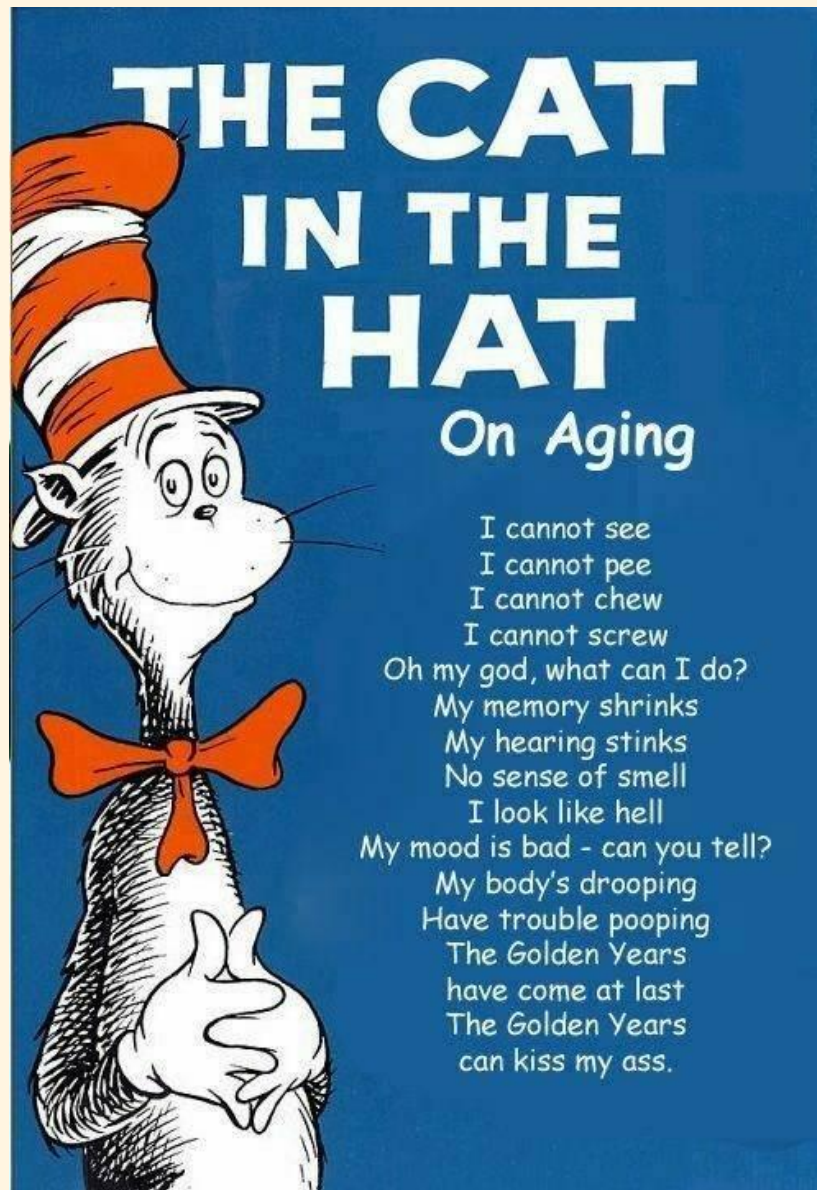


Exercise Prescription and Programming for Older Individuals

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Physiology of Ageing

- Interaction of lifestyle and genetic factors
- ↑ Total blood cholesterol
- ↓ Respiratory and cardiac parameters
- ↓ Total body blood and water volume
- ↓ Immunocompetance
- ↑ Susceptibility to disability and disease

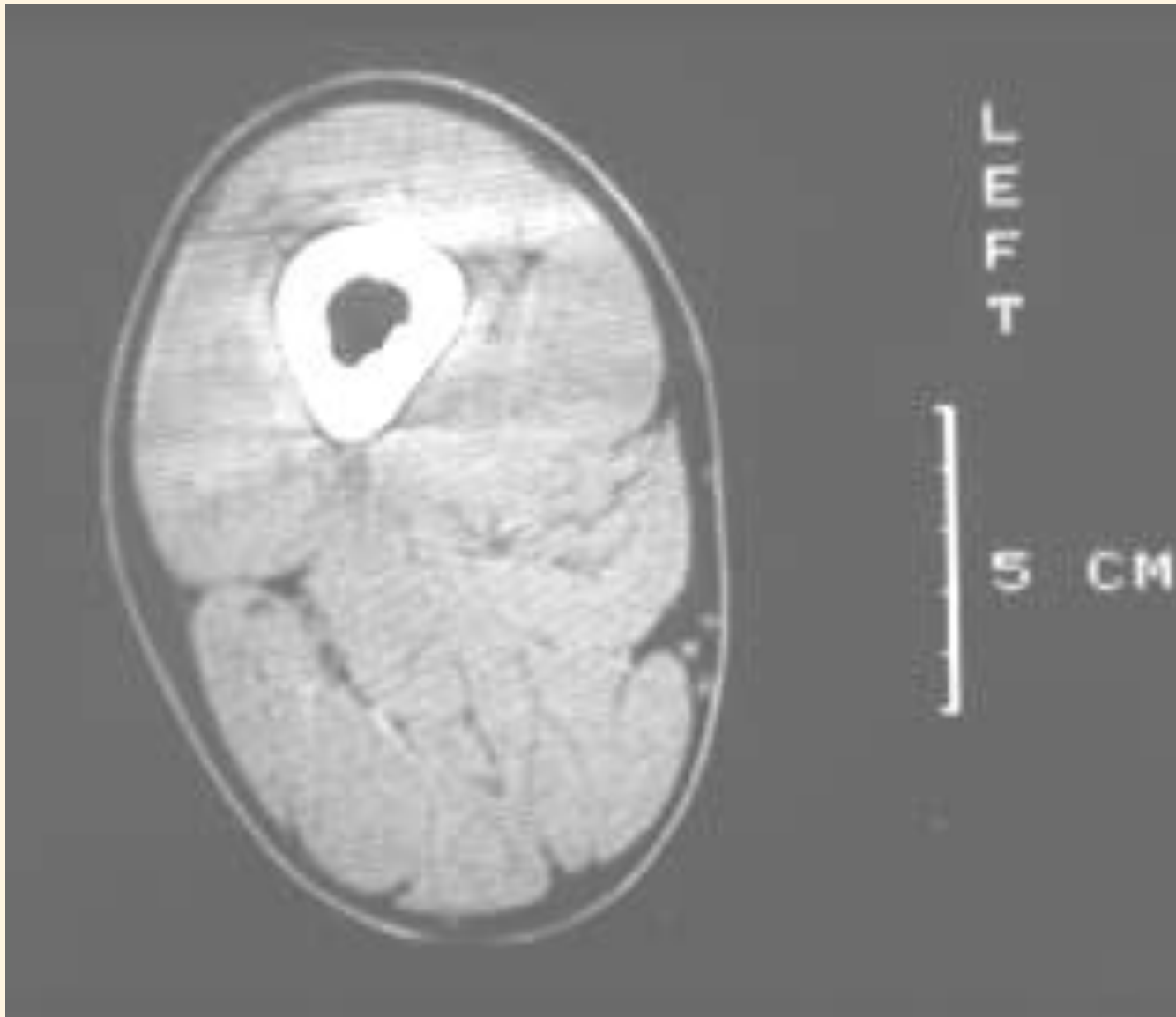
Decreased Muscle Mass

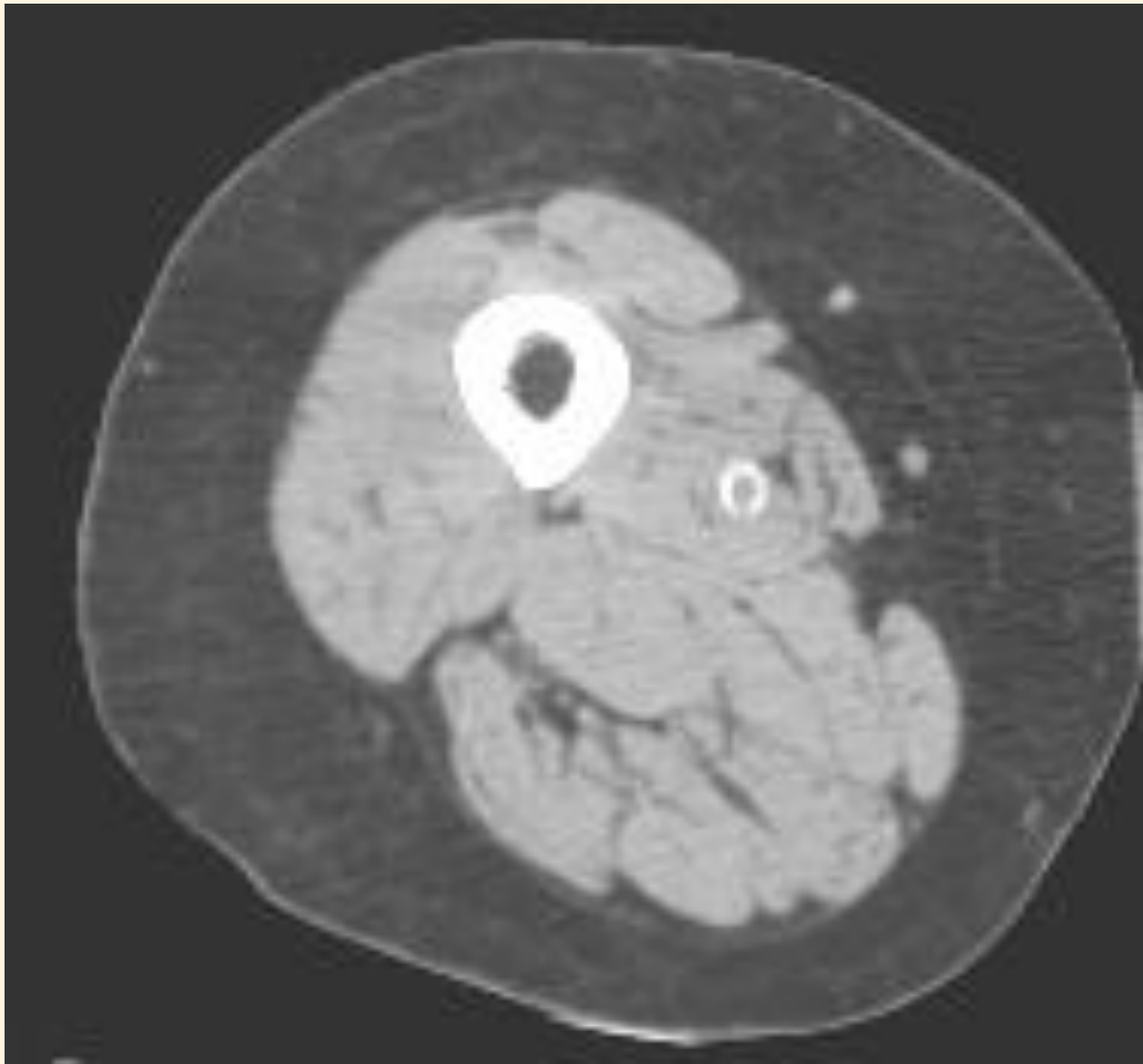
- 25% ↓↓ in muscle cross-sectional area
 - ↓↓ muscle strength and muscle power
 - 28% of men and 66% of women > 74 years cannot lift > 4.5 kg
 - 50% ↓↓ in muscle strength and 75% ↓↓ in muscle power
- Frailty
- ↓↓ balance confidence
 - ↑↑ incidence of falls
- ↓↓ functional ability
 - ⇒ losses of independence

