

GROWING UP: AGING AND IT'S EFFECT ON THE BODY

WHO IN THE WORLD AM I?

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Exercise Physiologist- American College of Sports Medicine
Medical Exercise Specialist - American Council on Exercise
Functional Aging Specialist - Functional Aging Institute
Older Adult Exercise Specialist - Cooper Institute

Over 20 years as Health and Fitness Professional
Equinox PT Manager and later GM
Eight years in Clinical Environment at VOI
Founder and President of Renu Health & Fitness
Specializing in Fitness over 40 and Post-Rehabilitation



COURSE OUTLINE

1. AGING AND ITS EFFECTS ON THE BODY... LEFT UNCHECKED

HOW MOVEMENT AND EXERCISE FIGHT THE EFFECTS OF AGING

2. ON OUR MUSCLES AND SKELETAL SYSTEMS
3. ON OUR MOBILITY, FLEXIBILITY AND POSTURE
4. ON BALANCE, AGILITY AND FALL PREVENTION
5. ON OUR CARDIOVASCULAR SYSTEM AND THE BRAIN
6. PUTTING IT ALL TOGETHER AND THE ROLE OF NUTRITION

TODAYS OUTLINE

AGING AND ITS EFFECTS ON THE BODY... LEFT UNCHECKED
TYPES OF AGING
AGING AND THE CARDIOVASCULAR AND RESPIRATORY SYSTEMS
IMPACT OF AGING ON:

- ...BONES AND JOINTS
- ...DISCS AND VERTEBRAE
- ...FLEXIBILITY AND MOBILITY
- ...MUSCLE
- ...POSTURE, GAIT AND BALANCE
- ...THE BRAIN
- ...BODY COMPOSITION

GOALS

TO PRESENT AN ALTERNATIVE, AND GIVE YOU THE TOOLS TO ACHIEVE IT
TO ATTAIN AND/OR PRESERVE INDEPENDENCE YOU NEED
STRENGTH, AEROBIC CAPACITY, POWER,
MOBILITY, FLEXIBILITY AND BALANCE



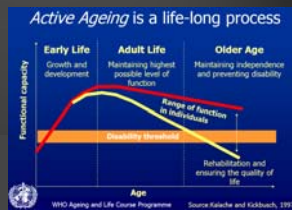
"THE MIND, ONCE STRETCHED BY A NEW
IDEA, NEVER RETURNS TO IT'S ORIGINAL
DIMENSIONS"

RALPH WALDO EMERSON

NOT ALL AGING IS THE SAME



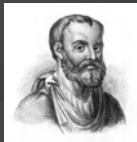
DR KENNETH COOPER



EXERCISE AS MEDICINE, AVOID AND DELAY DECLINE

THE MOST IMPORTANT TOPIC YOU REALLY NEED TO GRASP

"When Health is absent,
Wisdom cannot reveal
itself, Art cannot manifest,
Strength cannot fight,
Wealth becomes useless,
and Intelligence cannot be
applied."



Herophilus. Greek Physician -
(widely regarded as the father of
anatomy)

THE MOST IMPORTANT TOPIC YOU REALLY NEED TO GRASP

WHATEVER ELSE YOU LEARN, KNOW OR ACQUIRE IS USELESS UNLESS:

- You can benefit and enjoy the fruits of it
- Live with as little pain, frailty and dependence
- Live as long with as much quality of life as possible
to see the impact and outcomes of your influence

"So many people spend their health gaining wealth
and then have to spend their wealth to regain their
health." A.J. Mater

TYPES OF AGING

Chronological

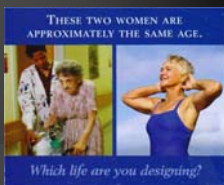
Outdated method of using age alone

Biological

Natural process that occurs over time
to varying degrees

Functional/Relative

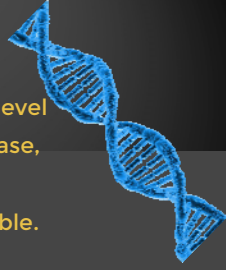
Extent compared to others of same chronological group



AGING...NOT IF BUT HOW?

Primary

Natural process at the cellular level
Increases susceptibility to disease,
Injury and mortality over time.
Hard wired, natural and inevitable.



