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Exercise Program Design for the 55+
Functional Aging Training Model

Dan Ritchie, PhD, CSCS

16+ years experience – personal trainer, manager, owner

Certified Strength and Conditioning Specialist

FallProof Balance and Mobility Enhancement Specialist

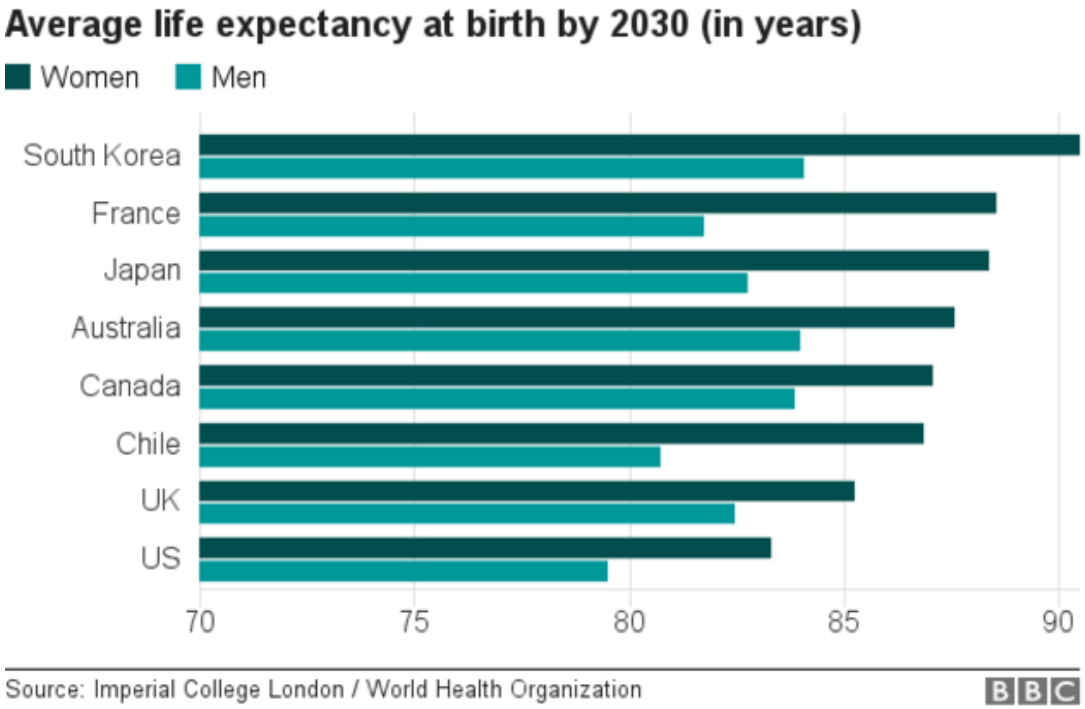
Enhance Fitness Master Trainer

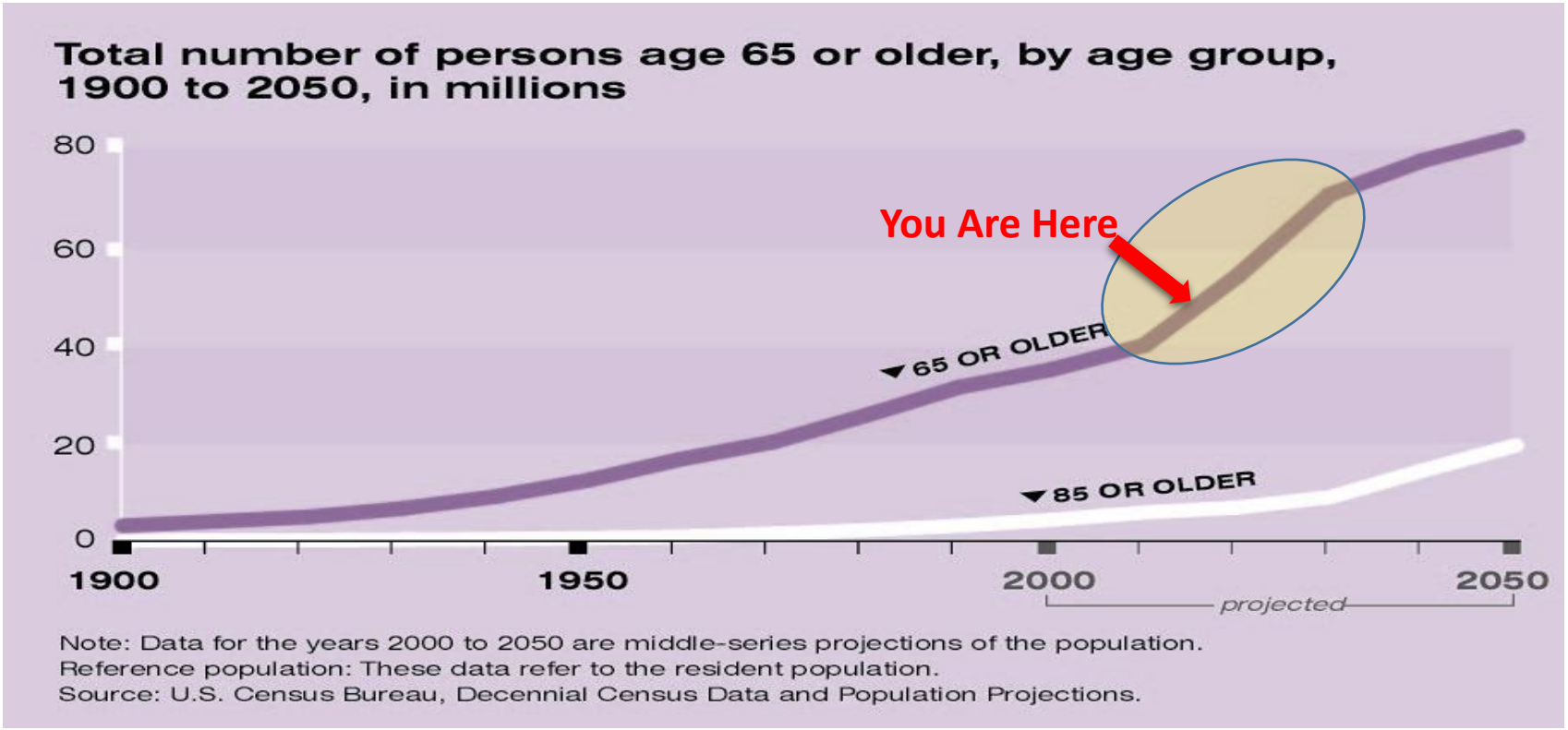
2014 PFP Personal Trainer of the Year

Act!vate Brain and Body Advisory Board

How Long Will You Live?

Are you really ready for the longevity revolution?




Total number of persons age 65 or older, by age group, 1900 to 2050, in millions
80
60
40
20
0
You Are Here
65 OR OLDER
85 OR OLDER
1900
1950
2000
2050
projected
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.