As well as contributing to:

- ↓↓ metabolic rate
- ↓↓ total blood volume
- ↑↑ body fat
- ↓↓ bone mineral density
- ↓↓ quality of life







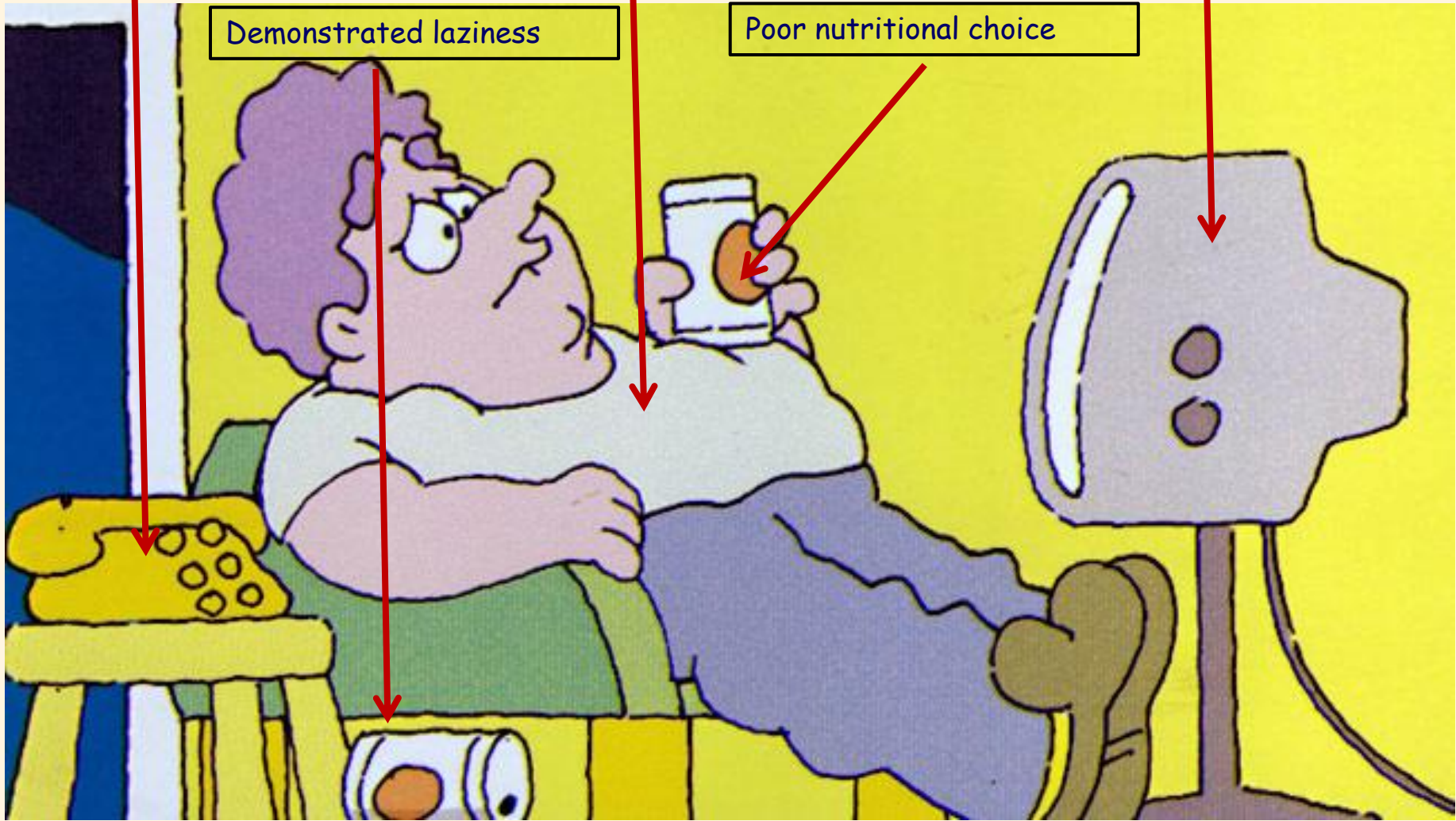
Convenient location of time saving devise

