Exercise and Healthy Aging

Dr Noel McCaffrey

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Healthy aging is the “process of developing and maintaining the functional ability that will enable older people to do the things that matter to them”

World Report on Aging and Health (WHO, 2015)

Successful aging involves lack of chronic diseases, physical disabilities and risk factors for disease in older age, as well as good mental health, cognitive function and social engagement

Rowe and Kahn, 1977

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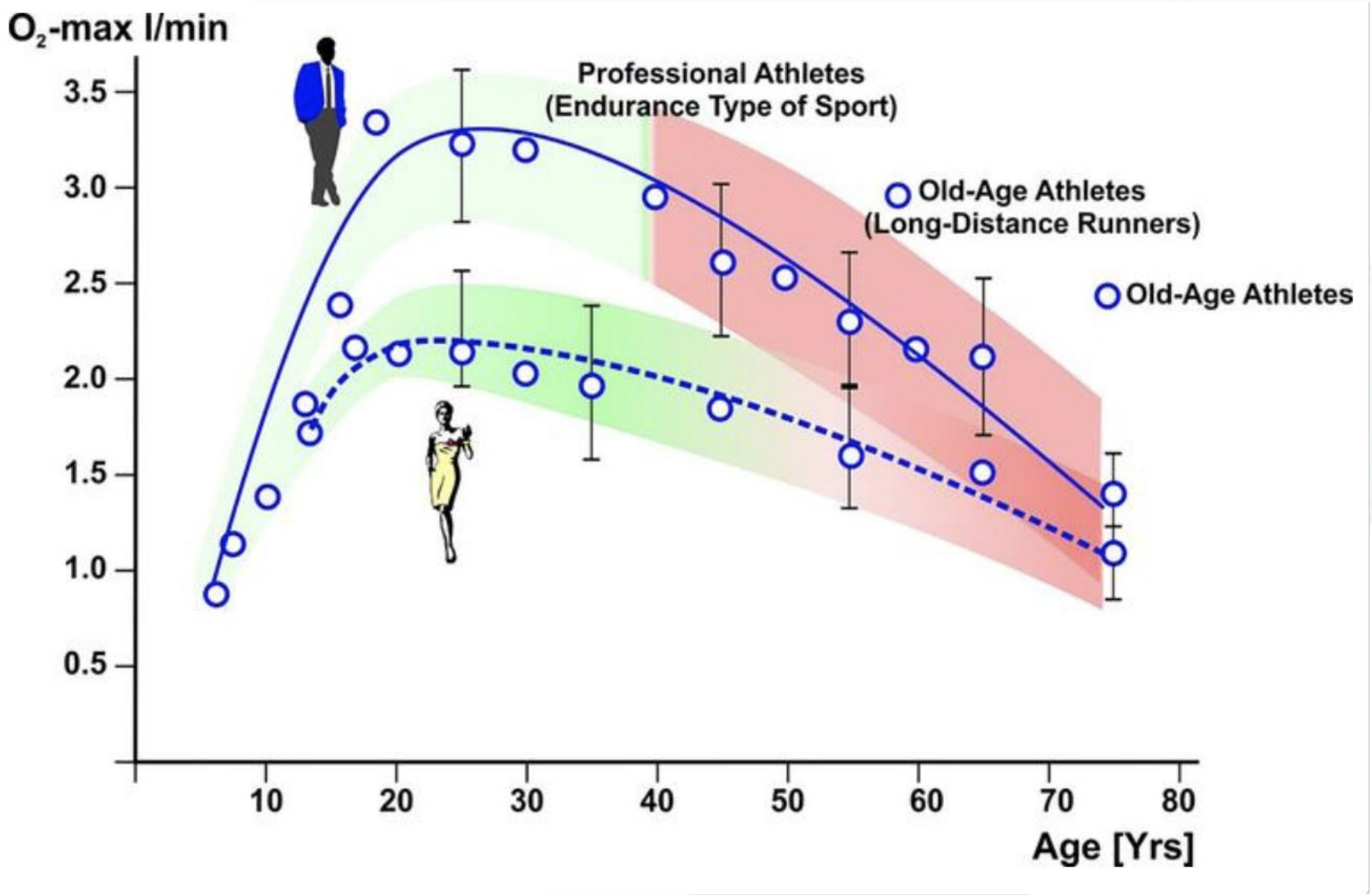
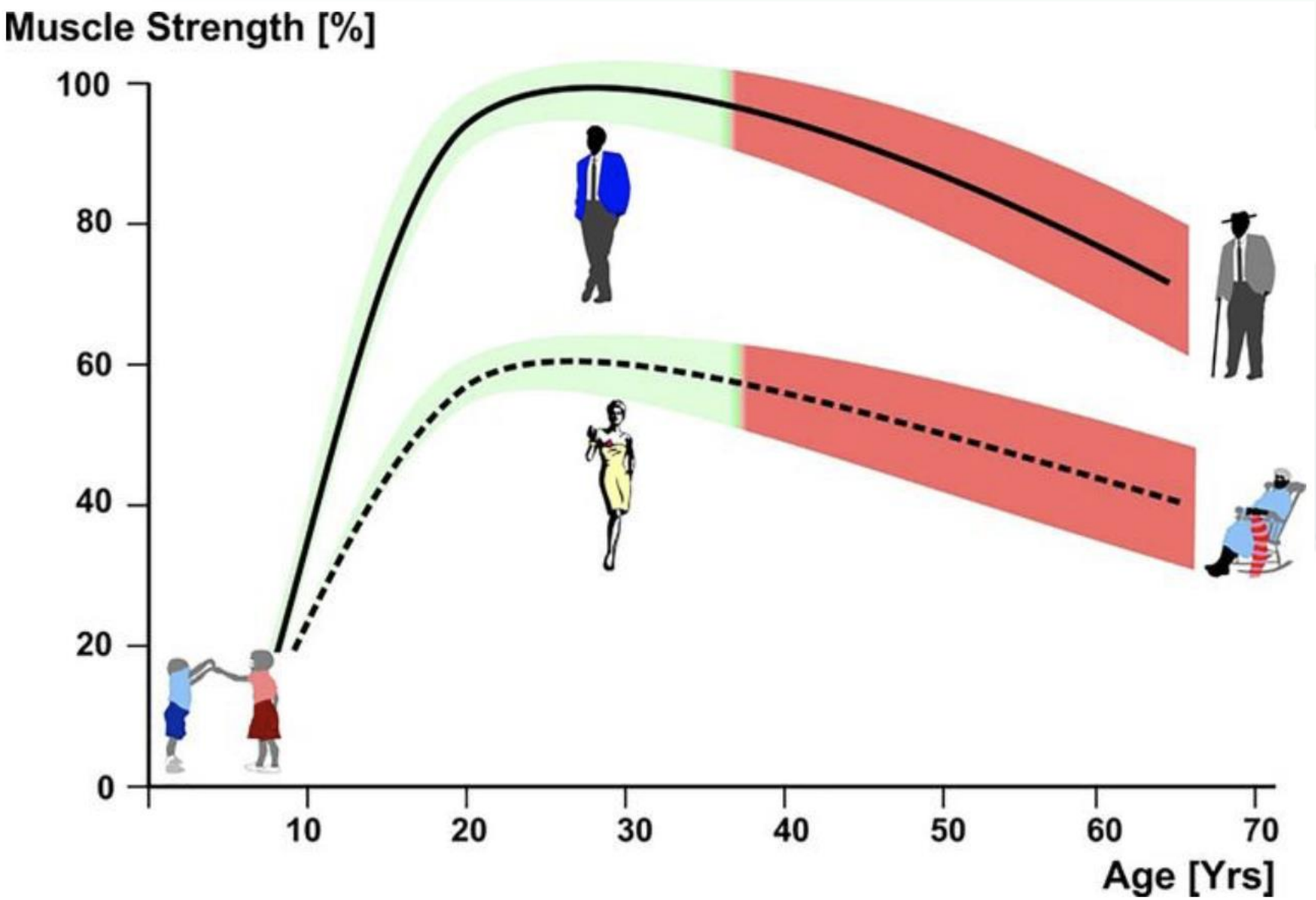
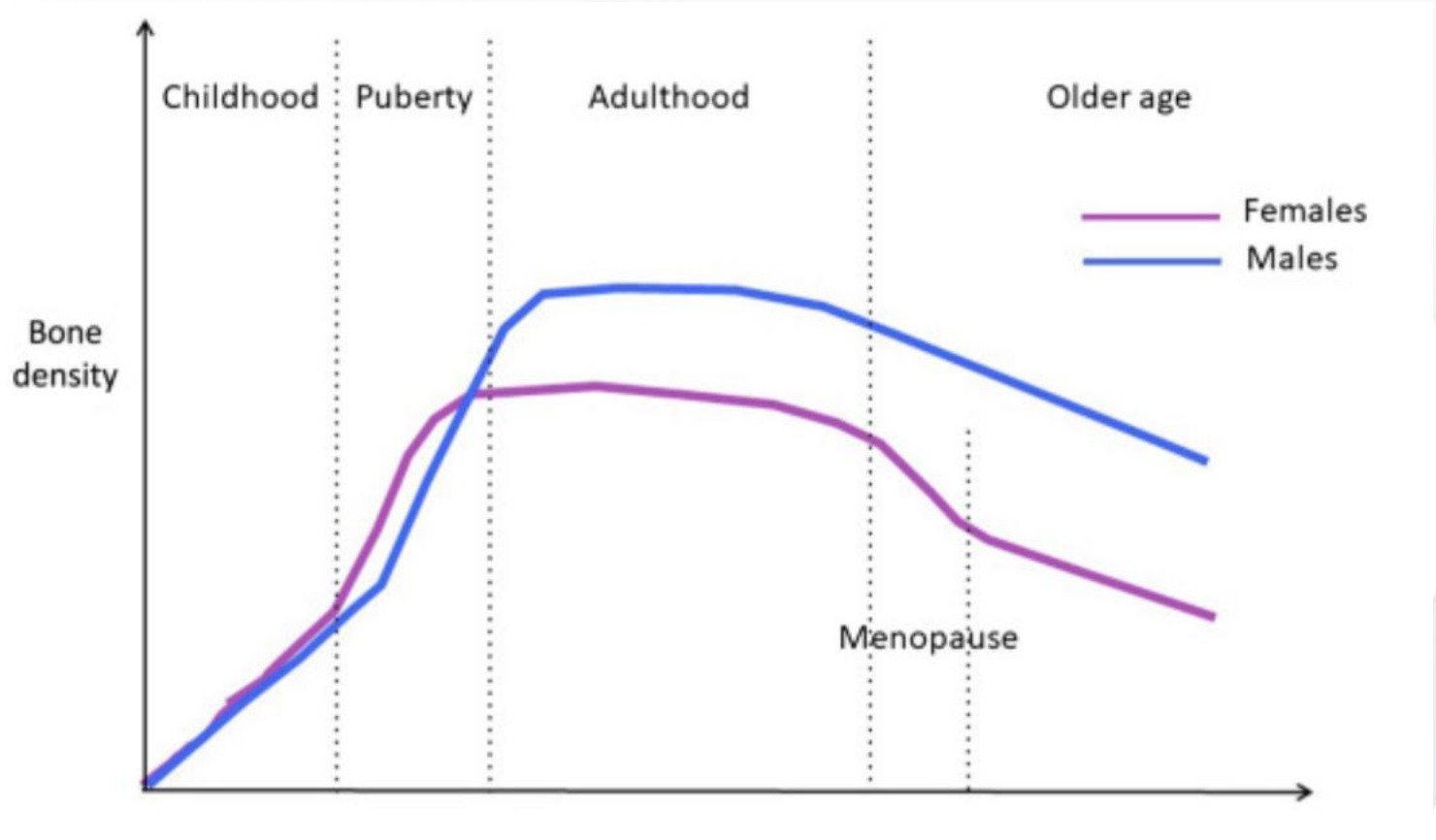
- Aging
- Aging and Illness
- Mortality, Quality of Life and Exercise
- Getting Started
- 2 stories
- Discussion