BIG & GETTING BIGGER

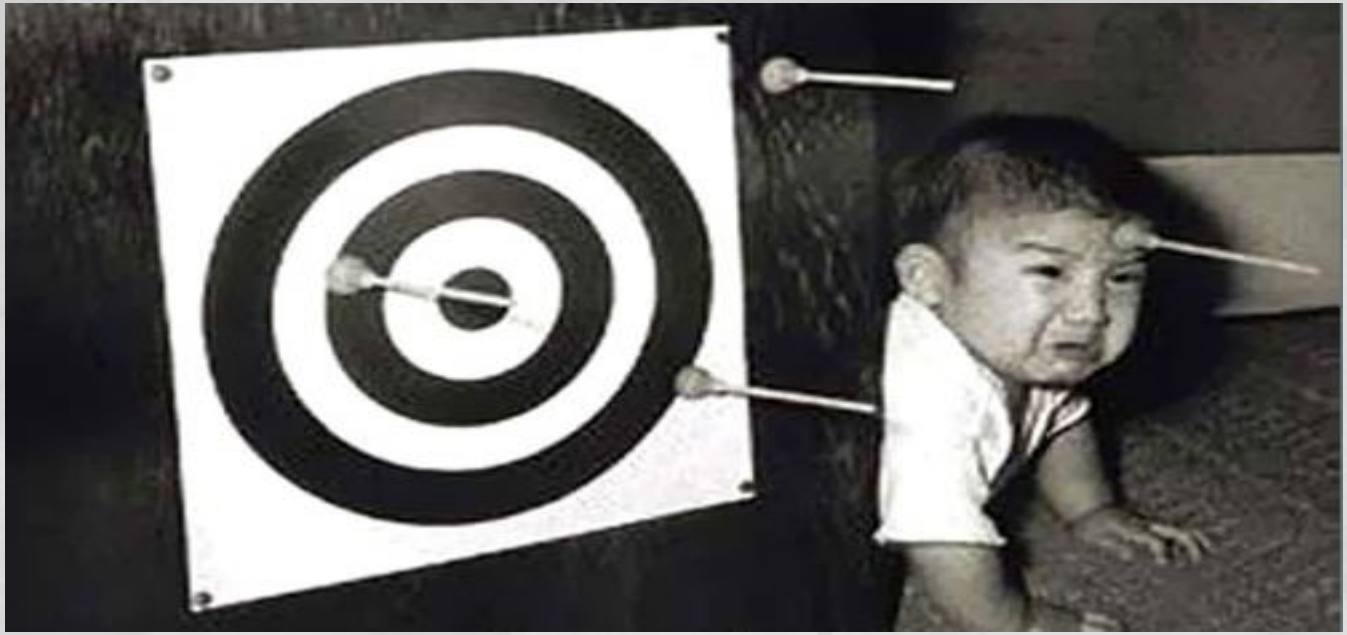
TODAY:	50+	100M
		Growth Rate
20 YEARS:	50+	+34%
	18-49	+12%

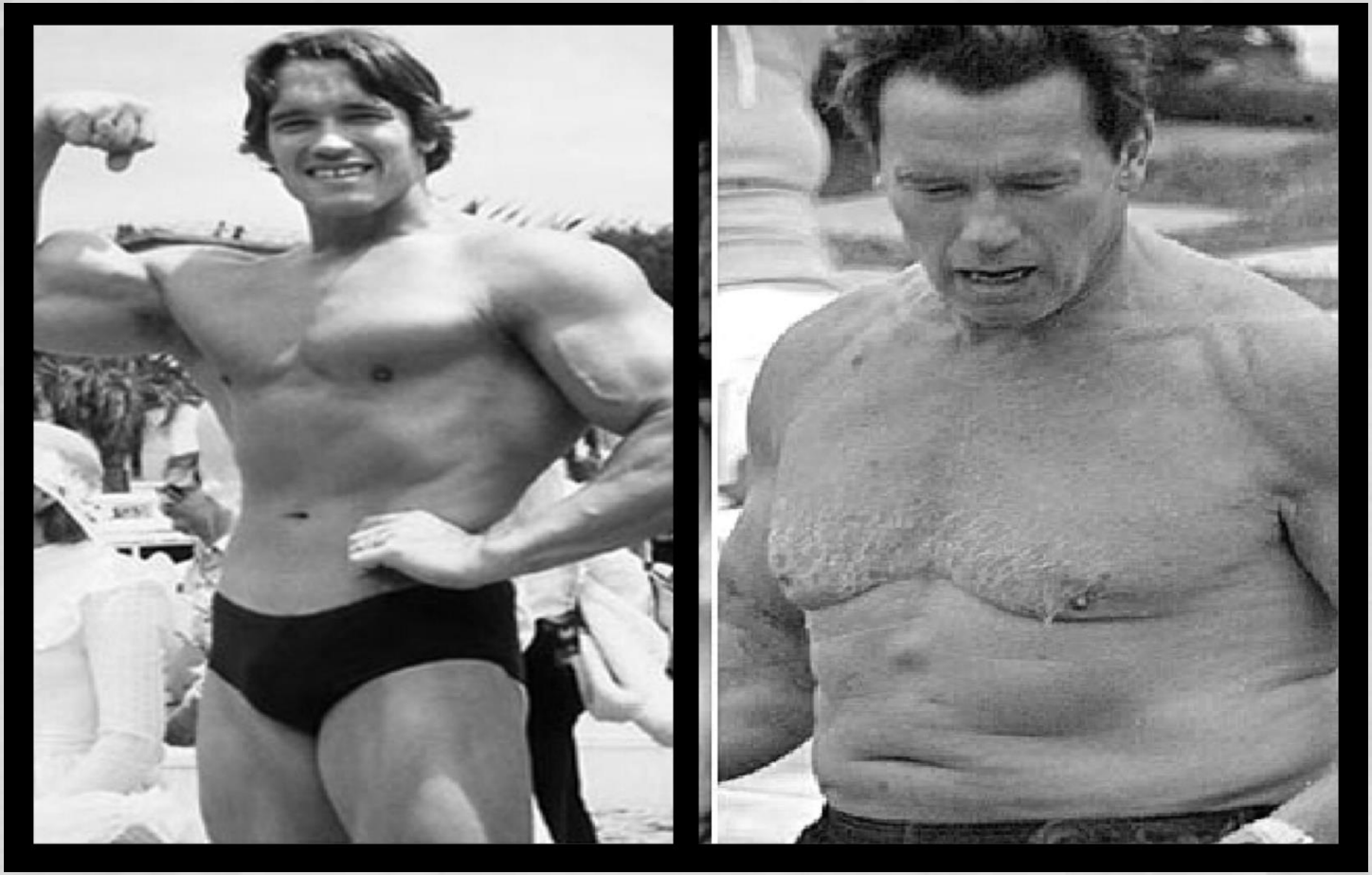
1946-1964

Currently Ages 55-73

76,000,000+

We've Missed the Mark





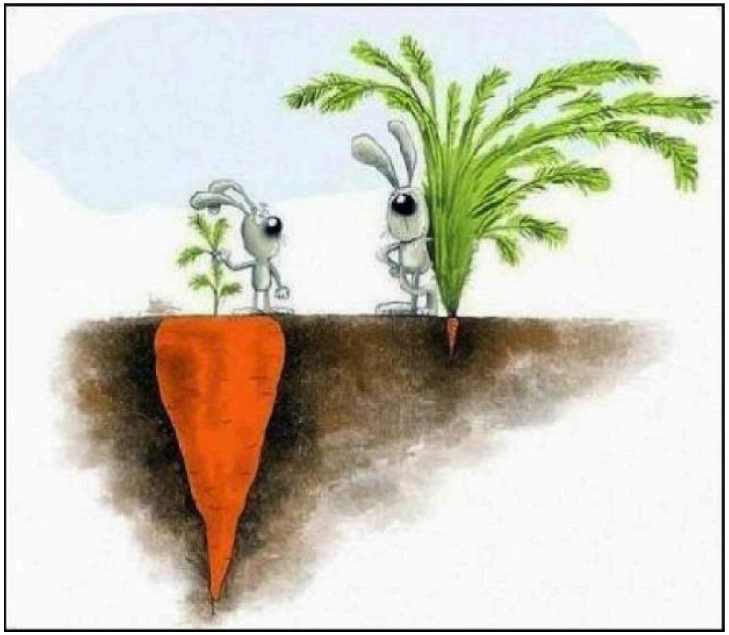
WHAT FUELS MY PASSION?

