fibers than rope like bundles leading to decreased elasticity
  - Decreased elasticity in the skin leading to poor scar healing



Epidermis and dermis changes

Nutrition

- Protein:
  - 1-1.2 g per a Kg of body weight
  - Decreased IMAT and increased muscle mass and wound healing
- Vitamin D supplementation
  - Found to improve the amount of IMAT in mobility- limited older people when coupled with exercise
- Multiple studies found that exercise + nutrition provided the most benefits in combating sarcopenia and sarcopenic obesity with an increased rate of IMAT loss and increased muscle mass

Falling

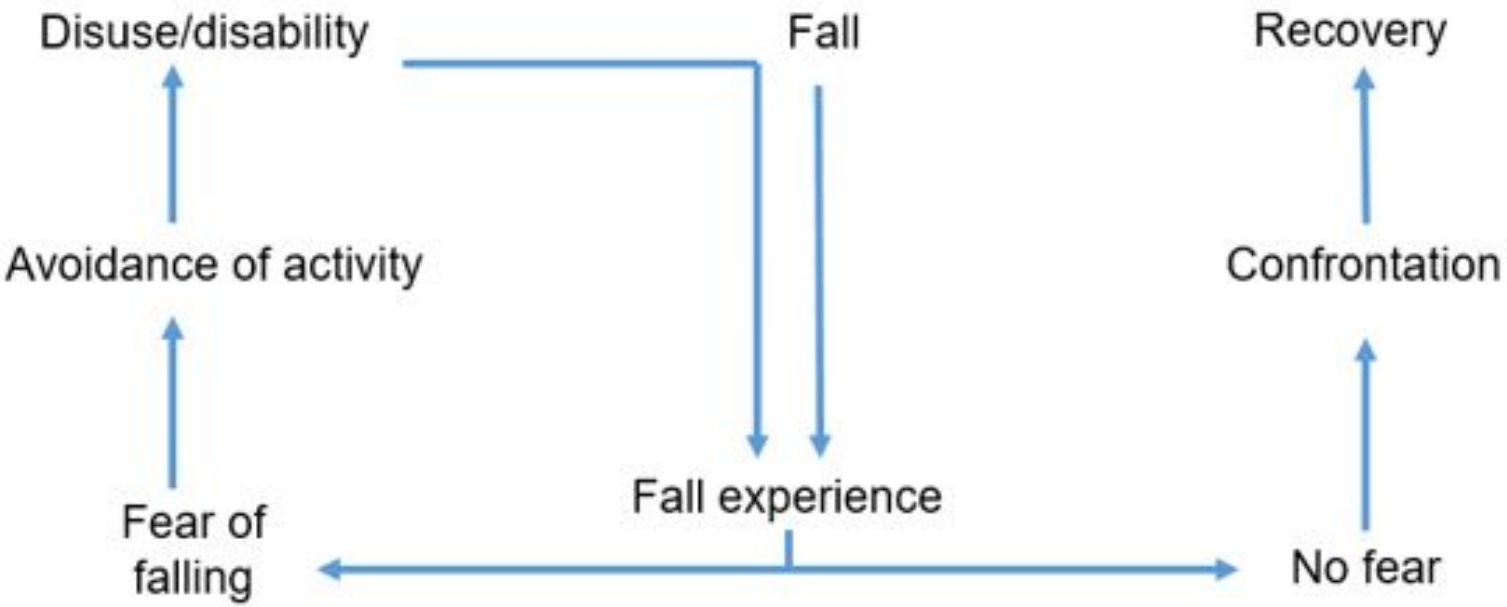
Falls

- Fear of falling can lead to decreased physical activity and result in deconditioning and even changes in gait
  - This could lead to an increase in falling

- Address both physiological and psychological concerns of a patient

- Education and balance/ rebalancing training was found to be beneficial when combating fear of falling and demonstrated improved knee flexor/extensor isometric strength

Fear Avoidance



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Questions?