Obesity

Extended TV viewing

Demonstrated laziness

Poor nutritional choice



The Benefits of Being or Becoming Physically Active

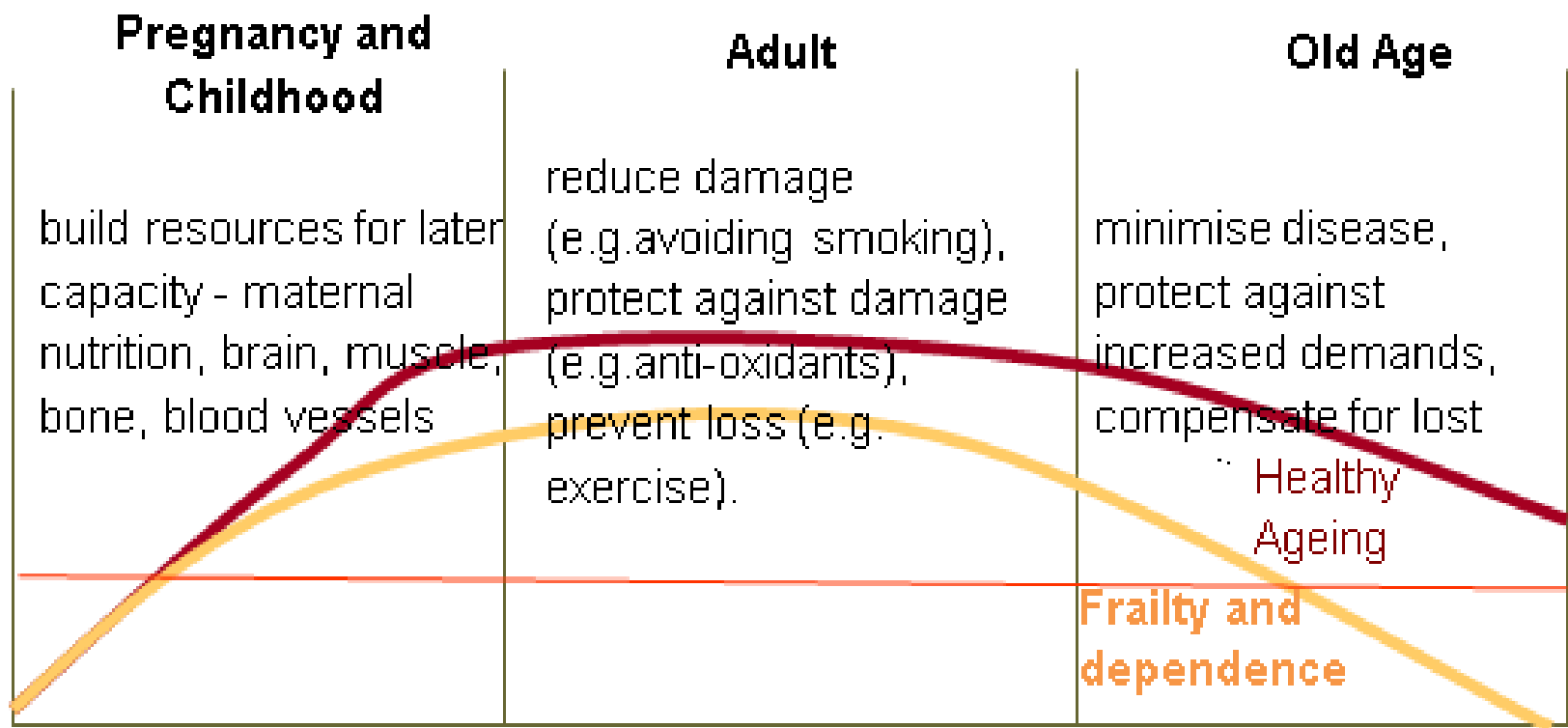


Figure: Health Promotion for Old Age, Adapted from Alexandre Kalache WHO

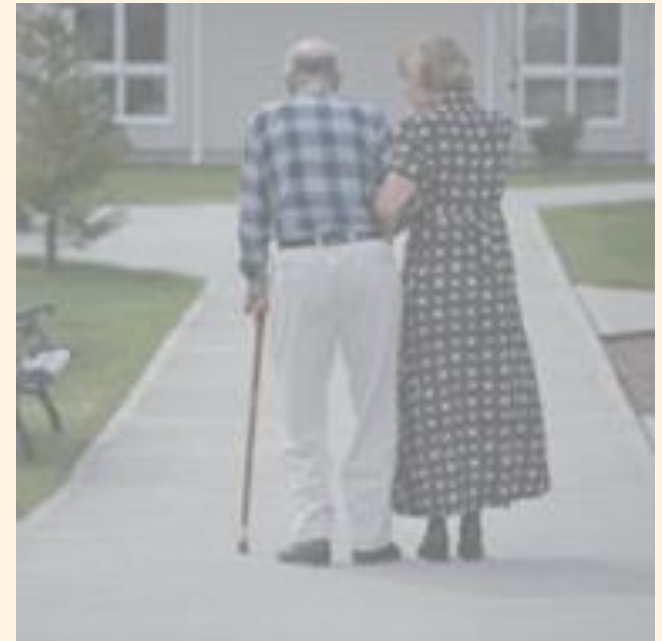
Falls and the Older Adults



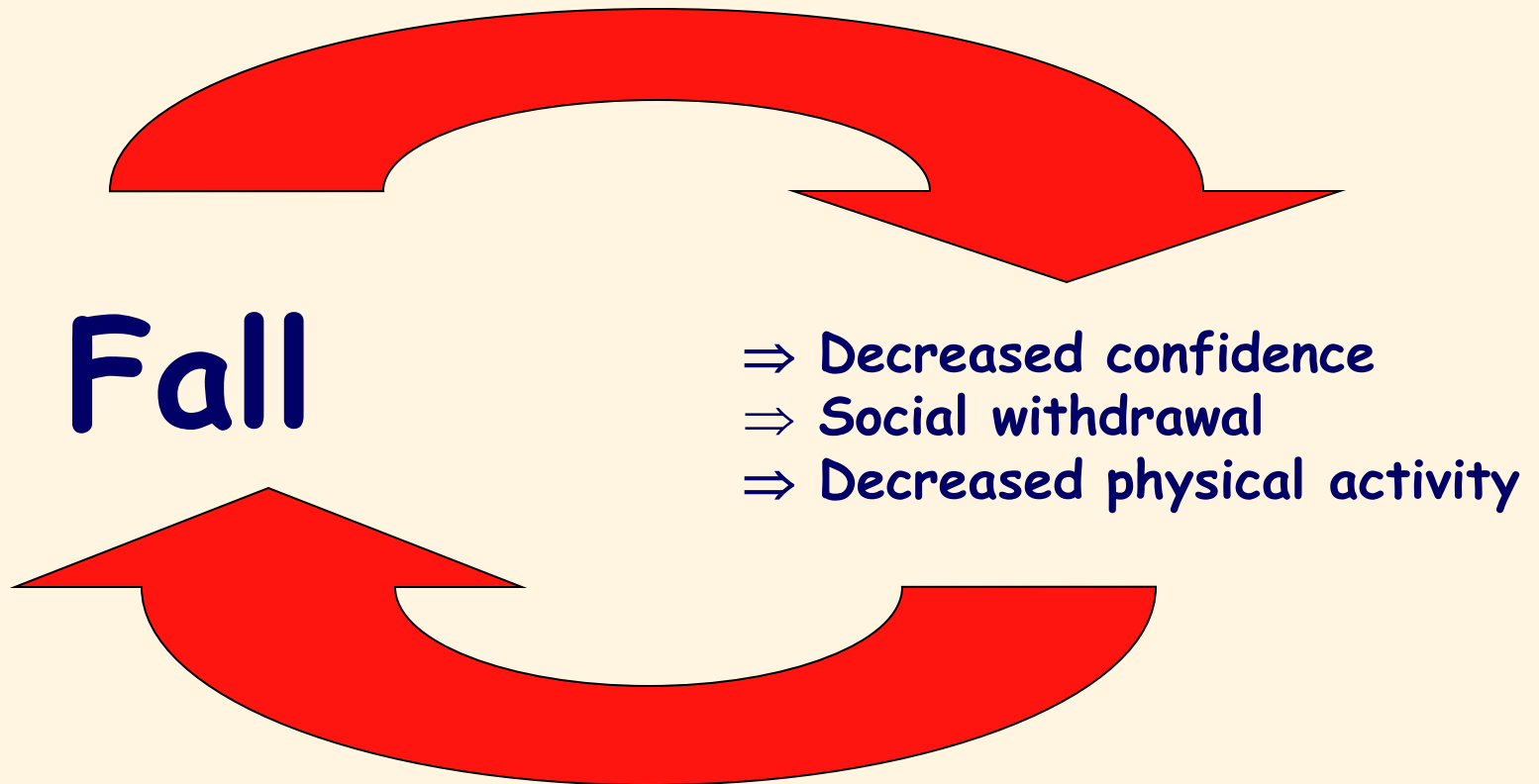
- Leading cause of injury related hospitalisation in older people
- 30% of adults > 65 years of age fall each year
- 40% of adults > 75 years
- 50% of adults > 80 years

Factors Associated to Falls

- Muscle Strength and Power
- Diminished Balance
- Compromised Gait
- Lost Confidence



Falls and the Older Adults



Exercise and the Older Adult - Benefits

- Improves cardiac and respiratory function
(Lambert & Evans 2005)
- ↑ Muscle parameters (Rogers & Evans 1993)
 - ↑ Muscle mass
 - ↑ Muscle strength, muscle power and muscle endurance
 - ↑ Mitochondrial and capillary density
 - ↑ Functional ability
- ↓ Markers of inflammation (Colbert et al. 2004)
- Prevent further loss of bone mineral density
(Milliken et al. 2004)

Exercise and the Older Adult - Benefits

- ↓ **Body fat** (Daley & Spinks 2000)
- ↓ **Symptoms of disease, depression and anxiety** (Singh et al 2005)
- **Improves sleeping patterns** (King et al. 1997)
- ↑ **Balance, postural stability and flexibility** (Buchner et al. 1997)
- ↑ **Social interaction** (Katula et al. 2006)
- ↑ **Quality of life** (Grimby et al. 1992)
- ↑ **Cognitive performance** (Heyn 2004)

