Functional Aging Specialist Workshop

Dan Ritchie, PhD – President, Co-Founder

Cody Sipe, PhD – Vice President, Co-Founder



Cody Sipe, PhD

- 25+ years industry experience
- Over 100 presentations internationally
- Over 30 published articles
- 2005 IDEA Program Director of the Year
- 2019 IDEA Fitness Innovator of the Year Finalist
- Advisory Boards for Curves USA, Act!vate Brain and Body, IDEA, others
- Editorial Board - Journal of Physical Activity and Aging
- Associate Professor, Director of Clinical Research in the Doctoral Physical Therapy Program at Harding University
- Chair, Harding University Institutional Review Board
- Co-Owner, Miracles Fitness

FAI

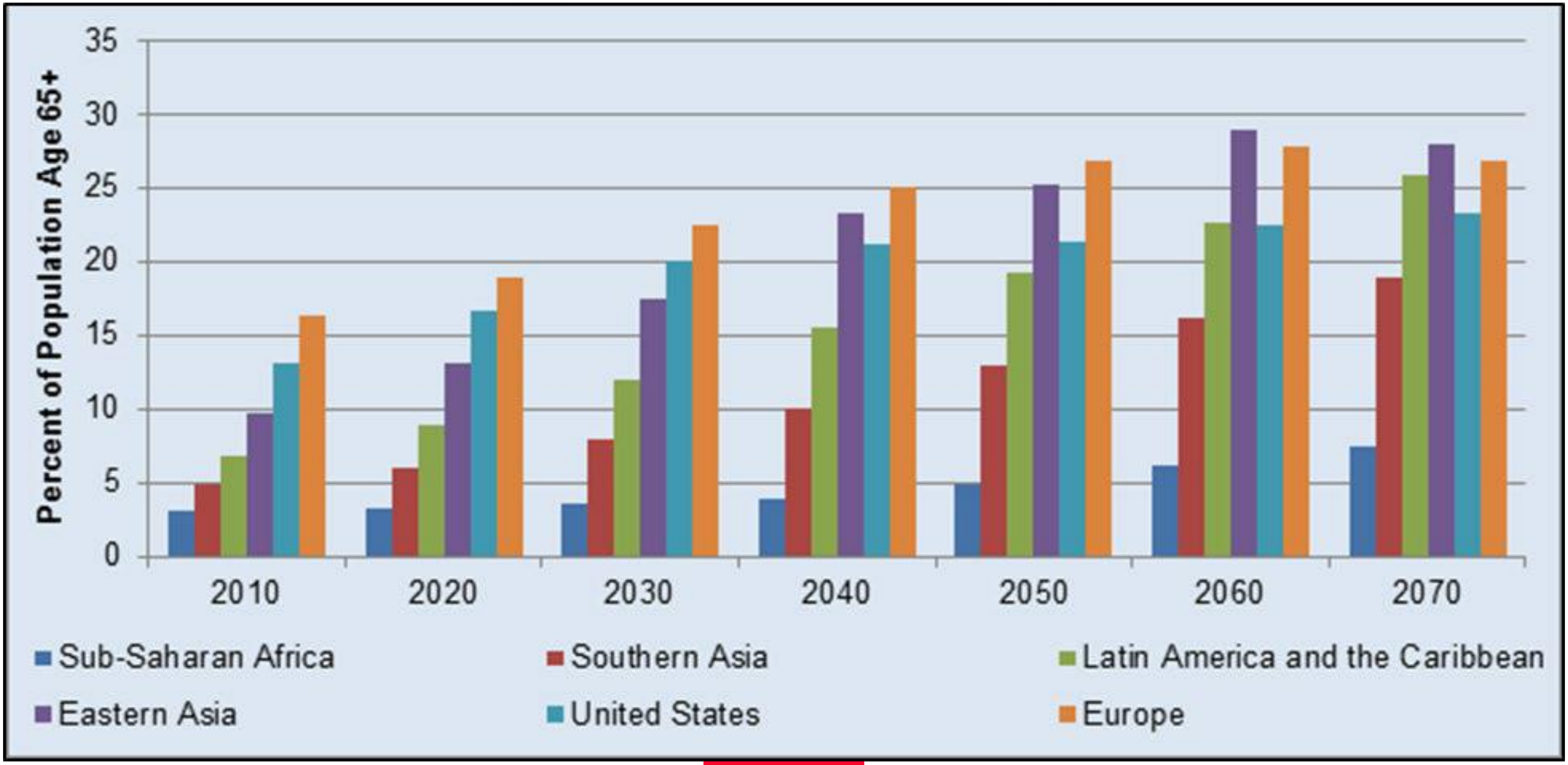
Dan Ritchie, PhD, CSCS

20+ years experience – personal trainer, manager, owner
Certified Strength and Conditioning Specialist
FallProof Balance and Mobility Enhancement Specialist
Enhance Fitness Master Trainer
2014 PFP Personal Trainer of the Year
Act!vate Brain and Body Advisory Board
Co-Owner, Manager, Miracles Fitness

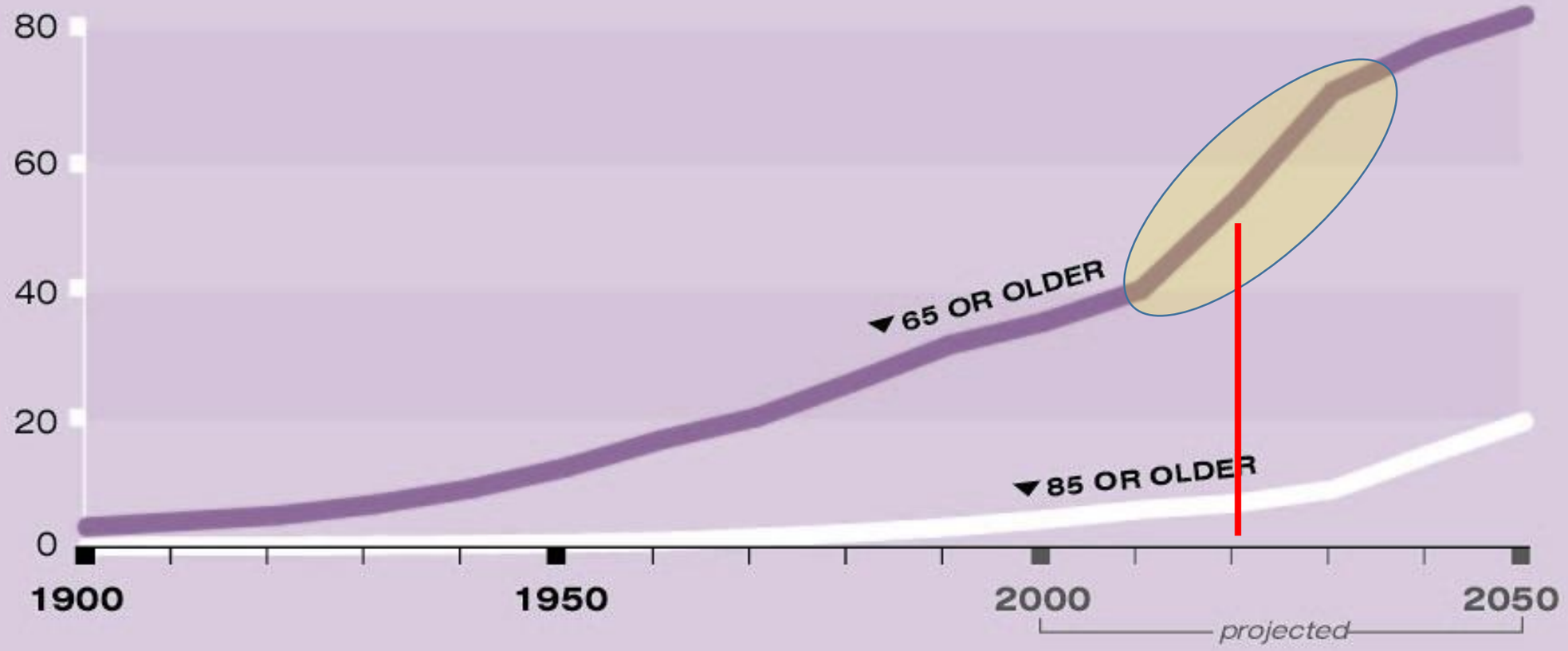


About FAI

- Founded in 2014 by Dan Ritchie, PhD and Cody Sipe, PhD
- Launched the Functional Aging Specialist Certification in 2015
  - Over 4,500 FAS globally
  - International Partners
    - Australia
    - Mexico
    - Europe
    - UK
    - Russia
    - Taiwan
    - China
- Annual Functional Aging Summit
- Certifications
  - Functional Aging Specialist
  - Brain Health Trainer
  - Tai Chi
- Continuing Education Courses
  - Joint Replacements
  - Balance Matters
  - Rapid Movement Training
  - Stroke Recovery
  - Health Coaching – Riding the Age Wave
  - Anchor Point Training Active Aging
  - Balance Specialist
  - One Day to Wellness
  - Complete Shoulder Conditioning
  - Complete Knee, Ankle, Foot Conditioning

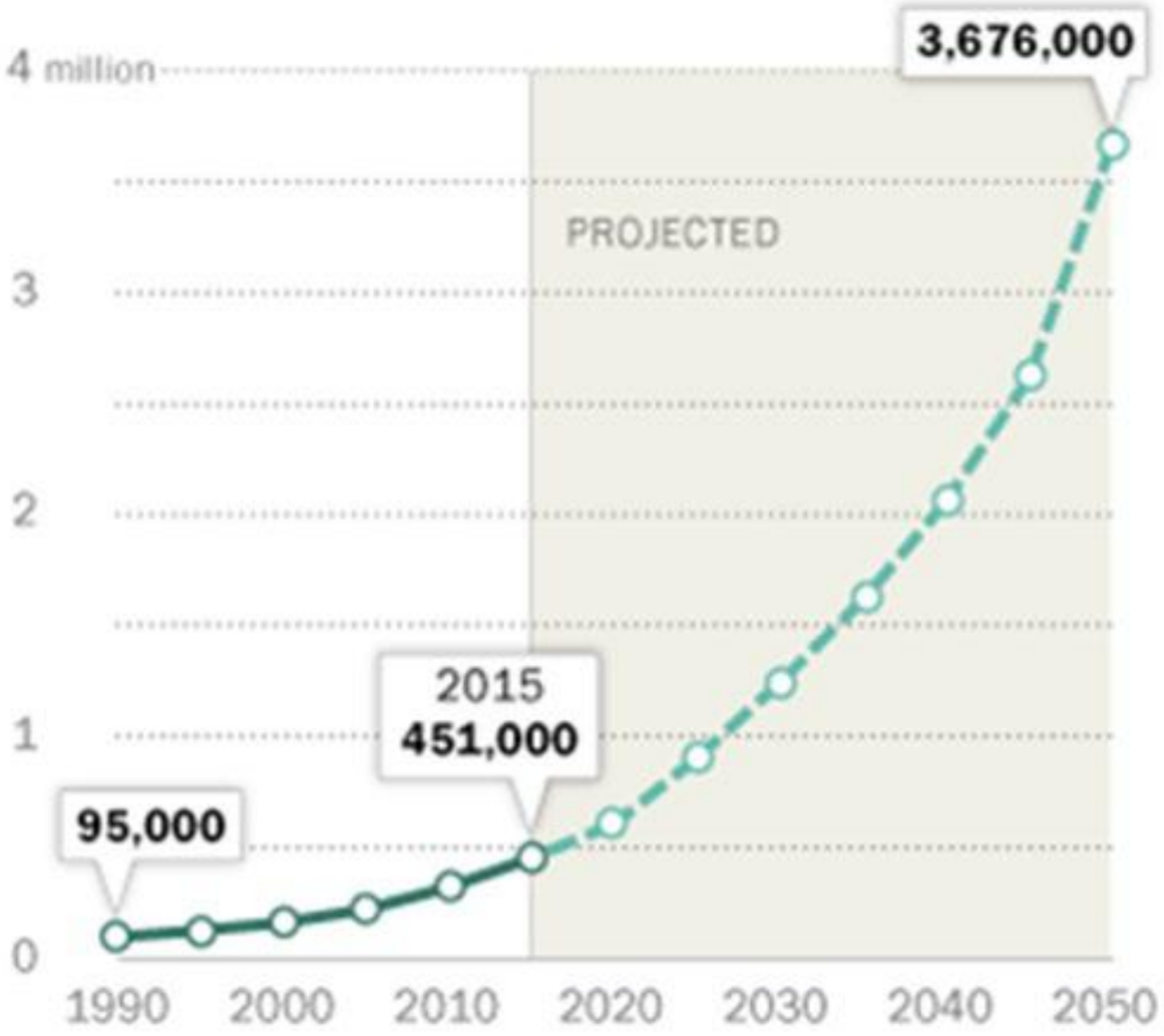

Percent of Population Age 65+
35
30
25
20
15
10
5
0
2010
2020
2030
2040
2050
2060
2070
Sub-Saharan Africa
Southern Asia
Latin America and the Caribbean
Eastern Asia
United States
Europe

Total number of persons age 65 or older, by age group, 1900 to 2050, in millions

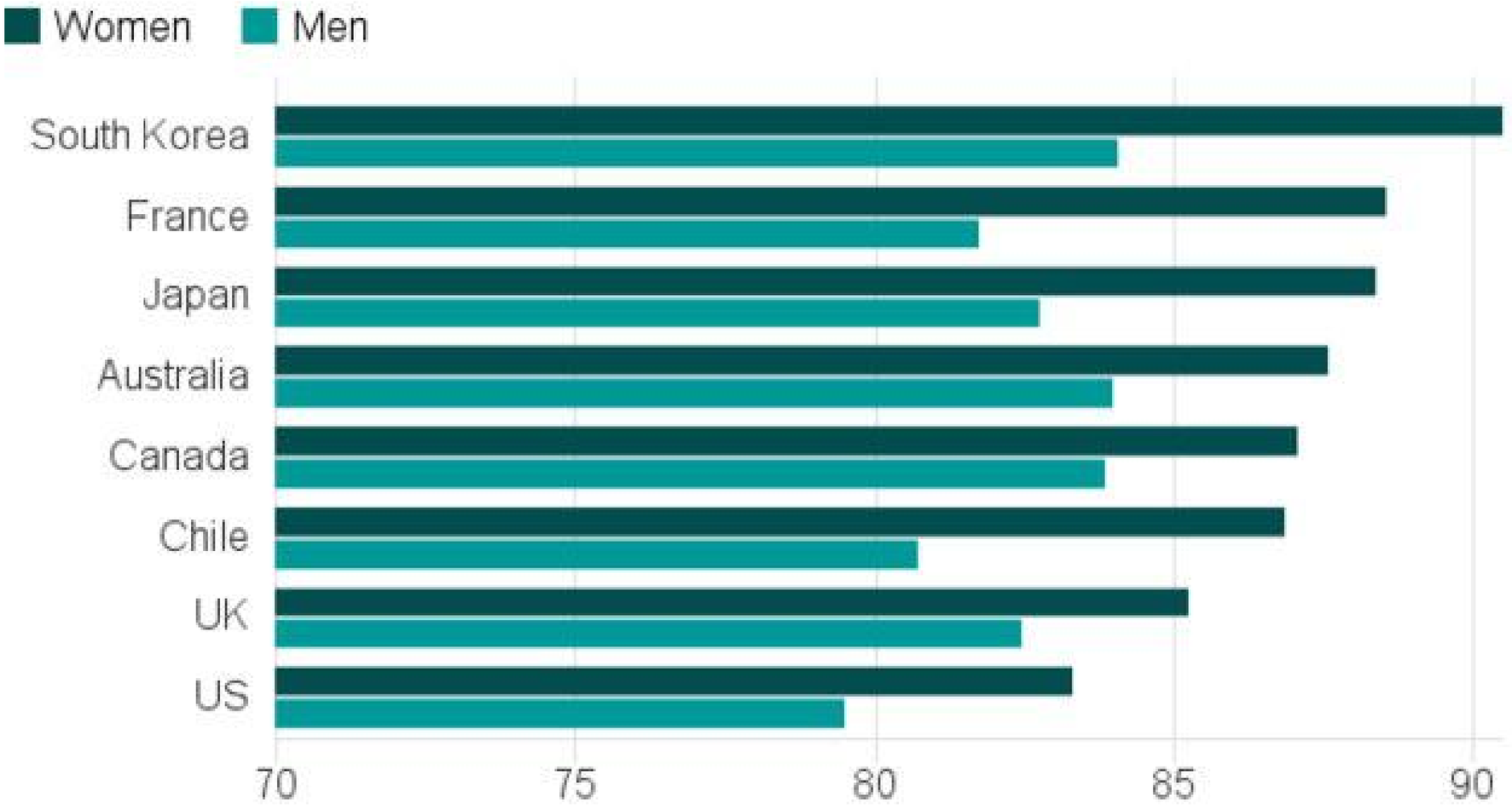


Note: Data for the years 2000 to 2050 are middle-series projections of the population.
Reference population: These data refer to the resident population.
Source: U.S. Census Bureau, Decennial Census Data and Population Projections.

The 100+ Year Old Population is Growing Rapidly



Average life expectancy at birth by 2030 (in years)



Source: Imperial College London / World Health Organization

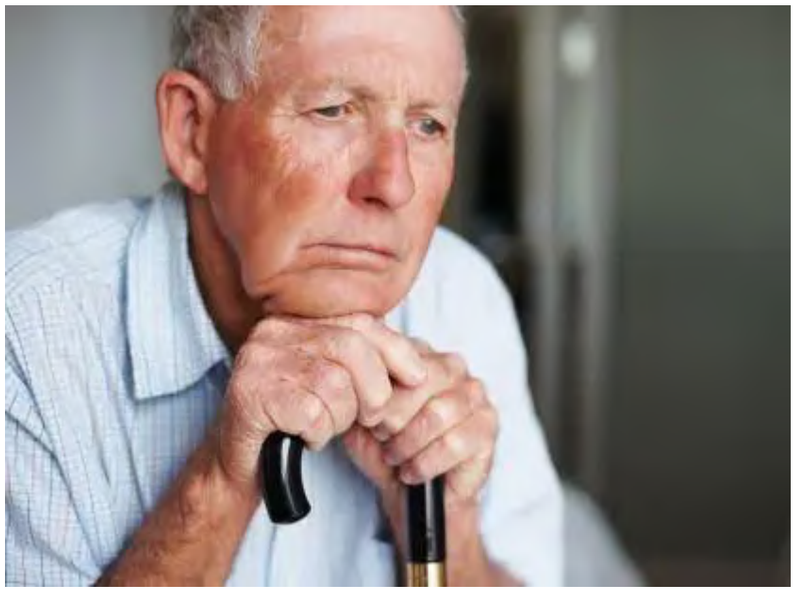
BBC

FAI

Common Myths of Getting Older

1. To be old is to be sick.
2. You can’t teach an old dog new tricks.
3. The horse is out of the barn.
4. The secret to successful aging is to choose your parents wisely.
5. The lights may be on but the voltage is low.
6. The elderly don’t pull their own weight.