O_2-max l/min
3.5
3.0
2.5
2.0
1.5
1.0
0.5
Professional Athletes
(Endurance Type of Sport)
Old-Age Athletes
(Long-Distance Runners)
Old-Age Athletes
10
20
30
40
50
60
70
80
Age [Yrs]


Muscle Strength [%]
100
80
60
40
20
0
10
20
30
40
50
60
70
Age [Yrs]


Childhood
Puberty
Adulthood
Older age
Females
Males
Bone density
Menopause

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Original Investigation | Health Policy

Development and Validation of the Chronic Disease Population Risk Tool (CDPoRT) to Predict Incidence of Adult Chronic Disease

Ryan Ng, PhD; Rinku Sutradhar, PhD; Kathy Kornas, MSc; Walter P. Wodchis, PhD; Joykrishna Sarkar, MSc; Randall Fransoo, PhD; Laura C. Rosella, PhD

2020

- aim was to develop a tool to predict 10-yr incidence of first major chronic disease in an adult population
- 6 chronic illnesses i.e. congestive heart failure, COPD, diabetes, lung cancer, myocardial infarction, stroke (including transient ischemic attack)
- data taken from 6 cycles of Canadian Community Health Survey between 2000 – 2014
- 133,991 adults (over 20 yrs) representative of the Ontario and Manitoba populations
- no prior history of major chronic disease.

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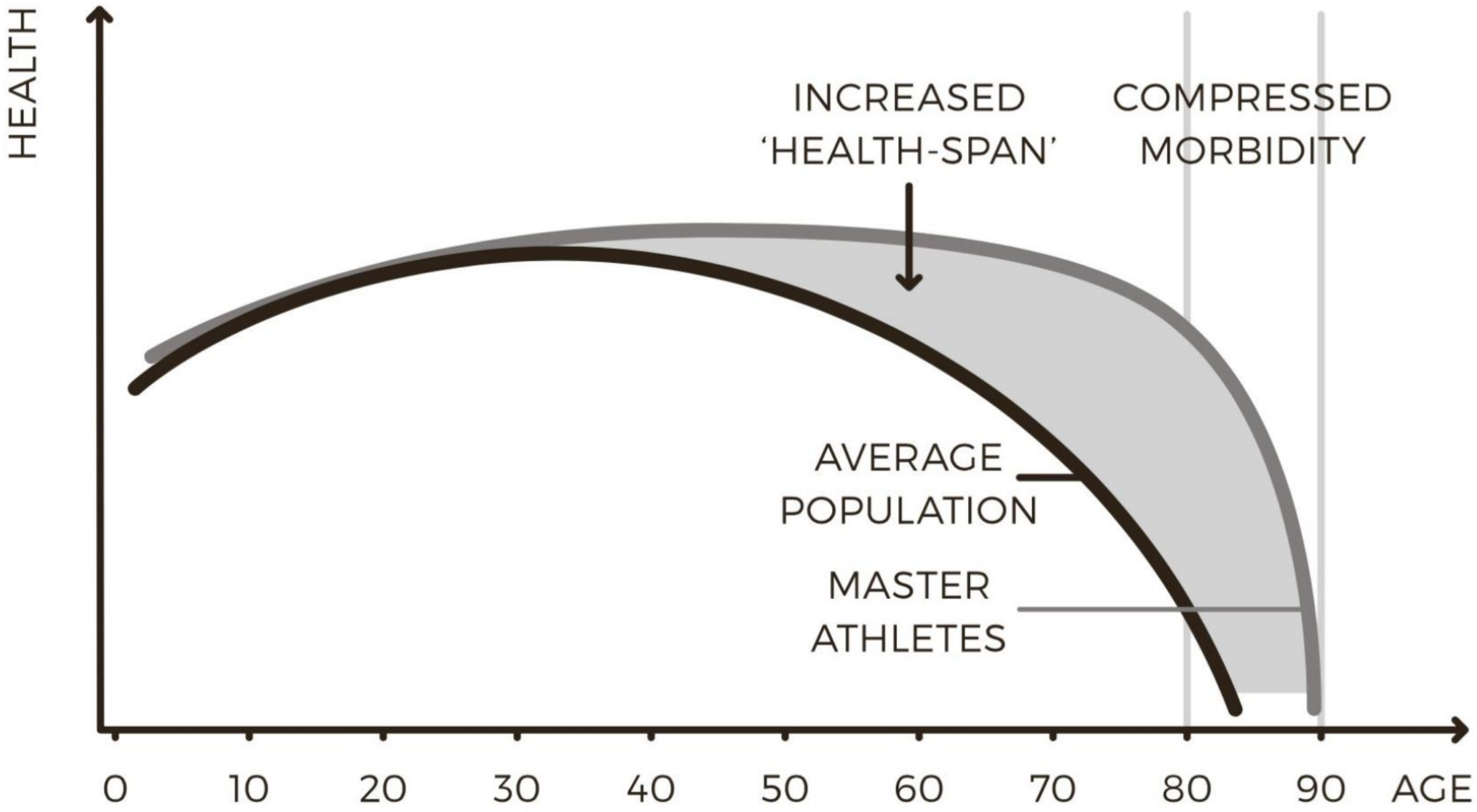
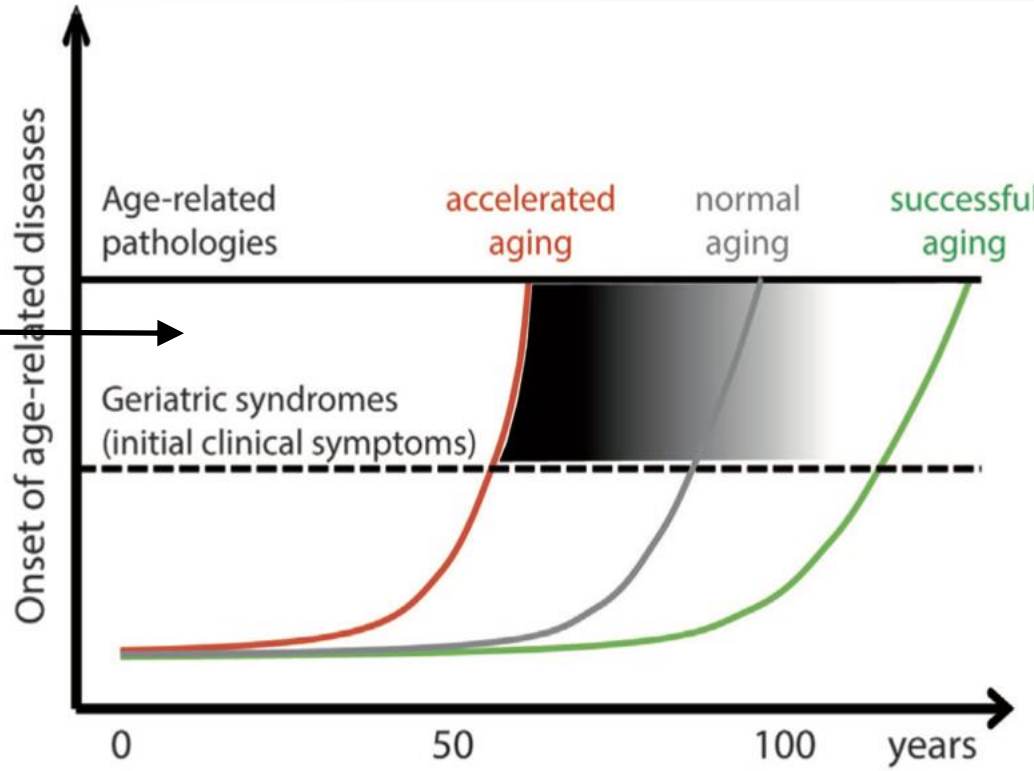
3 major predictors

