Frail Older Adults

Lecture 5 - Ageing and Health

The Centre for Activity and Ageing

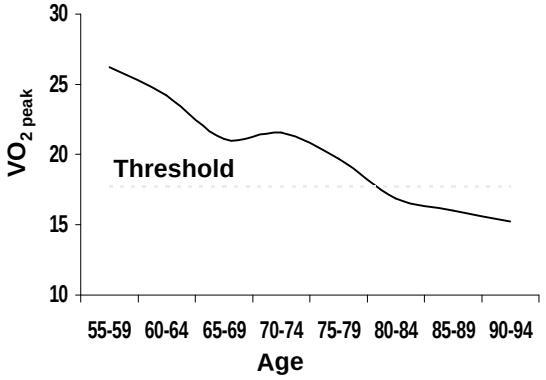
This past decade has witnessed accumulated evidence that dispels the myths of futility and provides support for the safe and effective implementation of exercise interventions for the frail older adult population.

The benefits of exercise are wide-ranging and include physiological, psychological, and functional adaptations that can contribute significantly to the quality of life of this growing cohort.

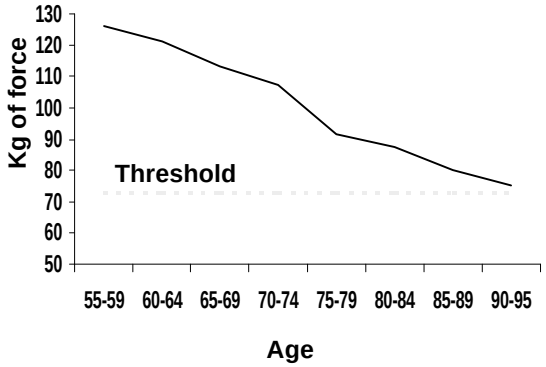
This presentation will address our understanding of the definition of frailty, the determinants of health and their relationship to frailty, exercise interventions and guidelines and future directions for exercise programming for the frail older adults.

Determinants of Independence

Cardiorespiratory Fitness



Plantar Flexor Strength



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Cunningham et al. 1993

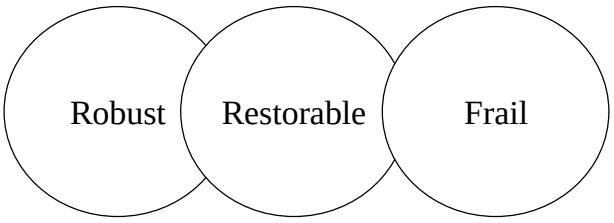
Decline of aerobic capacity with inactivity or illness eventually causes aerobic capacity to fall below the level required for daily tasks. By age 75 many ADL require 75% or more of one's VO2max and thus become very fatiguing. The vicious cycle of no longer participating in activities that have become fatiguing prevails. Thus compromised cardiorespiratory fitness in the older adults may reach a level to limit function and cause dependence.

A parallel explanation exists for strength. Reduced plantar flexion strength observed with advancing age makes walking with normal gait more difficult for the oldest old. This in turn will compromise cardiorespiratory function.

Increasing maximal strength will improve function due to the relationship between peak strength and endurance for sub-maximal tasks. Suppose maximal strength for about one second is 20 kg. If after an exercise program, maximum strength improves to 40 kg, the person should be able to lift the 20 kg weight for 60 seconds which will improve performance on sub-maximal activities of daily living.

Both explanations involve a threshold effect. Levels of fitness below the threshold are associated with impaired ability to do the activity. If fitness drops below the threshold, the activity can no longer be performed.

Ageing Continuum



In essence ageing can be thought of as a dynamic continuum. A shift to the right may signify increased physical and psychological challenges due to failing health, lost independence and inactivity.