Being Old Means…





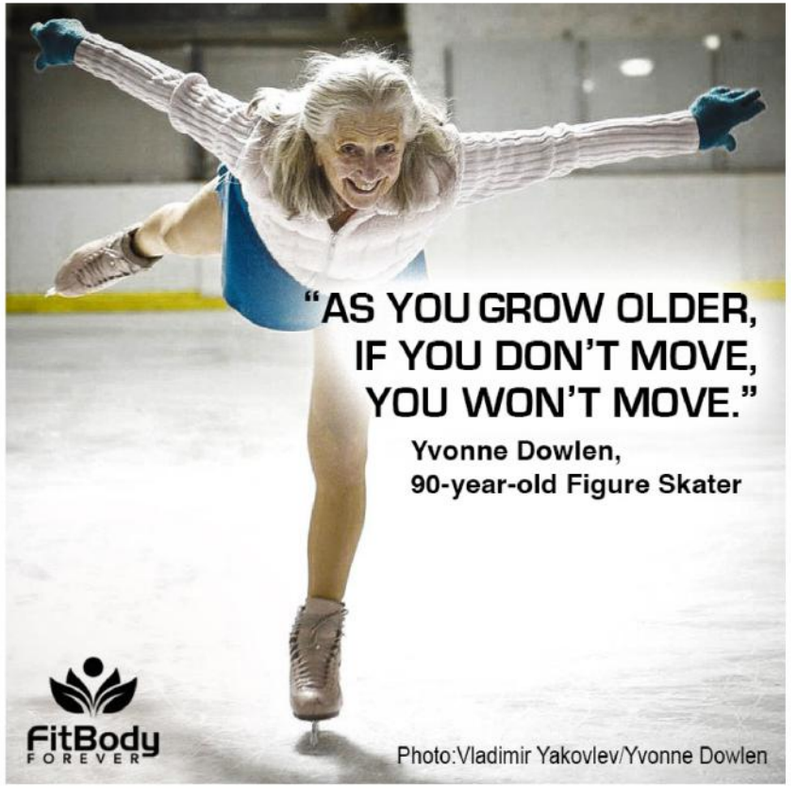




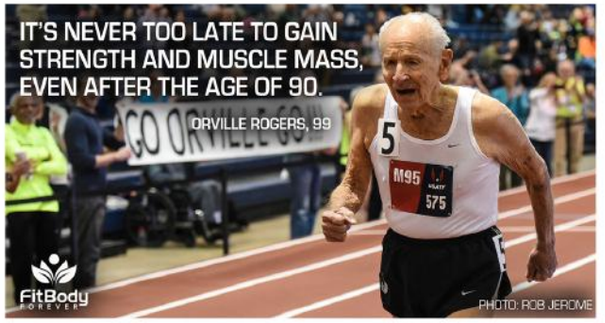


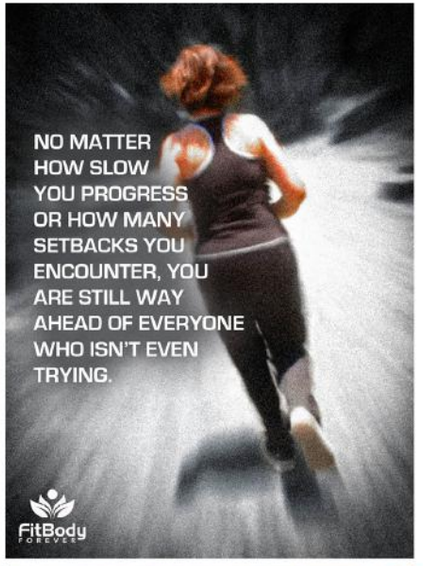

VENICE


BJORN BORG BJORN


"AS YOU GROW OLDER,
IF YOU DON'T MOVE,
YOU WON'T MOVE."
Yvonne Dowlen,
90-year-old Figure Skater
FitBody FOREVER
Photo:Vladimir Yakovlev/Yvonne Dowlen


I am not training for a 5k.
I'm not chasing a record.
I'm not trying to impress you.
I'm saving my life.
I'm lengthening my life.
I'm improving my quality of life.
FitBody FOREVER


IT'S NEVER TOO LATE TO GAIN
STRENGTH AND MUSCLE MASS,
EVEN AFTER THE AGE OF 90.
ORVILLE ROGERS, 99
FitBody FOREVER
PHOTO: ROB JEROME

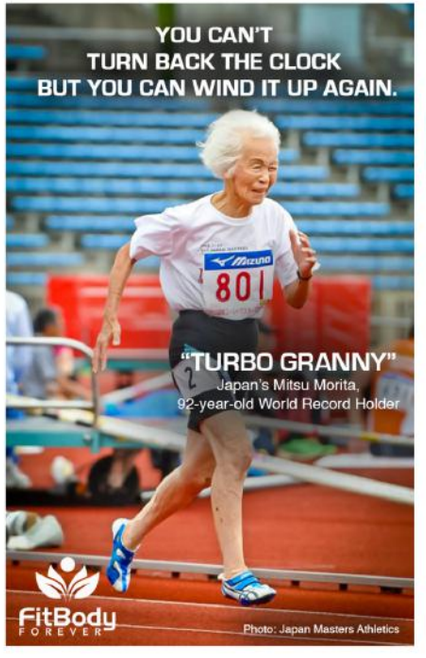

NO MATTER
HOW SLOW
YOU PROGRESS
OR HOW MANY
SETBACKS YOU
ENCOUNTER, YOU
ARE STILL WAY
AHEAD OF EVERYONE
WHO ISN'T EVEN
TRYING.
FitBody FOREVER


"Posture is important
as we age. I workout
twice every week."
John Corse, 94
World record holding
masters swimmer
and practicing
attorney
FitBody FOREVER
Photo: Eney Jones

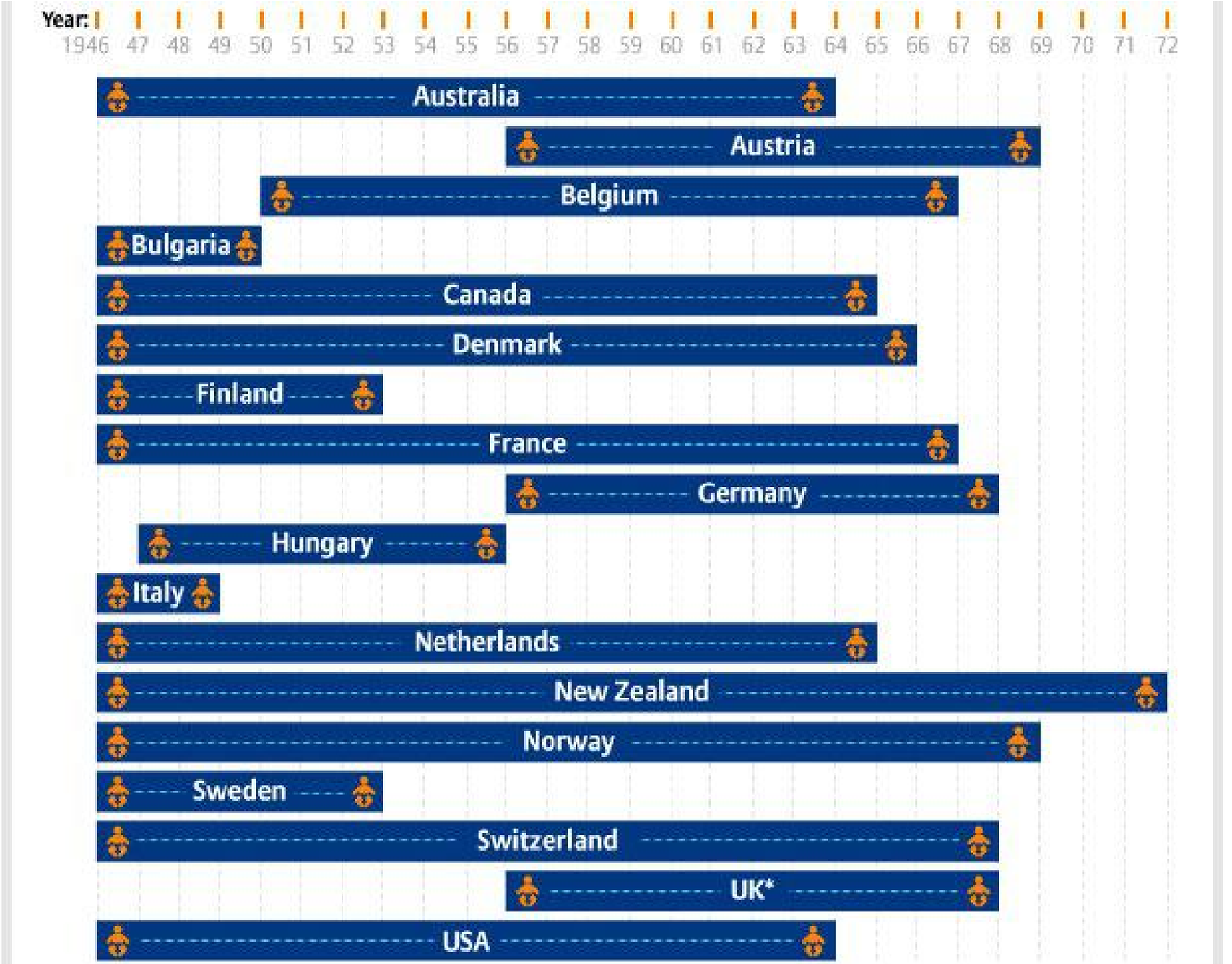

TODAY IS THE
YOUNGEST YOU
WILL EVER BE.
GET MOVING..
FitBody FOREVER

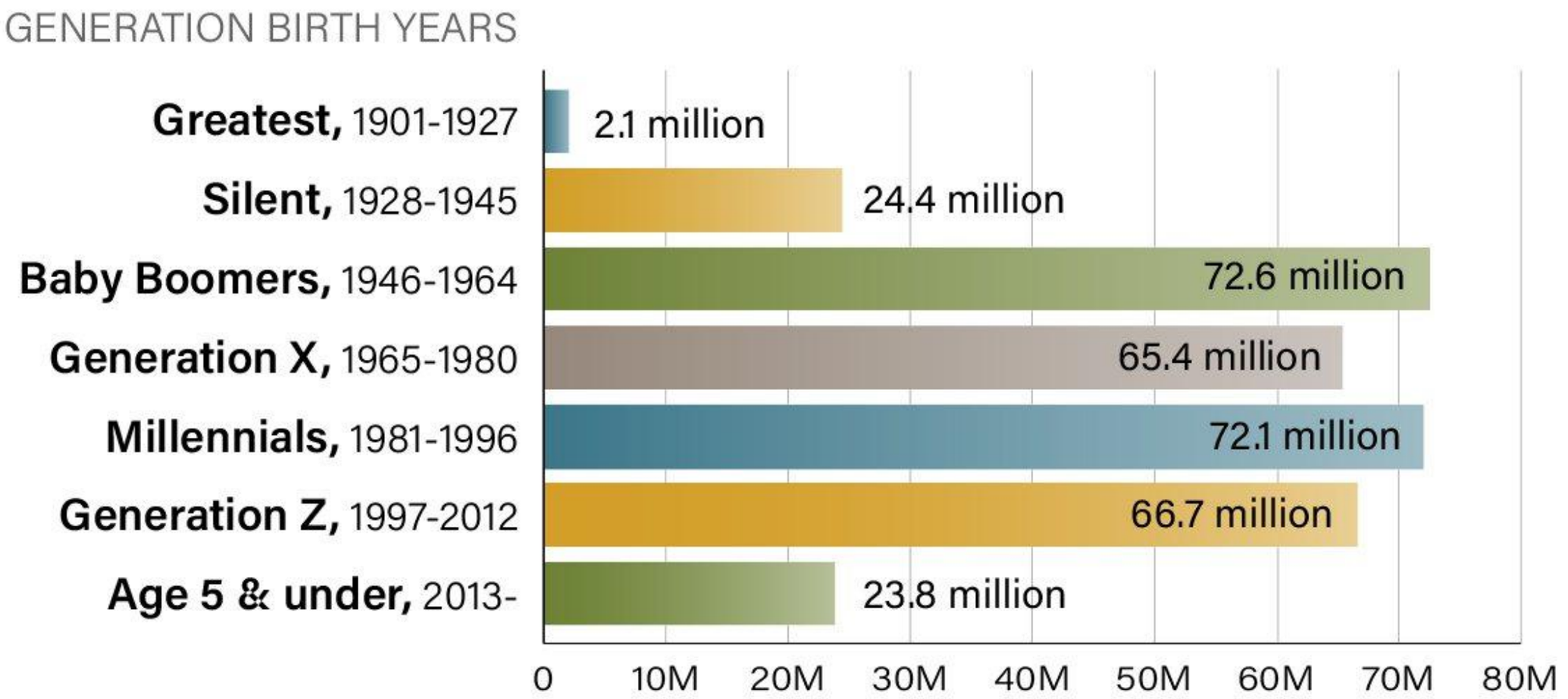

IF YOU DON'T
TAKE CARE OF YOUR BODY,
WHERE ARE YOU GOING TO LIVE?
FitBody FOREVER


YOUTHFULLNESS
IS ABOUT HOW
YOU LIVE.
NOT
WHEN YOU
WERE BORN.
Karl Lagerfield
FitBody FOREVER


YOU CAN'T
TURN BACK THE CLOCK
BUT YOU CAN WIND IT UP AGAIN.
"TURBO GRANNY"
Japan's Mitsu Morita,
92-year-old World Record Holder
FitBody FOREVER
Photo: Japan Masters Athletics


WORK OUT.
YOU'LL LIVE LONGER.
FitBody FOREVER


Year:
1946 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72
Australia
Austria
Belgium
Bulgaria
Canada
Denmark
Finland
France
Germany
Hungary
Italy
Netherlands
New Zealand
Norway
Sweden
Switzerland
UK*
USA


GENERATION BIRTH YEARS
Greatest, 1901-1927
2.1 million
Silent, 1928-1945
24.4 million
Baby Boomers, 1946-1964
72.6 million
Generation X, 1965-1980
65.4 million
Millennials, 1981-1996
72.1 million
Generation Z, 1997-2012
66.7 million
Age 5 & under, 2013-
23.8 million
0
10M
20M
30M
40M
50M
60M
70M
80M

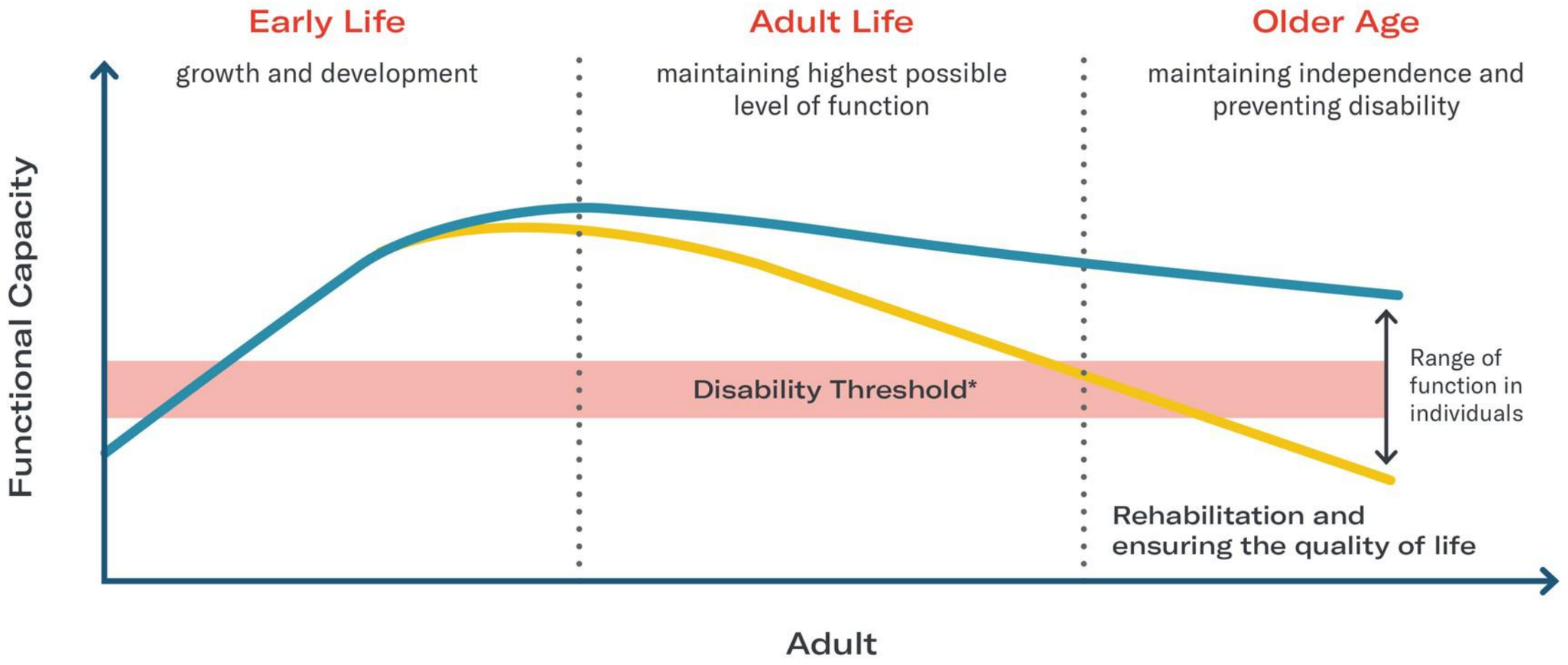
The Perfect Opportunity

1. The older adult population is large and growing rapidly
2. They need the services of fitness professionals
3. They are interested in fitness more than ever before
4. There aren’t many highly qualified fitness professionals who know how to meet their needs safely and effectively

The Functional Aging Training Model

A Brief Introduction

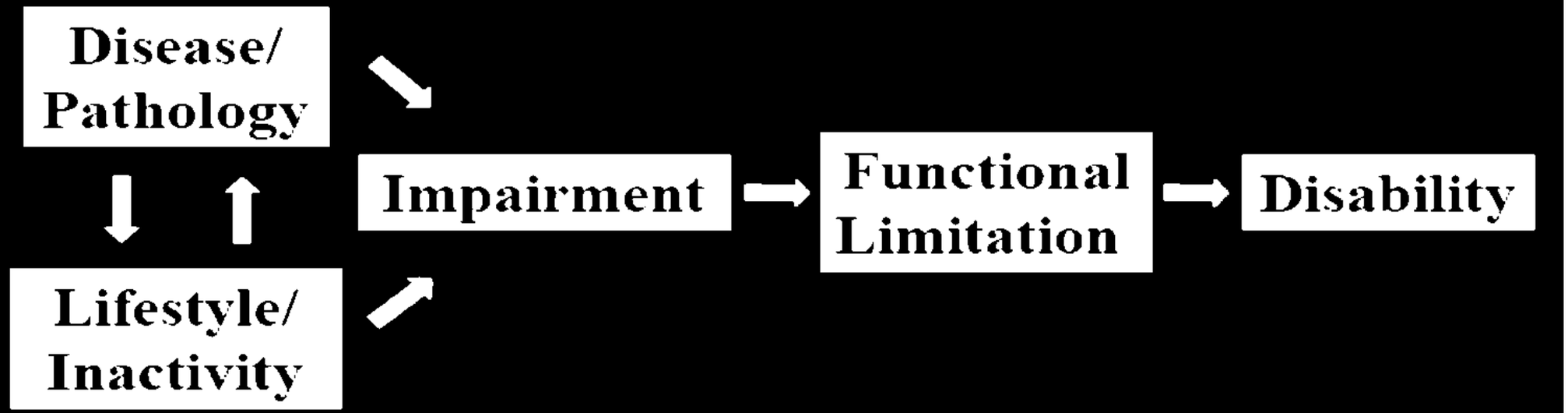
What is your Aging Trajectory?