AGING...NOT IF BUT HOW?

Secondary

Lifestyle based: activity, alcohol, tobacco, diet
Disease impact: CV, Diabetes, Cancer, etc...
Injuries and Illness
Environmental exposure
Dynamic: can be accelerated or slowed even
dramatically by actions taken.

NOT ALL AGING IS THE SAME



1940'S



1920'S

OK, SO WHAT HAPPENS

1. Cardiovascular and Respiratory Systems

VO₂ Max drops ~10% per decade after 25 to over 20% between 70-80^[1]

Elasticity carotid artery decreases by ~50% from 25-75yrs^[1]

Aorta and branches stiffen

Blood vessels and valves thicken and stiffen

Heart changes-stiffer and max HR decline.

1. Cardiovascular and Respiratory Systems

Age related changes in the lungs^[13]



+25%

Lung Capacity about same

Residual Volume (left after forced exhale)

Functional Residual Capacity (left after passive)

Vital Capacity (greatest exhale deepest breath.)

-25%

1. Cardiovascular and Respiratory Systems

Fatigue, Work Capacity and Efficiency

Lungs ability to take in oxygen

How well heart pumps blood

Muscles ability to extract oxygen during work

Loss of muscle as important as change in heart in using oxygen for work

Can be improved. Lowest function most gain.



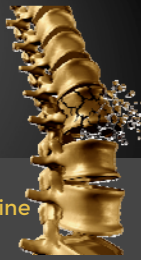
2. Bone and Joints



90% of peak for boys age 20, 18yrs for girls
Peak bone mass ~age 30
Women minimal change from 30 to menopause
First years after- rapid loss, slows but continues
Diet and Aging
Bone is reservoir of calcium for other uses
Loss of muscle mass and strength contribute.

2. Bone and Joints

BD declines 1% per yr. from 40-50
Women lose 2-3% yr. during and 5-10yrs after menopause
Women lose ~ 1/3 of BD during this time
Men don't see significant loss until 80's
Bone weakening unchecked can manifest in spine with hairline fractures: pain & up to 20% height reduction.



2. Bone and Joints

Degenerative changes in joints
Reduced synovial fluid
Breakdown of cartilage, bone on bone, spurs
Weight, muscle weakness and loss exacerbates
Osteoarthritis most common. 50% over 65 and 85% over 75 have it.^[2]
Most often in Knees, Hips and Back
Leading cause of disability in US.



3. Discs and Vertebrae

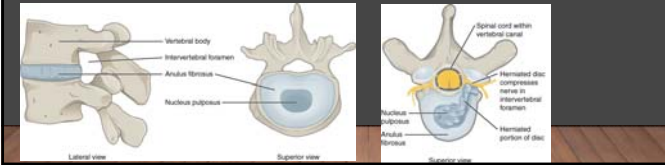
Disc Degeneration

Outer layer of disc annulus weakens

Disc becomes thinner



Supportive disc ligaments weaken



4. Flexibility and Mobility

Tendons and Ligaments lose elasticity

Alters ROM, can lead to pain and dysfunction

Loss of strength

Inflamed and/or arthritic joints

Compensatory Patterns



4. Flexibility and Mobility

Excessive flexibility

Purpose between flexibility and stability



5. Muscle

Type II (fast twitch) are lost at greater rate, force loss
Impact on glycemic control and insulin sensitivity

22-53% will develop Sarcopenia^[23]

Very definition of use it or lose it

Associated with fat mass gain

Impact on posture, gait and pain.



5. Muscle

Young adults 50% weight, by 75-80yrs ~25%^[7]

In Sedentary starts early as 30yrs 3-5% decade. Then^[9]
to 1-2% per year after 50

Multiple factors, most prominent inactivity^[10]

Definition of us it or lose it, easier to preserve^[12]

Loss linked with protein deficiency^[14]

Current .8g per kg RDA. Older adults 1.0-1.2g even^[15,16]
more cases of sarcopenia and illness.

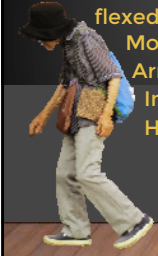


5. Muscle

Strongest risk factor loss of quality^[11]
of life, disability, hospitalization and
mortality is loss of muscle!