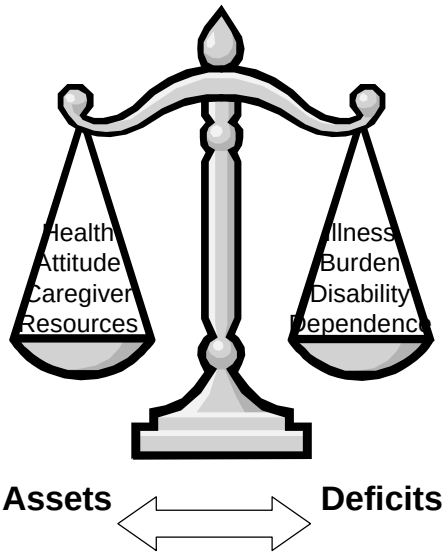
Physical activity intervention research on the older adult population has followed a similar process with the earlier studies concentrating on the still active - robust elderly in a bid to slow the aging process with more recent studies indicating that the frail elderly may experience similar functional gains.

It is the restorable and the frail groups that are of interest as they may have the most to gain from exercise interventions through improved health, return of independence and most importantly quality of life.

This continuum between extremes guards against an all or none categorization of frailty and the spectrum reminds us that although many subject decline from robust to frail, some reverse the trend, hence this allows for the reversibility of frailty.

What is Frailty ?

- **excess demand imposed upon reduced capacity**
- **multi-factorial construct**
- **dynamic in nature**
- **preventable & reversible**



Rockwood et al.1994

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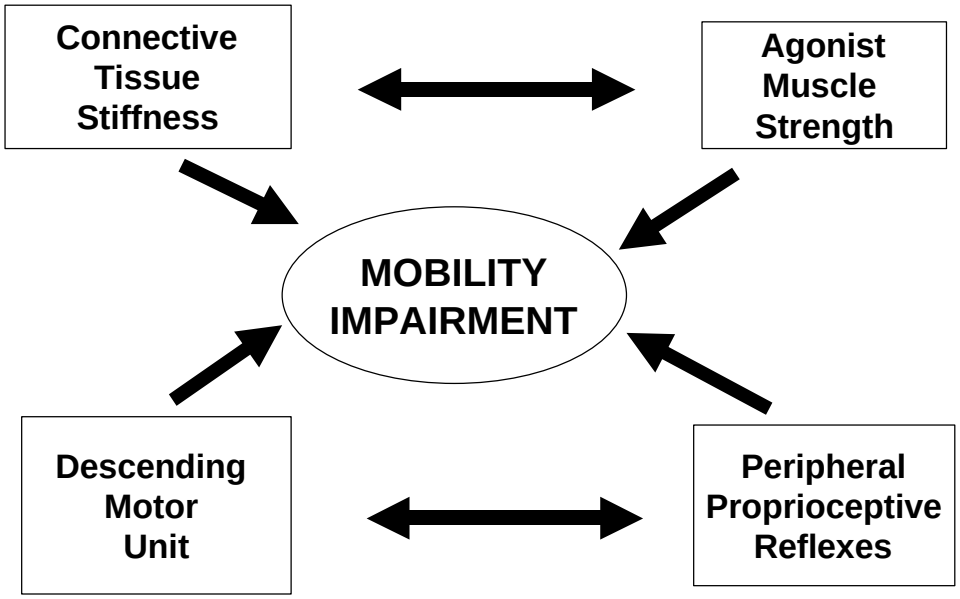
Frailty is something which is readily recognized but rarely defined. To describe frailty solely in terms of disability may be misleading. Disability may lead to frailty, but being disabled doe not necessarily mean one is frail. Similarly, frailty is inversely related to function but is not necessarily a reciprocal.

Frailty can be considered a product of excess demand placed upon reduced capacity. Like the ageing continuum illustrated in the previous slide the frail condition is dynamic with multiple factors including both assets and deficits.

This precarious balance may be easily upset by a relatively minor reduction in assets (eg. Son-in-law's heart attack may reduce daughters care for her frail mother) or an apparently minor increase in deficits (such as a Colles' fracture on the non-stroke affected side will dramatically induce acute disability).

Effective exercise may play an important role in preventing deconditioned state associated with frailty and help to rehabilitate the subject to shift the balance back toward the assets.



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Source: Kishnathasan & Vandervoort, 2000

Slower muscle contractions compromise older adults because of their inability to initiate ballistic protective reflexes. This problem is often augmented by other physiologic changes, such as decreased neural drive and decreased responsiveness of the musculoskeletal system. Vnadervoort noted that the kinesthetic awareness and pain sensitivity that are felt by an older person when they step on an object may be of decreased intensity and the speed of the nerve impulses also decrease as they travel around the reflex coupling in the muscle. After the signal arrives at the muscle the force response production to regain balance is slower and may not occur in time to maintain balance.