- Age
- Smoking
- BMI


HEALTH
INCREASED
'HEALTH-SPAN'
COMPRESSED
MORBIDITY
AVERAGE
POPULATION
MASTER
ATHLETES
0
10
20
30
40
50
60
70
80
90
AGE

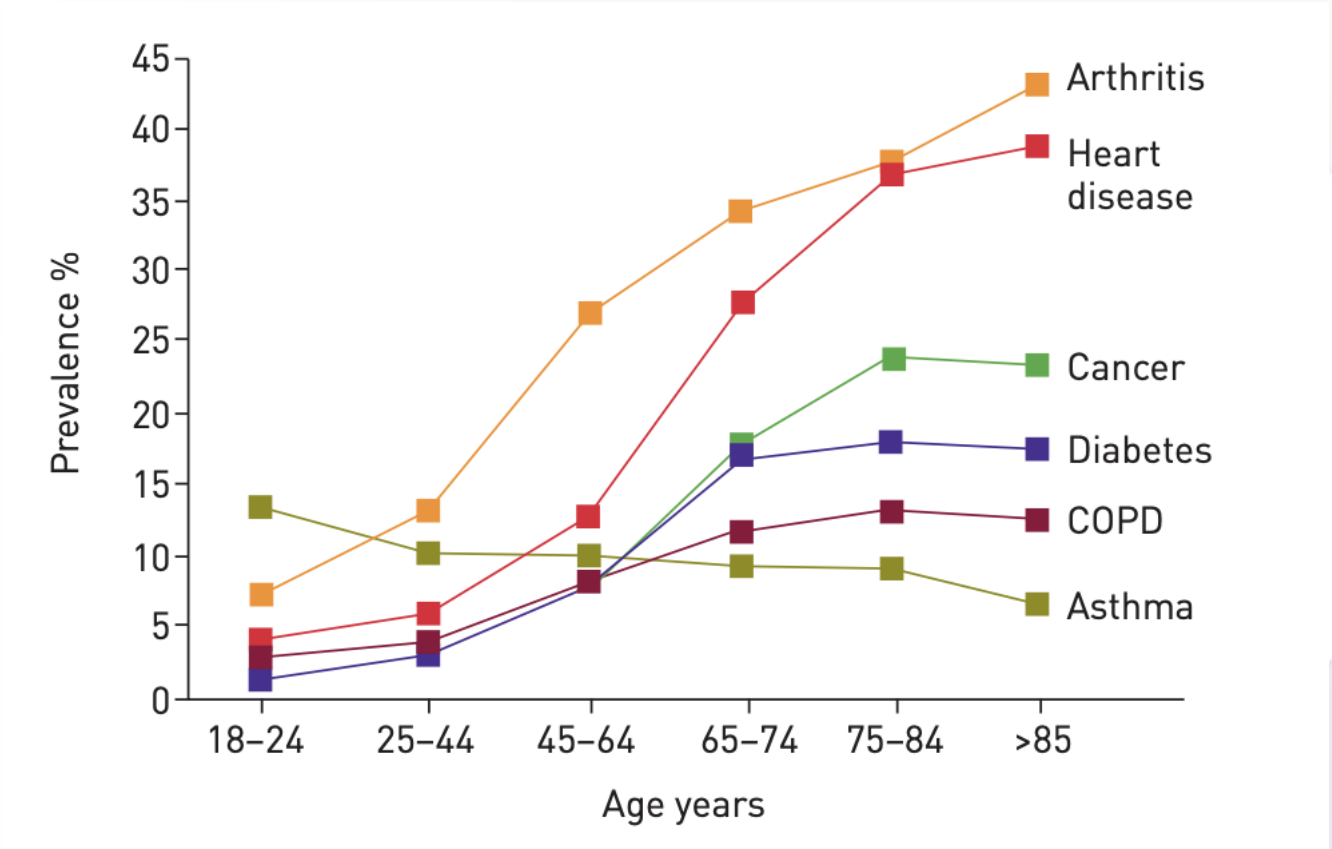
- Frailty
- MCI
- Met syndrome
  - DM
  - Hypertension
  - obesity



