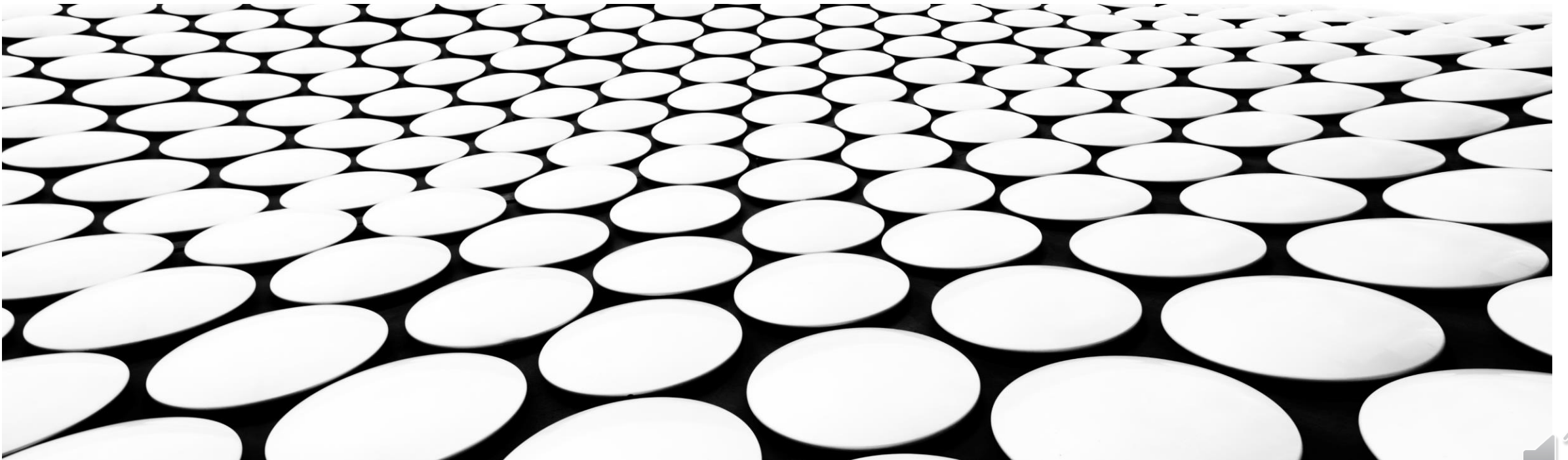

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PHYSICAL AND COGNITIVE CHANGES ASSOCIATED WITH AGING



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DEFINITIONS OF AGING

01

“Aging is the persistent decline in the age specific fitness components of an organism due to the internal physiological deterioration” (Rose, 1991: Evolutionary Biology of Aging)

02

“Aging is not a pathology (illness); it is a fact of life” (SENEC(I)ENCIA University of Barcelona Number1)

03

“At the biological level, ageing results from the impact of the accumulation of a wide variety of molecular and cellular damage over time. This leads to a gradual decrease in physical and mental capacity, a growing risk of disease, and ultimately, death.” (WHO; “Ageing and health” February 5th 2018)



