Strength Balance and Function in the Elderly

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Introduction

- Maintaining independent living and high quality of life are important for the elderly

- Compelling evidence exists regarding the benefits of physical activity programs for the elderly

- However, information regarding optimized programs integrating strength, balance and function for the elderly is lacking
Number of people age 65 and over, by age group, selected years 1900-2000 and projected 2010-2050

Note: Data for 2010-2050 are projections of the population.
Reference population: These data refer to the resident population.
Source: U.S. Census Bureau, Decennial Census and Projections.
“Every day you get older. It’s the law”
Sundance Kid to Butch Cassidy
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Sarcopenia

Age related loss of skeletal muscle mass
Sarcopenia

- Reduced protein reserves
- Decreased strength and functional capacity
  - Frailty, Falls
- Reduced aerobic capacity
- Reduced energy requirements
Sarcopenia

• Reduced levels of physical activity
• Loss of motor units (aging CNS)
• Reduced rate of muscle protein synthesis
  – changing endocrine function (testosterone, estrogen, growth hormone)
• Increased dietary protein needs
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**VO2peak (mL · kg⁻¹ · min⁻¹)**

**Age (y)**

**NASA Men:** \[ \dot{V}O_2\text{peak} = 57.726 - 0.537 \text{ (Age)}, \text{ SEE}=6.44 \]

**NASA Women:** \[ \dot{V}O_2\text{peak} = 59.48 - 0.46 \text{ (Age)}, \text{ SEE}=7.12 \]
$VO_{2\text{max}}$ of sedentary 75 year old woman compared to $O_2$ cost of activities

**Oxygen consumption (L/min)**

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Age-related changes in thigh cross-sectional area

21 year old woman

63 year old woman
Impaired Strength
Inability to lift 4.5 kg


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Death Rates According to Individual Performance Tests—Age and Sex Adjusted

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Aerobic Exercise and Aging: Does aging effect the adaptation to aerobic exercise training?
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VO$_{2\text{max}}$ (ml·kg$^{-1}$·min$^{-1}$)

Old (60-70)  Young (20-30)

Pre-Training  Post-Training
Older men and women experience a greater relative increase in aerobic capacity as a result of 12 weeks of aerobic exercise training.


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Resistance Exercise
Activity (kcal/week)

Pre Training

Post Training

Control

Exercise

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In very old nursing home residents, 10 weeks of progressive resistance exercise training:

- Increased walking speed
- Increased stair climbing ability
- Increased spontaneous activity
- Decrease in depressive symptoms
The Effects of an Aggressive Balance Program on Strength, Balance and Function

<table>
<thead>
<tr>
<th></th>
<th>Balance Group</th>
<th>Control Group</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td>73.3</td>
<td>71.7</td>
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<tr>
<td>BMI</td>
<td>25.3</td>
<td>24.6</td>
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Balance

Path Length (cm)

Control
Balance

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Function

30 m Walk

6-min walk

Sit to Stand
5 times
Helen Zechmeister, Age 81, Weight Lifter

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Woody Brown
Age 83
Surfer
John Turner:
Age 67
Weight Lifter
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