Franceschi et al 2018

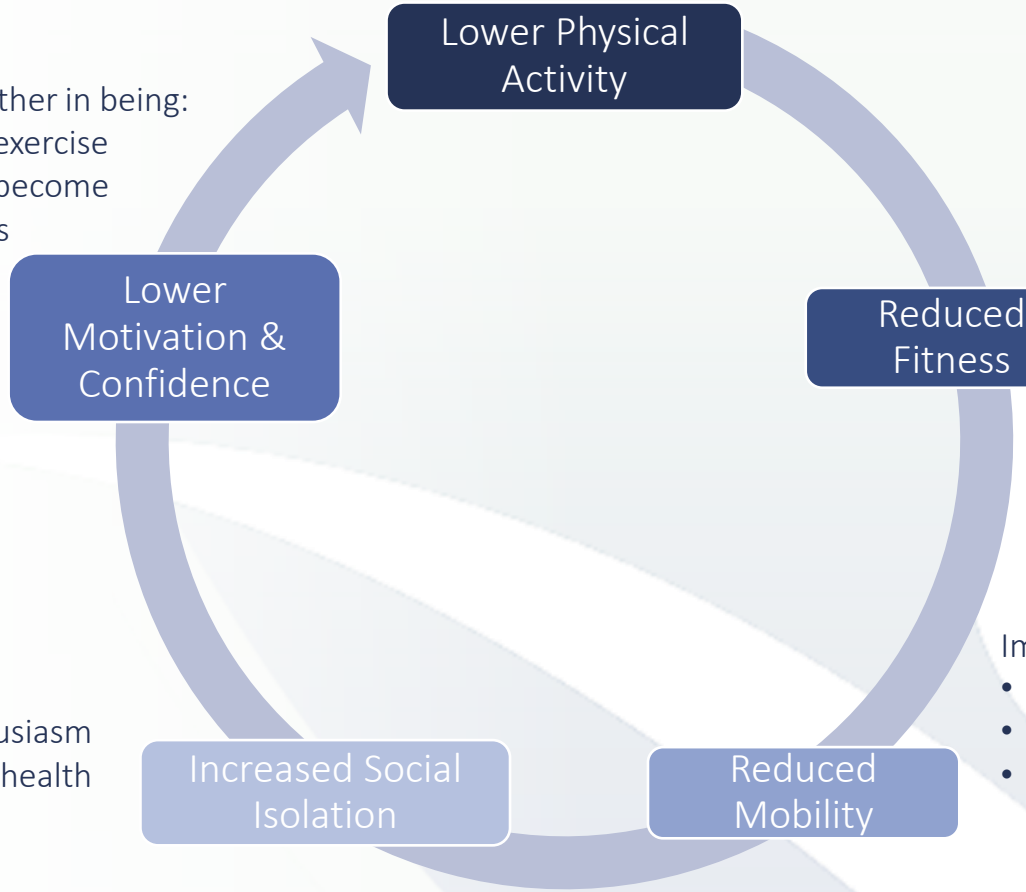
many chronic inflammatory diseases represent an acceleration of the ageing process

Conditions commoner in old age



Franceschi et al 2018

The Downward Spiral



Leading to Reduction in:
- Strength
- Aerobic capacity
- Flexibility
- Balance

Implications include:
- Loss of independence
- Family distress and burden of care
- Cost of care

Leading to:
- Loneliness
- Lack of enthusiasm
- Poor mental health

Resulting further in being:
- Afraid to exercise
- Afraid to become breathless

RESEARCH Open Access

The impact of physical activity on healthy ageing trajectories: evidence from eight cohort studies

2020

Darío Moreno-Agostino[1*†], Christina Daskalopoulou[1†], Yu-Tzu Wu[1], Artemis Koukounari[2], Josep Maria Haro[3,4],

Variable	ALSA	ELSA	ENRICA	HRS	JSTAR	KLOSA	MHAS	SHARE
Frequency of vigorous exercise	x			x	x	x		x
Frequency of less vigorous exercise	x			x	x			x
Level of physical activity		x						
Engagement in vigorous exercise during the last 2 weeks	x	x		x			x	x
Frequency of vigorous exercise activities in the last 2 weeks	x	x		x	x	x		x
Time spent doing vigorous exercise in the last 2 weeks	x		x		x	x		

- harmonised dataset
- 8 ageing cohorts in Australia, USA, Mexico, Japan, South Korea, and Europe
- 130,521 older adults (mean age 62.81 yrs)
- follow up for up to 10 years (mean 5.47 yrs)
- average no of observations = 3

Heathy aging score

- Cognition
- Psychological wellness
- Mobility
- Vitality
- Activities of daily Living
- Sensory function (hearing / vision)