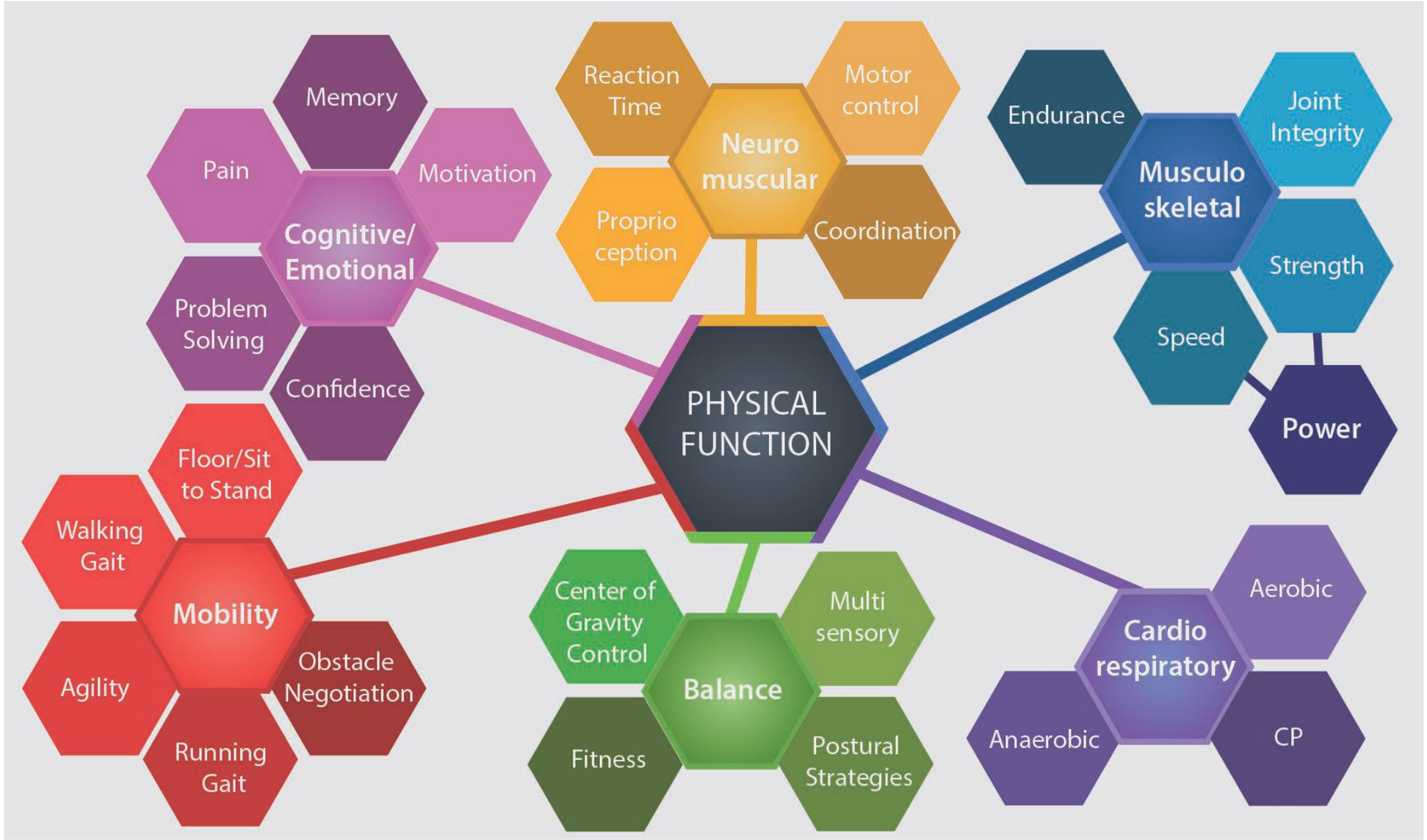

HIERARCHY OF FUNCTIONAL AGING
01
ELITE ATHLETE
02
FULLY FIT
03
SEMI FIT
04
HIGHER IND
05
LOWER IND
06
PRE-FRAIL
07
FRAIL
08
DEPENDENT
FAI
FUNCTIONAL AGING INSTITUTE

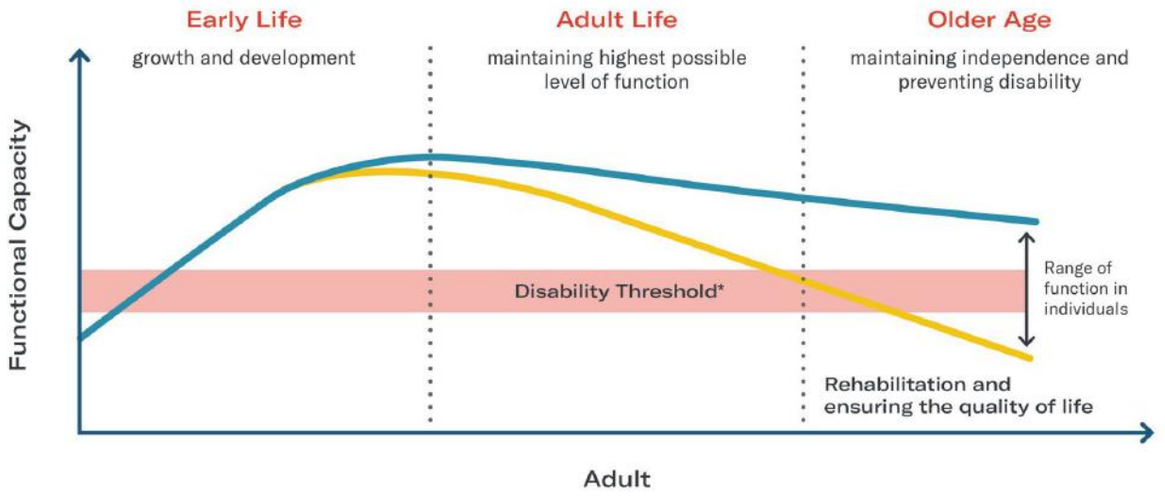
The Nagi Model

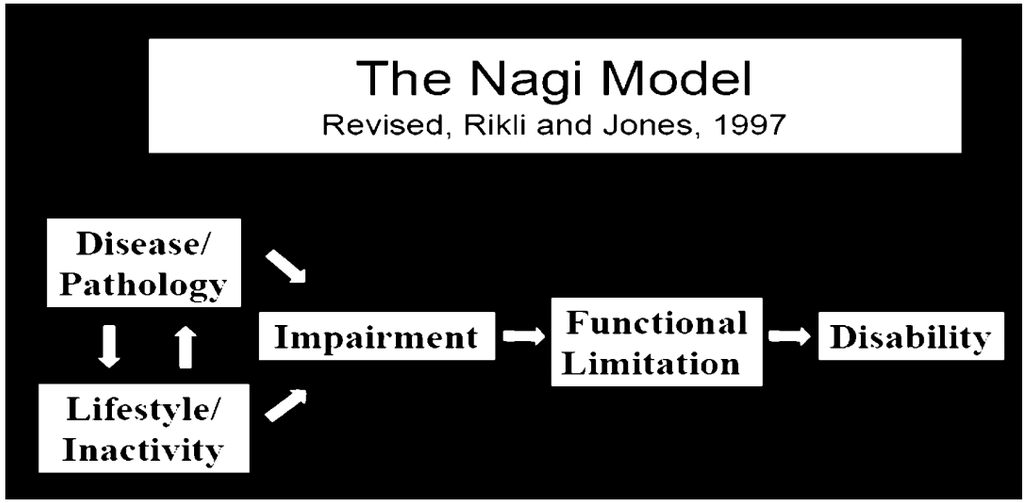
Revised, Rikli and Jones, 1997

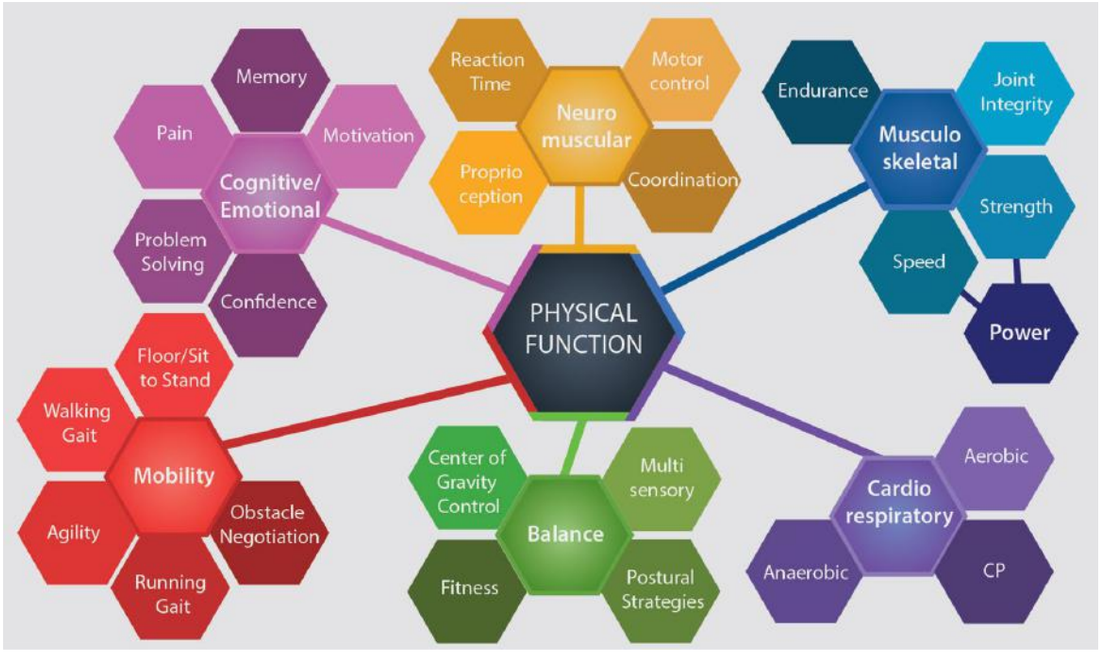


Six Domains of Physical Function




Early Life
growth and development
Adult Life
maintaining highest possible level of function
Older Age
maintaining independence and preventing disability
Functional Capacity
Disability Threshold*
Range of function in individuals
Rehabilitation and ensuring the quality of life
Adult


The Nagi Model
Revised, Rikli and Jones, 1997
Disease/ Pathology
Lifestyle/ Inactivity
Impairment
Functional Limitation
Disability


PHYSICAL FUNCTION
Cognitive/ Emotional
Memory
Pain
Motivation
Problem Solving
Confidence
Neuro muscular
Reaction Time
Motor control
Proprio ception
Coordination
Musculo skeletal
Endurance
Joint Integrity
Strength
Speed
Power
Mobility
Floor/Sit to Stand
Walking Gait
Agility
Obstacle Negotiation
Running Gait
Balance
Center of Gravity Control
Multi sensory
Fitness
Postural Strategies
Cardio respiratory
Aerobic
Anaerobic
CP


HIERARCHY OF FUNCTIONAL AGING
ELITE ATHLETE
FULLY FIT
SEMI FIT
HIGHER IND
LOWER IND
PRE-FRAIL
FRAIL
DEPENDENT
01
02
03
04
05
06
07
08
FAI

What we will cover today

Aging and Function

Core Principles of the FATM

Functional Assessments for All Levels of Function

Exercise Movements for the 6 Domains

- 7 Fundamental Movement Patterns
- Progressions and Regressions

Exercise Session Components

- Ready
- Set
- Go
- Ready
- Go

How to Design a Safe and Effective Exercise Program

FAS Certification Online Course

Lesson 1

Module 1: Population Aging Around the World

Module 2: Applied Physiology of Aging

Module 3: Principles of Healthy Aging and Longevity

Module 4: Functional Aging and Exercise

Module 5: Health and Functional Fitness Assessment

Lesson 2

Module 6: Functional Aging Training Model

Module 7a: FATM Strategies Part 1

Module 7b: FATM Strategies Part 2

Module 8: Functional Variations, Progressions and Regressions

Lesson 3

Module 9: The Exercise Session

Module 10: Functional Aging Training Program Design

Module 11: Individual and Small Group Training Strategies

Module 12: Safety and Monitoring for Mature Clients

Module 13: Exercise for Chronic Conditions

Workshop Details

Schedule

Food and Drink

Bathrooms

Participation

Questions

Group Task

Divide into groups of 4-6

Introduce yourself: Name, Age, Where are you from?, Why are you here?

Pick one “functional” exercise that you think is effective for older clients

AND

Demonstrate the move and explain to the rest of the group WHY you think it is an effective functional movement

Exercise Circuit for Independent to Fit

- Front/Back Lunge (L/R)
- Bush Walk
- Standing 1-arm tubing shoulder press (L/R, partner)
- One-legged stand (eyes closed)
- Side Plank (L/R)

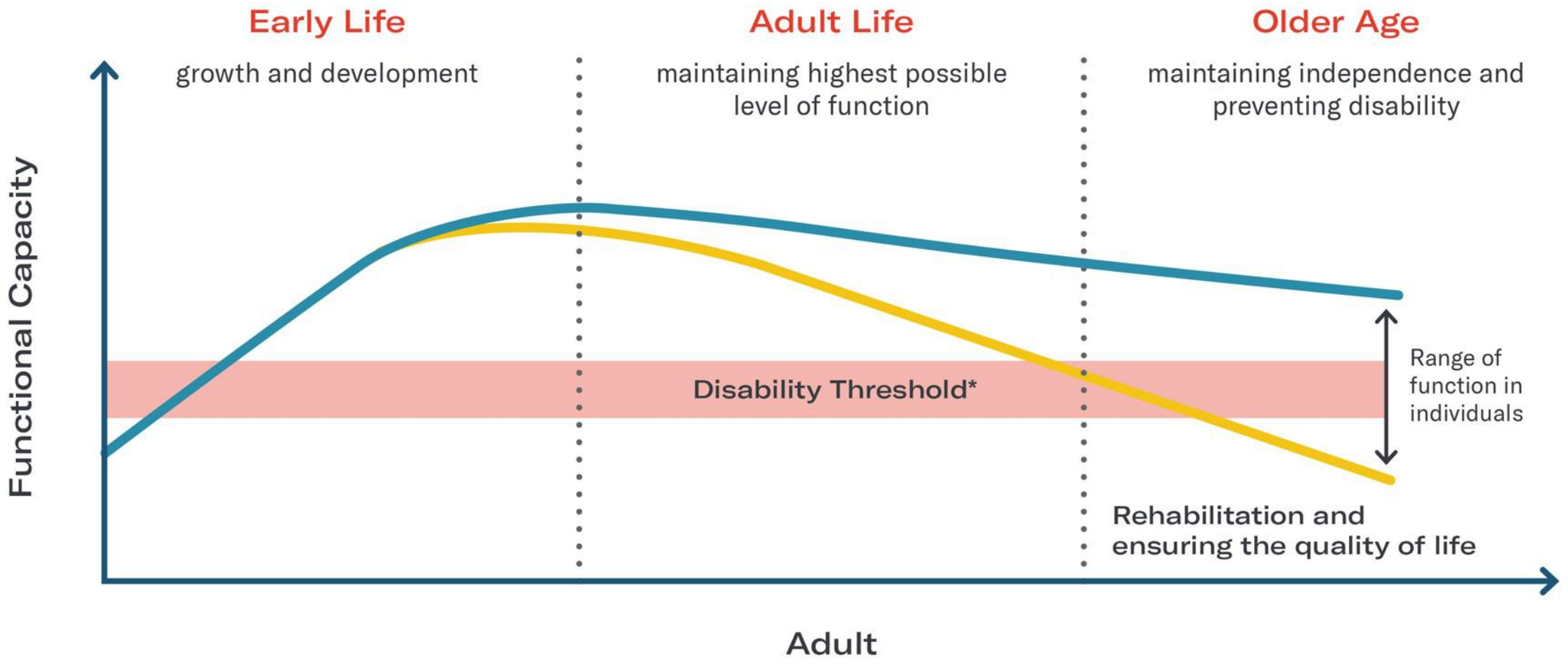
- Standing one-arm tubing row (L/R, partner)
- Carioche (L/R)
- Standing one-arm chest press (L/R)
- Walk the line, knees up, on toes
- Side Plank (L/R)

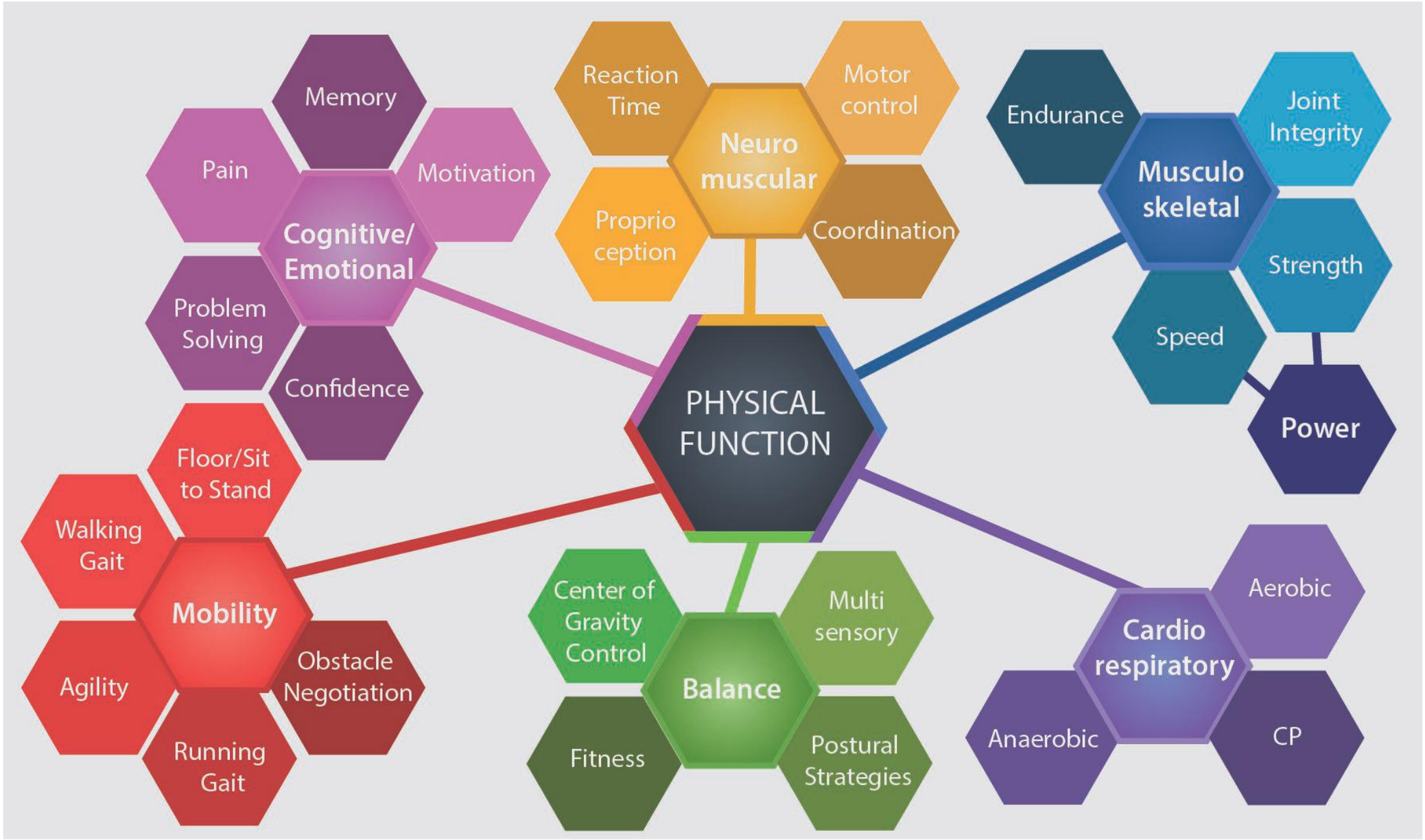
- Side lunge with reach
- High kicks
- Palof press with tubing (L/R, partner)
- Single Leg deadlift (no weight)
- Side Plank (L/R)

30s each exercise
Rest 1 Minute after Circuit
Repeat

Aging and Function

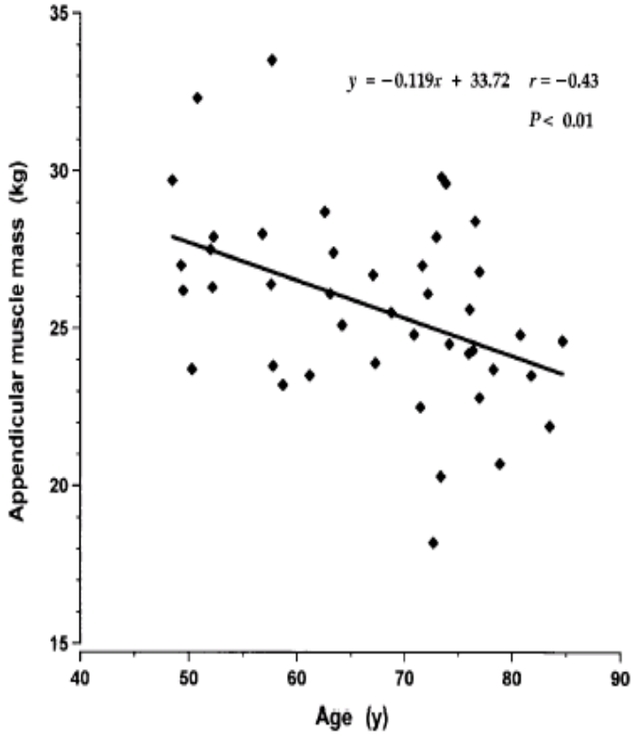
What is your Aging Trajectory?