THESE TWO WOMEN ARE APPROXIMATELY THE SAME AGE.

Which life are you designing?

Which would you choose?

Quality Quantity

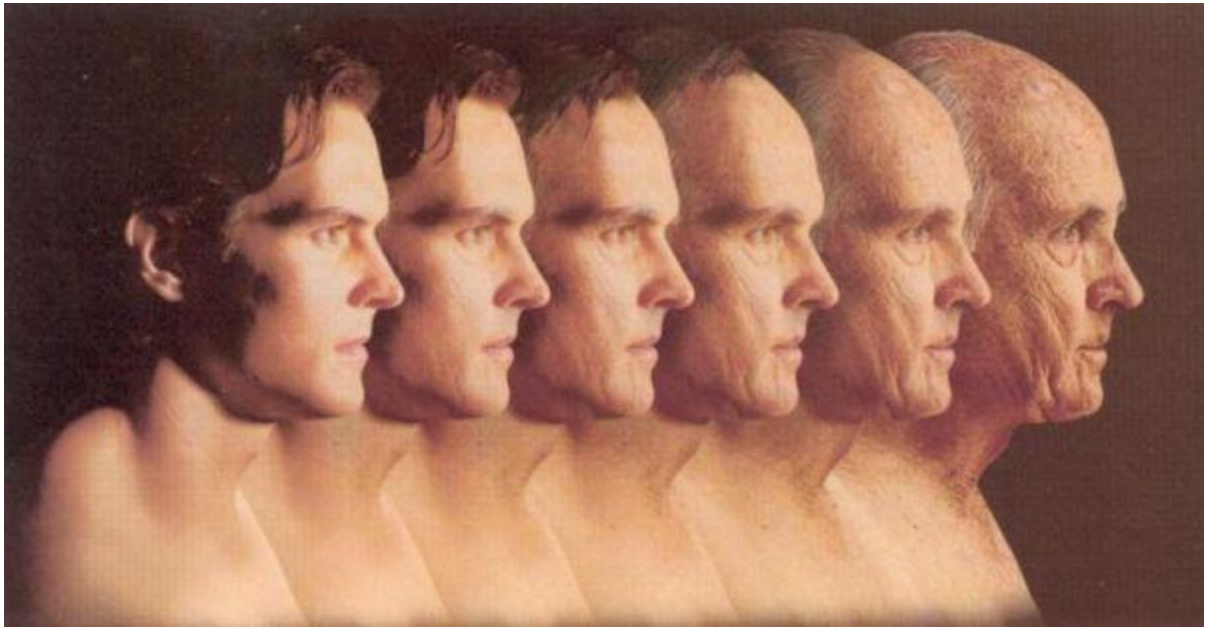


Functional Longevity

Maintaining your ability to do what you *need* to do, what you *want* to do and what you *like* to do as late in life as possible.

Genetics and Aging

- Account for 25% of aging

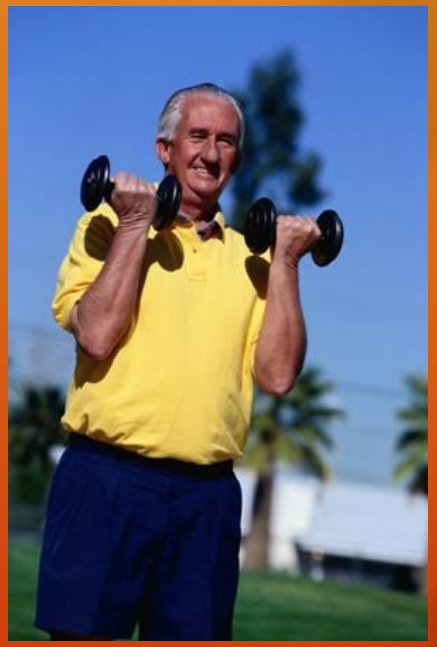


Primary vs. Secondary Aging

Which type of exercise is best?

Walking

Strength Training

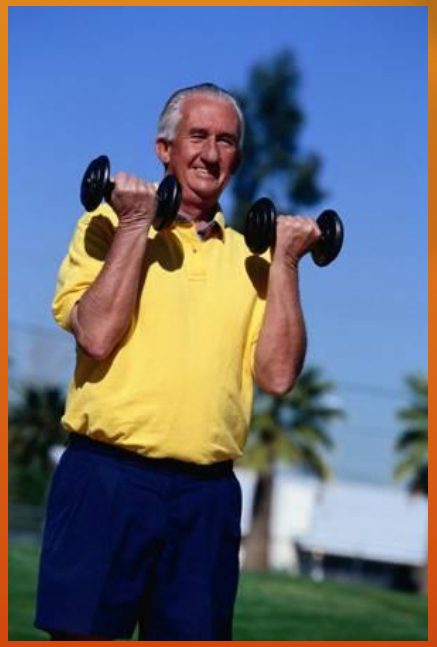


Walking

- Sufficient for older adults
- Easy
- Convenient
- No equipment necessary
- Limiting

Strength Training

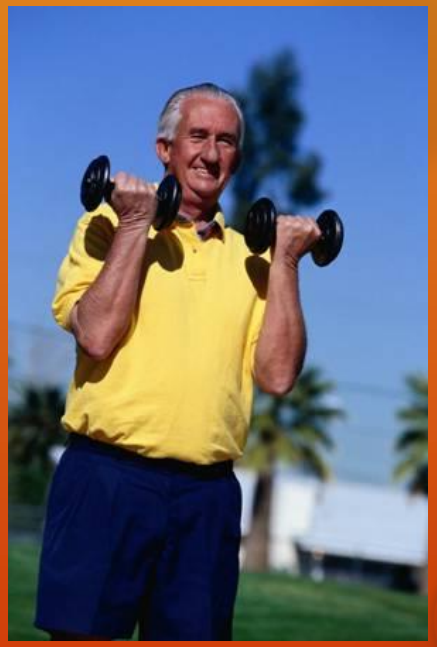
- Safe
- Traditional weight lifting
  - Improved strength and muscle mass
  - Strength gain may not translate to functional ability



Both Are Limited

Walking

Strength Training



The Research Says…

Have we oversold the benefits of late-life exercise? (2001)

Critical review of 31 studies

- Impairment – Strength, ROM, Aerobic capacity, body comp
- Function – Walking, chair rise, balance
- Disability – Physical, social, emotional, overall

Results

- Impairment: Very Strong
- Function: Strong but inconsistent
- Disability: Weak and inconclusive

Systematic review of PRT in older adults (2004)

Pooled data from 62 trials

- Randomized controlled trials
- PRT with subjects aged 60+

Results

- Large positive effect on muscular strength
- Small to moderate effect on functional ability
  - Strength gains do not equate to similar functional gains
- No evidence of an effect was found for physical disability

Multi-modal exercise programs for older adults – a systematic review (2007)

- 15 studies that concurrently used PRT, cardio and balance training
- Subjects aged 60+
- Conclusion:
  - Positive effect on falls prevention
  - Small effect on physical, functional* and quality of life outcomes