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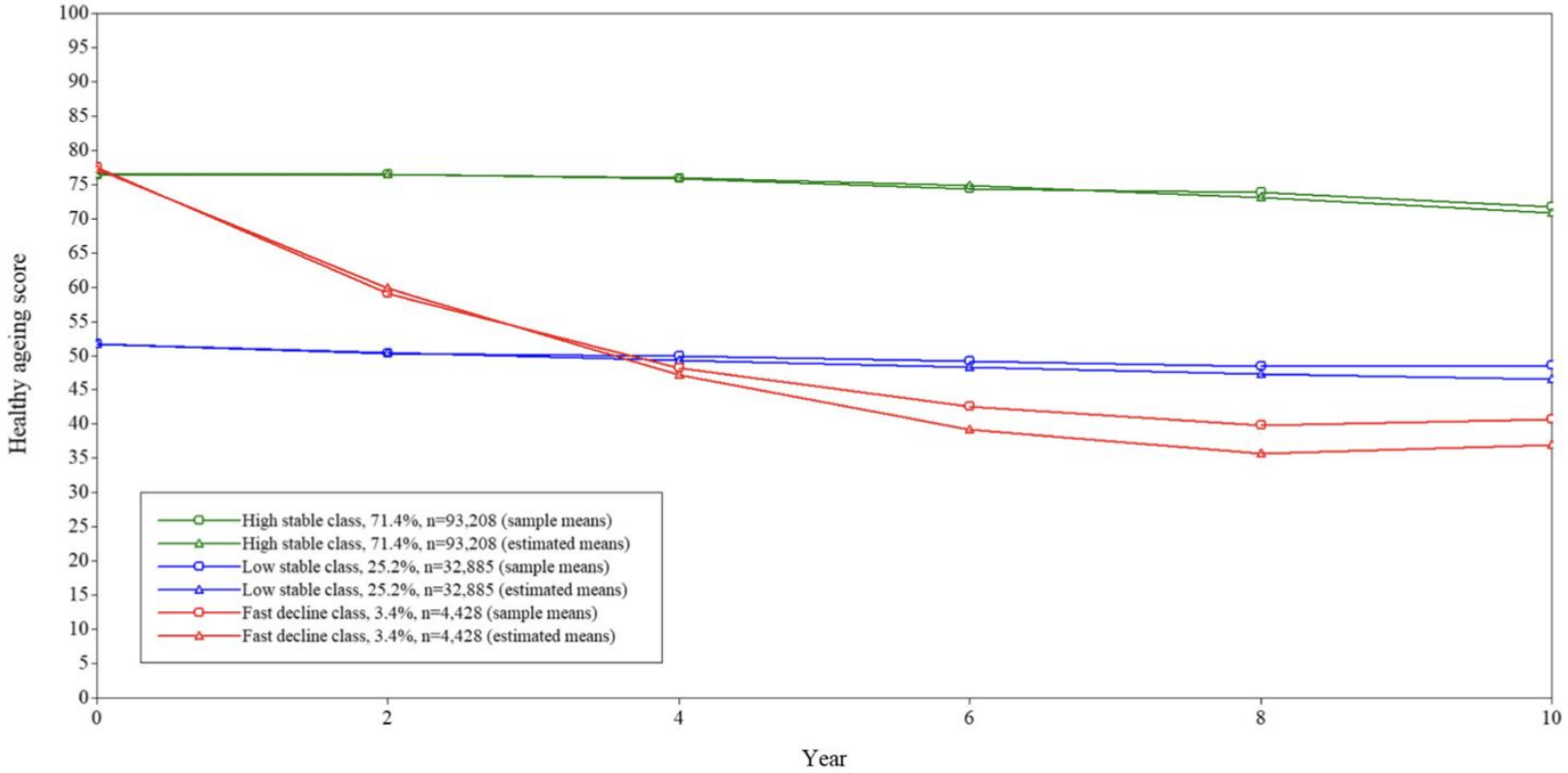
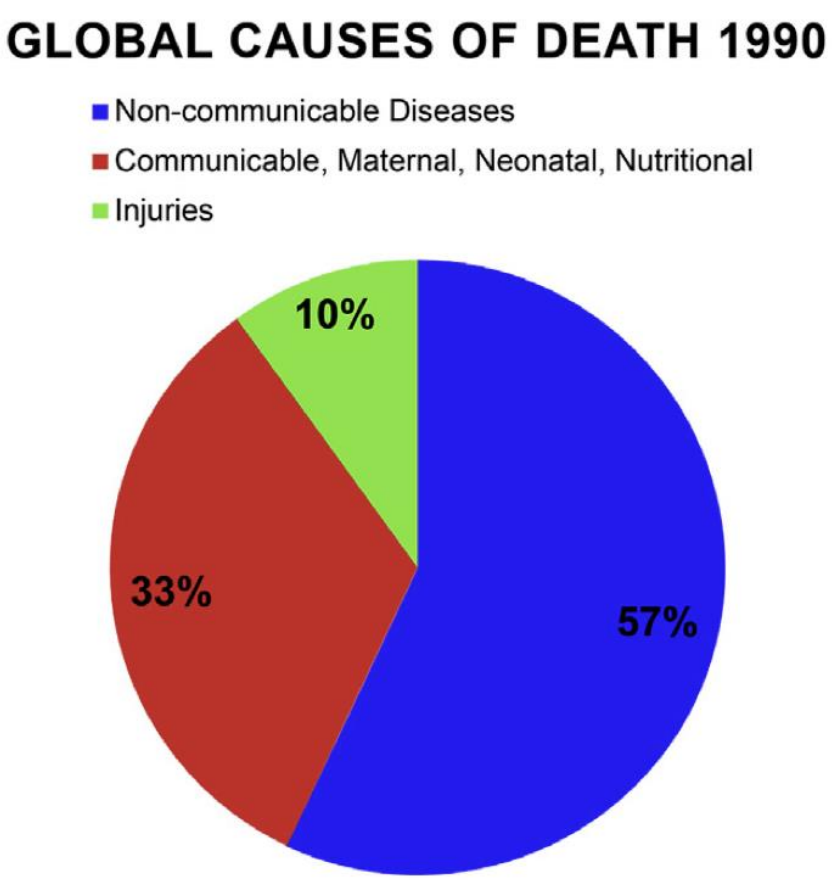
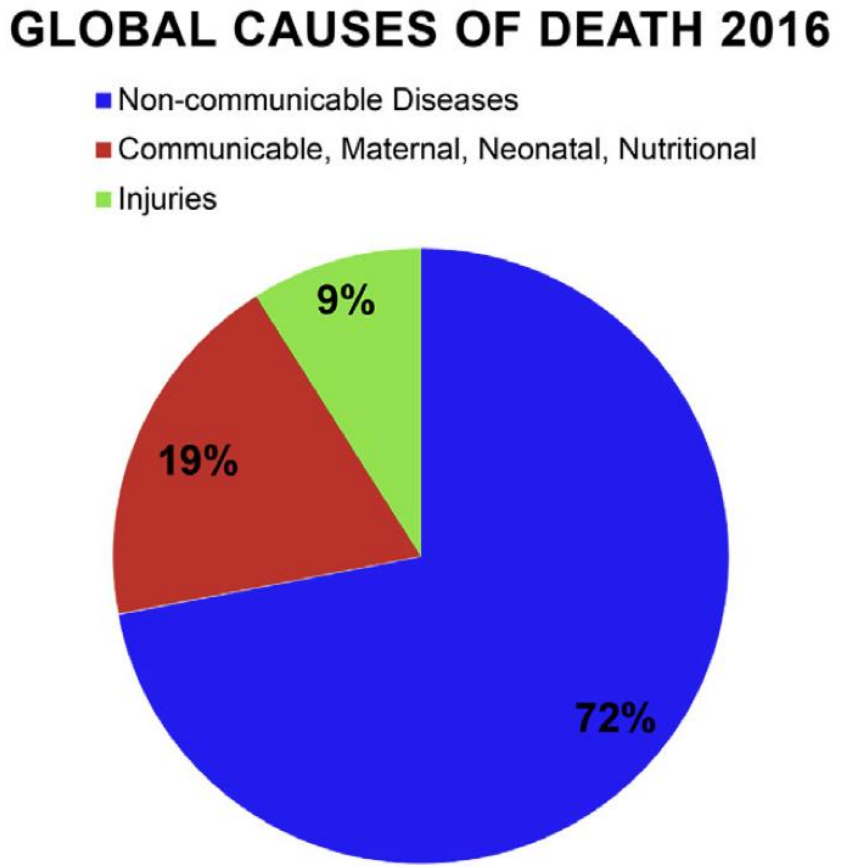