PHYSICAL FUNCTION
Cognitive/ Emotional
Memory
Pain
Motivation
Problem Solving
Confidence
Neuro muscular
Reaction Time
Motor control
Proprio ception
Coordination
Musculo skeletal
Endurance
Joint Integrity
Strength
Speed
Power
Mobility
Floor/Sit to Stand
Walking Gait
Agility
Obstacle Negotiation
Running Gait
Balance
Center of Gravity Control
Multi sensory
Fitness
Postural Strategies
Cardio respiratory
Aerobic
Anaerobic
CP

Sarcopenia = age related decline in muscle mass



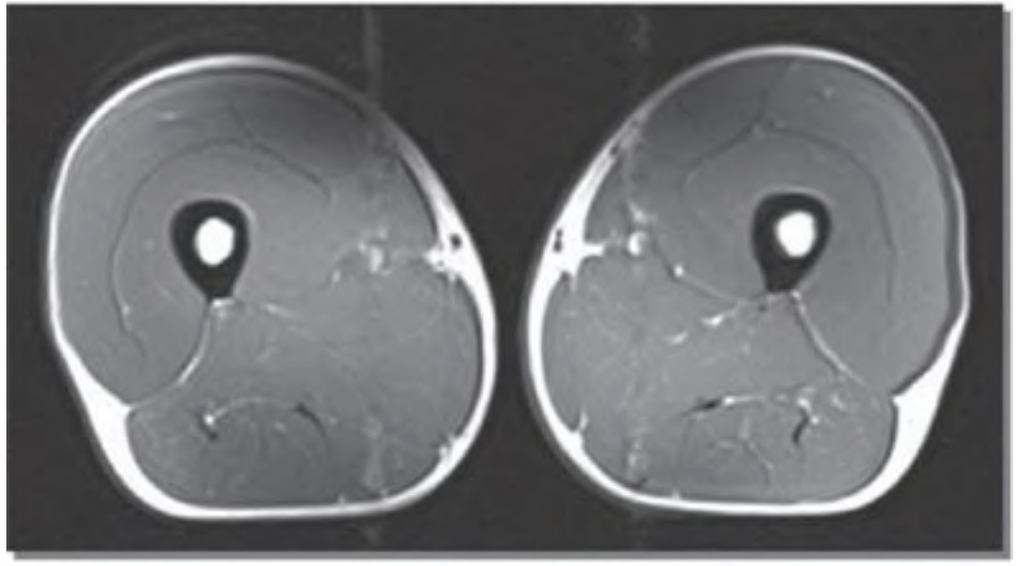


Starling et al. *Am J Clin Nutr* 1999

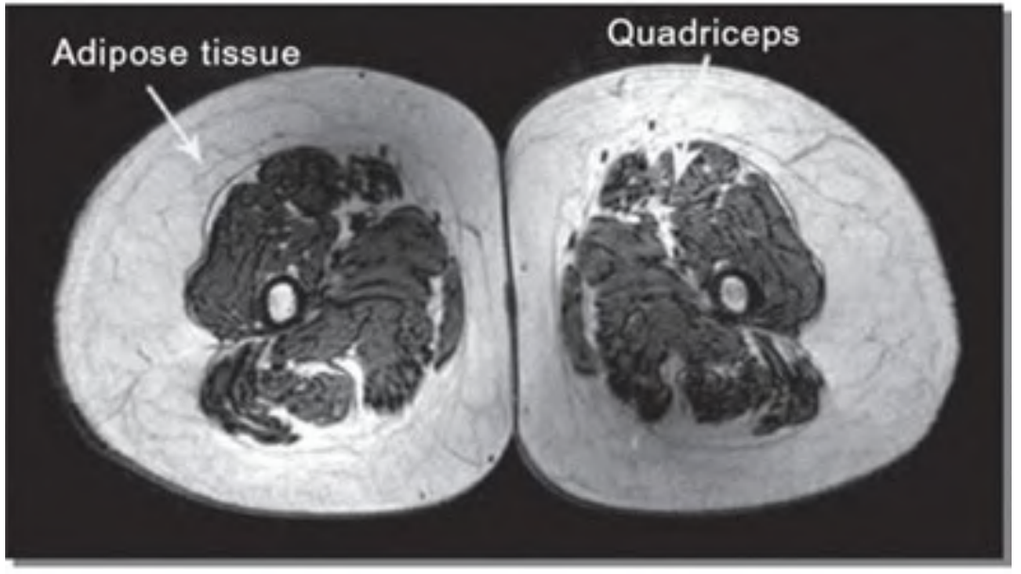
www.sarcopenia.com

Muscle strength declines 30% (on average) from age 50-70,
more dramatic losses after age 80
Large degree of variability between individuals

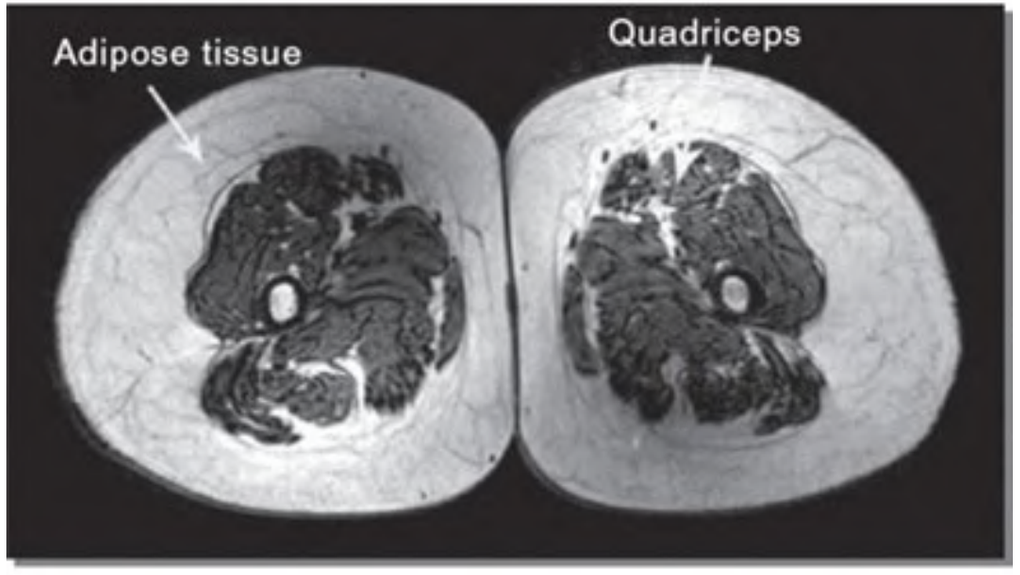
40-year-old triathlete



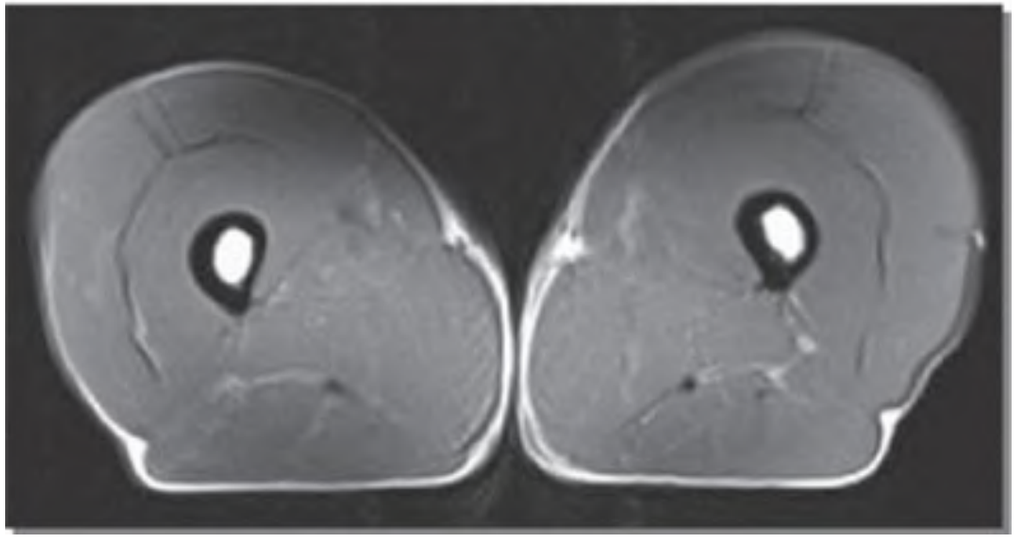
74-year-old sedentary man



74-year-old sedentary man



70-year-old triathlete



Two Kinds of Aging

Primary/Biological Aging

The unstoppable process of maturation that eventually ends in death for every human being

Genetics accounts for about 20% of the variability in longevity in humans

Secondary/Lifestyle Aging

The lifestyle choices people make every day – food, activity, smoking, alcohol – that can ***accelerate*** or ***decelerate*** the biological aging process

Lifestyle accounts for about 80% of the variability in longevity in humans

POWER 9®

Nine healthy lifestyle habits shared by people who've lived the longest.



Blue Zones Food Guidelines

95-100% Plant-Based
Go Wholly Whole
Daily Dose of Beans
Drink Mostly Water
Snack on Nuts
Go Easy on Fish
Eliminate Eggs
Slash Sugar
Reduce Dairy
Retreat from Meat

A Whole-Food Plant-Based Diet Can…

Slash Your Risk of Chronic Disease – Heart Disease, Diabetes, Cancers, Obesity

Potentially Reverse Your Chronic Disease

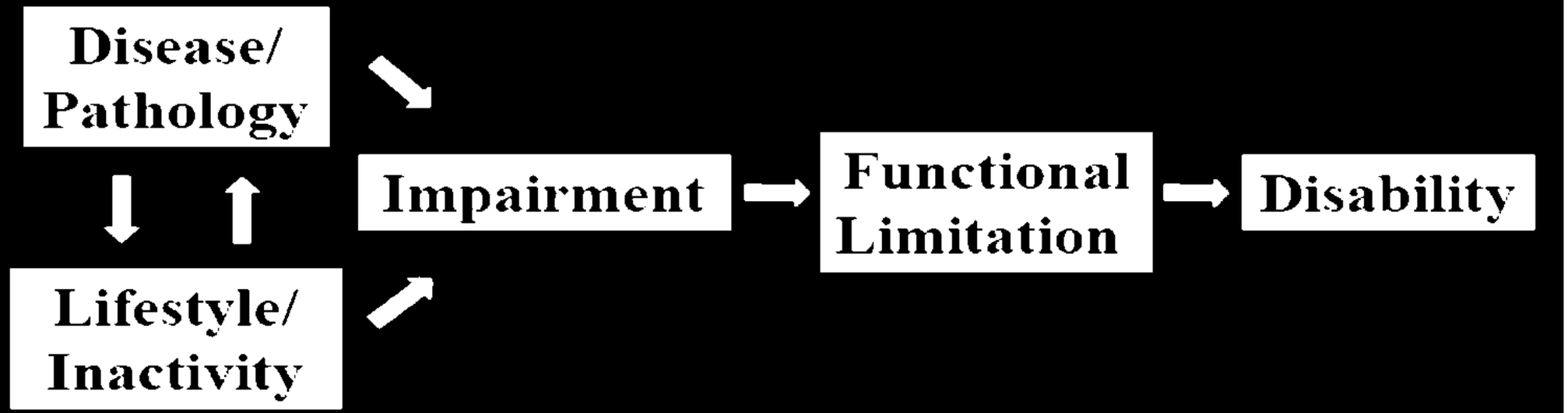
Increase Your Chances of Living a Long, Healthy, Functional Life

The Four Critical Lifestyle Behaviors

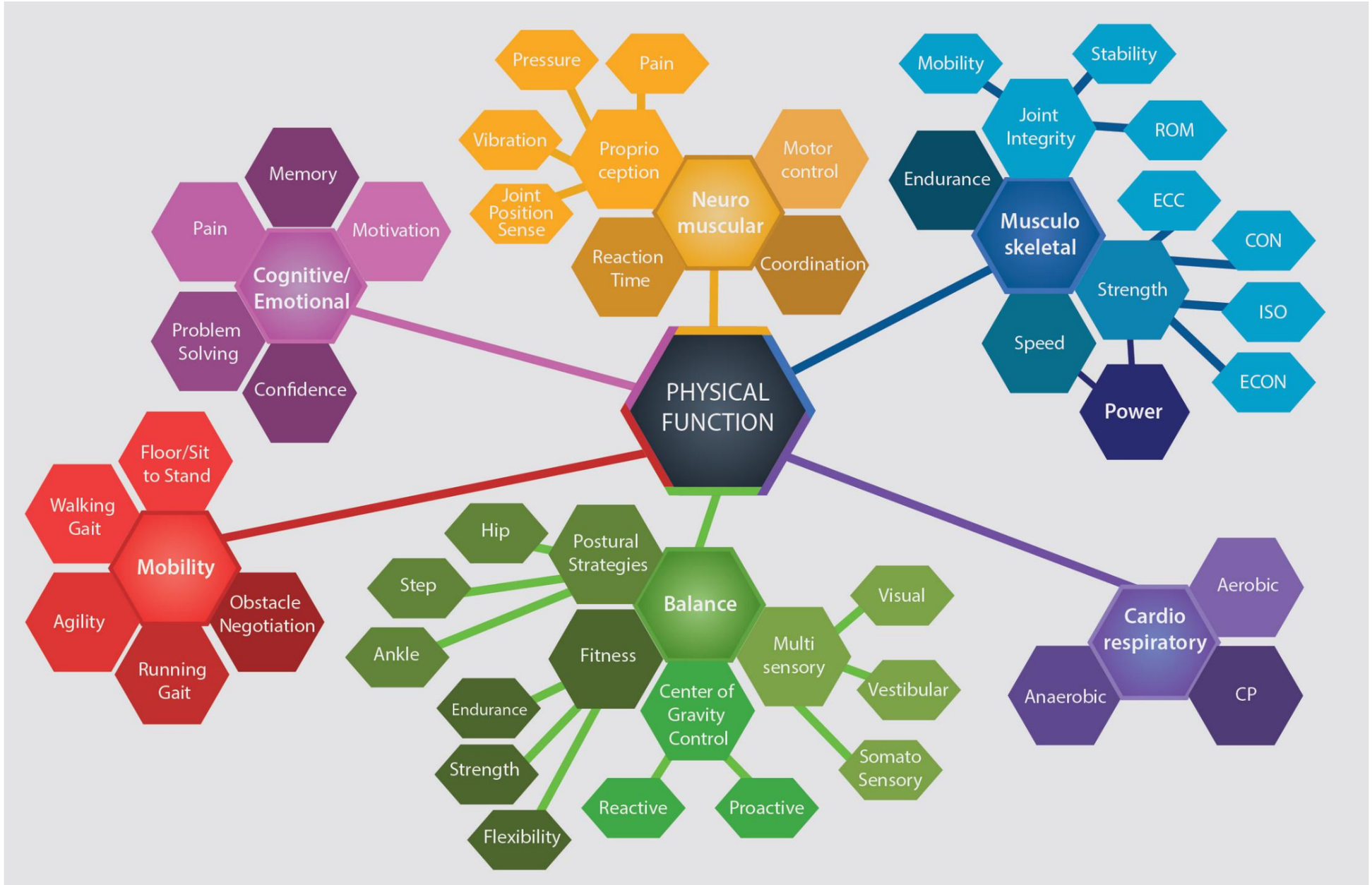
1. Tobacco Use
2. Physical Activity and Exercise
3. Nutrition and Diet
4. Alcohol Consumption

The Nagi Model

Revised, Rikli and Jones, 1997



Impairment Level Factors



Common Chronic Diseases and Conditions Among Older Adults

Osteoarthritis

Hypertension

Cardiovascular Disease

Osteoporosis

Diabetes

Cancers

Sarcopenia

Frailty

Common Impairments Among Older Adults

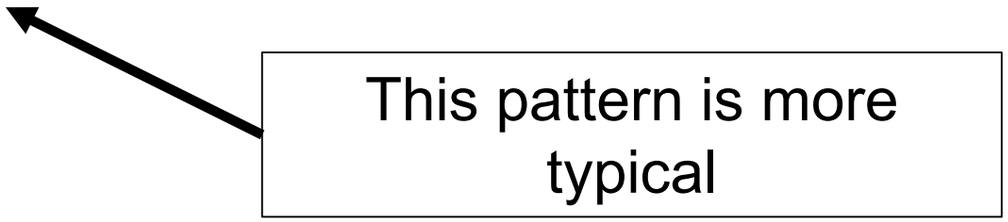
Low Muscle Strength
Low Muscle Poor
Poor Cardiovascular Endurance
Poor Balance
Poor Posture
Limited Joint Range of Motion
Low Self-Efficacy
Increased Fear

Low Muscle Power
Decreased Fine Motor Skills
Poor Coordination
Poor Muscle Endurance
Reduced Proprioception
Slow Muscle Contraction Speed
Sensory Loss
Slower Processing Speed

Patterns of Aging

#1 – There is a drastic decline in one or two impairment level factors (i.e. muscle strength). This one factor is the key to reduced functional ability.

#2 – There is a decline in many impairment level factors. It is the accumulation of numerous deficits that reduces functional ability.



Even Climbing Stairs Depends on Numerous Factors

- Quadriceps and Glutes
  - Strength
  - Power
- Hip flexor mobility
- Calf
  - Plantar flexor power
  - Dorsiflexion
- Ankle stability
  - Proprioception
- Lateral stability through core
  - Abdominals
  - Hips/pelvis
  - Back
- Somatosensation
- Endurance
  - Local muscle
  - Cardiorespiratory
- Balance

This “simple” task requires a lot more than just strength!

Common Functional Limitations Among Older Adults

Climbing Stairs

Negotiating Obstacles

Getting Out of a Chair

Getting Off the Floor

Housework

Yard Work

Lifting Objects

Carrying Objects

Driving

Group Task

What Do Older Adults…

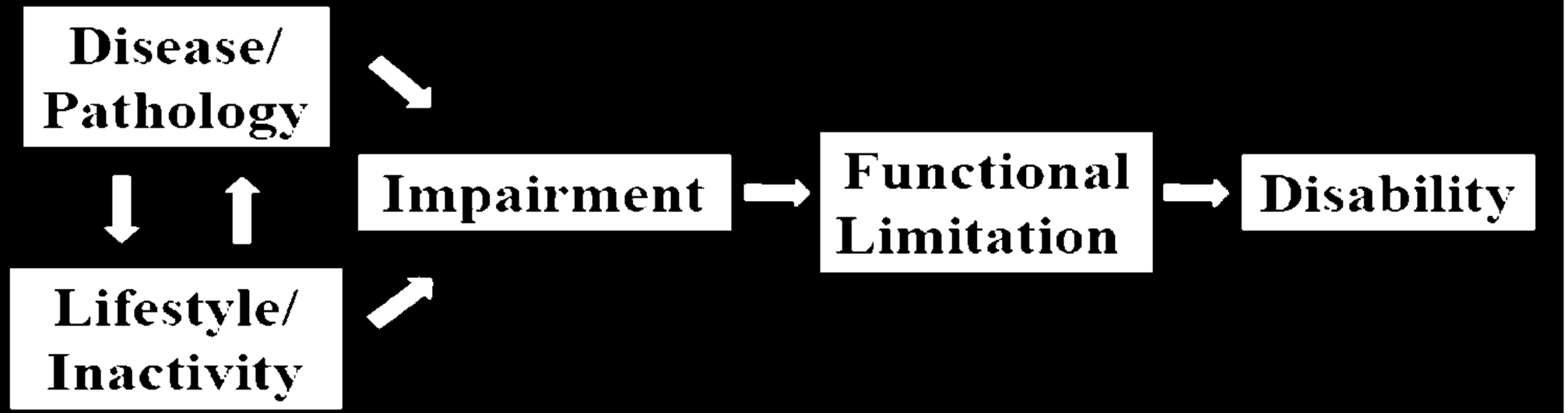
NEED to be able to do?

LIKE to do?

WISH they could do?

The Nagi Model

Revised, Rikli and Jones, 1997



Disabled = Dependent

- The person can no longer take care of themselves
- They require assistance from family or professionals
- They often have multiple chronic conditions and medications
- They are typically under the close supervision of medical professionals
- They often live in a home for the elderly
- They will not typically be a fitness training client unless the disability is temporary due to a recent event (e.g. illness)

The Good News

The aging process is “plastic” – it can be significantly and positively modified by exercise

Impairments can be improved through exercise

Function can be regained through exercise

Exercise is safe and effective for almost everyone

Exercise is the MOST powerful intervention to enhance, maintain or restore function in older adults that we know of!

Key Points

- The aging process affects people very differently
- MOST of the health and functional differences between individuals are due to lifestyle
- The development of chronic diseases and conditions can have a significant impact on physical function
- The aging process affects NUMEROUS physiological systems
- Functional task performance is dependent on NUMEROUS physiological systems
- Exercise is powerful!