- **Prolonged independence**

The Benefits of Being or Becoming Physically Active

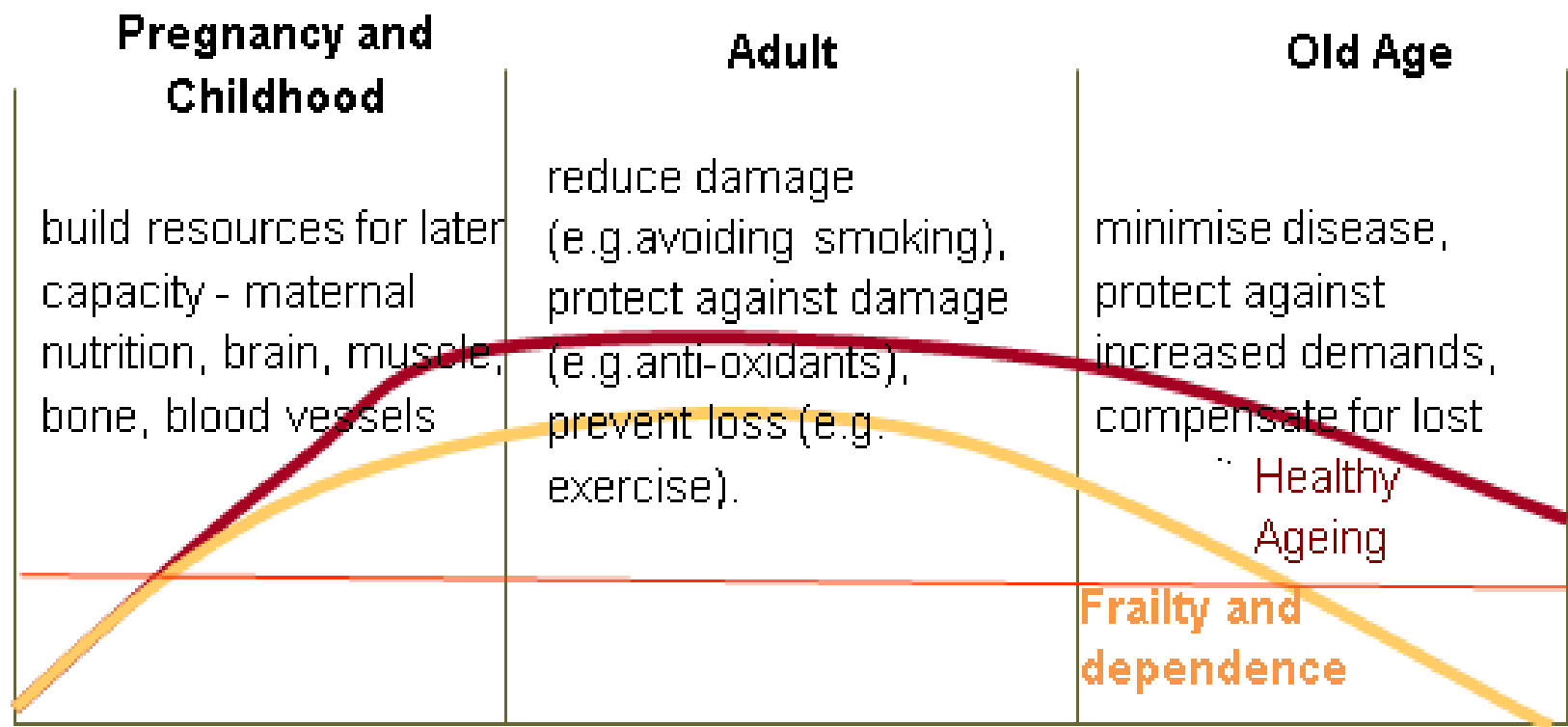
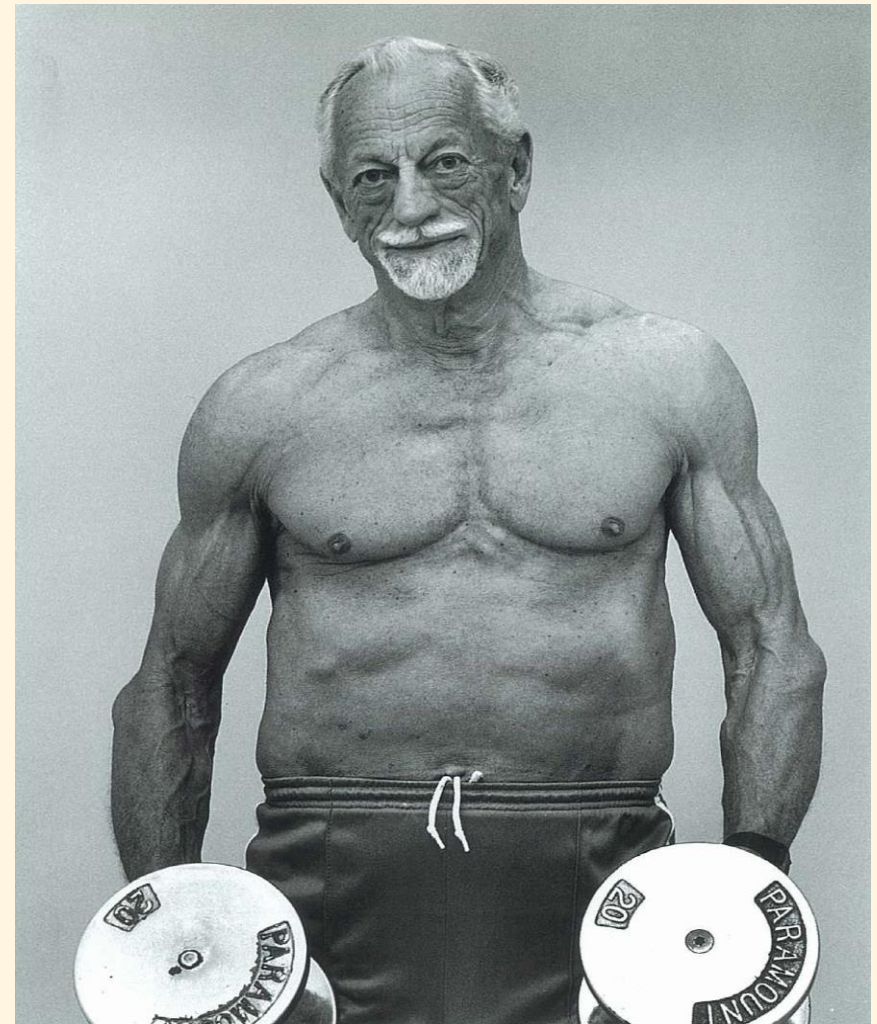
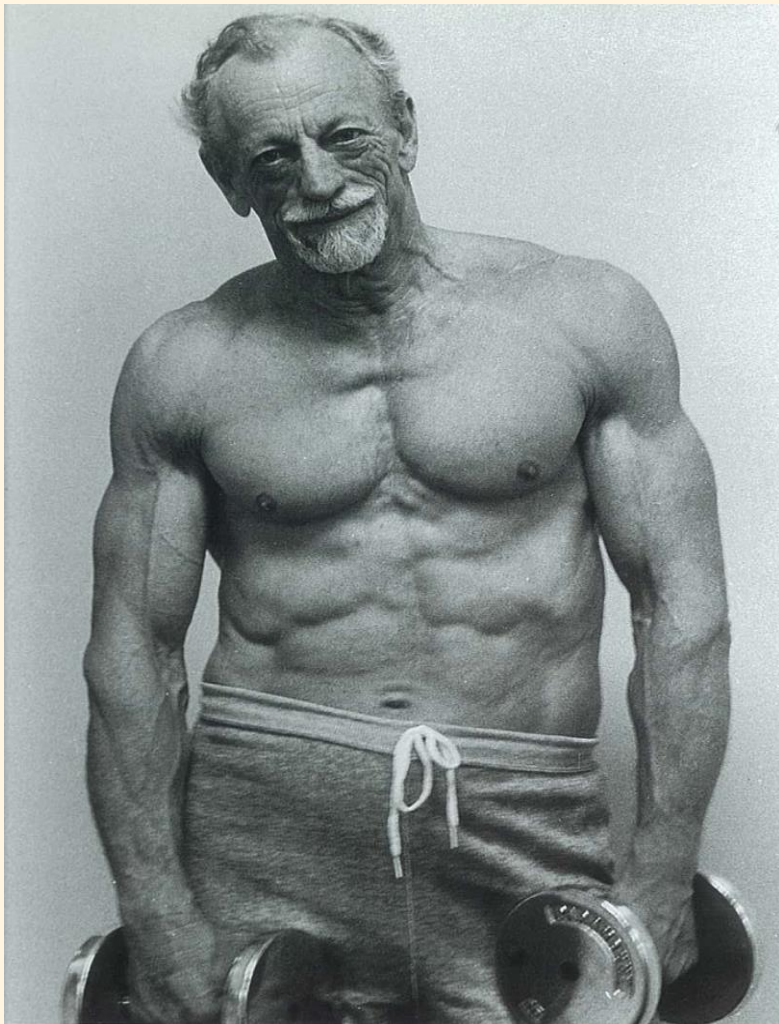
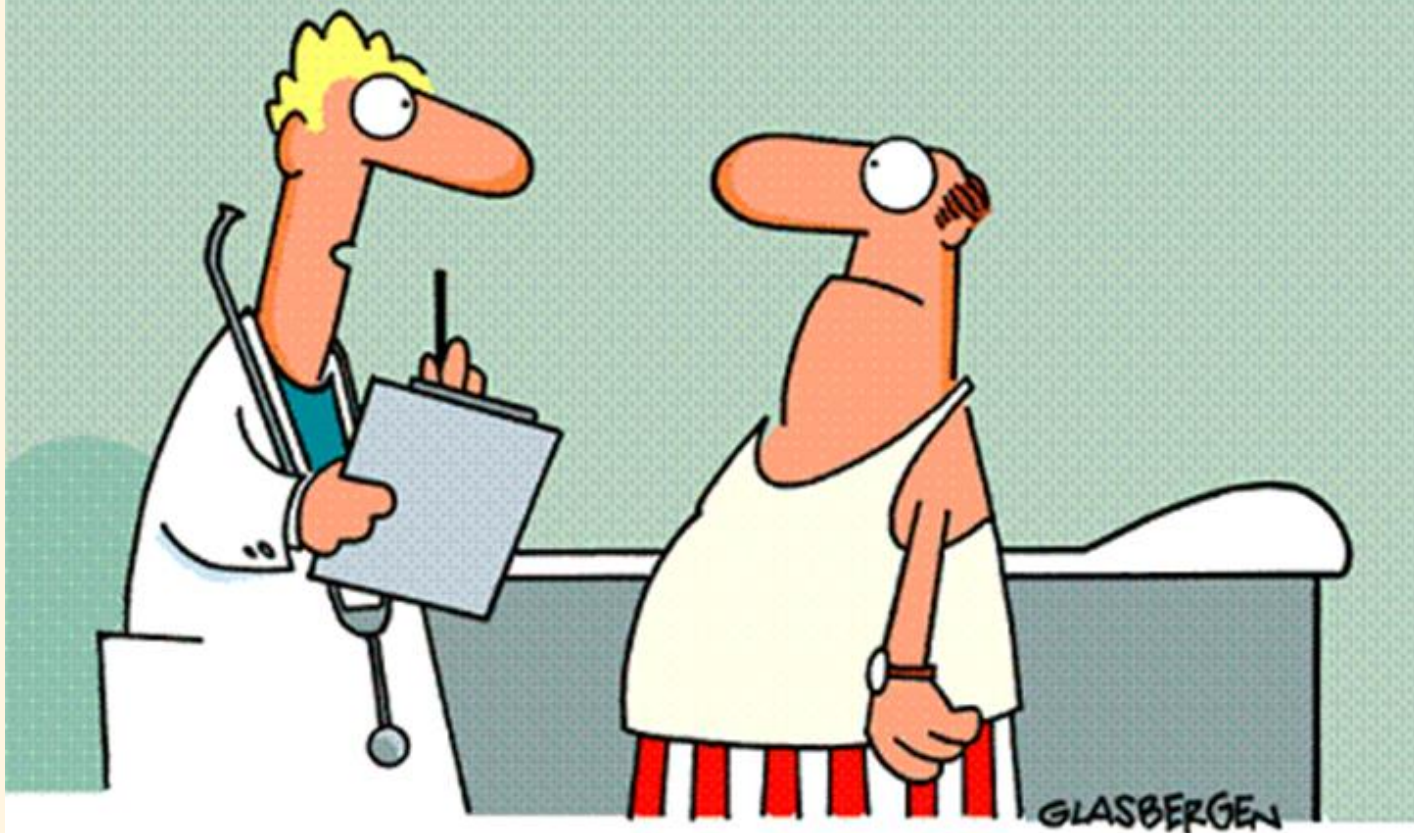


Figure: Health Promotion for Old Age, Adapted from Alexandre Kalache WHO



John Turner aged 67 and aged 79

Nb. Taken From Etta Clark *Growing old is not for sissies II*



“What fits your busy schedule better, exercising one hour a day or being dead 24 hours a day?”

Recommendations on physical activity for health for older Australians

Recommendation 1

- Older people should do some form of physical activity, no matter what their age, weight, health problems or abilities.

Recommendation 2

- Older people should be active every day in as many ways as possible, doing a range of physical activities that incorporate fitness, strength, balance and flexibility.

Recommendation 3

- Older people should accumulate at least 30 minutes of moderate intensity physical activity on most, preferably all, days.

Recommendation 4

- Older people who have stopped physical activity, or who are starting a new physical activity, should start at a level that is easily manageable and gradually build up the recommended amount, type and frequency of activity.

Recommendation 5

- Older people who continue to enjoy a lifetime of vigorous physical activity should carry on doing so in a manner suited to their capability into later life, provided recommended safety procedures and guidelines are adhered to.