* - habitual gait, maximal gait, chair stand

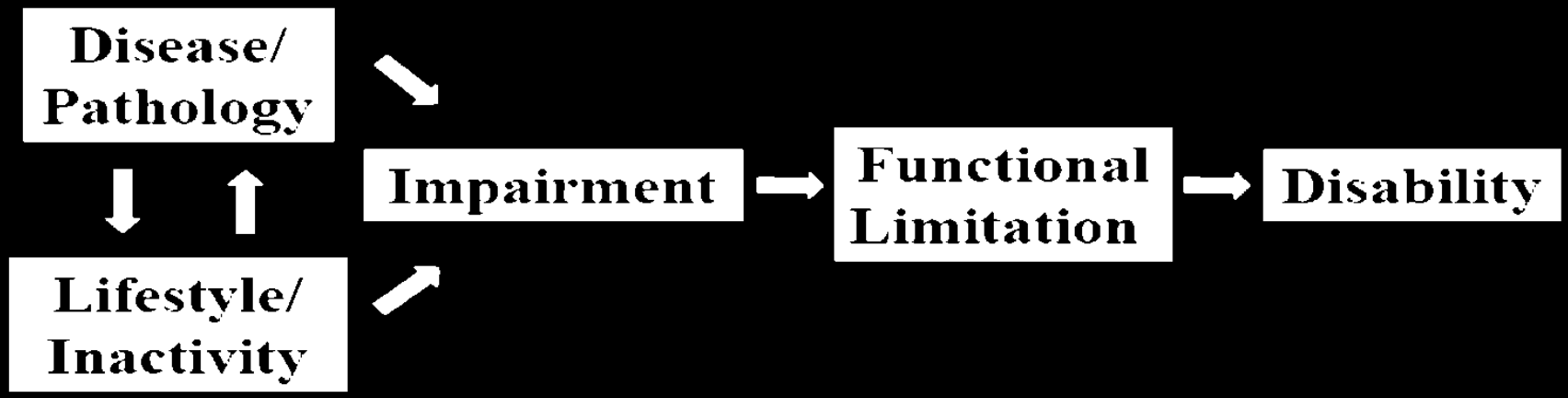
Exercise: necessary but not sufficient for improving function and preventing disability? (2011)

Key Points:

- There is consistent and convincing evidence that older adults and adults with knee OA who engage in strength training or aerobic exercise are able to decrease pain and increase strength and physical function
- The effects on strength, pain and function, though, are modest, at best
- It is not clear that exercise interventions alone will minimize or prevent disability
- Exercise may be necessary but not sufficient in minimizing or preventing disability. Effective interventions for minimizing disability are scarce and novel approaches are needed

The Nagi Model

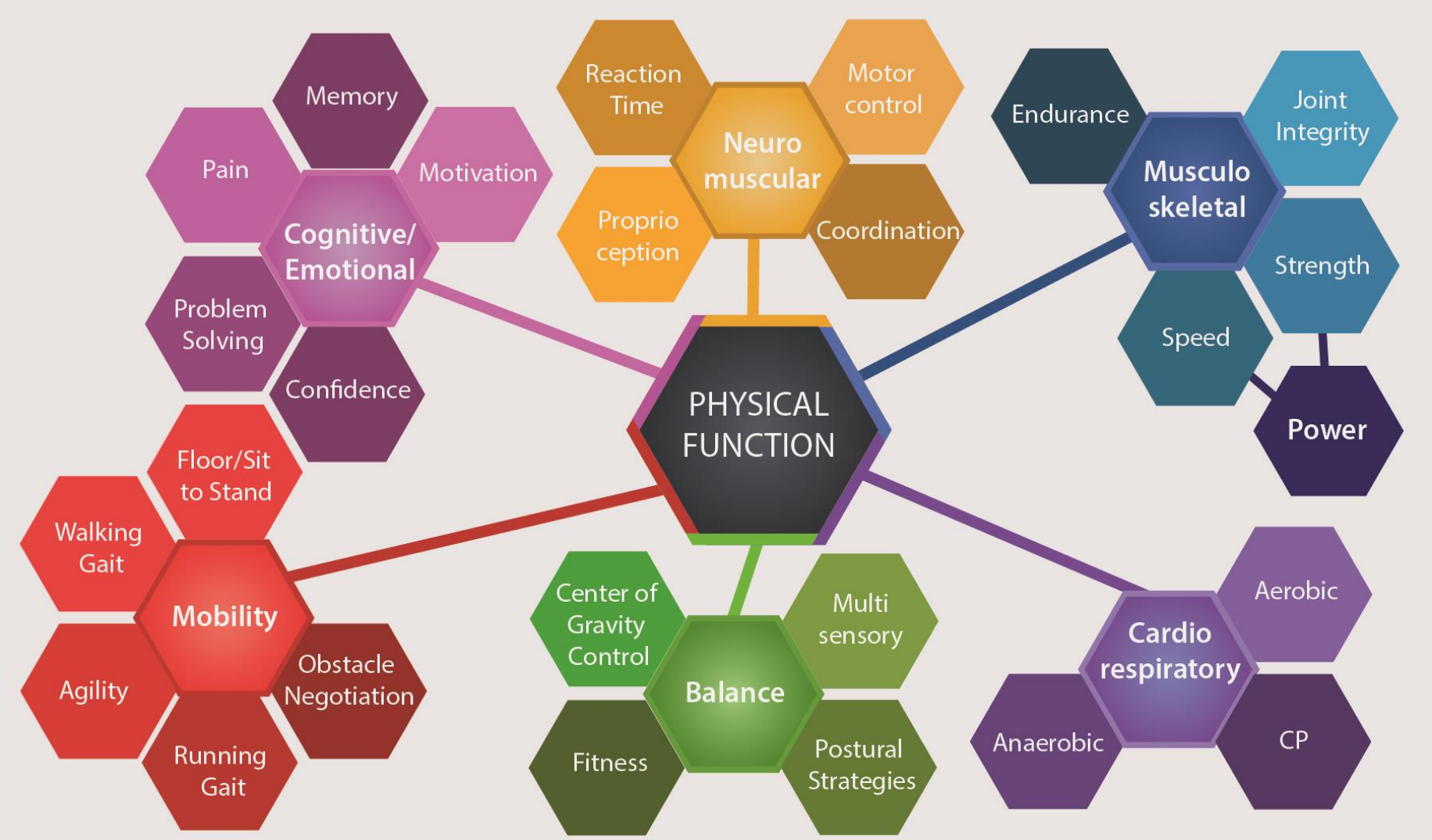
Revised, Rikli and Jones, 1997



What Impairment Level Factors are Vital for Function?