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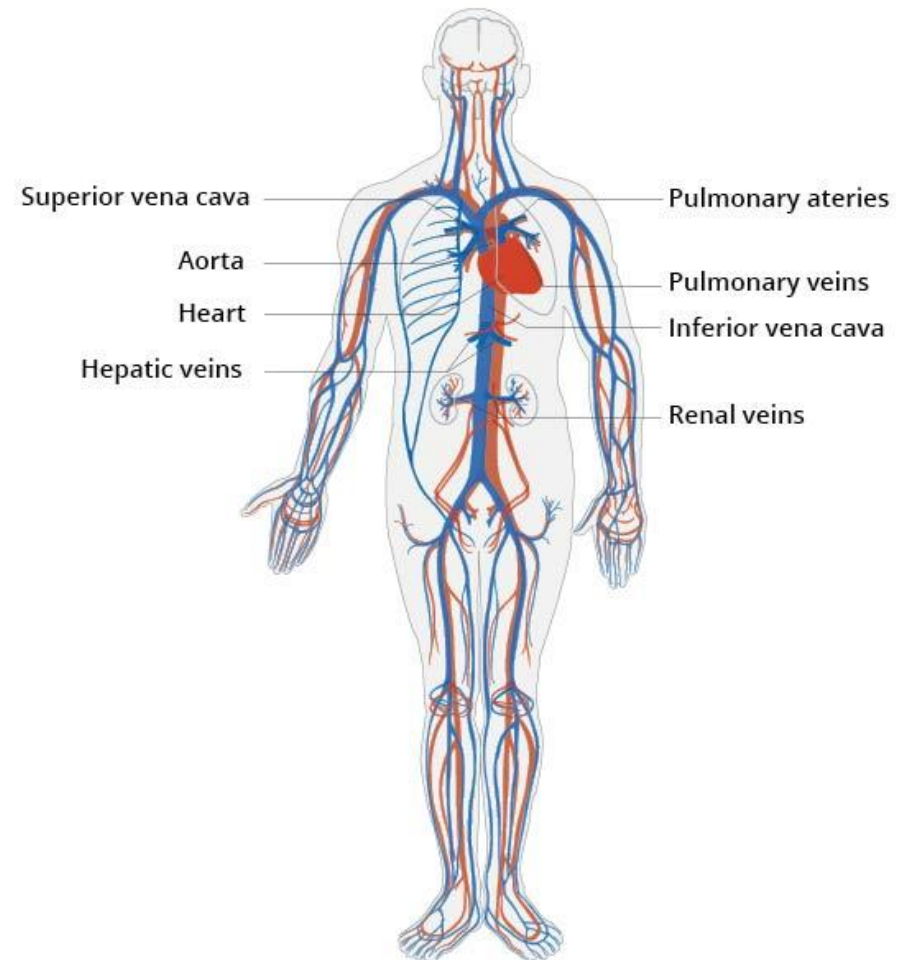
PHYSIOLOGICAL CHANGES

- Cardio Vascular System:

Reduced Cardiac Output

Increased Arteriosclerosis

Increased risk of Hypertension



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PHYSIOLOGICAL CHANGES OF AGING

- Pulmonary System

decrease of Vital Capacity
impaired gas exchange
slower expiratory flow rates
increased risk for infection (Pneumonia)



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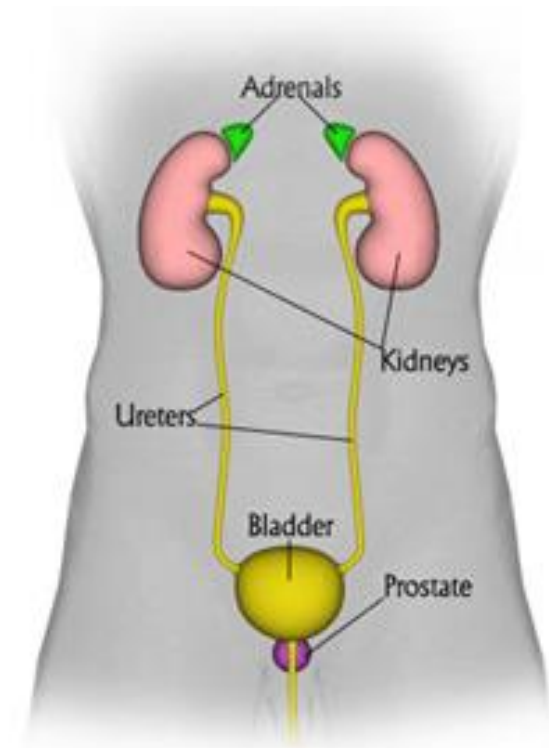
PHYSIOLOGICAL CHANGES OF AGING

- Genitourinary System or Urogenital System
(Kidneys, Bladder, Urethra, Reproduction Organs)

Kidneys: Volume and Weight reduction of Kidneys
Reduced Creatinine Clearance
Reduced Glucose Reabsorption

Bladder: Reduced elasticity causes increased need for urination
Reduced ability to empty bladder
Increased incontinence

Prostate: Enlarged Prostate leads to increased risk of UTIs

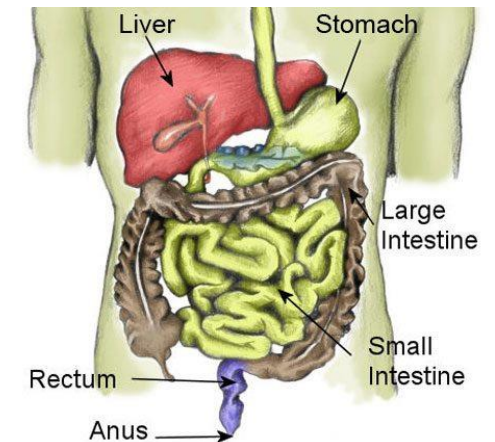


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PHYSIOLOGICAL CHANGES OF AGING

