

## What is Aging



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## Key Questions:

- What is aging?
- Why do we age?
- What are the consequences of aging?
- At what rate do we age?
- What can we do about it?

## What is aging?

## What is Aging ?

CHRONOLOGICAL  
AGE

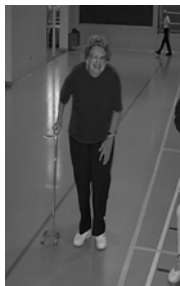
BIOLOGICAL  
AGE

"How long have  
you lived?"

"How old is your  
body?"

Female - 80 years old

osteoporosis  
COPD



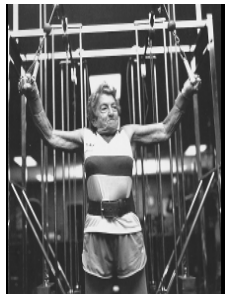
Male- 79 years old

Body  
Builder  
for 15 years



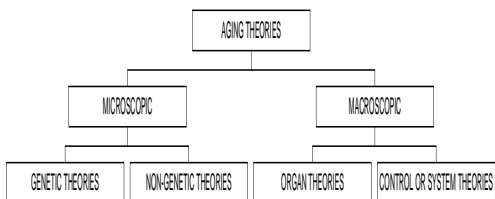
Female- 81 years old

Female weight trainer using machine

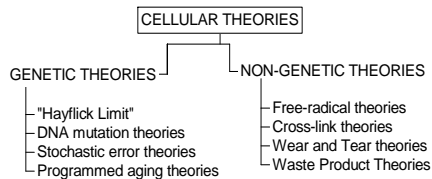


## Why do we age?

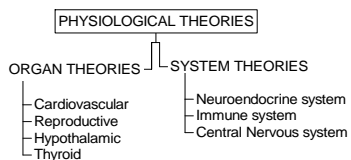
## Biological Theories of Aging



## Microscopic Theories



## Macroscopic Theories



## Multiple Factor Theories

- No single theory explains complexity of the aging process.
- Recent theories transcend microscopic and macroscopic explanations.

## Biological Aging Defined

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Aging is a complex biological process in which changes at molecular, cellular, and organ levels result in a progressive, inevitable, and inescapable decrease in the body's ability to respond appropriately to internal and/or external stressors.

Chodzko-Zajko & Ringel, 1987

## What are the consequences of aging?

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## Structural Changes with Age Respiratory System

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- senile kyphosis
- pleural drying and thinning
- decreased elastic recoil
- thoracic muscle atrophy
- vertebral degeneration
- costovertebral calcification
- costovertebral ossification

## Structural Changes with Age Laryngeal System

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- muscle atrophy
- cartilagenous calcification
- ligamental deterioration
- neuronal atrophy
- vocal fold edema
- neurotransmitter deficiency
- impaired blood supply

## GENERAL MODEL Structural Changes with Age

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ATROPHY  
DYSTROPHY  
EDEMA  
ELASTICITY  
DEMYELINIZATION  
NEOPLASM  
MUTATION

## Functional Consequences of Aging Respiratory System

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- decreased subglottic pressure
- decreased vital capacity
- decreased forced expiratory volume
- inability to generate stress contrasts
- diminished endurance
- reduced loudness
- smaller phrase units

## Functional Consequences of Aging Laryngeal System

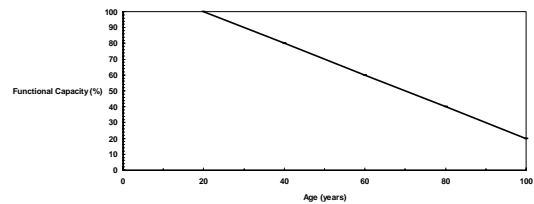
- reduced fundamental frequency
- decreased vowel prolongation time
- diminished vocal intensity
- increased vocal jitter
- increased vocal shimmer
- decreased H/N ratio

## GENERAL MODEL Functional Consequences of Aging

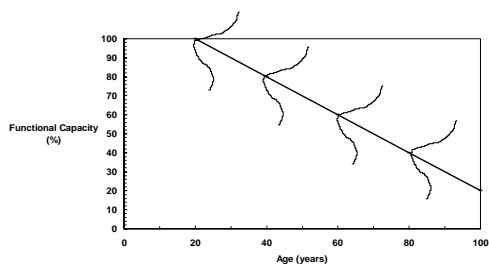
ACCURACY  
SPEED  
RANGE  
ENDURANCE  
COORDINATION  
STABILITY  
STRENGTH

At what rate do we age?

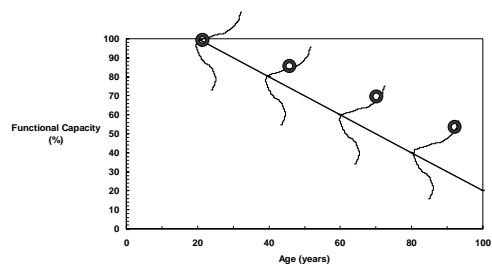
## Linear Senescence



## Linear Senescence Reconsidered Normal Human Aging

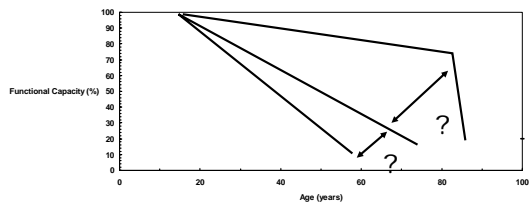


## Deviations from Linear Senescence



## Plasticity of Aging

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**What can we do about it?**