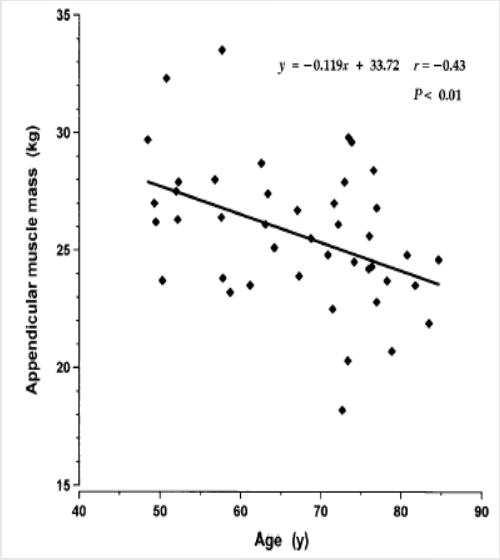
- Muscular Strength
  - Concentric
  - Eccentric
  - Isometric
- Contractile Velocity
  - Acceleration
  - Deceleration
- Muscular Power
- Muscular Endurance
- Aerobic Power
- Flexibility
- Joint Range of Motion
- Coordination
- Reaction Time

- Motor Control
- Proprioception
- Somatosensation
- Vestibular control
- Vision
- Mobility
- Agility
- Balance
- Stability
- Gait
- Postural Control


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


PHYSICAL FUNCTION
Neuro muscular
Pressure
Pain
Vibration
Proprio ception
Motor control
Joint Position Sense
Reaction Time
Coordination
Musculo skeletal
Mobility
Stability
Joint Integrity
ROM
Endurance
ECC
Strength
CON
ISO
ECON
Speed
Power
Cognitive/ Emotional
Memory
Pain
Motivation
Problem Solving
Confidence
Mobility
Floor/Sit to Stand
Walking Gait
Agility
Obstacle Negotiation
Running Gait
Balance
Hip
Postural Strategies
Step
Ankle
Fitness
Endurance
Strength
Flexibility
Center of Gravity Control
Reactive
Proactive
Multi sensory
Visual
Vestibular
Somato Sensory
Cardio respiratory
Aerobic
Anaerobic
CP

Sarcopenia = age related decline in muscle mass



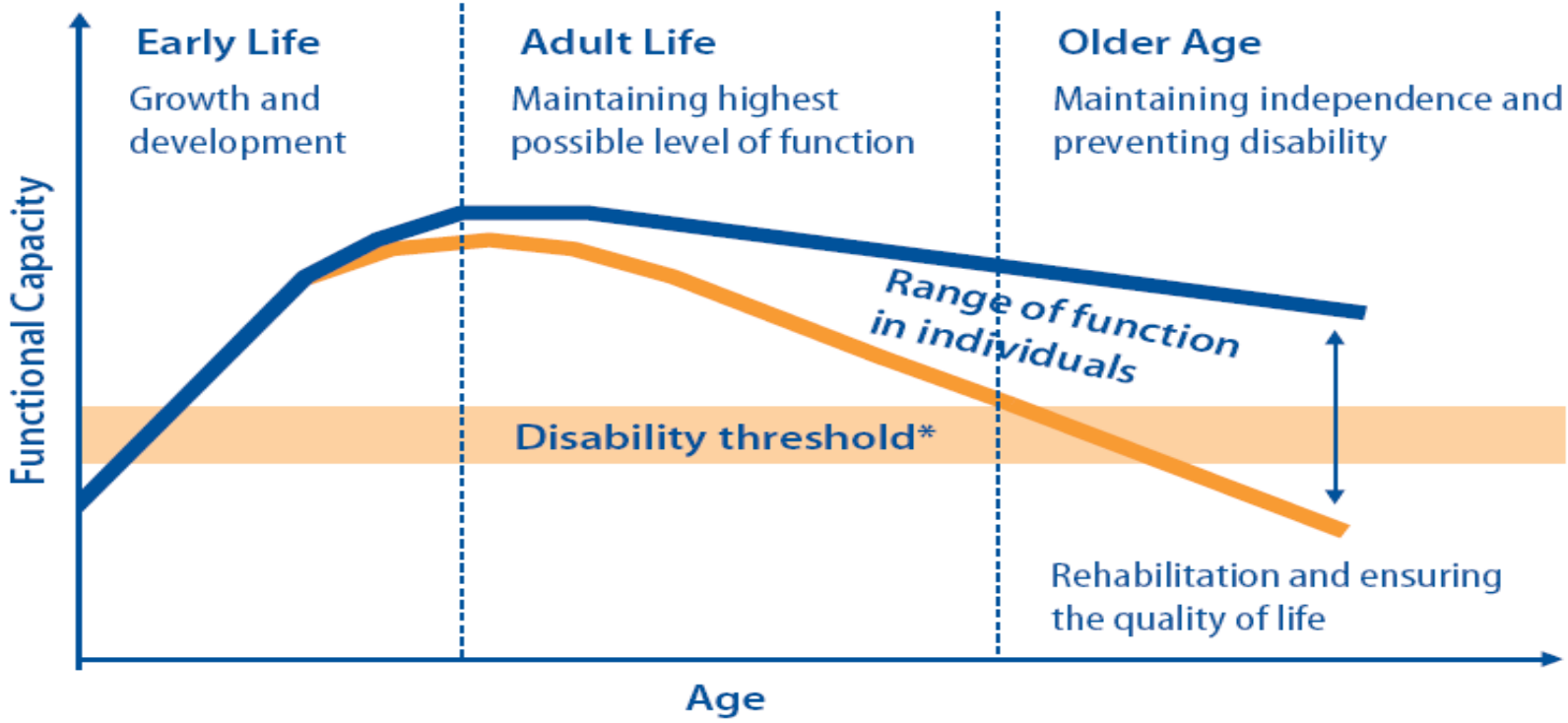
Starling et al. *Am J Clin Nutr* 1999

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

Huge variability in impairments means huge variability in functional abilities

Figure 4. Maintaining functional capacity over the life course



Source: Kalache and Kickbusch, 1997

Why do traditional exercise programs fail to maximize functional ability in older adults?

The following Information needs to be considered and addressed!

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.

2 Pillars

Specificity

- SAID
- How you train is how you gain
- Correlation of the exercise to the functional goal