■ Gastrointestinal System

- Esophagus: Increased trouble swallowing due to decreased peristaltic and increased non peristaltic responses
- Stomach: Increased risk of gastritis and reduced nutritional absorption
- Colon: Decreased motility leads to increased constipation
Reduced Sphincter control
- Liver: Prolonged Hepatic Drug Metabolism



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PHYSIOLOGICAL CHANGES OF AGING



- The Endocrine System

Glucose Homeostasis:	Deterioration of beta cells leads decreased insulin production Greater output of inactive Proinsulin Increased Peripheral Insulin Resistance (due to increased adiposity)
Osteoporosis:	Relative increase of resorption over formation leads to age related bone density losses. The exact cause remains unknown



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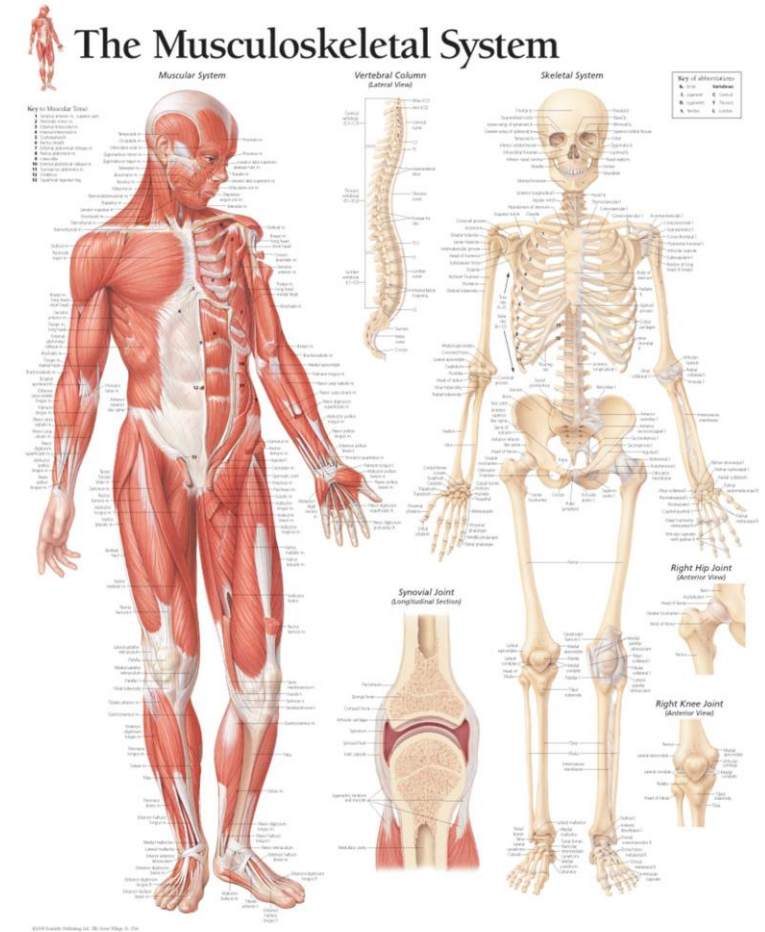
PHYSIOLOGICAL CHANGES OF AGING

- The Musculoskeletal System:

Muscular: Loss of lean muscle mass and atrophy of muscle cells as well as age related changes to muscle innervation lead to decreased locomotion and function.

Tendons and Ligaments: Loss of water content leads to greater stiffness and risk for injury

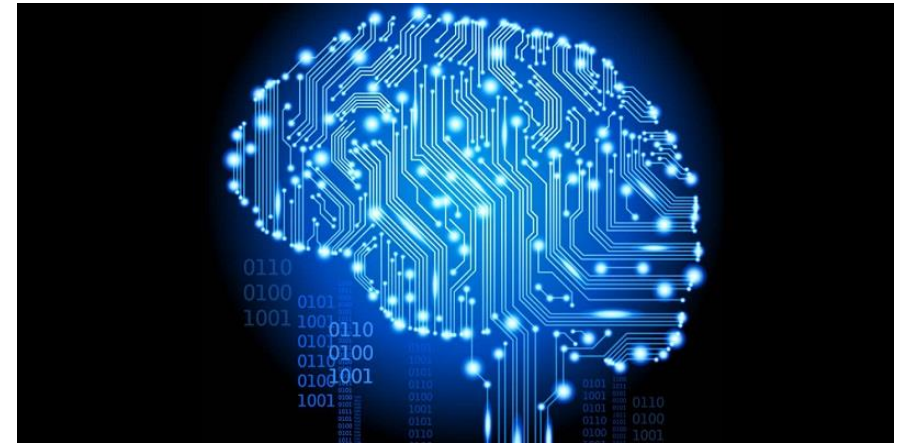
Skeletal: Wear and tear on protective joint structures lead to Arthritic conditions that are painful and restrict function and movement.