Prehabilitation

- Surgical interventions among adults 75 - 84 years doubled in the past decade
- Increased post-surgical mortality and morbidity in adults > 75 years



Prehabilitation

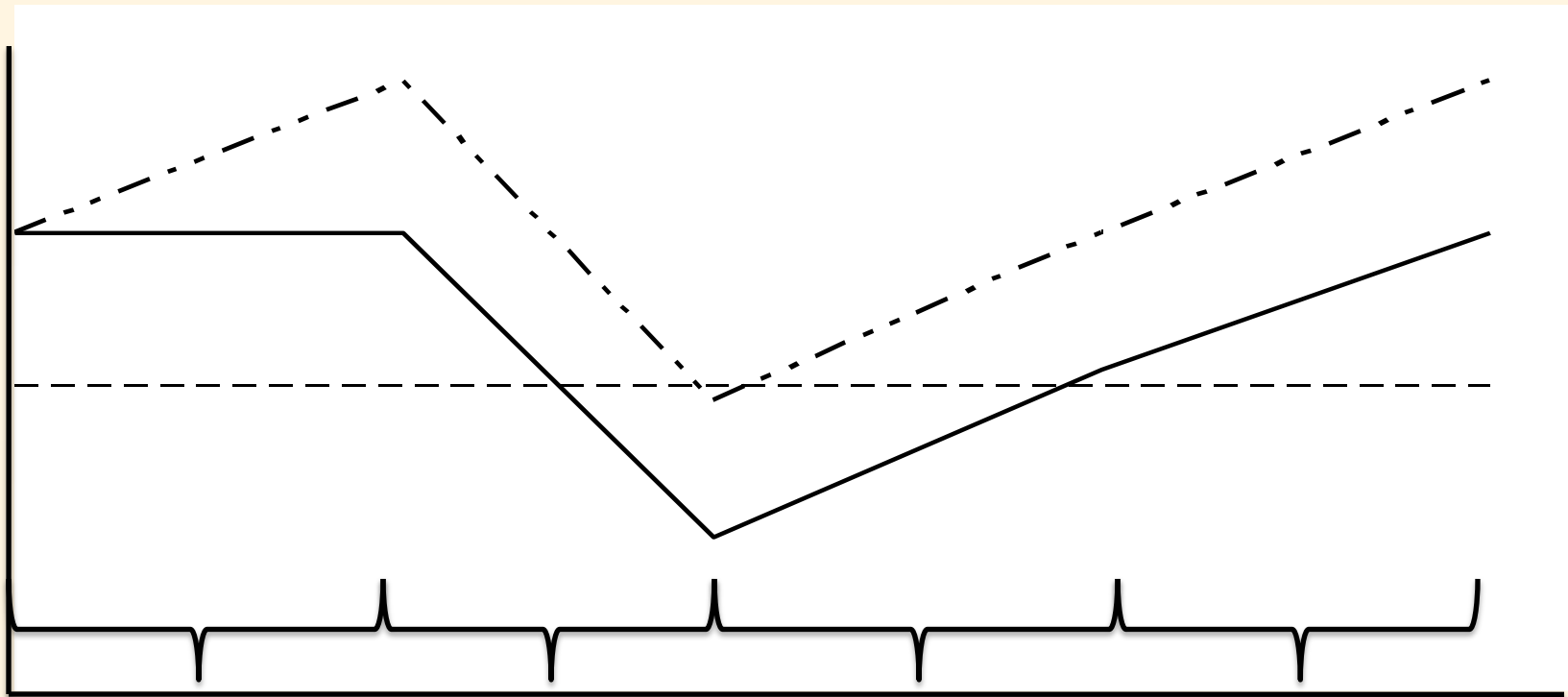
- Playforth (87) and Cook (01): Decreased fitness associated with an increased risk of deaths 30 days post-surgery, increased stay in hospital and an increased risk of surgical complications.

Prehabilitation

Exercise undertaken by older adults pre-extended hospitalisation:

- ⇒ Shortened recovery time
- ⇒ Increased quality of life during recovery
- ⇒ Decreased post-operative complications
- ⇒ Increased functional ability post-departure from hospital

(Carli & Zarosky 2005)



Prehabilitation
phase

Surgical
procedure

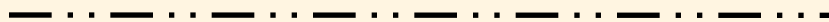
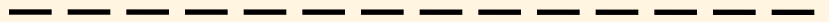
Rehabilitation
phase

Post-Rehabilitation
phase

Functional threshold

Prehabilitation patients

Non-Prehabilitation patients



Exercise Considerations

- Age
- Functional Capacity
- Medical clearance
- Medical background and medications
- Access to facilities
- Confidence and education
- Present/past PA level
- Fitness Assessment
- Goals
- Conditioning phase
- Education
- Motivation
- Supervision



Exercise for the Cardiovascular System

- ↑ Level of fitness
- 10-30 % ↑ in VO_{2max}
- Improved cardiac response
- Improved glucose tolerance and insulin sensitivity
- ↓ Blood pressure
- ↓ Fat mass

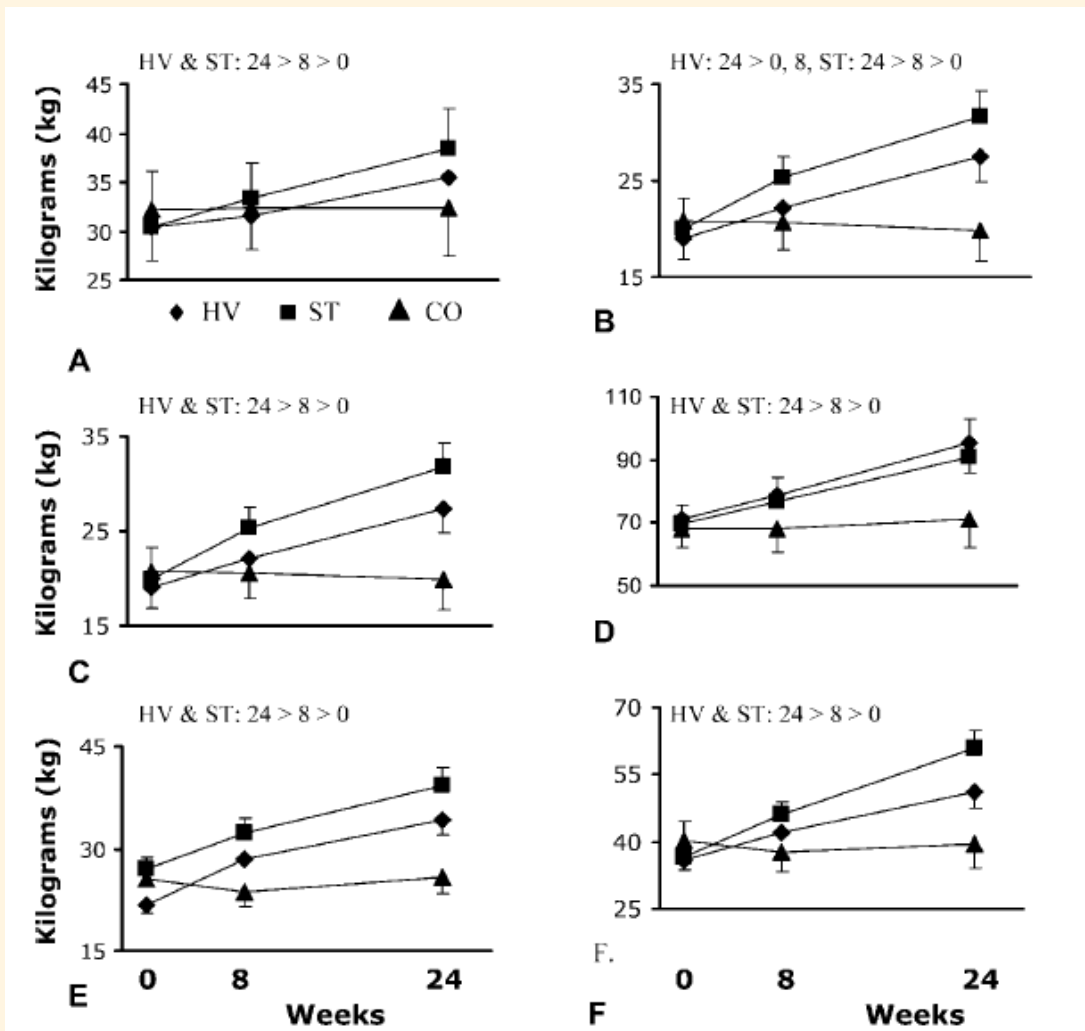


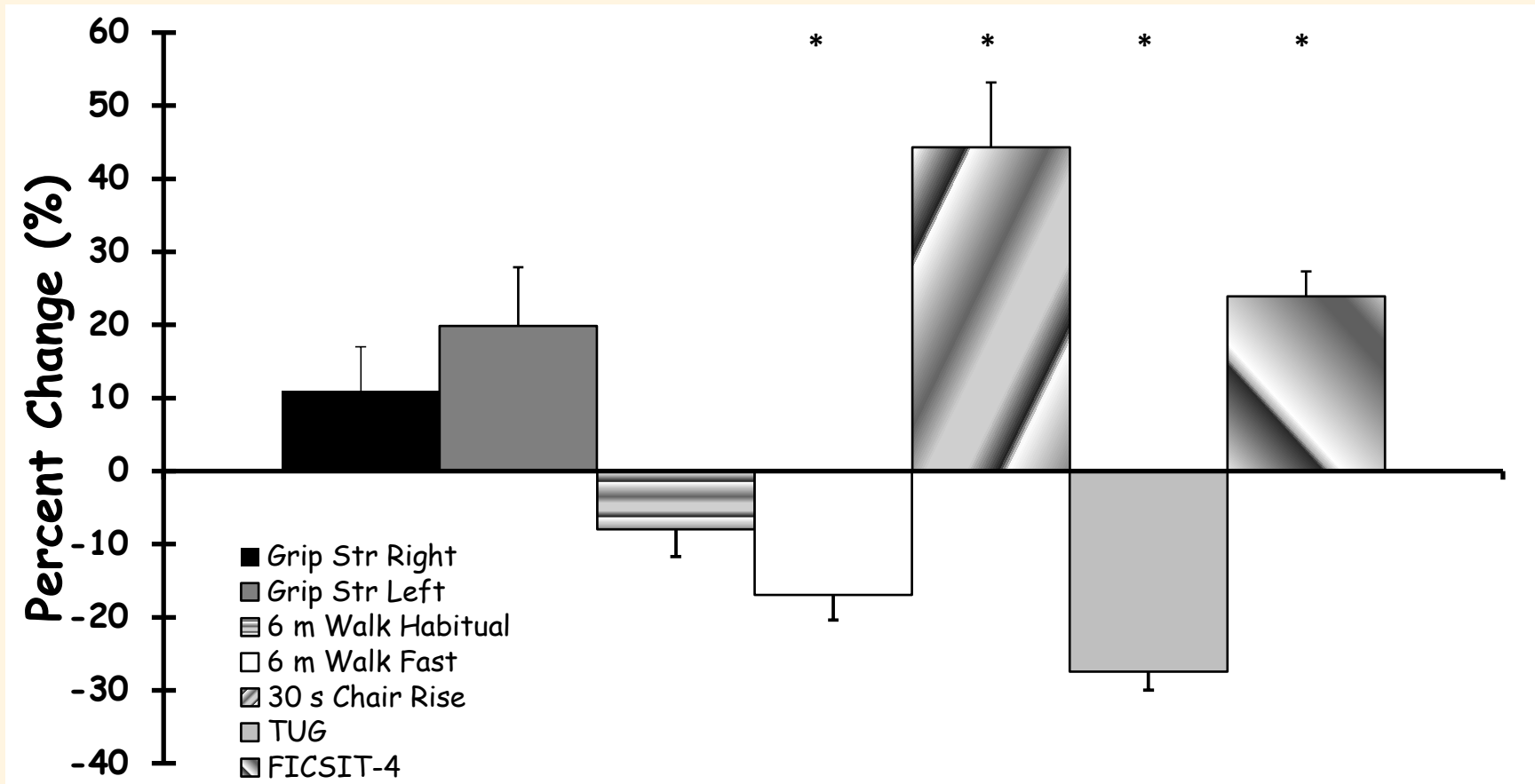
Resistance training and weight bearing exercise