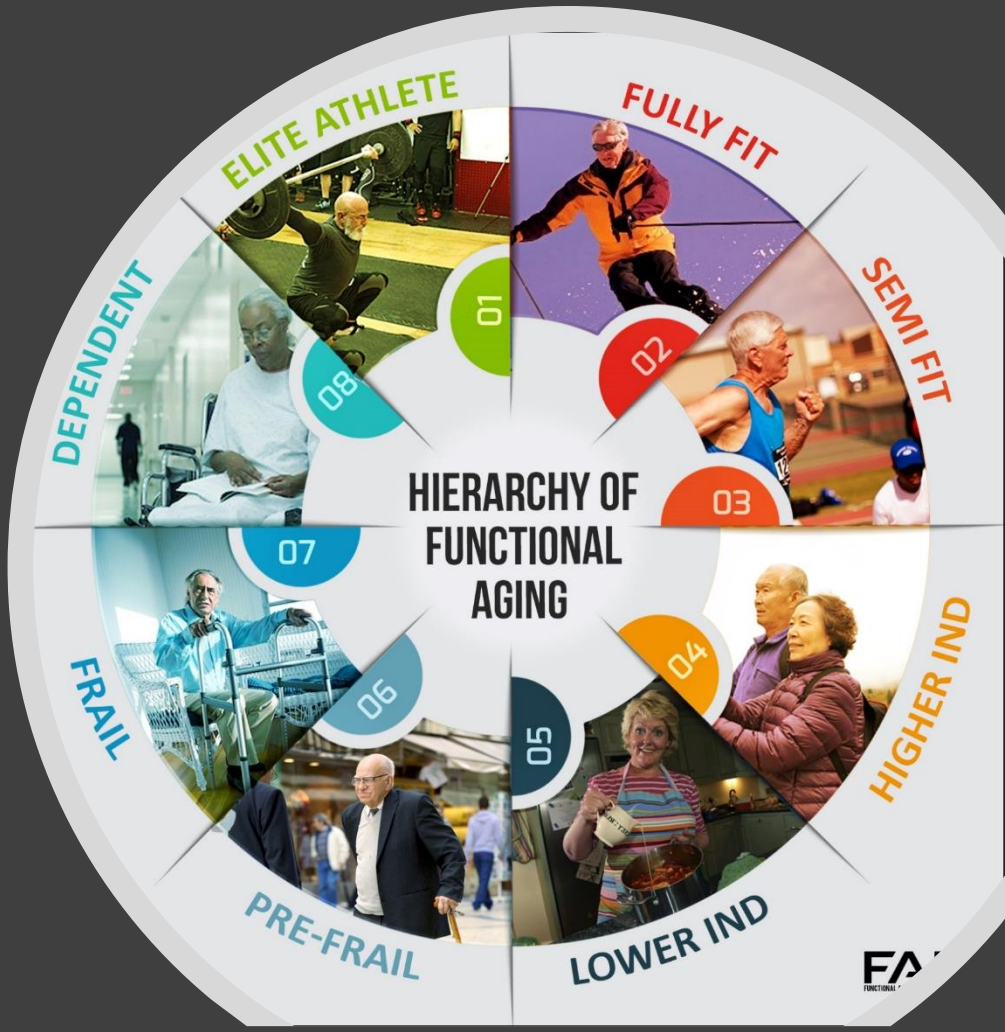
Progressive Overload

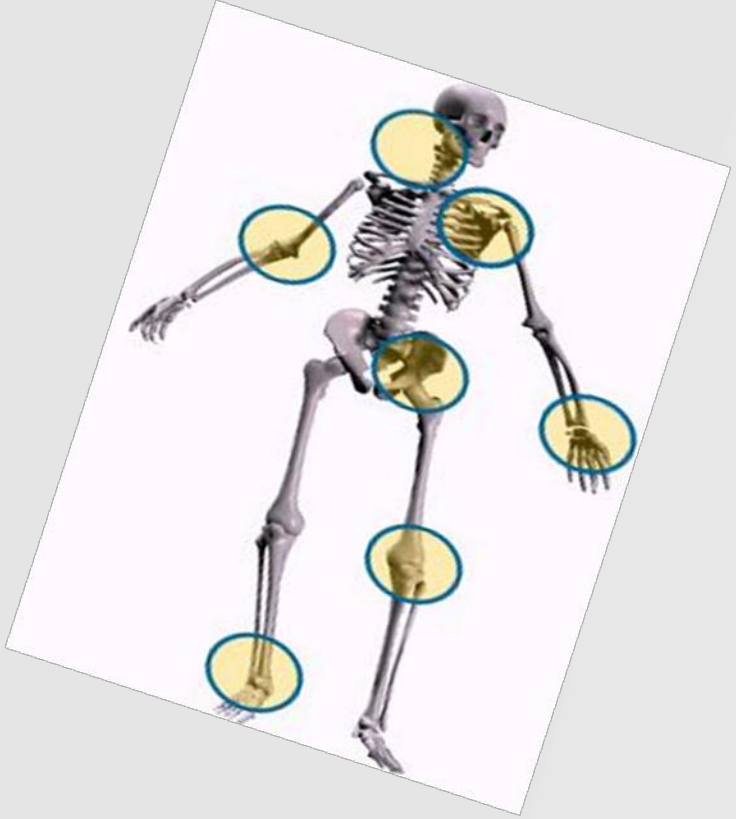
- Body adapts to overload (at any age)
- Overload must be progressed in order to stimulate further improvement

7 Key Principles

1. Assess, prioritize and train ALL components of function
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

Hierarchy of Physical Function





Is the Exercise Safe and Effective?

1. Purpose?
2. Does it Fulfill the Purpose?
3. Stress Points?
4. Risk Benefit Ratio?
5. Specificity and Appropriateness?


Functional Fitness Assessments

Screening & Health History

- PARQ is inadequate
- Comprehensive health history interview is highly recommended
  - Current health conditions
  - Current medications
  - Current problems or issues
  - Current activity and exercise
  - Past…all of them
- Informed consent

Qualities of Functional Assessments

Validity – Does it measure what it is intended to measure?

Reliability – Are the results able to be replicated accurately?

- **Intra-Rater**
- **Inter-Rater**

Floor Effect – a lower (min) limit for potential scores

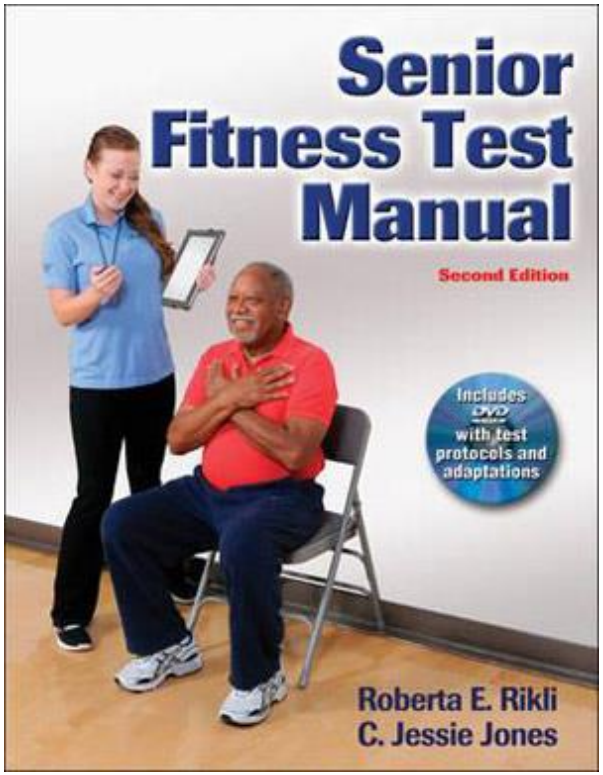
Ceiling Effect – a higher (max) limit for potential scores

Develop the Hawk Eye

- Observe
- Collect Data
- Coach
- Customize
- Hypothesize
- Research
- Network

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



Chair Stand

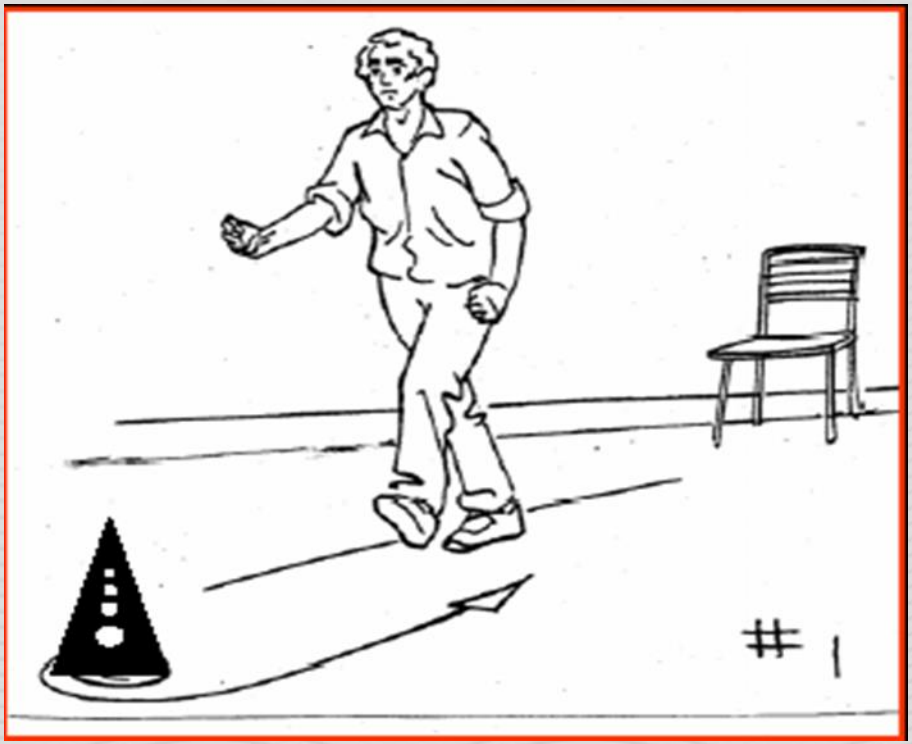
- Assesses lower-extremity strength under practical (functional) conditions
- Validated against 1RM leg press
- Number of times a person can rise from a chair in 30 seconds