ACSM Guidelines

Progressive high intensity resistance

2-3 days per week
2-3 sets (1 set may be sufficient)
training of major muscle groups

→ **Balance training**
reduce base of support

→ **Aerobic training**
3 days per week
20 min in duration
40-60% of heart rate reserve

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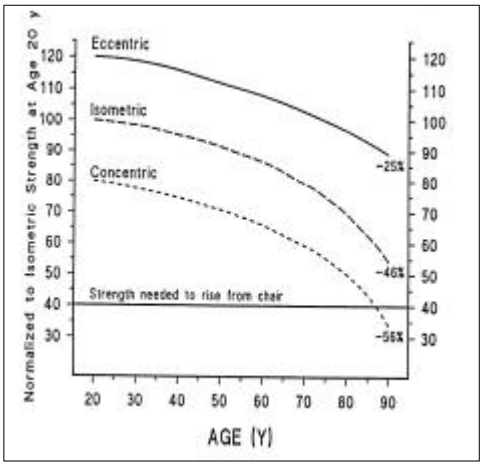
Case for Eccentric Training in the Frail

- Decline of eccentric strength, with age, is considerably less than concentric strength.
- Eccentric training may have a carryover effect to the concentric phase of the contraction.
- DOMS does not seem to be a problem in older adults.



Sale & Spriet, 1996

Training the remaining assets!!!!

Aerobic Training for the Frail

- **Compromised aerobic capacity**
- **Increased O_2 cost using assistive devices?**
- **Modified programs**
  - **arm ergometers,**
  - **weighted wheelchairs**
  - **steps /stairs**
  - **standing**

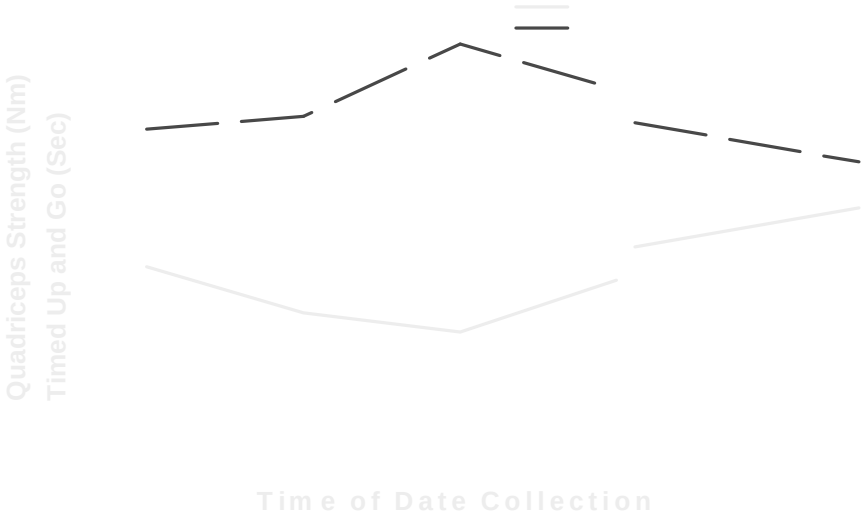
In terms of restoring function some evidence exists that the absolute gains in aerobic power over the duration of a typical training experiment are smaller in older subjects.

Green and Crouse (1995) recently completed a meta-analysis of 29 training studies and concluded that over the age range of 60-80 years, gains in aerobic power were inversely related to age and among those aged 75-80 year the gains were only 1 to 2 ml/kg-min.

Nevertheless, a major part of the problem in the attempt to train the frail elderly is bringing them to a level of condition at which they can exercise cardiorespiratory function effectively.

ACSM guidelines strength - balance - aerobic

When the intervention ends !



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Connelly & Vandervoort, 1997

Future Research

- **Need for sustainable exercise programs for frail older adults through education and training.**
- **Need for clearly defined exercise interventions for those at home and the institutionalized.**
- **Need for research interventions that look at eccentric muscle strength training and aerobic conditioning programs for frail older adults.**