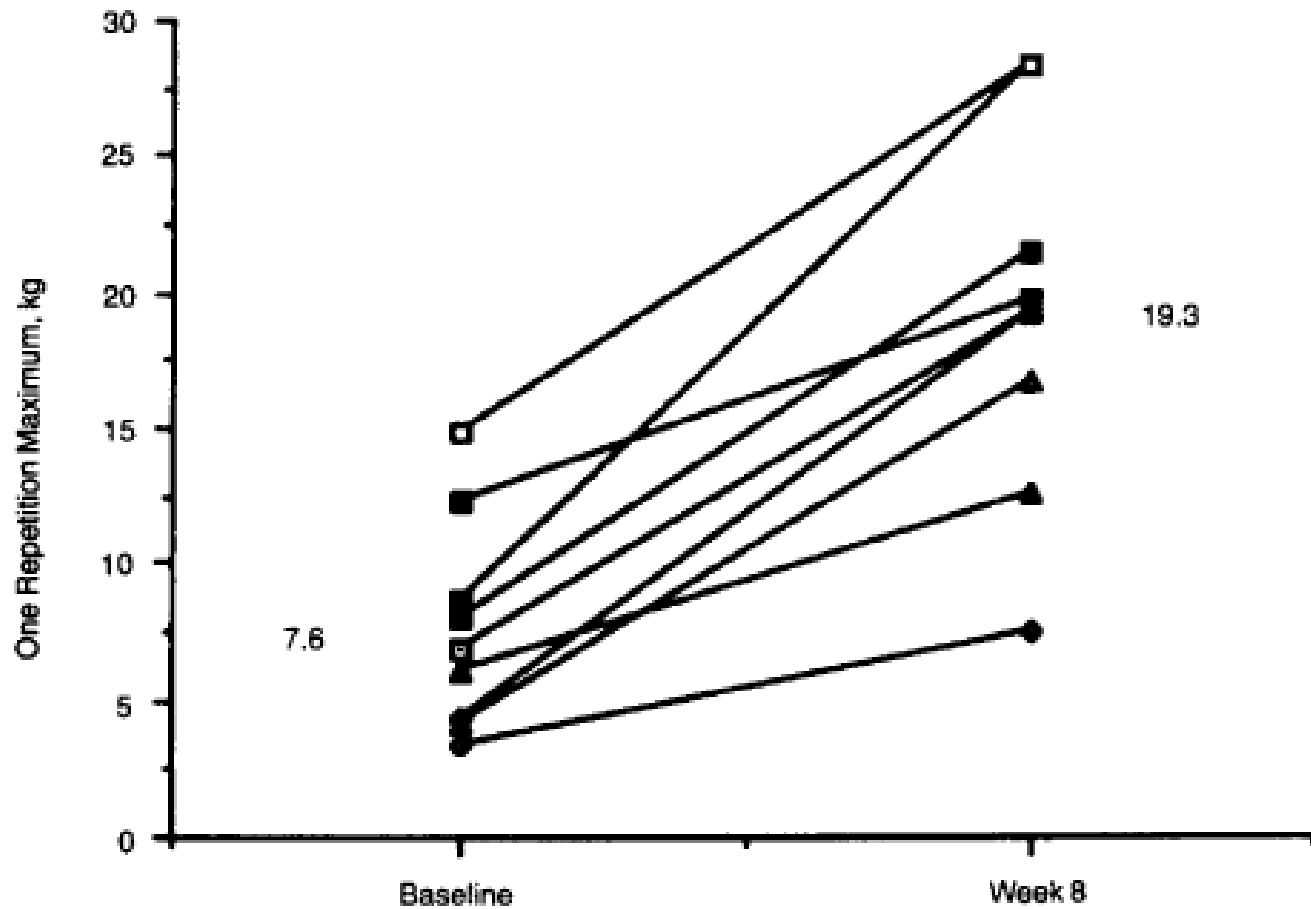
HV- High velocity varied resistance
 ST -moderate velocity constant resistance
 CO - Control

Henwood et al. J Gerontol: Med Sci
 2008, 63, 83-91.

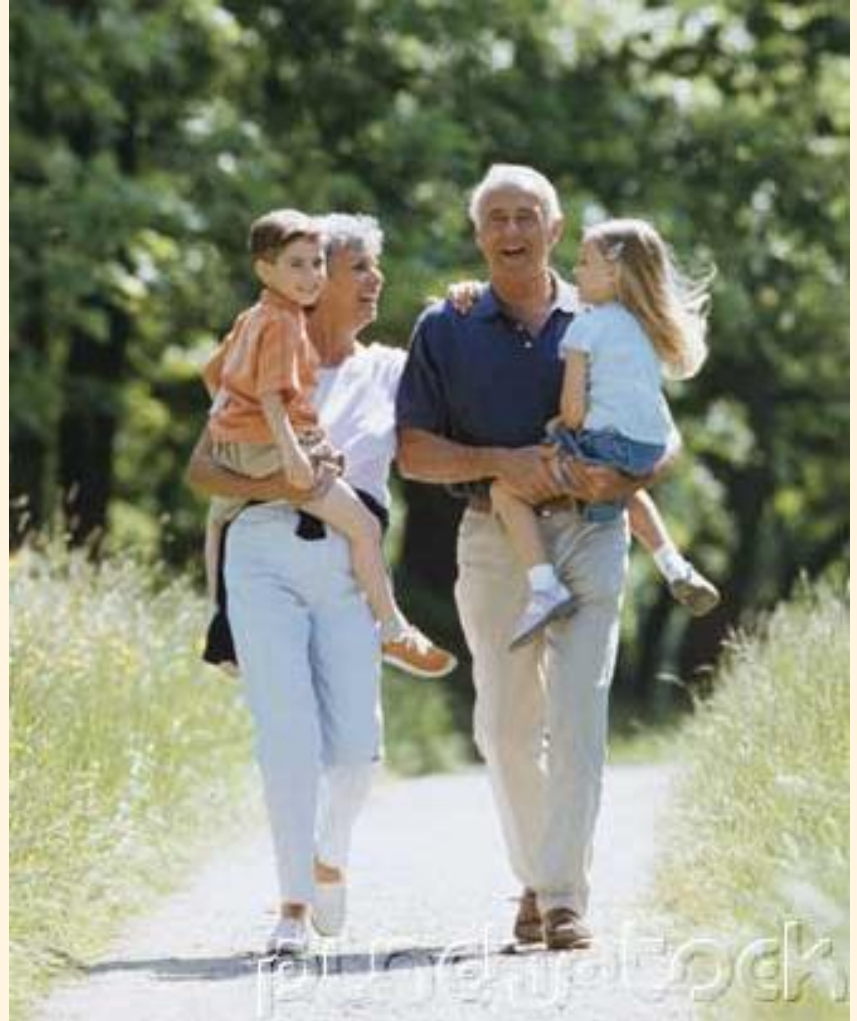




Henwood et al. 2013. * $p < 0.05$.



Fiatarone et al. JAMA 1990, 263, 3029 - 34.



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Balance and Flexibility

- Improved postural stability and balance
- ↓ occurrence of falls
- ↑ ROM
- Improvement in tasks of daily living



Functional Training and Physical Activities

- Improved functional ability
- ↓ occurrence of falls
- Maintained muscle mass and cardio respiratory function
- Prolonged functional independence



General Recommendations



- Start slow
- Warm up and cool down
- Low impact with light to ↑ intensities
- ↑ You daily physical activity
- Group/organised activities
- Seek help/advise
- Beware medication effects
- Beware of early warning signs
- Breath

Recommendations



Resistance/weight training

- 1-2 days/week
- 3 sets of 8-12 repetitions
- Respect proper technique and balance
- Full ROM
- Varied resistance
- Machines 1st, dumbbells 2nd
- Incorporation of explosive concentric movements

Balance

- Dynamic, static and agility training
- Slow and conservative movements
- PRT and aerobic exercise

Endurance/Aerobic

- Intermittent sessions
- Duration: 20-60 minute
- Frequency: 3-5 days/week
- Monitor HR and/or RPE