3 trajectories of healthy aging identified:

1. stable high
2. Stable low
3. Fast decline

Any level of PA engagement associated with reduced likelihood of being in Stable Low or Fast Decline trajectories



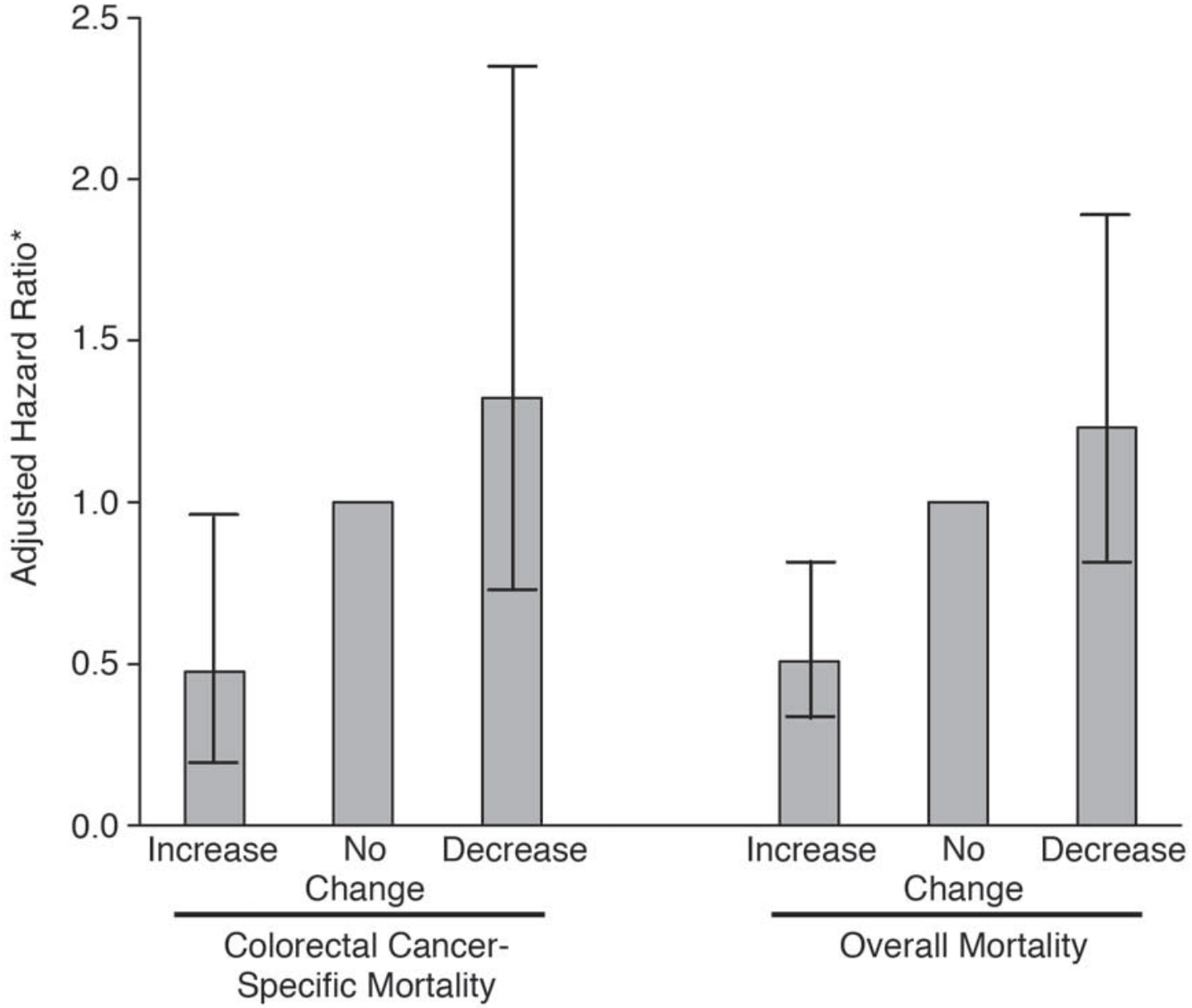


Anderson and Durstine, 2019

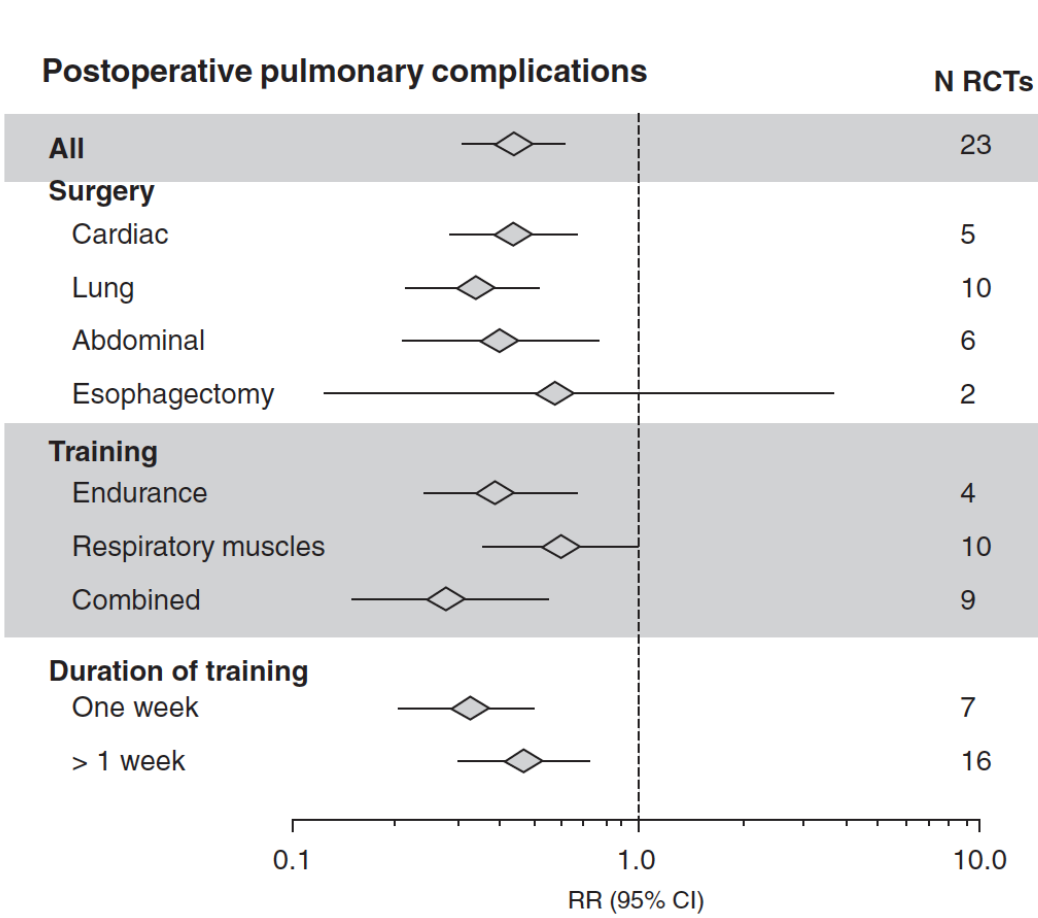
	IR	T2DM	DysL	BP	Ob	COPD	CHD	CHF	IC	OA	RA	OP	FM	C	DEP	Asth
Path	A	A	A	A	A	D	A	A	A	D	D	A	C	D	D	D
spec symps	A	A	A	A	A	A	A	A	A	A	C	B	A	B	A	C
funct cap	A	A	A	A	A	A	A	A	A	A	A	B	A	B	A	A
quality of life	A	A	B	A	A	A	A	A	A	A	B	B	A	B	A	B

Evidence for exercise as a treatment in chronic disease
Pedersen & Saltin, 2006

A = strong	several high quality studies
B = moderate	at least one HQ, a number moderate
C = little	at least one moderate
D = none	none



Effect of change in physical activity pre- to post-treatment in patients with colorectal cancer
Nurses Health Study Cohort 1976-2004: Meyerhardt J et al, 2006



Postoperative pulmonary complications	N RCTs	N events/total patients (%) intervention	control	RR (95% CI)	TSA
All	23	165/934 (17%)	289/930 (31%)	0.52 (0.41 to 0.66)	Conclusive
Surgery					
Cardiac	5	45/308 (15%)	85/305 (28%)	0.53 (0.38 to 0.73)	Conclusive
Lung	10	44/284 (15%)	102/282 (36%)	0.45 (0.33 to 0.60)	Conclusive