6. Posture, Gait and Balance

Loss of BD contributes as do muscles
Becomes bent forward, knees and hips flexed, neck tilted, shoulders round
Movement slows, shorter steps
Arm swing less
Impact of how and how long we sit
Head weight, lumbar, gluteal amnesia.



6. Posture, Gait and Balance

What is Balance, really?
1 out of 3 Americans over 65yrs falls each year
Those 65-84yrs, falls account for 87% of all fractures (2nd cause of spinal cord and brain injury)
Reaction time slows, power to catch self
Blood pressure drops when standing
Medications, dehydration
Muscle loss and weakness especially in legs
Changes in vision, sensory feedback.

6. POSTURE, GAIT AND BALANCE

But...

Physical Activity can reduce the risk of falling

Tai Chi study of 256 adults 70-92yrs. ^[17]
After 6 months 52% fewer falls in Tai Chi group.

Meta Analysis of 1,016 adults 65-97yrs, ^[18]
strength and balance work reduced risk of falls 35-45%



7. THE BRAIN

Common belief of aging and cognitive decline.

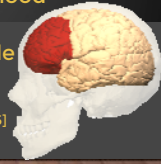
More associated with secondary effects of lifestyle than primary aging process^[2]

While 2% of body wt., brain receives 20% blood supply (NIA)

Greatest influence outside disease: Lifestyle and medication

Brain atrophy progresses with aging^[24]

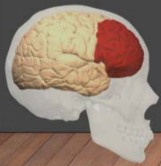
Gray matter 15% decrease from 20s to 70s^[25]



7. THE BRAIN

Study of 381 Men and 393 Women (aged 53-68):^[20]
Tracked Physical activity and frontal lobe atrophy during 8 year period (MRI used)

Results? "Physical Activity and Total Energy Expenditure are Significant Predictors of Frontal Lobe Atrophy"



Also...

"Promoting participation in activities may be beneficial for attenuating age-related frontal lobe atrophy and for preventing dementia."

8. BODY COMPOSITION, OBESITY & DIABETES

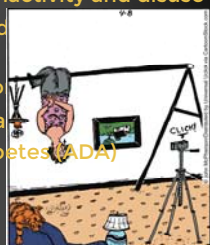
Normal part of aging, less to age than inactivity and disuse

With muscle loss, basal metabolic rate decreases between 20-70yrs

Cannot judge by scale, composition more important

Risk of diabetes also increased by loss of muscle mass

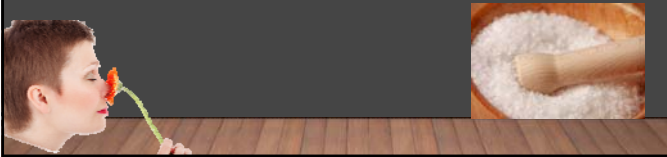
Of Americans over 65yrs, 26% have diabetes (ADA)



Although gravity had taken its toll on Connie, she had devised a way to look youthful in her online dating photo.

8. BODY COMPOSITION, OBESITY & DIABETES

Loss of smell, 75% of 80yrs+ have major smell impairment^[26]
Taste loss is more rare, impacted by smell.
Loss of appetite, wt loss, malnutrition, impaired immunity
Tendency for higher salt and sugar intake^[27]
Reported 2-3 x salt concentration to detect in tomato soup^[28]



8. BODY COMPOSITION, OBESITY & DIA

Excess weight complicates and increases pain arthritis, joint replacements, harder to move or balance, downward spiral.
Flip side don't go too far, excess weight loss
Need health reserve for illnesses, events and injuries