Flexibility

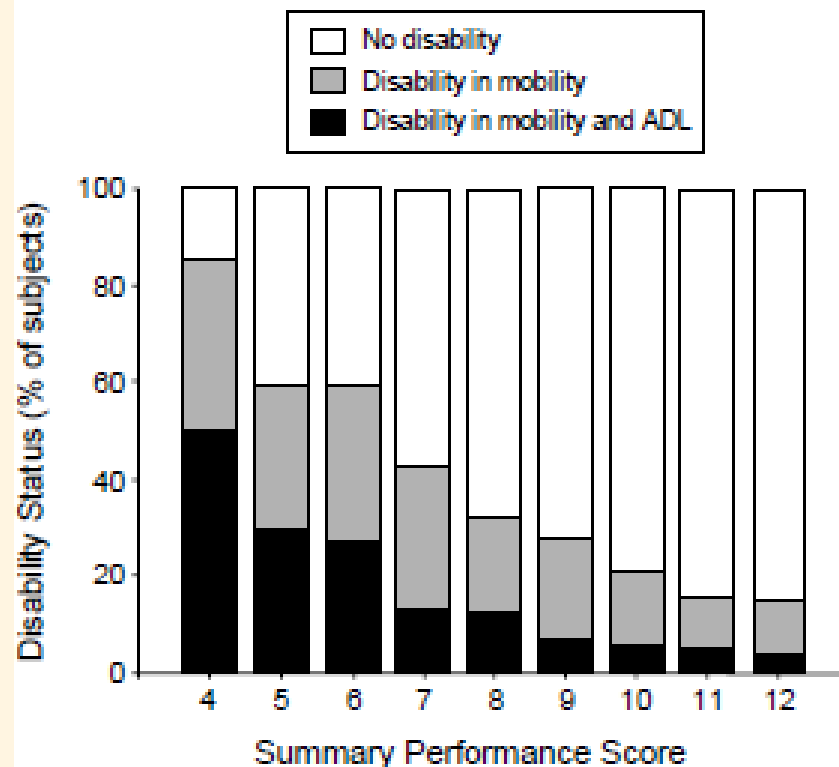
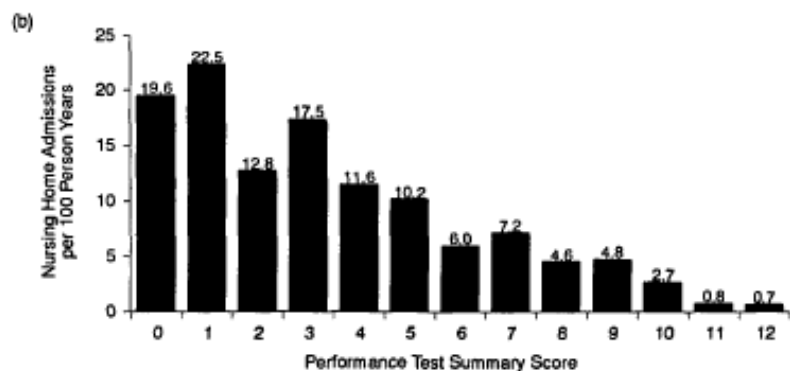
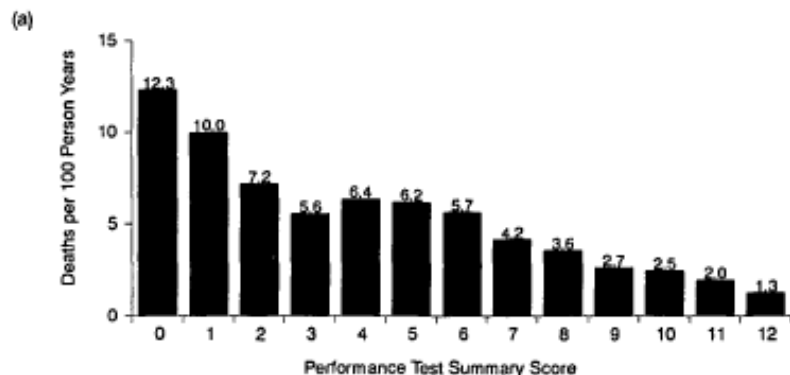
- 20 sec/stretch
- No bouncing
- Full range of motion activities

Exercise is Medicine



- <http://exerciseismedicine.org.au/public/factsheets>
- Preventative
- Symptom reduction

Prevention of negative health outcomes



Guralnik JM, et al. *J Gerontol Med Sci.* 1994, 49, M85-M94.
 Guralnik et al. *N Engl J Med* 1995, 332, 556-561.

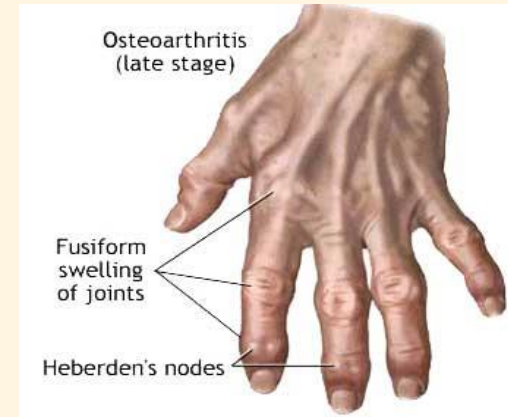
Osteoarthritis

Background

- Degenerative disease effecting cartilaginous bone endings caused by continual overuse or injury

Benefits of Exercise

- ↑ range of motion.
- ↓ inflammation.
- ↑ functional ability.
- ↑ blood supply and bone regeneration
- ↑ muscle tone, particularly if a joint replacement is a projected outcome of the level of deterioration.



Contraindications

- Musculoskeletal injury

Recommendations

- Time of day, warm-up cool-down, low impact environment

Type 2 Diabetes

Background

- Elevated blood glucose levels → insulin resistance.
- 6th leading cause of death.
- >8% of the Australian population

Benefits of Exercise

- Better than medications in prevention
- ↑ metabolic control
- ↑ cardiorespiratory fitness, muscular strength, endurance, and body composition.
- Favourable effect on CV risk factors

Contraindications

- Hypoglycaemia - not common
- Foot Care - impact forces
- Microvascular Disease - Retinopathy/nephropathy
- Cardiac Risk

Recommendations

- 150 min/week moderate or 90min/week vigorous aerobic.
- Resistance training 3 x /week encouraged

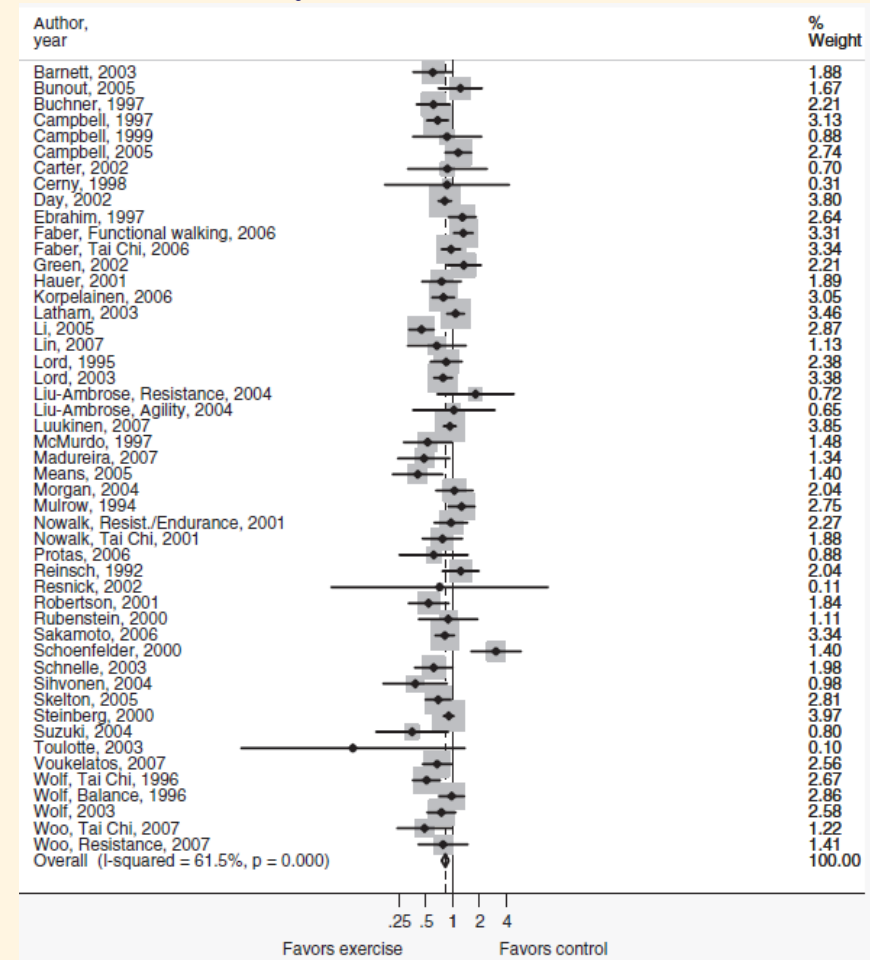
Exercise for the prevention of falls: a systematic review and meta-analysis

Sherrington, et al. *J Am Geriatr Soc* 2008; 56(12): 2234-2243.

44 RCT's with 9,603 participants

Greatest outcomes related too:

- higher total dose of exercise
- challenging balance exercises
- didn't include a walking program.



Alzheimer's disease and dementia

Canadian Study of Healthy Ageing

- Laurin, et al. *Arch Neurol.* 2001, 58, 498-504.

Table 2. Relationship Between Physical Activity and Risk of Cognitive Impairment–No Dementia (CIND) and Dementia

	CIND		Dementia					
			Alzheimer Disease		Vascular Type		Any Type	
	No. of Cases/ No. of Controls	OR (95% CI)*	No. of Cases/ No. of Controls	OR (95% CI)	No. of Cases/ No. of Controls	OR (95% CI)	No. of Cases/ No. of Controls	OR (95% CI)
Physical activity†								
None	169/1103	1.00	80/1103	1.00	23/1103	1.00	110/1103	1.00
Low	44/485	0.66 (0.46-0.96)	21/485	0.67 (0.39-1.14)	5/485	0.54 (0.20-1.44)	28/485	0.64 (0.41-1.02)
Moderate	122/1360	0.67 (0.52-0.87)	52/1360	0.67 (0.46-0.98)	18/1360	0.70 (0.37-1.31)	79/1360	0.69 (0.50-0.95)
High	47/731	0.58 (0.41-0.83)	16/731	0.50 (0.28-0.90)	8/731	0.63 (0.27-1.44)	31/731	0.63 (0.40-0.98)
Test for trend	$P < .001$		$P = .02$		$P = .46$		$P = .04$	

*OR indicates odds ratio; CI, confidence interval.