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

8’ Up and Go

- Assesses agility/dynamic balance
- How long it takes a person to rise from a chair, walk around a cone 8’ 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

MCTSIB

Modified Clinical Test of Sensory Interaction in Balance

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

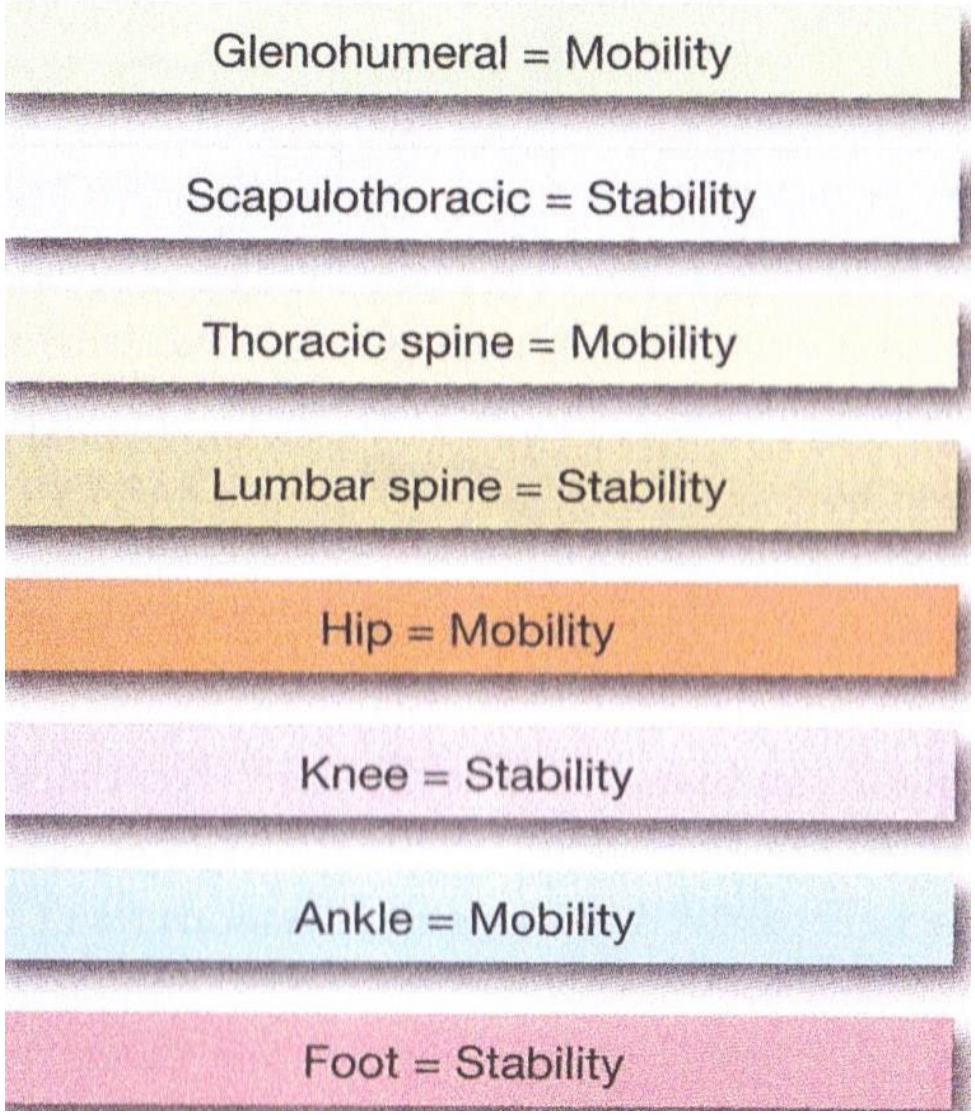

Functional Strategies, Techniques
and Exercises

Functional Continuum

Less Functional

More Functional

Isolation vs. Integration



The Body Works as a Unit

When Postural Muscles are Compromised – The Whole Body is Affected

Misalignments Lead to:

- Compensations
- Wearing in Joints
- Injury and Pain

The purpose of these techniques and strategies is to address as many impairment level factors as possible.

Start Positions

Shoulder-width (athletic)
Wide
Narrow
Side-by-Side
Semi-Tandem
Tandem
In-Line
One-Legged
Lunge
Squat

Half-Kneeling
Full Kneeling
Prone
Supine
Quadruped
Seated

Arm Movements

Bilateral
Unilateral
Alternating
Reciprocating
Multidirectional

Temporal, Speed and Rhythm Variations

Slower to Faster

On “beat”

Varied beat pattern

Cueing: Snap, Clap, Verbal

Benefits:

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

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

Moves to Consider Avoiding/Modifying

Rotation away from midline with resistance

- Cable rotation
- Twisting med ball crunch
- Twisting med ball throws

Excessive spinal flexion

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

Superman

Roman chair extension

Push/Pull Variations

Rows

- Standing, half-kneeling, kneeling
- 2 arm (sagittal)
- 1 arm (transverse)

Pull-Downs

- Standing, half-kneeling, kneeling
- 1 arm (frontal plane)

Chest Press

- Standing 2 arm (sagittal)
- Standing 1 arm (transverse)
  - Punch with rotation
  - Lateral punch (multiplanar)

Shoulder Press

- Standing, half-kneeling, kneeling
- 1 arm (frontal)

FAI

Chop and Lift Sequences

- Cable
  - Seated on Stability Ball
  - Half-Kneeling
  - Standing
    - Add step
- CorBall
  - Lifts
    - Seated on Stability Ball
    - Half-Kneeling
    - Standing
    - Lunge
  - Chops
    - Ball slams

Lunge and Squat

Lunge Variations

- Rotation
- Forward Reach
- Rear lunge with twist
- Multi-directional lunges with reach

Squat

- Air squat
- Potty squat
- “Spread the Floor” squat
- Sit to stand
- Elevator Squat
- Total Body Extensions

Exercise Movements for Power

Frail/Lower Independent

- Power Stands
- Step Ups/Stair Climb
- Get Up and Go
- Chair Drills
- Red Light/Green Light