cdc 2015 Noninstitutionalized Individuals with Obesity

REMEMBER THAT BELL CURVE

LIVE LOVING WHAT YOU DO
STAY AS HIGH FUNCTIONING AS POSSIBLE
FIGHT BACK



"Live your life and forget your age." @GILVIAJ

REFERENCES

- [1] Rice, C. Muscle function at the motor unit level. Consequences of aging. Topics in Geriatric Rehabilitation, 2000, 15, p. 70-82.
- [2] Tanaka H and Seals DR. Endurance exercise performance in Masters athletes: age-associated changes and underlying physiological mechanisms. 2008, Jan 1,586(1):55-63.
- [3] Iannuzzi-Sucich, M.P., K.M., Kenny, A.M., Prevalence of sarcopenia and predictors of skeletal muscle mass in healthy older men and women. The Journals of Gerontology: Medical Sciences, 2002, 57A(12), p. M72-77.
- [7] Short KR, Vitousek JL, Bigelow ML, Proctor DN, Nutr KS Am J Physiol Endocrinol Metab. 2004;Jan; 286(1):E92-101.
- [8] Starling et al. Am J Clin Nutr 1999
- [9] Fielding RA, Vellas B, Evans WJ, et al. J Am Med Dir Assoc 2011;12:249-56
- [10] Rosenberg IH J Nutr. 1997 May; 127(5 Suppl):990S-991S
- [11] Evans WJ. What is sarcopenia? J Gerontol A Biol Sci Med Sci 1995, 50, 5-8
- [12] Fiatarone MA, O'Neill EF, Ryan ND, et al. Exercise training and nutritional supplementation for physical frailty in very elderly people. N Engl J Med 1994; 330 :1739-75.
- [13] Tanaka H and Seals DR. Endurance exercise performance in Masters athletes: age-associated changes and underlying physiological mechanisms. 2008, Jan 1,586(1):55-63.
- [14] Protein intake and muscle strength in older persons: does inflammation matter? Bartali B, Frongillo EA, Stipanuk MH, Bandinelli S, Salvini S, Palli D, Morris JA, Volpato S, Gurinik S, Ferrucci L. J Am Geriatr Soc. 2012 Mar; 60(3):480-4.
- [15] American Journal of Physiology, Endocrinology and Metabolism January 1, 2015; 308(1): E21-E28
- [16] Clinical Nutrition December 2014, Volume 33, Issue 6, Pages 929-936
- [17] Tai Chi and fall reductions in older adults: a randomized controlled trial. J Gerontol A Biol Sci Med Sci. 2005 Feb;60(2):187-94.
- [18] Robertson MC, Campbell AJ, Gardner MM, Devlin N. Preventing injuries in older people by preventing falls: a meta-analysis of individual level data. J Am Geriatr Soc. 2002;50:905-911.

REFERENCES

- [19] Neuroprotective lifestyles and the aging brain: Neurology October 23, 2012 vol. 79 no. 17 1802-1808
- [20] Relationship Between Physical Activity and Brain Atrophy Progression. Med Sci Sports Exerc. 2012 Dec;44(12):2352-8.
- [21] Bengtson, V.L.S., Merrill, Putney, Norella M, Gans, D. Handbook of Theories of Aging, 2nd. 2009, New York: Springer Publishing Company.
- [22] Chau D, Cho LM, Jani P, St Jeor ST. Curr Opin Clin Nutr Metab Care. 2008 Jan; 11(1):27-31.
- [23] Vandervoort, A.S., TB. Functional and metabolic consequences of sarcopenia. Canadian Journal of Applied Physiology. 2001, 26, p. 90-101.
- [24] Ge Y, Grossman RI, Babl 25, Rubin ML, Mannon LJ, Kolson DL. Age-related total gray matter and white matter changes in normal adult brain. Part I: quantitative magnetization transfer ratio histogram analysis. AJNR Am J Neuroradiol. 2002; 23: 1334-41.
- [25] Taki Y, Kinomura S, Sato K, Goto R, Kawashima R, Fukuda H. A longitudinal study of gray matter volume decline with age and modifying factors. Neurobiol Aging. 2011; 32: 907-15.
- [26] Doty R L, Shaman P, Applebaum S L, et al/Smell identification ability: changes with age. Science 1984;226:1441-1443,1443
- [27] Corwin J, Loury M, Gilbert A N. Workplace, age and sex as mediators of olfactory function: data from the National Geographic smell survey. J Gerontol Psychol Sci 1995;50B:179-186,186
- [28] Stevens J C, Cain W S, Demarque A, et al/On the discrimination of missing ingredients: aging and salt flavour. Appetite 1991;16:129-140,140
- [29] DHHS. 2008 Physical Activity Guidelines for Americans. Rockville (MD): U.S. Department of Health and Human Services; 2008.