†Data are adjusted for age, sex, and educational level. See the "Subjects and Methods" section for an explanation of the physical activity categories.

Muscle strength and cognitive decline

Rush Memory and Ageing Project

- > 900 older adults
- 3.6 year follow up
- 1 unit \uparrow in musc str
=> 43% \downarrow risk of AD

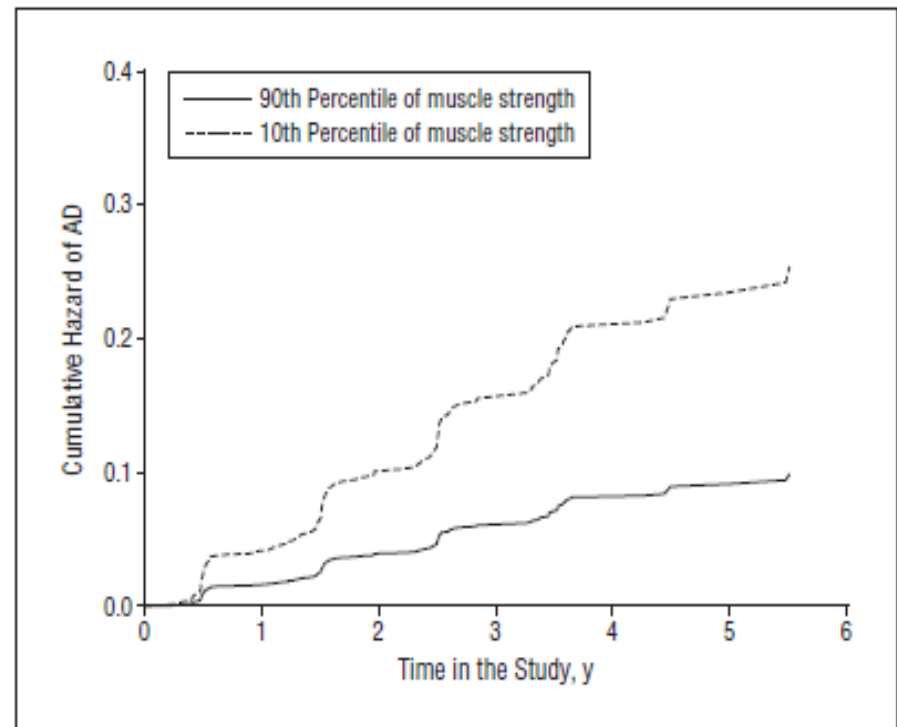
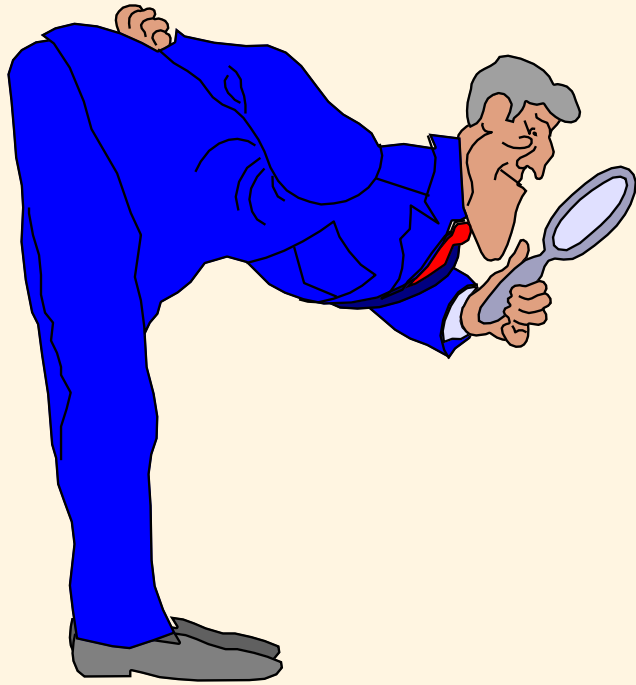


Figure 1. Cumulative hazard of Alzheimer disease (AD) for participants with low muscle strength vs those with high muscle strength.

Boyle et al. Arch Neurol 2009 66: 339-1344.

Barriers



- Poor health
- No-one to exercise with
- Physical environment
- Accessibility
- Knowledge
- Lack of interest
- Time

Motivations

- Health and well-being
- Social support
- A purpose for physical activity
- Environmental factors
- Avoiding the negative stereotype of old age

Exercise should be stopped/avoided in the presence of:

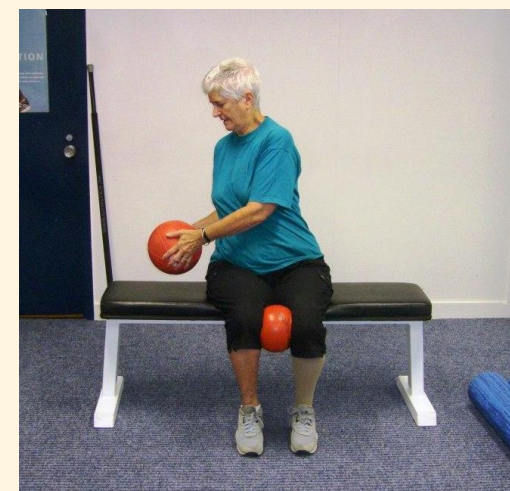
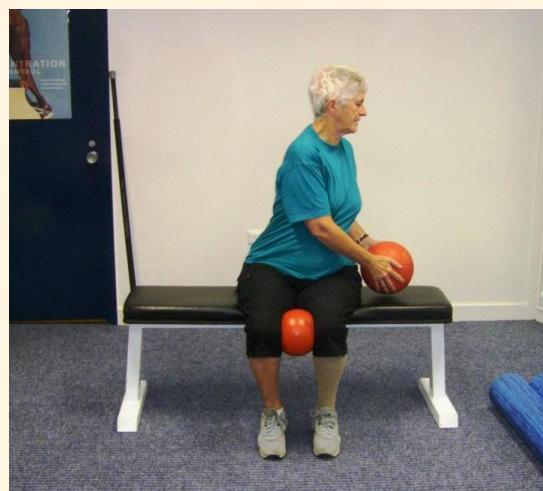
- Pain or discomfort
- Shortness of breath at rest or with mild exertion
- Dizziness or fainting
- Cardiac irregularities
- Undue fatigue

- Recent changes in resting ECG
- Unstable angina
- Unstable blood glucose levels
- Recent significant retinal haemorrhage
- Acute infection or fever

Be aware of the contraindications of medication on exercise.



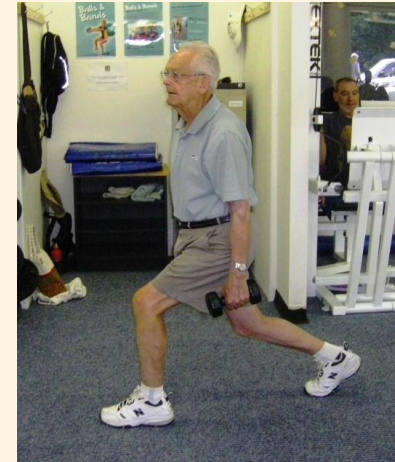
Trunk twist



Chair stands



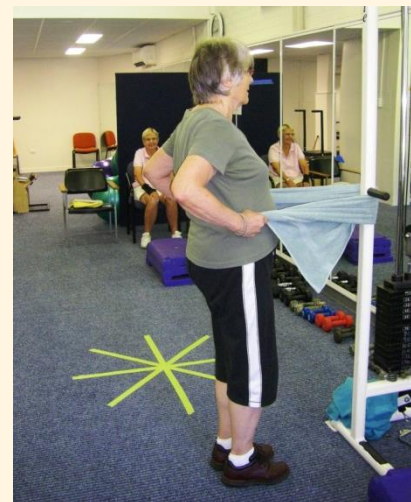
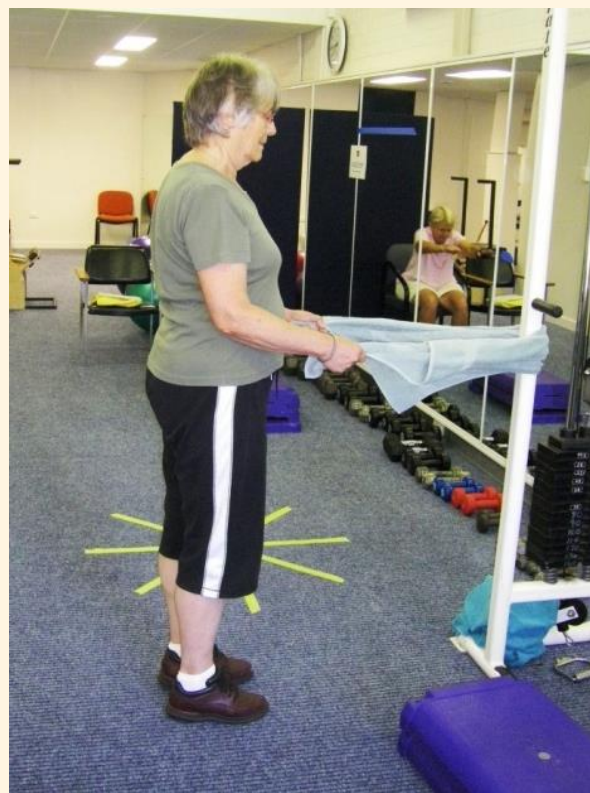
Assisted standing lunges



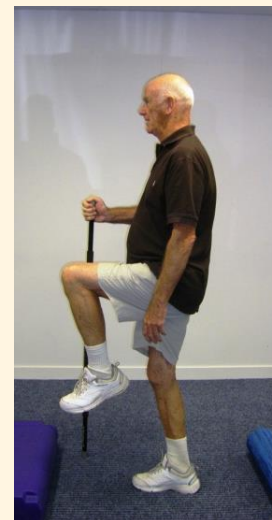
Wall pushups



Towel rows



Dynamic Step-up





Just remember
we are all part of the
ageing process

Thank you

t.henwood@uq.edu.au