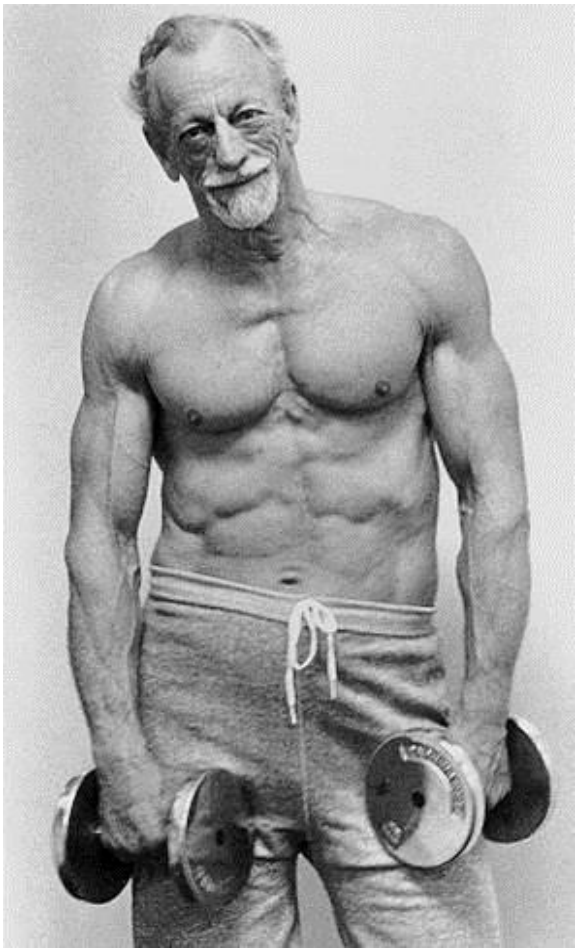
Independent/Average

- Power Stands/Jumps
- Line Hops
- Short Sprints
- What Time is It?
- Jumping Jacks

Exercise Movements

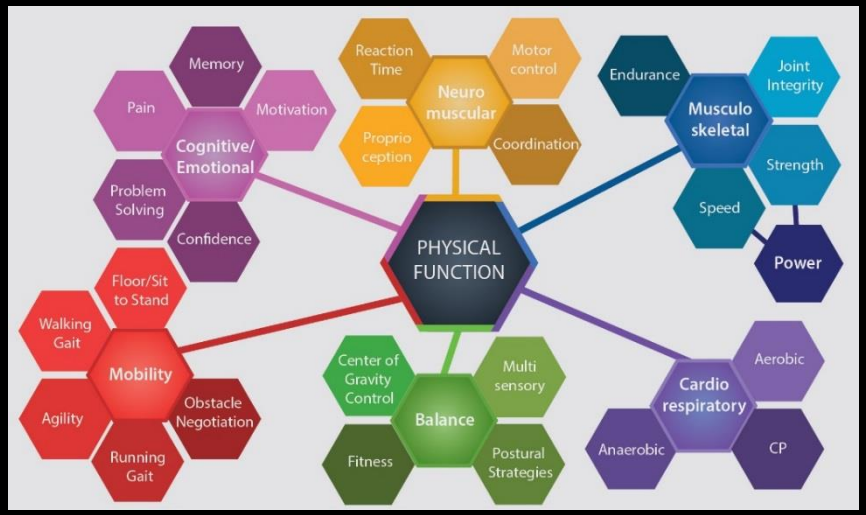
Fit/Athletic

- Plyometrics*
- Med Ball Throws
- Power Punch
- Power Row
- Hang Cleans
- Push Press



Specific Strategies and Techniques

- Balance Training
- Mobility
- Neuromuscular
- Musculoskeletal
- Cardiorespiratory
- Cognitive/Emotional



You MUST continue to gain knowledge and skill in specifically addressing each of these areas

Balance and Mobility Training

FallProof™ Model

1. Center of Gravity Control
2. Postural Strategies
3. Gait Pattern Enhancement and Variation
4. Multisensory
5. Fitness Parameters
   - Strength, Power, Flexibility, CV Endurance…

Balance and Mobility Training: Gait Exercises

Goal: Create an adaptable, flexible and efficient gait pattern

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

Walking
- Narrow/Wide
- Heels/Toes
- Backwards

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

Sample Stations

Posture Station (5 min total)

Supine Snow Angels (15 sec)
(Rest 5 sec) X3
Dead Bug (30 sec)
(Rest 15 sec) X2
Prone Snow Angels (15 sec)
(Rest 5 sec) X3

Plank Series
Front, Left Side, Front, Right Side (15 sec ea)
(Rest 15 sec)
Front, Left Side, Front, Right Side (15 sec ea)
(Rest 15 sec)

Balance Station (6 min total)

One leg balance (15 sec ea leg x 2)

Walk the Line on Toes (15s fwd; 15s bwd)

Forward Reach with Narrow Stance (15s ea arm x 2)

Side Reach with Narrow Stance (15s ea arm x 2)

Red Light, Green Light (60 sec)

One leg balance (15 sec ea leg x 2)

Walk the Line on Toes (15 sec fwd; 15 sec bwd)

Forward Reach with Narrow Stance (15s ea arm x 2)

Side Reach with Narrow Stance (15 sec ea arm x 2)

Red Light, Green Light (60 sec)

Sample Stations

Gait and Agility Station (6 min total)
Carioche Left and Right (30 sec)
Square Stepping Clockwise (15 sec)
Rest 15 sec
Square Stepping Counterclockwise (15 sec)
Rest 15 sec
Tick Tock Walks (60 sec)
High Knee March Fwd/Bwd on Toes (30 sec)
Skipping (30 sec)
Cross the Stream (60 sec)
Rest 60 sec
Repeat all

Strength Station (6 min total)
Tall kneeling DB front raises to side raises (60 sec)
Prisoner Get Ups alternating feet (60 sec)
Rest 30 sec
Squat to DB hammer curl (30 sec)
DB deadlift to high pull (30 sec)
Walking Lunges DB in Right Hand (30 sec)
Walking Lunges DB in Left Hand (30 sec)
Rest 30 sec
Alternating DB curl to shoulder press (30 sec)
Bent over one arm DB row to tricep kickback (30 sec ea side)
Rest 30 sec
Repeat Station

24” Box Jumps at 83?

Functional Program Design

- Prioritize Primary Areas of Individual Deficit for Significant Improvement
- 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

Level 2 Workout

Equipment: Tubing anchored chest level, dumbbells,

Time: 17 min

- Split Squat – 12 reps each leg
- Sleeping Dog front and back – 3 reps each leg
- Two arm standing dumbbell lateral raises – 12 reps
  (repeat)

- Standing alternating tubing rows – 12 reps each arm
- Sleeping Dog side to side – 5 reps
- Standing alternating chest press – 12 reps each arm
  (repeat)

- Standing alternating lat pull down – 12 reps each arm
- Heel Toe Rocks – 30 seconds
- Side Step Ups – 12 reps each leg
  (repeat)

- Bridge with arms together – 3 reps (5 sec hold)
- Bird Dog with limb movement to side – 2 reps each limb
  (repeat)

Level 3 Workout

Equipment: tubing anchored chest level, tubing anchored above head, step

Time: 16 min

- Stationary Lunge – 12 reps each leg
- Bush Walk – 30 seconds
- Standing upright tubing row – 12 reps

- Standing reciprocating row – 12 reps each arm
- Monster Walk – 30 seconds
- Standing reciprocating chest press – 12 reps each arm

- Stationary Lunge – 12 reps each leg
- Bush Walk – 30 seconds
- Standing upright tubing row – 12 reps

- Standing reciprocating row – 12 reps each arm
- Monster Walk – 30 seconds
- Standing reciprocating chest press – 12 reps each arm

- Half-kneeling reciprocating lat pull down -12 reps each arm
- High kicks – 30 seconds

You can't help
getting older,
but you don't have
to get old.

(GEORGE BURNS)