Functional Assessments

FAS Assessments

What we will cover today

5x Sit to Stand

Timed Up and Go

Senior Fitness Test 8’ Up and Go

Senior Fitness Test 30 Second Chair Stand

Berg Balance Scale

Fullerton Advanced Balance Scale

Modified Clinical Test of Sensory Interaction in Balance (mCTSIB)

Short Physical Performance Battery

Additional Assessments Online

- PARQ+
- Single Leg Stance
- Handgrip Strength
- Functional Movement Screen
- Cognitive Screens
- Dynamic Gait Index
- Senior Athlete Fitness Exam
- Senior Fitness Test Battery
- Functional Reach Test
- Sarcopenia Questionnaire (SARC-F)

About Assessments FAI Recommends

Valid and Reliable

Easy to Learn and Conduct

Minimal Equipment

Appropriate for a Broad Range of Functional Abilities and Conditions

Assessments are the best way to identify impairments and is the first step in the FATM process

Select the Ones that Meet Your Client's Abilities and Needs

5X Sit to Stand

- Assesses lower-extremity strength under practical conditions
- Used alone or as part of the Short Physical Performance Battery
- Often used in clinical settings or in elderly care homes
- The score is the amount of time (to the nearest decimal in seconds) it takes a patient to transfer from a seated to a standing position and back to sitting five times.
- The time starts on the word “go” and stops when the person’s bottom touches the chair after the fifth chair stand

Score $\geq$ 14 seconds indicates increased fall risk

Timed Up and Go

- Widely used to screen for mobility limitations in older adults
- Most suitable for lower-functioning older adults
- Clients stand up from a standard-height chair, walk to a line 3m from the front edge of the chair, turn around, walk back to the chair and sit down
- They should walk at their usual pace
- Timer starts on the word “go” and stops when their buttocks touch the seat when they sit back down

Scoring

< 10 seconds	Normal
10-15 seconds	Risk of mobility decline
>15 seconds	Mobility impairment

Short Physical Performance Battery

- Widely used assessment tool typically utilized in clinical settings or in elderly care homes
- Assesses 3 Primary Areas:
  - Mobility/Strength
  - Balance
  - Gait
- Each area is scored from 0-4 pts (maximum score 12 points)

Score >10 indicates a mobility limitation and is predictive of all-cause mortality

Short Physical Performance Battery

Balance

- Side-by-Side
- Semi-Tandem
- Tandem

Hold each position for 10 seconds

No assistive devices are allowed

Gait Speed

Time how long it takes to walk 3 or 4 m at their usual pace

Average two trials

Assistive devices are allowed

Mobility/Strength

Single chair stand first

Then, if successful, they perform the 5x Sit to Stand

16.7+ sec = 1 pt

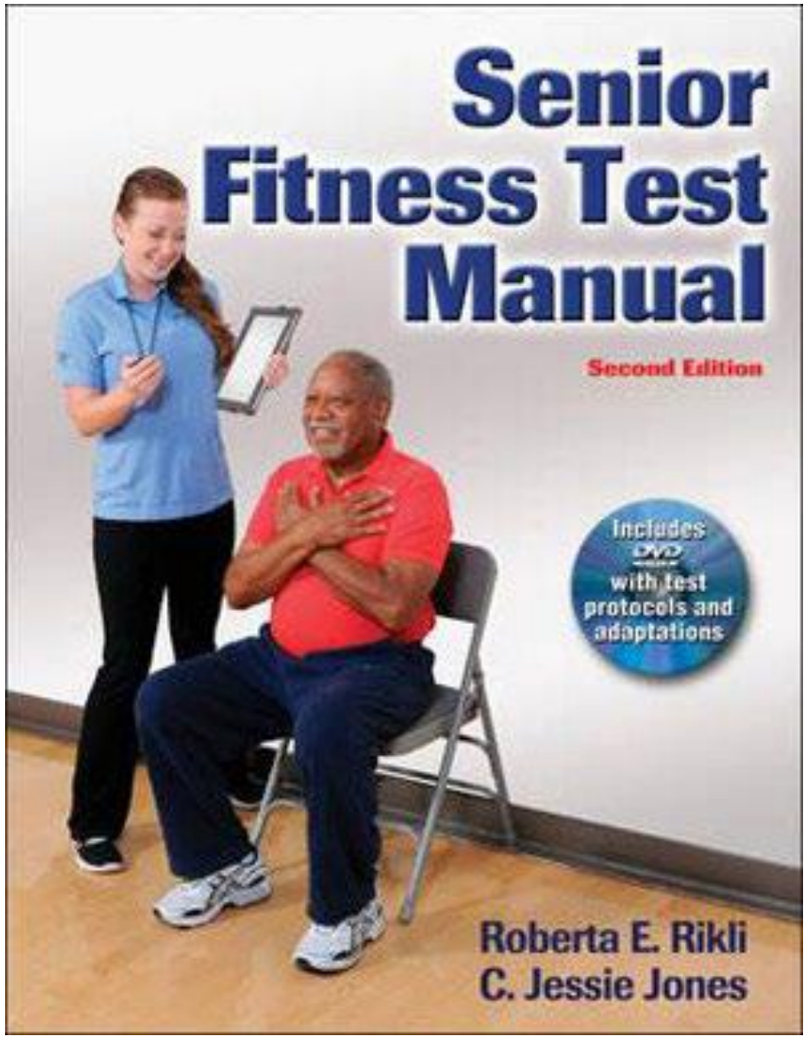
13.7-16.69 = 2 pts

11.2-13.69 = 3 pts

11.19 or less = 4 pts

Senior Fitness Test Battery

- Chair Stand
- Arm Curl
- 8’ Up and Go
- 2-min Step in Place
  - Or 6 min Walk
- Chair Sit and Reach
- Back Scratch



Must use the published norms in the textbook in order to score

30 Second Chair Stand Test

- Assesses lower-extremity strength under practical (functional) conditions
- Validated against 1RM leg press
- Comparable to the 5X Sit to Stand
- Number of times a person can rise from a chair in 30 seconds
- Uses a standard-height chair (43-45cm, 17-18in) with a non-compliant surface

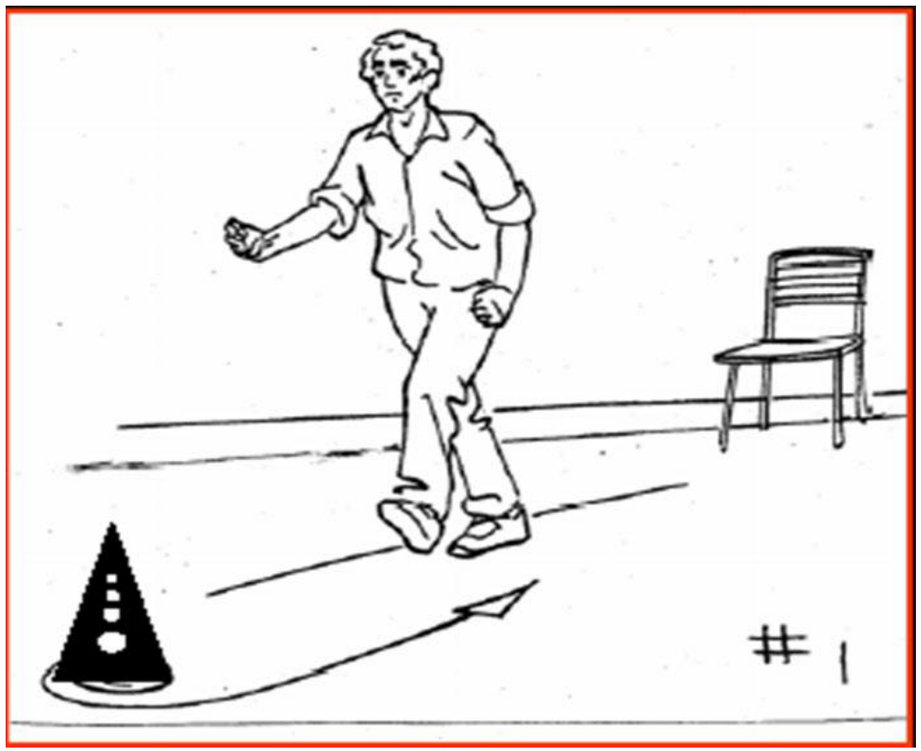
Chair Stand Norms

	Women				Men			
% Rank	60-64	65-69	70-74	75-79	60-64	65-69	70-74	75-79
90	20	18	18	17	22	21	20	20
80	18	16	16	16	20	19	18	18
70	17	15	15	14	19	18	17	16
60	16	14	14	13	17	16	16	15
50	15	14	13	12	16	15	14	14
40	14	13	12	12	15	14	13	13
30	12	12	11	11	14	13	12	12
20	11	11	10	9	13	11	11	10
10	9	9	8	8	11	9	9	8

Chair Stand

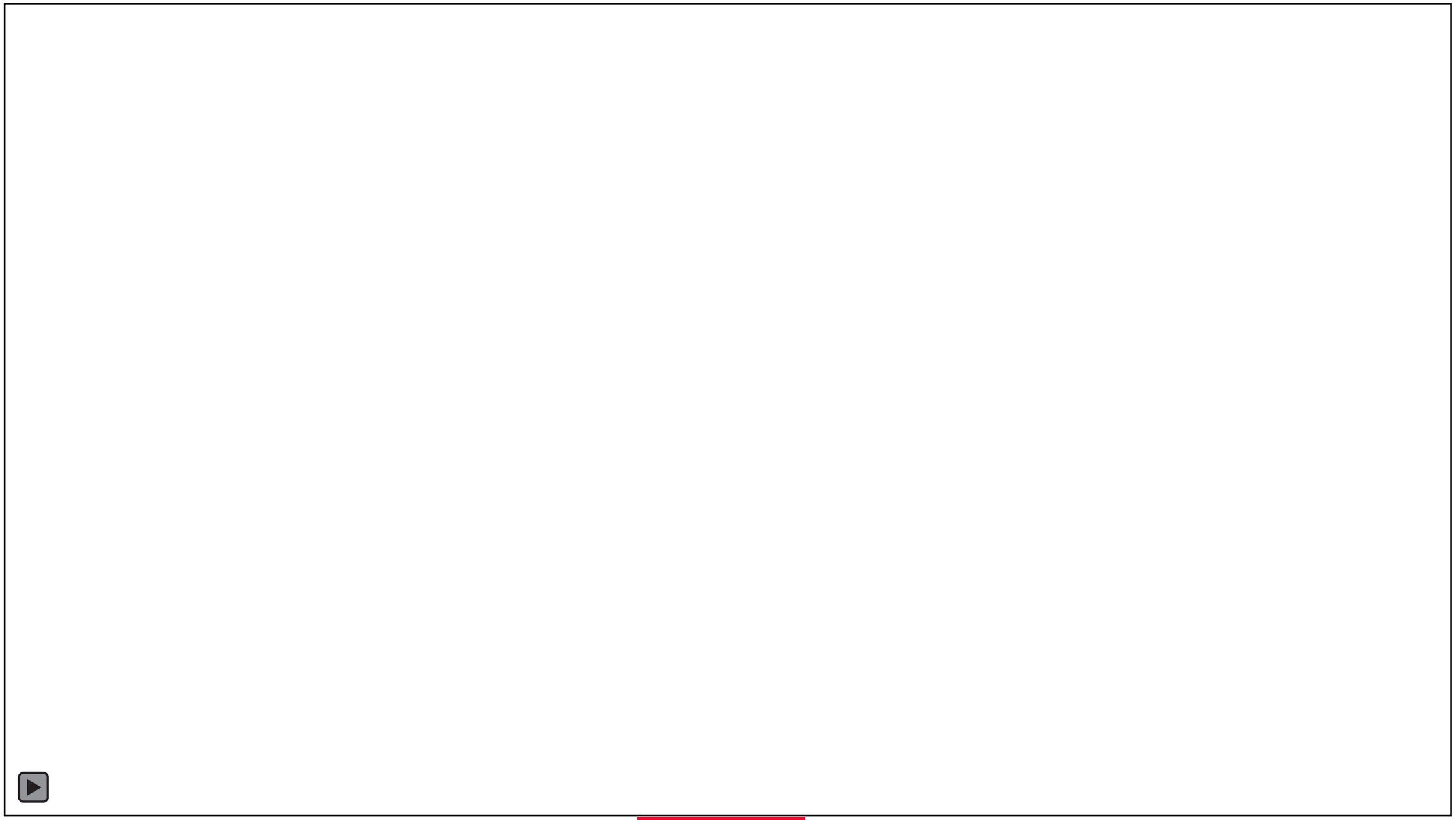
8’ Up and Go

- Assesses agility/dynamic balance
- How long it takes a person to rise from a chair, walk around a cone 8’ (2.44m) away and return to their seat
- Older adults who required greater than 8.5 seconds to complete the UG were classified as fallers.
- Overall prediction rate of classification was 82%.



8’ Up and Go Norms

	Women				Men			
% Rank	60-64	65-69	70-74	75-79	60-64	65-69	70-74	75-79
90	3.7	4.1	4.0	4.3	3.0	3.6	3.6	3.5
80	4.2	4.6	4.7	5.0	3.6	4.1	4.2	4.3
70	4.6	5.0	5.2	5.5	4.0	4.5	4.6	4.9
60	4.9	5.3	5.6	5.9	4.4	4.8	5.0	5.4
50	5.2	5.6	6.0	6.3	4.7	5.1	5.3	5.9
40	5.5	5.9	6.4	6.7	5.0	5.4	5.6	6.4
30	5.8	6.2	6.8	7.1	5.4	5.7	6.0	6.9
20	6.2	6.6	7.3	7.6	5.8	6.1	6.4	7.5
10	6.7	7.1	8.0	8.3	6.4	6.6	7.0	8.3



8’ Up and Go

Berg Balance Scale

Description: 14-item scale to measure balance of the older adult in a clinical setting.

Equipment needed: Ruler, 2 standard chairs (one with arm rests, one without), footstool or step, stopwatch or wristwatch, 15 ft (4.57m) walkway

Time: 15-20 minutes
Scoring: Scale from 0-4. “0” indicates the lowest level of function and “4” the highest level of function. Total Score = 56

Interpretation:
41-56 = low fall risk
21-40 = medium fall risk
0 –20 = high fall risk

“Authors support a cut off score of 45/56 for independent safe ambulation”



Berg Balance Scale Items

TURN 360 DEGREES
INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.
( ) 4 able to turn 360 degrees safely in 4 seconds or less
( ) 3 able to turn 360 degrees safely one side only 4 seconds or less
( ) 2 able to turn 360 degrees safely but slowly
( ) 1 needs close supervision or verbal cuing
( ) 0 needs assistance while turning

PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED
INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touch the step/stool four times.
( ) 4 able to stand independently and safely and complete 8 steps in 20 seconds
( ) 3 able to stand independently and complete 8 steps in > 20 seconds
( ) 2 able to complete 4 steps without aid with supervision
( ) 1 able to complete > 2 steps needs minimal assist
( ) 0 needs assistance to keep from falling/unable to try

Berg Balance Scale Items

STANDING UNSUPPORTED ONE FOOT IN FRONT
INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the step length should exceed the length of the other foot and the width of the stance should be the subject's normal stride width.)
( ) 4 able to place foot tandem independently and hold 30 seconds
( ) 3 able to place foot ahead independently and hold 30 seconds
( ) 2 able to take small step independently and hold 30 seconds
( ) 1 needs help to step but can hold 15 seconds
( ) 0 loses balance while stepping or standing

STANDING ON ONE LEG
INSTRUCTIONS: Stand on one leg as long as you can without holding on.
( ) 4 able to lift leg independently and hold > 10 seconds
( ) 3 able to lift leg independently and hold 5-10 seconds
( ) 2 able to lift leg independently and hold ≥ 3 seconds
( ) 1 tries to lift leg unable to hold 3 seconds but remains standing independently.
( ) 0 unable to try of needs assist to prevent fall



Fullerton Advanced Balance Scale

Description: A 10-item scale used for more independent and fit clients or when clients score a 56/56 on the Berg Balance Scale

Time: 15-20 minutes

Equipment: Stopwatch, pencil, short ruler (12-inch), long ruler (36-inch), 6-inch high bench, masking tape, two high-density foam pads, metronome

Fullerton Advanced Balance Scale

10 tasks scored from 0-4 (max score 40):

- Stand with feet together and eyes closed
- Reach forward to retrieve an object (pencil) held at shoulder height with outstretched arm
- Turn 360 degrees in right and left directions
- Step up onto and over a 6-inch bench
- Tandem walk
- Stand on one leg
- Stand on foam with eyes closed
- Two-footed jump
- Walk with head turns
- Reactive postural control

Score ≤25/40 points indicates higher risk for falls

Fullerton Advanced Balance Scale

Stand on foam with eyes closed

( ) 0 Unable to step onto foam or maintain standing position independently with eyes open

( ) 1 Able to step onto foam independently and maintain standing position but unable or unwilling to close eyes

( ) 2 Able to step onto foam independently and maintain standing position with eyes closed for 10 seconds or less

( ) 3 Able to step onto foam independently and maintain standing position with eyes closed for more than 10 seconds but less than 20 seconds

( ) 4 Able to step onto foam independently and maintain standing position with eyes closed for 20 seconds

Two-footed jump

( ) 0 Unwilling or unable to attempt or attempts to initiate two-footed jump, but one or both feet do not leave the floor

( ) 1 Able to initiate two-footed jump, but one foot either leaves the floor or lands before the other

( ) 2 Able to perform two-footed jump, but unable to jump farther than the length of their own feet

( ) 3 Able to perform two-footed jump and achieve a distance greater than the length of their own feet

( ) 4 Able to perform two-footed jump and achieve a distance greater than twice the length of their own feet

Fullerton Advanced Balance Scale

Walk with head turns

( ) 0 Unable to walk 10 steps independently while maintaining 30^0 head turns at an established pace

( ) 1 Able to walk 10 steps independently but unable to complete required number of 30^0 head turns at an established pace

( ) 2 Able to walk 10 steps but veers from a straight line while performing 30^0 head turns at an established pace

( ) 3 Able to walk 10 steps in a straight line while performing 30^0 head turns at an established pace but head turns less than 30^0 in one or both directions

( ) 4 Able to walk 10 steps in a straight line while performing required number of 30^0 head turns at established pace

Reactive postural control

( ) 0 Unable to maintain upright balance; no observable attempt to step; requires manual assistance to restore balance

( ) 1 Unable to maintain upright balance; takes two or more steps and requires manual assistance to restore balance

( ) 2 Unable to maintain upright balance; takes more than two steps but is able to restore balance independently

( ) 3 Unable to maintain upright balance; takes two steps but is able to restore balance independently

( ) 4 Unable to maintain upright balance but able to restore balance independently with only one step

MCTSIB

Modified Clinical Test of Sensory Interaction in Balance

Purpose: To Screen for Vestibular Hypofunction

Test in Four Conditions for 30 seconds:

- Eyes Open Stable EOS
- Eyes Closed Stable ECS
- Eyes Open Unstable EOU
- Eyes Closed Unstable ECU

Cross arms over chest, Stand erect, Shoulder-width stance

Unstable Surface = 2 high density foam pads

Limitation: Cannot identify a deficit in one specific system



Functional Movement Screen



1. Squatting



2. Stepping



3. Lunging



4. Reaching



5. Leg Raising



6. Push-up



7. Rotary Stability

Common Limitations in Older Adults

- Ankle Dorsiflexion
- Thoracic Mobility
- Shoulder Mobility
- Trunk/Core Stability
- Glute Activation (aka Dormant Butt Syndrome)

Hierarchy of Functional Aging


ELITE ATHLETE
FULLY FIT
SEMI FIT
HIGHER IND
LOWER IND
PRE-FRAIL
FRAIL
DEPENDENT
01
02
03
04
05
06
07
08
HIERARCHY OF FUNCTIONAL AGING
FAI
FUNCTIONAL AGING INSTITUTE

Hierarchy of Functional Aging

Elite: Top performer (<1%) in most/all physical domains (sports competition, high-risk and power sports, performance-focused exercisers)

Physically Fit: Well-above average performer in most/all domains (moderate to heavy physical work, endurance sports and games, regular exercisers)

Semi-Fit: Well-above average in one particular domain (e.g. CV fitness) but lower in other domains

Higher Independent: Average to above average in most domains (light to moderate physical work, low physical demand activities, can pass all IADL's, may be low-intensity exercisers)

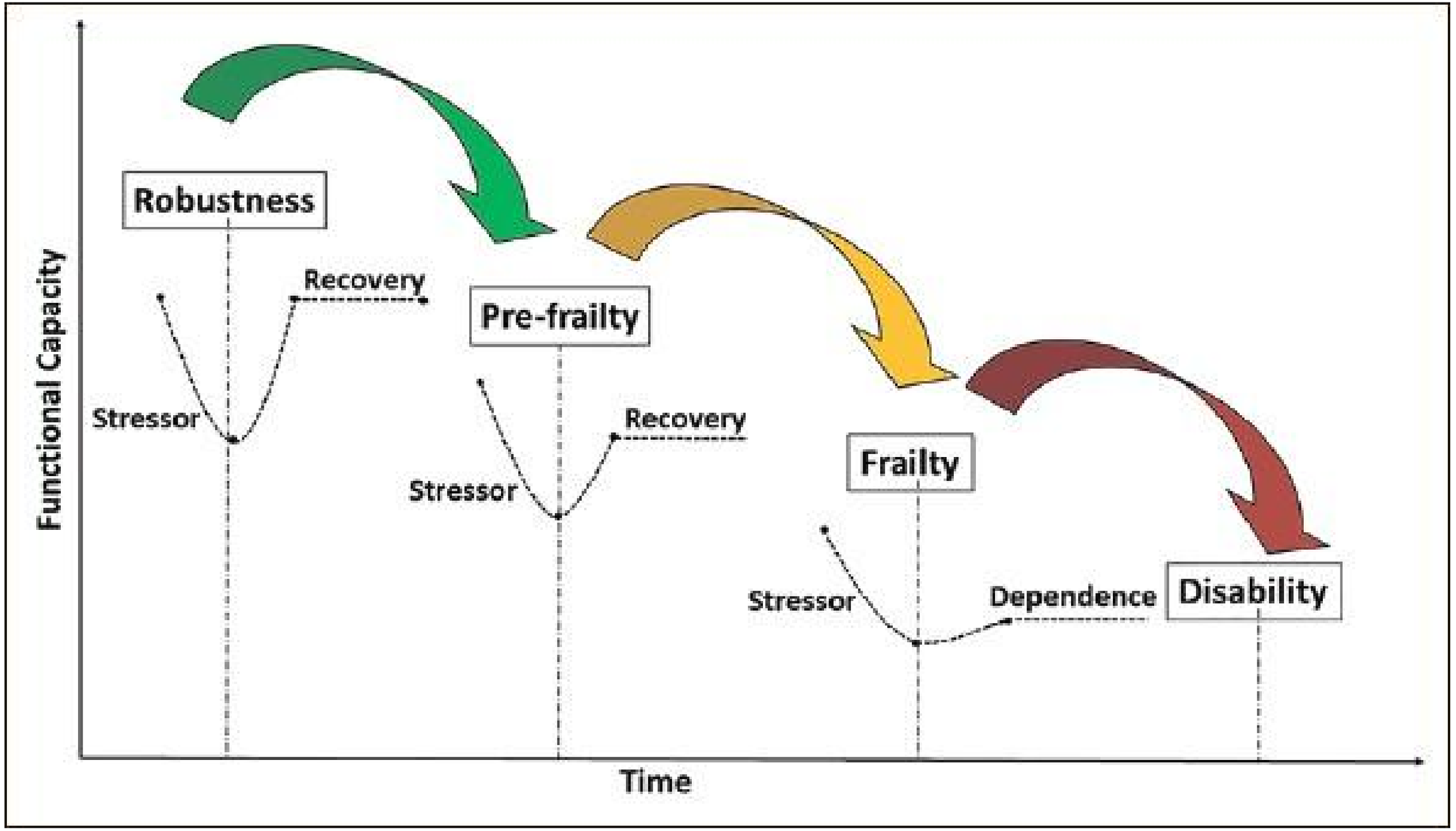
Lower Independent: Average to below average in most domains (very light physical work, mostly inactive, non-exerciser)

Pre-Frail: Meets 1-2 of the frailty criteria, high risk of frailty, cannot pass all IADL's

Frail: Meets frailty criteria (can pass all BADL's but may need help with IADL's)

Dependent: Cannot pass some or all IADL's or BADL's (walking, bathing, dressing, eating, transferring), needs home or institutional care




Functional Capacity
Robustness
Recovery
Stressor
Pre-frailty
Recovery
Stressor
Frailty
Stressor
Dependence
Disability
Time

Functional Aging Training Model
Process, Philosophy, Principles

FATM Process

1. Perform an in-depth health history interview to glean all pertinent medical information including the client's exercise experience and functional goals;
2. Administer the appropriate screening and fitness assessments to determine the client's functional level (according to the Hierarchy of Functional Aging) and to identify deficits across the 6 functional domains (and their subdomains);
3. Create a training program that prioritizes their specific deficits while simultaneously addressing as many of the other domains and subdomains as possible and considers their health conditions;
4. Perform ongoing qualitative assessment to determine what tweaks or changes (including progressions and regressions) need to be made to their program in order to keep them moving successfully towards their functional goals;
5. Perform follow-up assessments on a periodic basis as needed in order to gauge progress and update their program appropriately.

