THE WRIGHT FOUNDATION

"Means Exercise Referral"

Aging and Exercise

Page 10-11 of the Course Manual

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Session Objectives

- By the end of this presentation, you will be able to:
- Understand the physiology of ageing
- The effect of aging on body composition and stature
- Guidelines for an aerobic training program for a healthy older adult

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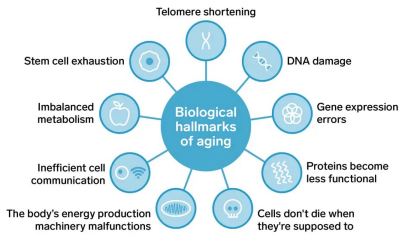
Why Do We Age [Let's Talk About Cells]?



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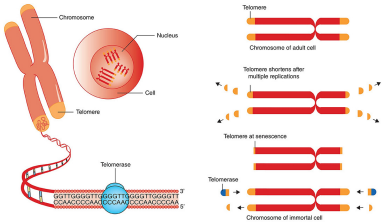
Telomeres



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The Ageing Process

all post maturational changes and the increasing vulnerability individuals face as a result of these changes.

- The group of effects that lead to a decreasing expectation of life with increasing age
- **Senescence:** the process by which the body gradually breaks down and becomes unable to function properly, leading to death.

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Senescence, cont'd

- Differs from other biological processes:
  - Its characteristics are universal
  - Changes come from within the individual
  - Associated processes occur gradually
  - Changes have a deleterious effect on the individual

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Age-related Physiological Changes

- Functions that involve coordinated activity of more than one organ system decline most.
- Changes due to age are most easily observed when the person is stressed.
- Readjustment following a stressor such as exercise is considerably slower.

International Society for Aging and Physical Activity and www.isapa.org

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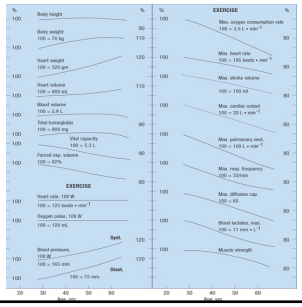
Functional Variables with Age



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Changes in Muscle Function with Age

- **Strength**
  - Strength decreases due to loss of muscle mass.
- **Muscle Endurance**
  - The proportion of slow twitch fibers increases and fast twitch fibers decreases, so that there is little change in the rate of decline in force during a fatiguing task.
- **Force-velocity Curve**
  - The maximum velocity produced against a mass is less for the old, with the greatest loss at higher velocities.

Huffington Center on Aging: Geriatric Education and Research and www.hcoa.org/default.htm

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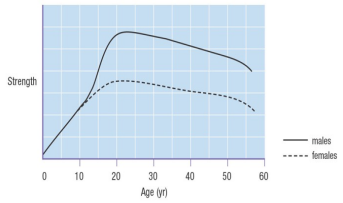
Age-related Changes in Muscular Strength for Males and females



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Changes in Cardiovascular Function with Age

- **Maximum heart rate**
  - decreases with age (MHR = 220 – age)
- **Resting Cardiac Output**
  - declines about 1% per year during adulthood
- **Coronary Arteries**
  - cross-sectional area of the lumen is reduced by about 30% from young adulthood to 60 years
- **Blood Flow**
  - during exercise is less, probably due to increased peripheral resistance
- **VO_2 max**
  - declines gradually with age (9 to 15% per decade)

Huffington Center on Aging at www.hcoa.org/default.htm for more information

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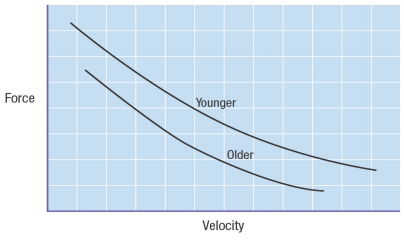
Force-velocity Curves for Younger and Older Adults