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AGE RELATED CHANGES IN COGNITIVE FUNCTION

- “Just as age-related changes in brain structure and function are not uniform across the whole brain or across individuals, age-related changes in cognition are not uniform across all cognitive domains or across all older individuals. The basic cognitive functions most affected by age are attention and memory.” (Brain Aging: Models, Methods and Mechanisms. Chapter 1: Changes in Cognitive Function in Human Aging, Elizabeth L. Glisky)



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AGE RELATED CHANGES IN COGNITIVE FUNCTION

- **Attention** is a complex cognitive process involved in nearly all other cognitive domains. Exception are the task performances that have become automatic and habitual.
- **Selective Attention** refers to the ability to focus on certain stimuli while neglecting others. As we age information processing slows leading to a slow down in recognizing important stimuli while distraction by non important stimuli seems mostly unaffected by aging.
- **Divided Attention** refers to the ability to process stimuli and instructions necessary to perform multiple tasks at the same time. Aging seemingly limits the processing resources. This becomes more apparent the greater the complexity of the tasks performed simultaneously.
- **In Summation:** Older Adults processing important information slower but aren't distracted any more than they were in younger years. The biggest problem is information processing while multi tasking being able to divide attention equally effective. Sustained Attention does not seem to be impaired in Older Adults.



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AGE RELATED CHANGES IN COGNITIVE FUNCTION

- Working Memory

“Older adults exhibit significant deficits in tasks that involve active manipulation, reorganization, or integration of the contents of working memory... Many complex everyday tasks such as decision-making, problem-solving, and the planning of goal-directed behaviors require the integration and reorganization of information from a variety of sources.” (**Changes in Cognitive Function in Human Aging**, Elizabeth L. Glisky, NIH)

- These processes, for today unknown reasons, seem impaired or slowed in the older adult.



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AGE RELATED CHANGES IN COGNITIVE FUNCTION

- Long Term Memory

While Episodic Memory (recalling events of the past in great detail, time and location) and Prospective Memory (remembering to do things in the future incl. habitual actions like taking your meds) seem to show moderate to significant decline in Older Adults, the other aspects of Long Term Memory (Semantic, Autobiographical, Procedural and Implicit) are mostly unaffected by aging.



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AGE RELATED CHANGES IN COGNITIVE FUNCTION

- Higher Levels of Cognitive Function:

Speech & Language: Processing of Speech and Language seems mostly unaffected by aging.

Decision Making: Older Adults and Younger Adults commonly reaching the same decisions when faced with a problem but rely on different methods to reach that decision.

Executive Control: Depends on different processes that are involved in the planning, organization, coordination, implementation, and evaluation of many of our nonroutine activities. The “Central Executive” sharpens focus by increasing attention to important stimuli and reduce distractive White Noise. It does direct all manner of problem solving, decision making and goal-oriented activities. Executive decisions are mostly a responsibility of the brain’s Prefrontal Cortex, which declines in older adults in volume and function.



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HOW DO AGE RELATED CHANGES AFFECT FITNESS TRAINING?

- Age related changes require age appropriate fitness training

Keep in mind that aging affects every individual differently. Some of the changes as we get older will affect physical and cognitive abilities more than others making adjustments in training planning and execution necessary. Changes to the respiratory-, cardio-vascular-, and endocrine system might require an adjustment in work-out intensities and careful monitoring during the exercise session. Cognitive changes, might make it necessary to advance exercise techniques more slowly use hands on tactile instructions and reduce distractions. It might be helpful to take into account whether your client is an Auditory, Visual or Tactile Learner (or combination) to make any learning experience easier for him or her. Breaking the learning process down into several steps often enables the older client to learn more successful.



QUIZ

1. How does the WHO define aging?
2. What are the common age related changes to the Cardiovascular System?
3. How is the Vital Capacity affected by aging?
4. What causes an increased risk of UTI's in older men?
5. Blood Glucose Control and Bone Density are affected by the aging process of which body system?
6. How does aging affect our muscles?
7. Which basic cognitive functions are mostly affected by aging?
8. What is selective attention?
9. Which part of the brain is mostly responsible for Executive Decisions?
10. What strategies can you use to adjust training to the cognitive changes of aging?