FATM Philosophy: The 4 Cornerstones

1. An in-depth UNDERSTANDING of the aging process and its implications for exercise
2. A RECOGNITION of the desires, goals and aspirations that accompany the third age
3. A strong BELIEF that people can be fit, healthy, vibrant and functional at any age
4. An APPROACH to exercise that is grounded in evidence and honed with experience.

FATM Philosophy: The 2 Pillars

Specificity

- SAID – Specific Adaptations to Imposed Demands
- How you train is how you gain
- Correlation of the exercise to the functional goal

Progressive Overload

- Overload is necessary for adaptation to occur (at any age)
- This is true for every impairment-level domain and factor
- Once adaptations occur the stimulus must be progressed in order to stimulate further improvement

FATM: The 7 Key Principles

1. Assess, prioritize and train ALL components of function – Train the 6 Domains
2. Make purposeful decisions for every aspect of training
3. Integrate movement patterns (train in all 3 planes) to prepare for functional demands
4. Include isolation-type exercise movements as supplementary and complementary rather than the primary component of the routine
5. Perform exercise movements in a seated position only when absolutely necessary or when it serves a specific purpose
6. Order the session according to energy level with more complicated, multi-component movements occurring earlier and less complicated, isolation-type movements occurring later
7. Maximize client safety and success by taking a holistic approach to training

FATM Philosophy: The Functional Continuum



Less Functional

More Functional

Isolation vs. Integration

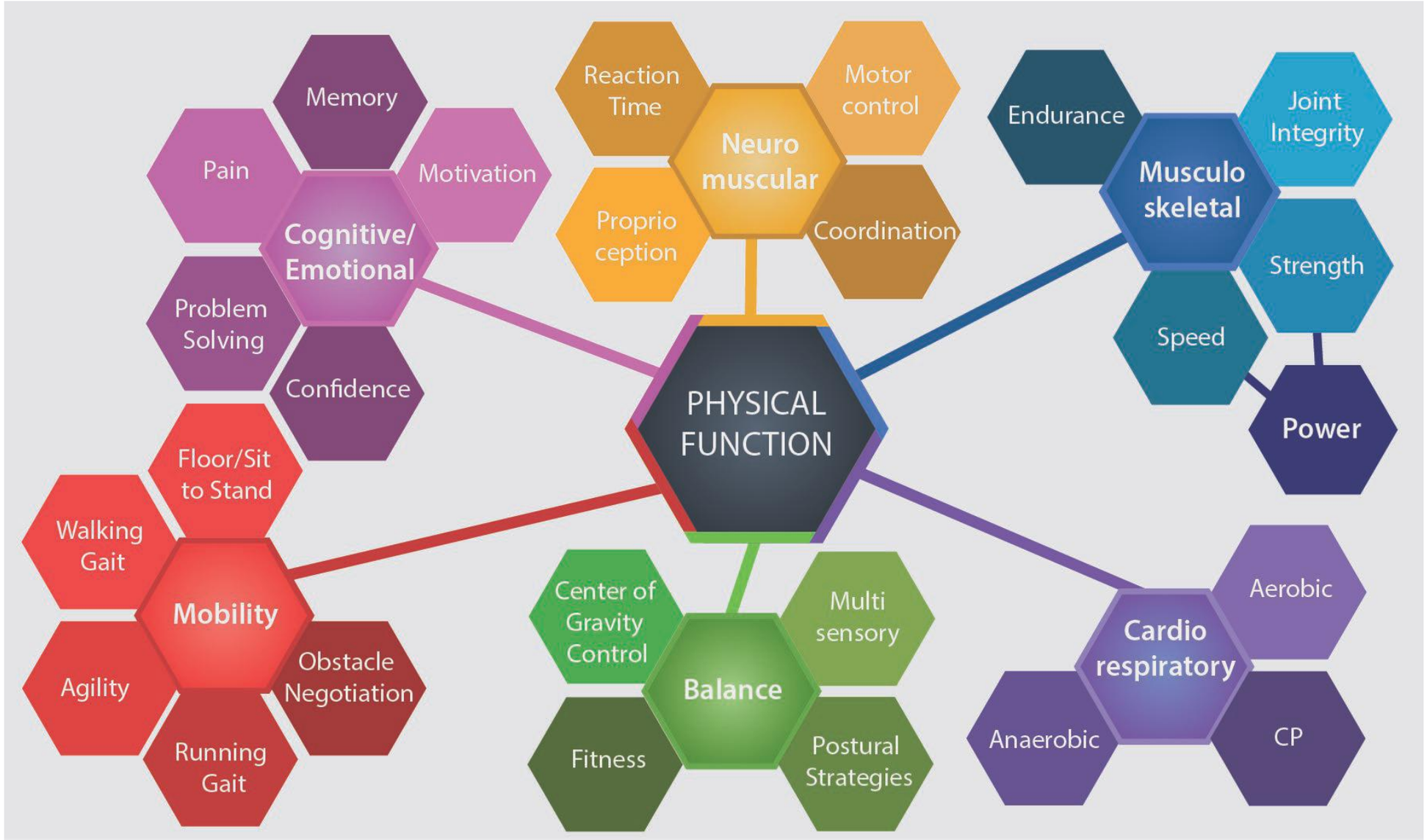
Functional for whom?
"Function" is both person and context-dependent

Discuss the question:

Is a seated dumbbell bicep curl an effective functional exercise for an older adult?

FATM Exercise Strategies

Domain-Specific Strategies



The Cardiorespiratory Domain

Cardiorespiratory Training

- Recommendations are similar to those for adults of all ages
  - Accumulate 150+ min of moderate or 75+ min of vigorous exercise each week or a combination
- Modality depends on chronic conditions, goals and personal preferences
- Intensity can be measured several ways:
  - Heart Rate
    - Calculate Max Predicted Heart Rate: 208-(0.7xage)
  - Rating of Perceived Exertion
  - Talk Test
- High-Intensity Interval Training is safe and effective
- Cardiometabolic Training

The Musculoskeletal Domain

Almost ANY Type of RT is Beneficial for Older Adults

Machines
Free Weights
Elastic Resistance
Hydraulics
Body Weight
Pneumatic
Aquatic
Manual

Concentric
Eccentric
Isometric

Isolated
Compound

They CAN Load Heavy but They May Not NEED To



According to LOTS of Research

(Raymond 2013; Silva 2014; Borde 2015; Csapo 2016)

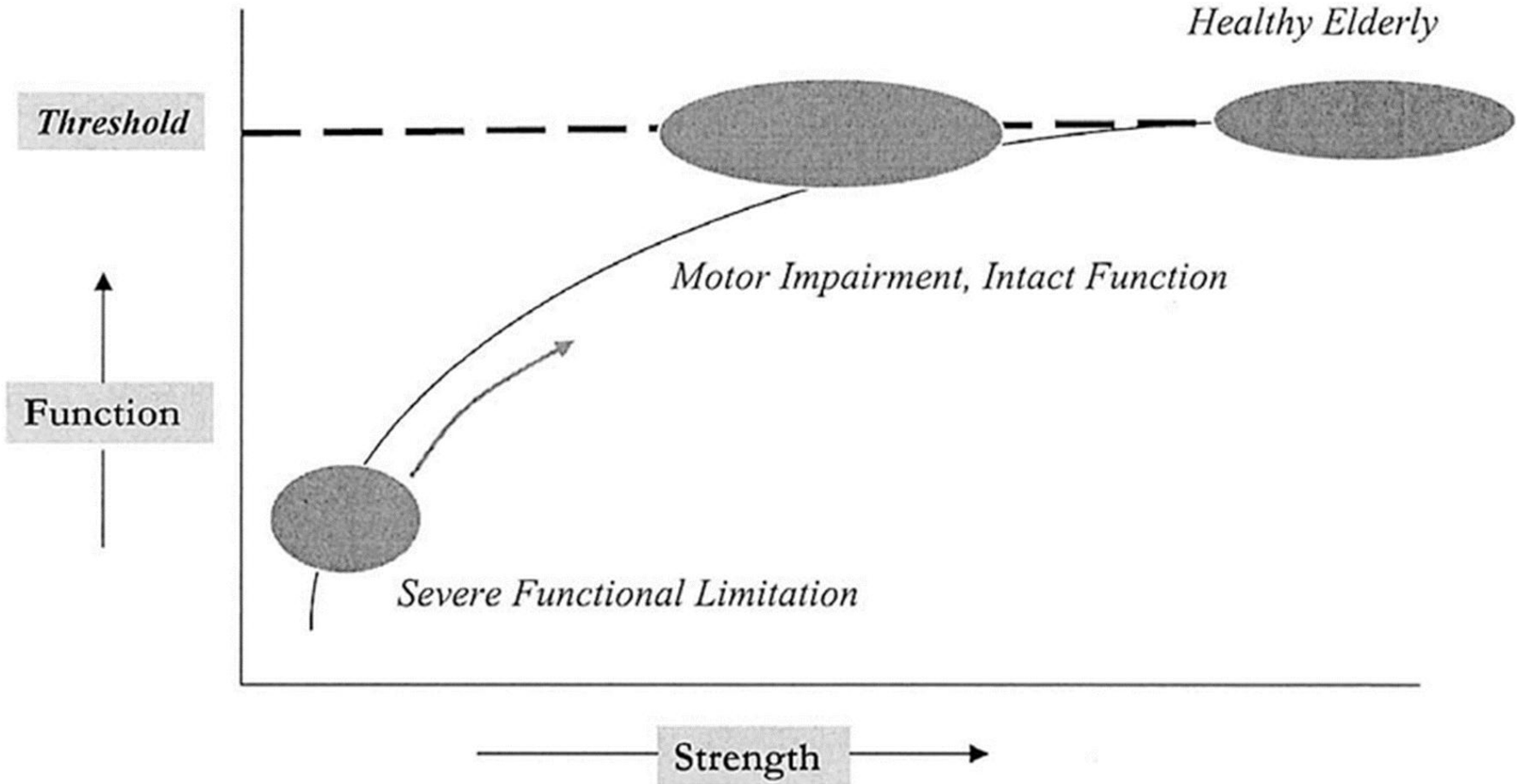
Lifting heavy (80% 1RM) appears to be safe for older adults

Higher intensities appear to improve strength more than low to moderate intensities in the short-term

After about 1 year of lifting lower intensities (40-50% 1RM) improve strength nearly as much as higher intensities (80% 1RM) as long as volume is equal

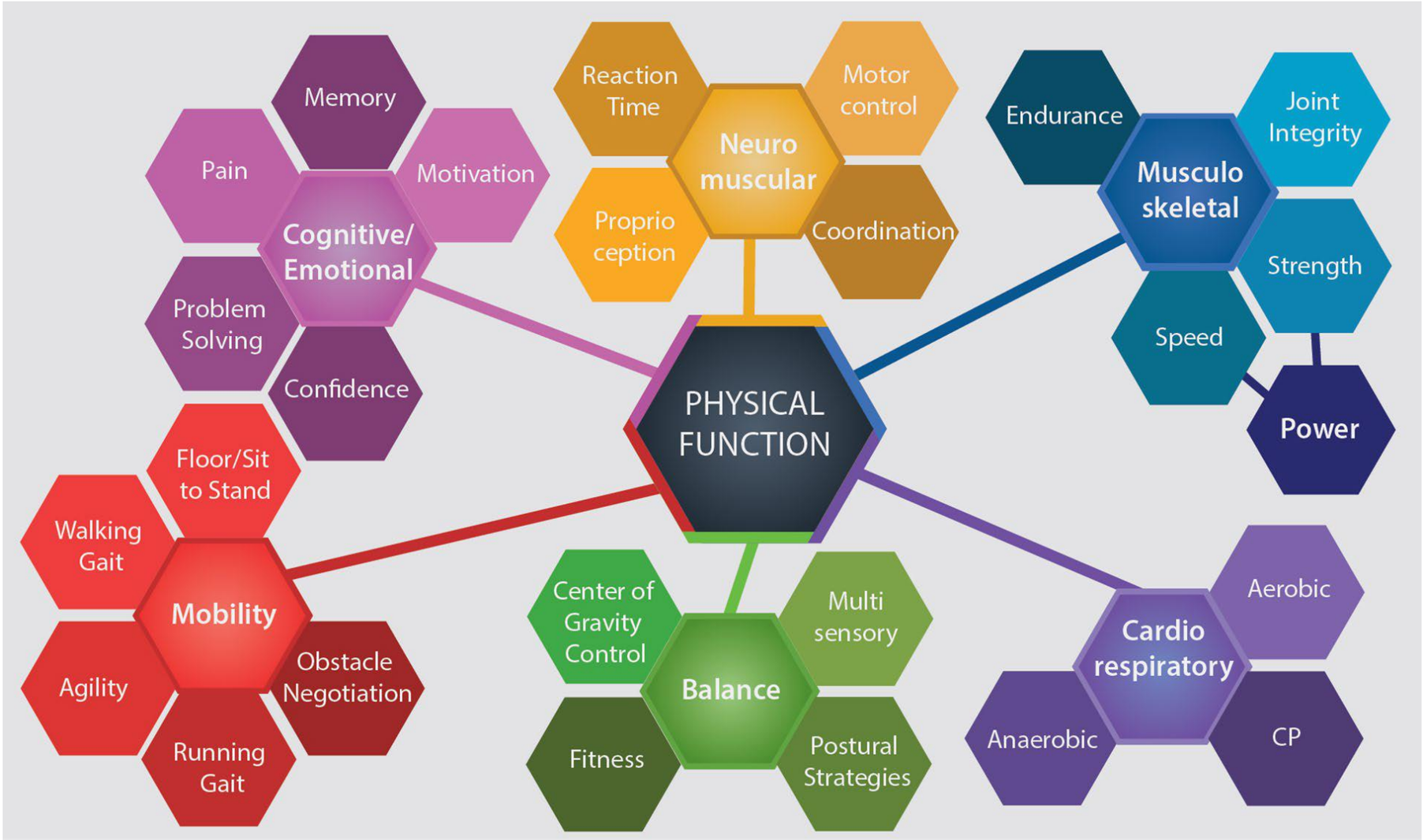
Higher intensities do not appear to improve functional tasks better than lower intensities – they are both effective (strength threshold)

Strong Enough is Strong Enough



Do Certain Functional Tasks Require More or Less Strength to Complete Successfully Compared to Other Functional Tasks?

Progressive Overload Means More than Increased Weight

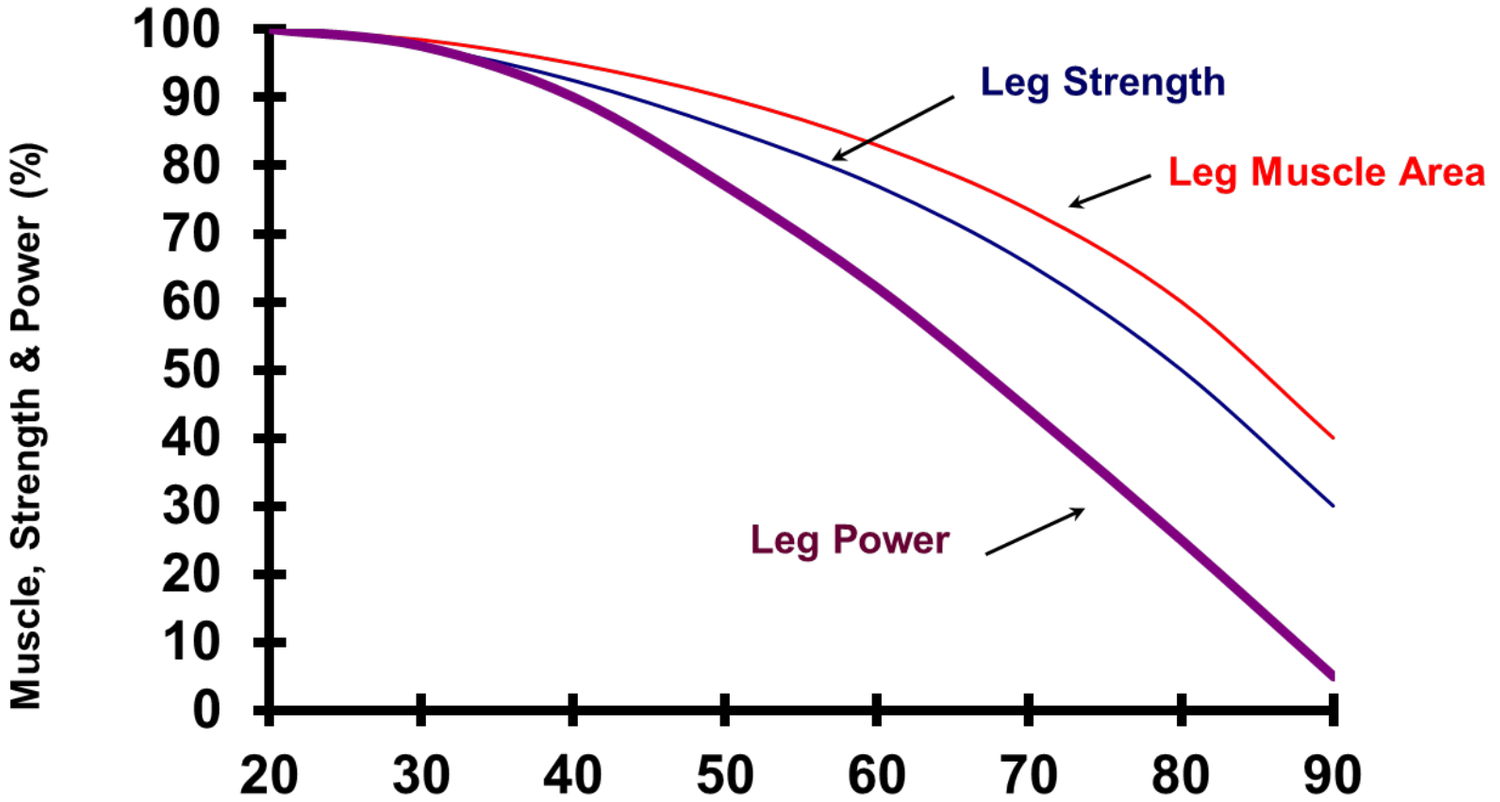


This is Inspiring But…

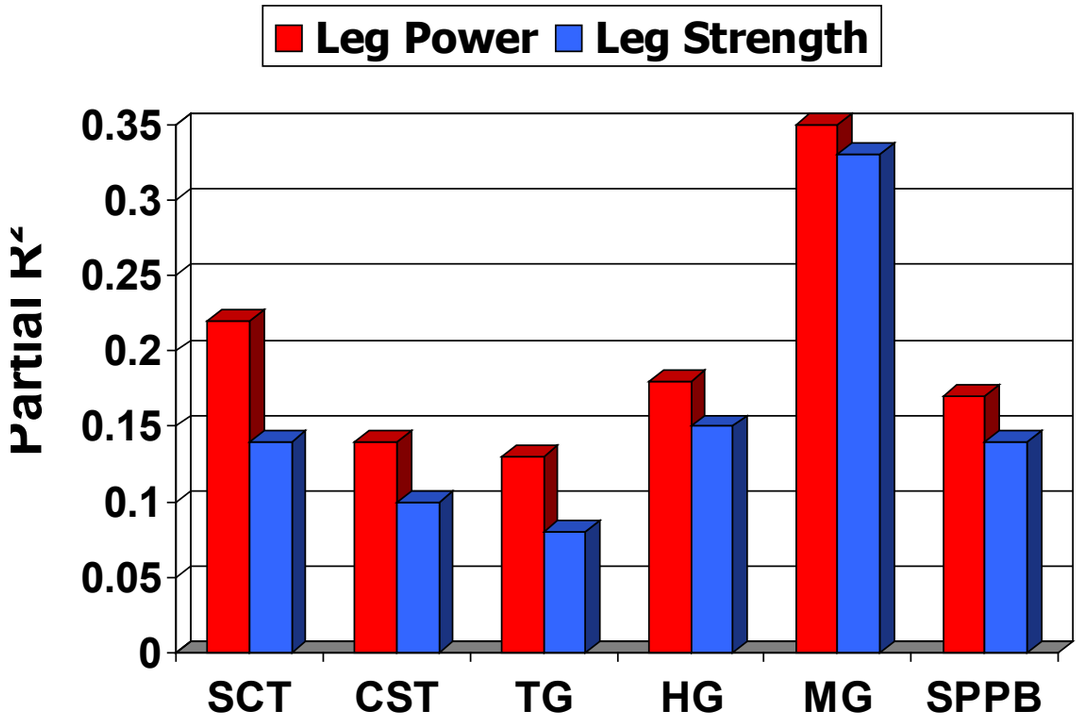




Power is the New Strength and It's Essential



Strength, Power and Function



SCT = Stair Climb Time
CST = Chair Stand Time
TG = Tandem Gait
HG = Habitual Gait
MG = Maximal Gait
SPPB = Short Physical Performance Battery