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Changes in Pulmonary Function with Age

- **Lung Volumes and Capacities**
  - Vital capacity of the lungs declines
  - Ratio of residual volume to total lung capacity increases
  - Anatomic dead space in the lungs increases
- **Thoracic Wall Compliance**
  - Lung compliance increases, but thoracic wall compliance decreases
- **Pulmonary Diffusion**
  - The capacity for pulmonary diffusion at rest and during exercise decreases significantly
- **Ventilatory Mechanics in Exercise**
  - Process of breathing becomes less efficient with age

MFAAA—Links at www.mfaaa.org/links.html

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The Effect of Aging on the Nervous System

- Reaction time slows.
- Arteriosclerosis results in decreased cerebral function.

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The Effect of Aging on Body Composition and Stature

- Aging humans tend to increase body weight and percent body fat and to decrease fat-free weight.
- We grow shorter as we get older by about one-half inch per decade after age 30.

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Factors that Contribute to Changes in Functional Capacities with Age

- True aging phenomena
- Unrecognized disease processes
- Disuse phenomena

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Steps to Combat Bone Density Loss

- A combination of aerobic and resistance training
- Adequate calcium intake

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Guidelines for an Aerobic Training Program for a Healthy Older Adult

- **Mode**
  - aerobic activity
- **Intensity**
  - 55 to 90% of maximal heart rate or 40 to 85% of maximum heart rate reserve
- **Duration**
  - 20 to 60 minutes a session (or in 10-minute bouts accumulated throughout the day)
- **Frequency**
  - A frequency of three to five days per week

Physical Fitness and Senior Citizens at http://seniors-site.com/sports/fitness.html

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The Benefits of Aerobic Training for Older Adults

- Better blood lipid profiles
- Improved glucose tolerance
- Reduced body fatness
- Decreased hypertension
- Increased bone mineral density
- Reduced risk of falls
- Increased endurance
- Reduced fatigue
- Increased vigor

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Potential Benefits of Aerobic Training in Older Adults

Factor	Response
Maximal oxygen consumption rate (VO_2 max)	increase
Resting metabolic rate	increase
Triglycerides	decrease
High-density lipoprotein (HDL)	increase
HDL/total cholesterol ratio	increase
Glucose tolerance	improve
Blood pressure (in hypertensives)	decrease
Abdominal fat stores	decrease
Bone mineral density	increase or maintain
Risk of falls	decrease

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Other Activities That Can Improve Aerobic Conditioning in Older Adults

- Brisk walking
- Gardening
- Yard work
- Housework
- Climbing stairs
- Active recreational pursuits

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Benefits of Resistance Training for Older Adults

- Increased strength
- Increased muscle mass
- Increased bone mineral density
- Increased resting metabolic rate
- Decreased body fatness
- Decreased risk of falls

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Potential Benefits of Resistance Training in Older Adults

Factor	Response
Isometric strength	increase
Dynamic constant external resistance (DCER) strength	increase
Isokinetic strength	increase
Muscle cross-sectional area	increase
Muscle fiber size (fast twitch and slow twitch)	increase
Bone mineral density	increase
Percent body fat	decrease
Abdominal fat stores	decrease
Daily living tasks	improve
Flexibility	increase or no change
Risk of falls	decrease
Resting metabolic rate	increase
Glucose tolerance	improve

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Guidelines for Designing a Resistance Training Program for an Older Adult

- Focus on four to six large muscle groups and supplement with exercises for three to five small muscle groups
- Begin with a warm-up followed by exercises for the large muscle groups, then the small muscle groups, and end with a cool-down
- Resistance should be about 50 to 85 percent of the 1 RM load for 8 to 15 repetitions
- Progress from one to three sets of each exercise
- Include rest intervals between sets and exercises of about two to three minutes
- Training should be done at least twice a week with a minimum of 48 hours between sessions
- Complete the session in 20 to 30 minutes

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