Bean (2002), *The relationship between leg power and physical performance in community dwelling mobility limited older people*

Functional benefit of power training for older adults

(Hazell et al 2007; Journal of Aging and Physical Activity, 15; 349-359)

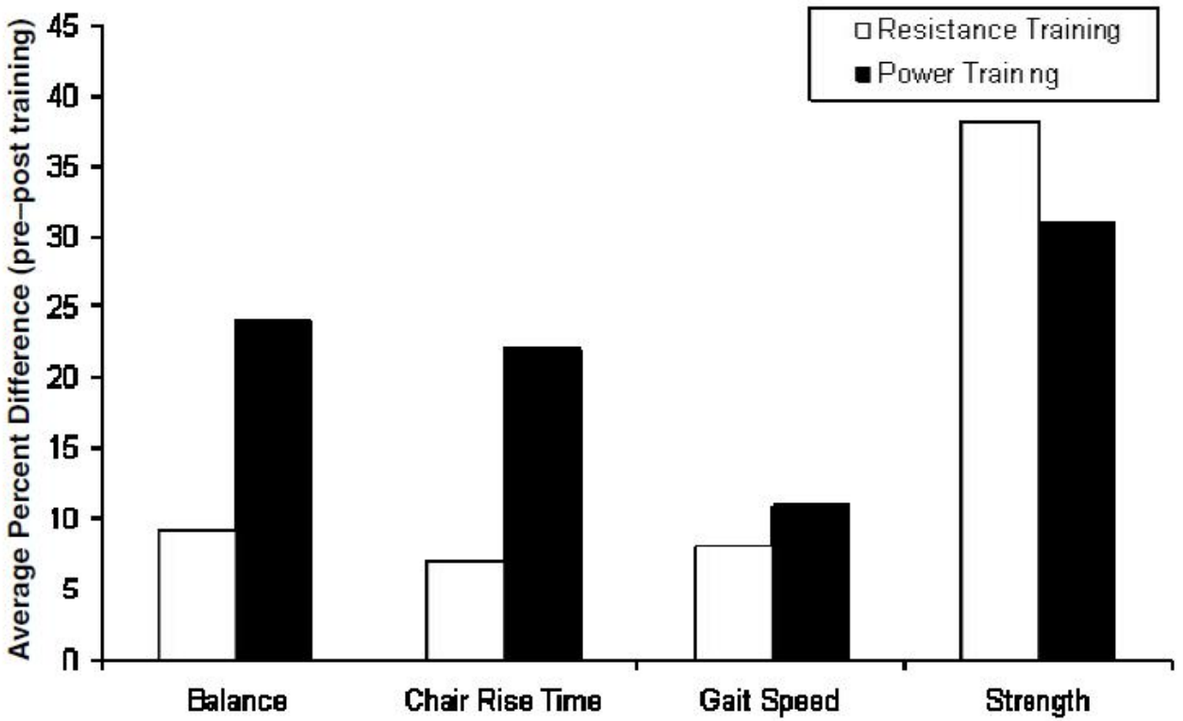


Figure 1 — Differences for activities of daily living and strength reported from a variety of studies on older adults subsequent to 8–16 weeks of resistance or power training. Values are calculated differences and the subsequent averages for resistance-training studies (Brandon, Boyette, Gaasch, & Lloyd, 2000; Fiatarone et al., 1994; Jette et al., 1999; Judge et al., 1994; Schlicht, Camaione, & Owen, 2001; Singh et al., 1997; Skelton & McLaughlin, 1994; Skelton et al., 1995; Westhoff, Stemmerik, & Boshuizen, 2000) and high-velocity-training studies (Bean et al., 2004; Earles et al., 2001; Fielding et al., 2002; Henwood & Taaffe, 2005; Hruda et al., 2003; Kongsgaard et al., 2004; Sayers et al., 2003).

Power Training for Older Adults

- “As fast as you can” on the concentric portion (explode)
- “Slow and controlled” on the eccentric portion (load)
- Lower loads will allow the client to move faster and may be better for function
- Moving faster reduces movement accuracy
- If the person does not perform the movement well when they do it slowly then do not speed up the movement
- Spot clients closely, especially for falls

Power Exercise Categories

Lifts

Throws

Jumps

Starts/Stops

Exercise Movements for Power Development

Frail/Lower Independent

- Leg Press
- Band LE/LC
- Power Stands
- Bug Stomps
- Step Ups/Stair Climb
- Get Up and Go
- Chair Drills
- Red Light/Green Light
- Dot Drills
- Line Drills

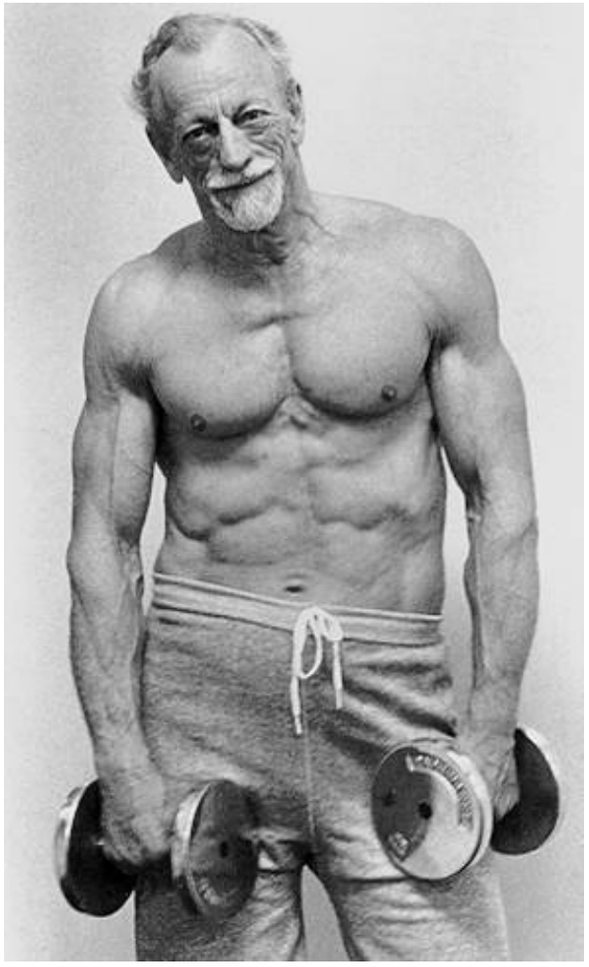
Independent/Average

- Power Stands
- Jumps
  - Vertical
  - Broad
- Line Hops
- Short Sprints
- What Time is It?
- Jumping Jacks
- Wall Balls
- Fast Feet
- Agility Ladder
- Kicks
- Punches

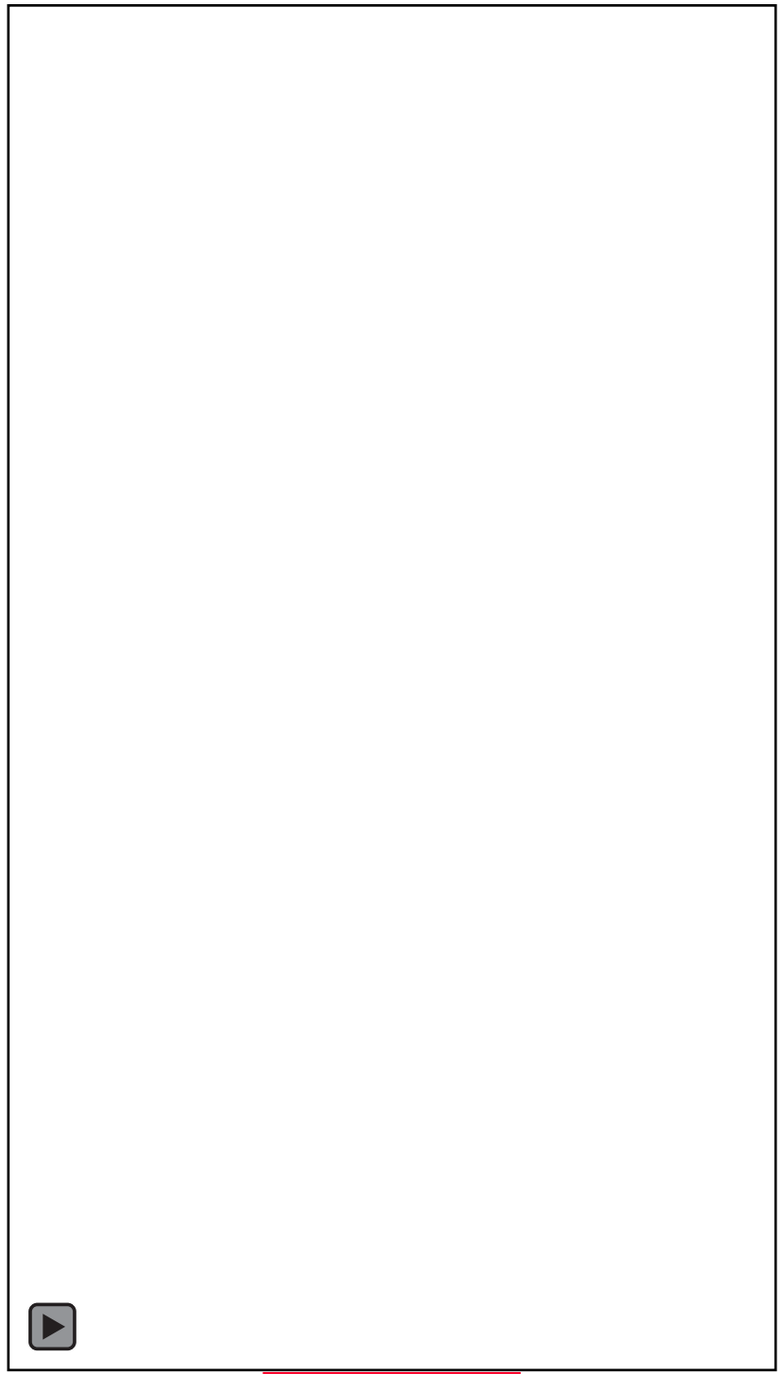
Exercise Movements for Power Development

Fit/Athletic

- Plyometrics*
  - Bounding
  - Scissor Jumps
  - Box jumps
- Med Ball Throws
- Power Punch
- Power Row
- Hang Cleans
- Push Press



It is important to teach clients how to jump and how to land.



Follow the 7 Fundamental Movement Patterns

1. Squat
2. DL
3. Lunge
4. Push
5. Pull
6. Rotation/Anti-rotation
7. Gait/Carry

Make your goal movement rather than just weight lifted

Short Foot

Benefits

- Helps to create a stable “base” when standing
- Immediately improves balance and foot control

Instructions

- With shoes and socks off have client place their foot on the ground
- Find a balance between the heel, ball of big toe and ball of little toe (this is the foot tripod)
- Lift and spread out your toes
- Place toes on the ground and try to “pull” the floor towards your heel
- Pay special attention to anchoring the big toe
- Notice that the arch of the foot has lifted
- Practice this in double and single leg stance positions

Hinge/Deadlift Pattern

This is a key movement pattern that all older adults should learn.

Proper form is dependent on:

- Hip mobility
- Hip hinge pattern
- Core/trunk stability

Teach:

- Neutral Spine
- Bracing
- Hip Flexion vs Spinal Flexion

Teaching the Hip Hinge

Form from standing:

- Hips move back ("shut the file cabinet") while trunk leans forward
- Trunk leans forward as far as their hip mobility allows while maintaining a neutral spine (no spinal hinges)
- Head should move forward with trunk so that vision naturally moves downward
- Knees should remain slightly flexed
- Shins stay vertical throughout movement

Deadlift Tips

Use Short Foot to establish a good base

Start “top-down” (from standing)

A light load can help them learn the pattern (it provides proprioceptive feedback)

When moving to “bottom-up” bring weights to them (use blocks or steps)

Depth depends on their posterior chain mobility

Make sure they have good hip mobility and core stability before loading heavy (“earn the right”)

Deadlift Movements

KB/DB Top Down

KB/DB Bottom Up

Resistance Band (around feet)

Barbell

Single-Leg

Traditional vs Straight-Legged

Squat Pattern

A chair stand and a squat are similar but are NOT the same movement pattern

Proper squatting is dependent on:

- Hip mobility
- Knee mobility
- Ankle mobility
- Core stability
- Squat pattern

Squat Set Up

- Feet shoulder width apart or a little wider (experiment)
- Toes straight ahead or pointed slightly outwards like "11:00 and 1:00" or "10:00 and 2:00" (experiment)
- Grip (short foot) or "screw" feet into the ground before initiating movement
- Posture is tall and upright with spine in neutral position

Due to variations in individuals' anatomic structures some people can squat more naturally.

No ONE squat pattern works for everybody.

Squat Movement

- Hips drop down while knees *move* forward and trunk leans forward slightly
- Knees rotate outward slightly (moving towards second toe) opening up the hips ("drop into the hole")
- Depth is as low as a person can go while:
  - Remaining pain free
  - Maintaining proper joint alignment
  - Avoiding the "buttwink"
- Weight remains balanced *over* mid-foot so weight stays distributed on the whole foot
- Spine must maintain neutral or slightly extended position (no rounding or spinal hinges) at all times
- Try to maintain a "chest up, butt down" position
- Hips and shoulders rise simultaneously

Squat Movements

Chair Stand

Bodyweight (Air) Squat

KB/DB Goblet Squat

Mini-Band Squat

Goblet with Mini-Band

Barbell

Squat vs Deadlift

Squat

- More ankle and knee mobility
- Hips primarily move vertically
- Butt drops low
- Shins tilt forward (knees can extend over toes)
- Chest stays "up" more
- More knee dominant movement (quads, glutes, back)

Deadlift

- More hip mobility
- Hips primarily move horizontally
- Butt stays high
- Shins stay vertical
- Chest folds (hinges) forward
- More hip dominant movement (glutes, back, quads)

Lunge

Proper lunge pattern is dependent on:

- Hip mobility (both anterior and posterior)
- Balance
- Adequate strength
- Core/trunk stability

Start with a stationary split squat

- Use balance aids as needed
- Place a foam pad under rear knee
- Stack additional pads to reduce depth

Lunge Movements

Split Squat

Stationary or Walking Front Lunge

Back Lunge

Side Lunge

Curtsy/Bowler’s Lunge

Lunge with Twist/Reach

Push/Press and Pull/Row

- Both are great for training core/trunk stability when performed unsupported
- Both are fundamental to many functional activities, tasks and sports
- Requires proper bracing and breathing
- Options:
    - Vertical or Horizontal
    - Unilateral or Bilateral
    - Body Position
    - Equipment

Anti-Rotation

- Essential for core/trunk stability in the transverse plane and helps to “spare the spine” from compressive forces
- Builds muscle endurance
- Requires proper bracing and breathing

Examples:

- Palof Press
- Half-kneeling chops/lifts
- Planks with arm or leg lift
- Bird Dog
- Single Leg Bridge
- Single Arm Horizontal Press/Row

Three Dimensional Core Stability Training

Sagittal

- Anterior chain
- Posterior chain

Frontal

- Left lateral chain
- Right lateral chain

Transverse

- Anterior Right
- Anterior Left
- Posterior Right
- Posterior Left

Combination

Anti-Extension
Anti-Flexion
Anti-Rotation

Trunk Muscle Co-contraction

- “Superstiffness” is a technique that engages numerous muscle groups simultaneously to stabilize the spine
- The varying orientations of the muscle groups provide a three-dimensional stability to hold the spine in neutral
- Synergistic effect: When entire ab wall is activated the three layers bind together to create a stiffness that is greater than the sum of its parts
- Factors:
  - Spine must be in neutral
  - Abdominal bracing: activation of all three layers of the abdominal wall plus lumbar extensors
  - “Guy wire” effect of muscles: wide base of support; need stabilizing compression and resistance of shear in direction of force

Stabilization

Abdominal Bracing

- Co-contraction of all abdominal muscles
- Maintains wide base for abdominal muscles (guy wires)
- Increases spinal stability
- Locks pelvis to ribcage to resist torsional forces
- Shallow breathing should be maintained (can simultaneously increase IAP)
- Check for co-contraction by palpation of rectus and obliques

Abdominal Hollowing

- “Sucking in” of transverse abdominis
- Obliques fall silent
- Narrows base for abdominal muscles
- Greatly reduces IAP
- Decreases spinal stability
- Creates energy leaks
- Increases injury risk

Core Stability - Basic Floor Work

Bird Dog

Dead Bug

Glute Bridge

Planks

- Front
- Side
- Rolling

Moves to Consider Avoiding/Modifying

Rotation away from midline *<u>with resistance</u>*

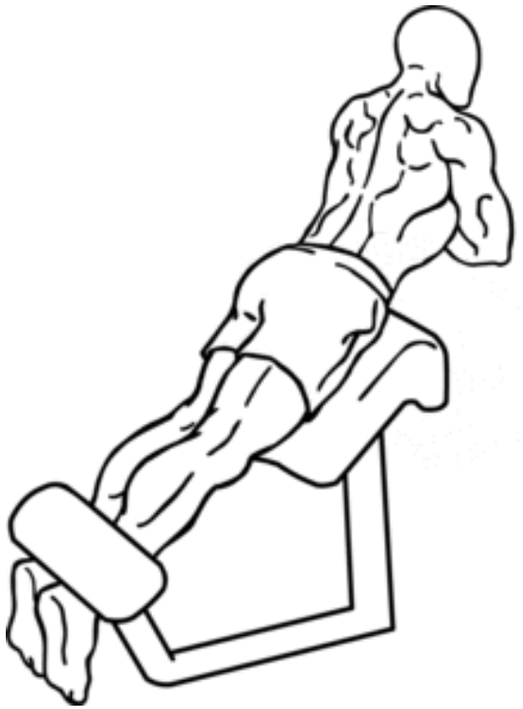
- Cable rotation
- Twisting med ball crunch (Russian Twist)
- Twisting med ball throws

Excessive spinal flexion

- Sit-Up (any leg position)
- Unsupported crunch
- Weighted side bend
- Ab crunch machine

Superman/Swimmers

Roman chair extension



Joint Mobility and Flexibility

Ankle Dorsiflexion

Straight Leg Calf Stretch

Step Stretch

Bent Knee Calf Stretch

Bent Knee Calf Stretch with Posterior Resistance

Foam Rolling for Calves

Whole Body Rotation

Hip Mobility

Straight Leg Hamstring Stretch

Pigeon Stretch

Perfect Stretch

Runner's Lunge

Box Stretch

Couch Stretch

Butterfly Stretch

Gentleman's Stretch

Frog

Bretzel

Thoracic Spine Mobility

Cat/Cow

Low Cobra

T-Spine Rotations in Quadruped with Lumbar Lock

Open the Book in Side-Lying

Child's Pose

Puppy Pose

Programming for the Musculoskeletal Domain

Muscle Strength

- 2-3 sets of 1-2 multi-joint exercises per muscle group
- 6-12 repetitions
  - Training to failure is not necessary
- 50-85% 1 RM
- 2-3 sessions per week
- New exercisers can start with 1 set

Muscle Power

- 40-60% 1 RM
- 2-3 sessions per week

The Neuromuscular Domain

Neuromuscular Training

- Diaphragmatic Breathing
  - Supine
  - Prone (Crocodile Breathing)
- Segmental Rolling
  - Prone to Supine
  - Supine to Prone
- Crawling
  - Contralateral movement that mimics gait
- Reaction Drills
- Fine Motor Skills

Front Crawling

- Quadruped position with neutral spine and eyes fixed a few feet in front of the hands
  - Stack shoulders over hands
  - Stack hips over knees
- Fingers are spread and ankles are plantarflexed
- Brace core slightly
- Hand and opposite leg move simultaneously – the timing is critical
- Hand and knee lift just high enough to clear the ground
- Trunk stays in same neutral spine position
- Back knee should almost touch the hand on the same side
- Reverse sequence to crawl backwards

The Balance Domain

Key Balance Concepts

Base of Support: the area beneath a person that includes all points of contact with the ground

Center of Gravity: the center of a person's mass which is usually below the umbilicus and 2-3 inches towards the spine

Limits of Stability: the furthest an individual can move their center of gravity over their base of support before they lose their balance

Center of Gravity Control (Postural Control): the ability to keep one's center of mass within their base of support during either static or dynamic activities

Balance Training Recommendations to Prevent Falls in Older Adults

1. Exercise must provide a moderate to high challenge to balance
2. At least 2 hours per week for 6+ months
3. Exercise must be maintained
4. Target the general community and those at high risk of falls
5. 1-1, group or home-based setting
6. Walking is not necessary but can be included
7. Strength training is not necessary but may be included
8. Address other risk factors (refer when necessary)

Evidence-Based Balance Programs

Otago Exercise Program

FallProof™ Balance and Mobility Enhancement

Tai Chi

FallProof™ Balance Program

1. Center of Gravity (Postural) Control
2. Postural Strategies
    1. Ankle
    2. Hip
    3. Step
3. Multisensory
    1. Visual
    2. Vestibular
    3. Somatosensory
4. Gait Pattern Enhancement and Variation
5. Fitness Programming

Postural Control Exercises

Seated

- Weight Shifting (“nose over toes”)
- Leans/Reaches

Stability Ball

- Hip movements (front/back, side to side, circles)
- Leans-Reaches

Standing

- Weight Shifting
- Leans/Reaches
- 3 Dot Drill
- 4 Dot Drill
- Multi-directional stepping

An “easy” way to challenge postural control is to use a narrower stance like tandem or single-leg

Postural Strategies

Ankle
- Forward and Sideways Leans
- Ice Cream Cones

Hip
- Hip hinge
- Heel/Toe rocks
- Stand on half-foam roller (flat side down)
- Reach forward
- Catch objects

Step
- Giant steps
- Lunge
- Bug Stomps
- Sprinter Starts
- Fake Falls

In real-life older adults should use their ankle strategy first, hip strategy second and step strategy as a last resort to keep from falling

Otago Exercise Program

Backwards Walking
Walking and Turning Around
Sideways Walking
Tandem Stance
Tandem Walk

One-Leg Stand
Heel Talking
Toe Walking
Heel Toe Walking Backwards
Sit to Stand

The Mobility Domain

Balance and Mobility Training: Gait Exercises

Goal: Create an adaptable, flexible and efficient gait pattern

Marching
- Straight-leg
- In-line/Tandem
- Crossover/Braided
- Backwards
- Pause
- Dog/Bush

Walking
- Narrow/Wide
- Heels/Toes
- Backwards/Sideways
- Turning

Obstacle Negotiation
- Sleeping Dog
- Steps
  - Up/Down
  - Swing Through
  - Over

Cue their vision to focus on an object at eye level instead of looking at their feet

Advanced Mobility: Agility Training

- Fast Feet over a line
- Four square stepping
- Switch feet (forward and backward)
- Hopping over a line
- Ladder drills
- Cariochoe (grapevine)
- Cone drills
- Quickly get up from the floor


FAI

The Cognitive-Emotional Domain

Open



Closed

Environment is constantly changing

Movements have to be continually adapted

Predominately externally paced

Stable & predictable environement

Movements have a clear beginning & end

Performer knows what to do & when





Training for Cognition

Four Primary Cognitive Domains

- Memory – encoding, storage and/or retrieval of information
- Attention – attending to a stimulus in focused, selective, switching or divided capacities
- Processing Speed – the length of time required to respond to one or more stimuli
- Executive Function – more complex cognitive functionals such as planning, organizing or impulse control

Four Primary Client Types

- Worried Well – healthy but still worried about their brain health and want to protect it
- Subjective Cognitive Impairment – feel that their cognitive abilities are starting to deteriorate
- Mild Cognitive Impairment
- Dementia

Exercise for Cognition

- Exercise of any kind is good for the brain
- 150-300 min of moderate aerobic exercise plus resistance training is recommended
- Exercise that is combined with simultaneous cognitive demands may improve cognition more than physical or cognitive exercise alone
  - Sports are a great way to challenge physical and cognitive areas simultaneously
- The “cognitive load” refers to how mentally demanding a task is and it should be about 6-8/10
- Every 3-6 months adopt a new skill-based activity

Easy Ways to Challenge Cognition

- Coordination
  - E.g. Combined arm and leg movement
  - E.g. dance/step pattern
- Balance
- Agility
  - E.g. learn a new ladder drill
- Complexity
- Games
  - E.g. Catch a tennis ball with the hand I call out while standing on one leg
  - E.g. Use playing cards to have them perform different movements based on the card shown

Emotional

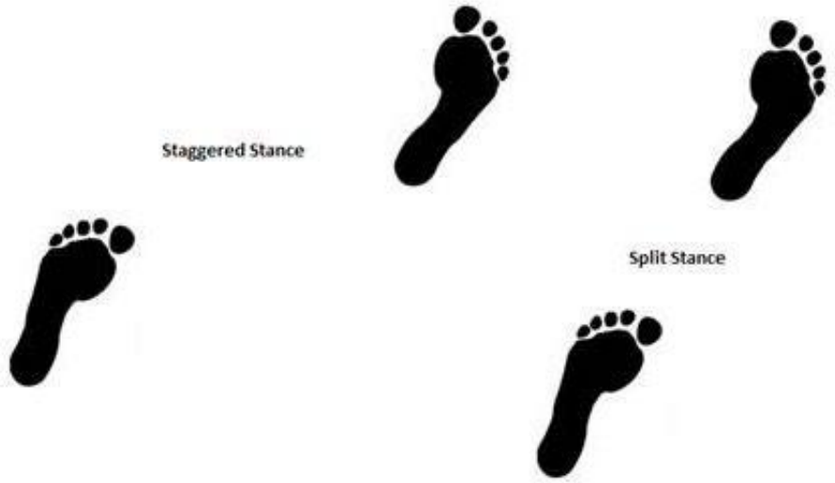
- Build Self-Efficacy
  - Start with success
  - Communicate what, how and why for an exercise
  - Prioritize safety
- Build trust
- Build relationships
- Express empathy
- Balance Confidence

Progressions and Regressions

Regression	Progression
Slower	Faster
Anticipatory	Reactive
Smaller ROM	Larger ROM
More Stable	Less Stable
Shorter Levers	Longer Levers
Less Complex	More Complex
Static	Dynamic
Less Resistance	More Resistance
Less Attentional Demand	More Attentional Demand
One Dimensional	Three Dimensional
Single Move	Sequenced Moves

Stance Positions in Standing

Shoulder-width
Feet Together
Semi-Tandem
Tandem
Braided (Crossed Feet)
Wide
Staggered
Split (aka inline)
Lunge
Squat
One-leg





Stance Positions on Floor

Half-Kneeling
Full Kneeling (aka tall kneeling)
Quadruped (hands and knees)
Pushup (high plank)
Plank
Prone (lying on stomach)
Supine (lying on back)
Supine with knees bent
Seated

Arm Movements

Bilateral – both arms move in same direction at same time

Unilateral – one arm moves, the other doesn't
*typically only the moving arm is loaded
*contralateral or ipsilateral

Alternating – one arm moves, then the other arm moves

Reciprocating – arms move in opposite directions at same time

Multidirectional – arms move in different directions

Speed and Tempo Variations

Speed: Slower to Faster
Tempo: Regular or irregular

Cueing: Self-paced, Snap, Clap, Verbal

Benefits:

- Higher velocity = higher power
- More acceleration and deceleration
- More challenging COG control
- Increases cognitive demands



The Exercise Session

Session Structure

READY – Prepare room and equipment, greet and check in on clients

SET – Movement preparation, mobility and warm-up

GO – The exercise session

READY – The cool-down

GO – Check in with client, say goodbye

Mobility Drills

- Foot and Ankle
  - Plantar stimulation with tennis/lacrosse ball
  - “Short foot” on two legs, one leg – with squat or deadlift pattern
  - Ankle pumping, circles, standing calf raise/toe raise
- Hip
  - Quadruped rocking in frog position
  - Supine lying hip rolls
  - Wide squat with weight shift
  - Rotational stepping
- Spine
  - Quadruped cat/camel, wag your tail, T-spine rotations
- Shoulder
  - “Flashers”, “flappers”, supine elbow presses, prone angels



FATM Program Design

Functional Program Design

- Prioritize Primary Areas of Individual Deficit for Significant Improvement
  - Assess the individual OR
  - Estimate based on their current functional level
- Address ALL of the Secondary Areas for Maintenance or Slight Improvement
  - Neuromuscular
  - Musculoskeletal
  - Cardiorespiratory
  - Balance
  - Mobility
  - Cognitive/Emotional
- For Efficiency Use Movements that Address Multiple Components Simultaneously
- Use Corrective Exercise Strategies as needed

The Exercise Program Should Be Tailored to the Client's Current Functional Level



Frailty Syndrome Defined

Three or more of the following characteristics (1-2 characteristics is called Pre-Frailty):

Unintended weight loss (at least 10 lbs or >5% body weight in prior year)
Muscle weakness (grip strength in lowest 20% for gender and BMI)
Exhaustion/poor endurance
Slow gait speed
Low physical activity

Sarcopenia is a central feature of physical frailty and is of critical importance

Identifying Frailty

Gait Speed less than 0.8m/s (taking more then 5 secs to walk 4m)

OR

Timed Up and Go of more than 10 sec

Source: Fit for Frailty: Consensus best practice guidance for the care of older people living with frailty in community and outpatient settings – a report from the British Geriatrics Society 2014

Sarcopenia Diagnostic Criteria

European Working Group on Sarcopenia in Older People (2010)

Low Muscle Mass (BIA)

Men: SMI $\leq$ 10.76 kg/m^2

Women: SMI $\leq$ 6.76 kg/m^2

and either

Low Muscle Strength (Handgrip Dynamometry)

Men: $\leq$ 30 kg

Women: $\leq$ 20 kg

OR

Low Physical Performance (6m Gait Speed)

Men and Women < 0.8 m/s

About the Frailty Syndrome

- Frailty varies in severity (individuals should not be labelled as being frail or not frail but simply that they have frailty).
- Frailty can quickly lead to disability.
- The frailty state for an individual is not static; it can be made better and worse.
    - A person who is hospitalized may exhibit frailty when they are discharged but then recover to Pre-Frailty or even Independence
- Frailty is not an inevitable part of ageing; it is a long term condition that is heavily influenced by lifestyle.

Priorities for FRAIL and PRE-FRAIL

- Low function
- Low fitness
- High Fall Risk
- Poor basic mobility and gait
- Multi-morbidity (CHF, Osteoporosis, OA)
- Higher potential for cognitive decline
- Low energy levels and endurance
- Higher risk of serious injury with training



Exercise for Frailty and Sarcopenia

Increase physical activity levels

and

Supervised training 3x/wk for 30-45 min for 3-6 months

1. Progressive Resistance Training
   - 2-3 sets of 8-12 reps (LOAD – RPE 15-16)
   - Heavy focus on lower body muscles
   - Mix of isolated and compound/functional movements
   - Incorporate high speed power movements
2. Balance and Gait Training
3. Cardio – typically walking

Priorities for INDEPENDENT

- Vary widely in their deficits
- Low to Moderate Fall Risk but may need balance training
- Cognitively adequate or sharp
- Low to moderate endurance
- Good basic mobility, poor complex mobility
- Good gait ability (specific deficits)
- Possible morbidity (huge variation)
- Low risk of serious injury with training



Priorities for FIT

- They are fit so typically very good strength, endurance, balance
- Low Fall Risk
- Less likely to have multi-morbidity (OA, HTN)
- Lower risk of musculoskeletal injury with training
- High energy levels
- Cognitively sharp
- Individual deficits vary



The SEMI-FIT will typically have deficits in areas they don’t typically train

Exercise Circuit for Lower Functioning Clients

- Chair Stands/Power Stands
- Narrow/Tandem Stand
- Step Ups alternating legs
- Ankle Sways

- Sideways Walking (L, R)
- DB/KB Deadlift
- Two-arm chest press (tubing)
- Two-arm row (tubing)

- Forward Reach
- 3-Dot Drill
- Figure 8 Walking
- Calf Raise on floor or step

- Glute Bridge
- Bird Dog arms only (L, R)
- Bird Dog legs only (L, R)

30 seconds each station
10 second transition

Exercise Circuit for Independent Clients

- Split Squat (L, R)
- Sleeping Dog front and back
- Pushup (floor/table/wall)
- Wide Walk (F, B)

- Standing tubing row (partner)
- Sleeping Dog side to side
- Standing chest press (partner)
- Crossover/Braided walk (F, B)

- Side Lunge
- Walk on Toes/Heels
- Squat with Overhead tubing press
- Fast Feet over line

- Glute Bridge with marching
- Bird Dog with arm and leg

Rest 1 Min

Repeat

Exercise Circuit for Independent to Fit

- Front/Back Lunge (L/R)
- Bush Walk
- Standing 1-arm tubing shoulder press (L/R, partner)
- One-legged stand (eyes closed)
- Side Plank (L/R)

- Standing one-arm tubing row (L/R, partner)
- Carioche (L/R)
- Standing one-arm chest press (L/R)
- Walk the line, knees up, on toes
- Side Plank (L/R)

- Side lunge with reach
- High kicks
- Palof press with tubing (L/R, partner)
- Single Leg deadlift (no weight)
- Side Plank (L/R)

30s each exercise
Rest 1 Minute after Circuit
Repeat

Exercise Circuit for Fit Clients

- Back Reach to Front Lunge
- Backward Crossover Walk on Toes
- Power Squat to 1-arm tubing shoulder press (L, R)
- One-legged stand (eyes closed) with body leans
- 20 Shoulder Tap Planks

- Rear Lunge with one-arm tubing row
- Carioche
- Power Punch with tubing
- Ladder Drill 2x
- 10 Rolling T-Planks

- Squat jumps
- Standing Tubing chops with side step
- Single-Leg deadlift (DB or KB; L/R)
- 20 Dead Bugs (arm and leg)

Perform Circuit 3x
No Rest

Create a Functional Aging Circuit

Domain	Sub Domain	Pattern	Level 1	Level 2	Level 3	Level 4
MS	Power	Squat	Power Stand w/ Hands	Power Stand no hands	Wall Balls	Vertical Jump
NM						
BAL						
MOB						
COG						
CV						

Functional Aging Circuit Example

	Level 4		***Level 3***		***Level 2***		***Level 1***	
Mvt Pat.	*Circuit 1*	*Movement*	*Circuit 1*	*Movement*	*Circuit 1*	*Movement*	*Circuit 1*	*Movement*
Push	1	Pushup - 10	1	ELEV Pushup - 10	1	ELEV Pushup - 10	1	Wall Pushup - 10
Pull	2	SA Bent Over Row	2	3 PT Row - 10e	2	Low Cable Two Arm Row - Staggered Feet - 10	2	Standing Row - Feet Together
Hip	3	SL Box Bridge	3	SL Floor/Box Bridge - 10e	3	Floor Bridge - 10	3	ASST SL Standing Butt Kick Backs
AE Core	4	Elephant Walk - 10	4	Kneeling Elephant Walk - 10	4	Leaning Wall Walk - 10	4	Leaning Hand Shuffles
Knee	5	KB Squat	5	BW Squat - 10	5	TRX ASST Squats	5	TRX ASSTChair Squats
Gen Con	6	Mountain Climbers - 50	6	ELE Mountain Climbers - 50	6	Elevated Mountain Climbers (No Jumps) - 25	6	Wall High Knees - 25
Gen Con	7	Burpees - no push up - 10	7	Total Body Extensions - Full Squat - 10	7	High Knees - Partial Squat - 10	7	High Knees - Hip Hinge - 10

Case Studies

Robert

67 year old accountant
Height: 6’2” (188cm) Weight: 170lbs (77.3kg)

Health Conditions:
- Bilateral Knee Osteoarthritis – mild discomfort/achiness climbing stairs
- Hypertension – well managed on medication (124/82 at rest)
- Visual – wears contacts

Senior Fitness Test Battery (score and percentile rankings)

• 30 sec Chair Stand	18; 70%
• 8’ Up and Go	4.3 sec; 70%
• 2-Minute Step Test	125; 85%
• 30 sec Arm Curl	20; 60%
• Chair Sit and Reach	2.5 in; 75%
• Back Scratch Test	0 in; 80%

- mCTSIB – cleared all 4 conditions

Goals:
- Starting to “feel his age” and doesn’t like it
- Wants to be healthy and more active
- Grandchildren are his motivation to get in shape
- Likes to travel and wants to continue to be able to do it for a long time
- Stomach has gotten bigger and he would like to “slim down” some

Activity History:
- Walks outside on a fairly regular basis with his wife (nothing strenuous)
- He doesn’t play sports but he enjoys playing golf once a week with his friends
- He likes to read and his work as an accountant is very sedentary
- He doesn’t really like working out

Questions to Get Started

1. How would you classify his current functional level according to the Hierarchy of Functional Aging?
2. What are his most glaring deficits (if any)?
3. How would you summarize his goals?
4. Does he have any conditions that would significantly alter the exercise prescription?
5. What does his current and past activity history tell you about how to get him started?
6. Are there additional tests you would like to perform? If so, which ones?

Robert’s Exercise Program

Create an initial exercise program for Robert assuming that he is willing to devote 60 min/day for 5 days/week to a routine and that you have access to a fully-equipped fitness facility.

State specific exercises (movements, equipment, body position, sets and reps/time, order), loading/resistance level (low, medium, heavy), rest periods and any other pertinent information for each day of training.

Julia

79 year old widow

Height: 5’5” (165cm) Weight: 110lbs (50kg)

Health Conditions:

- Bilateral Knee Osteoarthritis – mild discomfort/achiness climbing stairs
- Fall History – Has fallen multiple times at home in the past year without major injuries but 2 yrs ago she fell and broke her wrist
- Osteopenia – diagnosed a year ago (on medication for it)
- Uses a cane when she goes places but doesn’t really use it when she is at home or working in her yard

Senior Fitness Test Battery (score and percentile rankings)

- 30 sec Chair Stand 8; 10%
- 8’ Up and Go 7.8 sec; 20%
- 2-Minute Step Test 100; 75%
- 30 sec Arm Curl 15; 50%
- Chair Sit and Reach 3 in; 70%
- Back Scratch Test -1 in; 60%

mCTSIB – failed to complete condition 4 (eyes closed/unstable surface)

Julia

Goals:

- Wants to feel more confident doing chores around her house and yard because she is afraid she is going to fall and break her hip
- She wants to have more energy
- She feels weak and is struggling to keep up with her chores on her own
- Her son has put up extra handles in the bathroom and other areas but she hates that she has to use them
- When she has fallen she has struggled to get up by herself so she would like to be able to get up independently if she ever does fall again
- She wants to keep living with her husband in their home and doesn't want to move to a retirement community or assisted living facility

Activity History:

- Tries to stay active doing housework and yard work with her husband
- She is very socially engaged and volunteers at her church by working in the food pantry a couple of days a week
- Goes to her grandchildren's sporting events regularly (although climbing bleachers requires some help)
- She cooks a lot of the holiday meals when her children and grandchildren come over
- She hasn't formally exercised since college

Questions to Get Started

1. How would you classify her current functional level according to the Hierarchy of Functional Aging?
2. What are her most glaring deficits (if any)?
3. How would you summarize her goals?
4. Does she have any conditions that would significantly alter the exercise prescription?
5. What does her current and past activity history tell you about how to get her started?
6. Are there additional tests you would like to perform? If so, which ones?

Exercise Program for Julia

Create an initial exercise program for Julia assuming that she is willing to devote 30-45 min/day for 4 days/week to a routine and that you have access to a fully-equipped fitness facility.

State specific exercises (movements, equipment, body position, sets and reps/time, order), loading/resistance level (low, medium, heavy), rest periods and any other pertinent information for each day of training.

Wrap Up

In Order to Become Certified

- Must pass the 3 quizzes with 80% or better
- You have 3 attempts to pass each quiz
- You have 6 months to complete the course
- Go to the “Account” tab under your name to download and print CEC forms for this workshop and the online certification (once you pass)

* TAKE YOUR FIRST QUIZ THIS WEEK *



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