Abdominal	6	21/192 (11%)	41/192 (21%)	0.50 (0.32 to 0.78)	Unclear
Esophagectomy	2	55/150 (37%)	61/151 (40%)	0.73 (0.30 to 1.78)	---
Training					
Endurance	4	29/228 (13%)	61/232 (26%)	0.50 (0.34 to 0.74)	Conclusive
Respiratory muscles	10	102/504 (20%)	152/502 (30%)	0.61 (0.39 to 0.94)	Unclear
Combined	9	34/202 (17%)	76/196 (39%)	0.43 (0.31 to 0.60)	Conclusive
Duration of training					
One week	7	33/272 (12%)	79/271 (29%)	0.43 (0.30 to 0.62)	Conclusive
> 1 week	16	142/662 (20%)	210/659 (32%)	0.56 (0.41 to 0.76)	Conclusive

Figure 3. Analysis of postoperative pulmonary complications according to type of surgery, type of exercise training, and duration of training. CI = confidence interval; RCT = randomized controlled trial; RR = relative risk; TSA = trial sequential analysis.

Assouline, B et al, 2021, Annals ATS

Percutaneous Coronary Angioplasty Compared With Exercise Training in Patients With Stable Coronary Artery Disease

A Randomized Trial

2004

Rainer Hambrecht, MD; Claudia Walther, MD; Sven Möbius-Winkler, MD; Stephan Gielen, MD;

- n =101 males
- Stable angina and one stenosed vessel
- 20 mins / day cycle erg @70% max HR during stress test
- + 1 x group session x 60 mins weekly

Exercise Group

- Increased exercise tolerance
- Increased VO2 max
- Increased survival

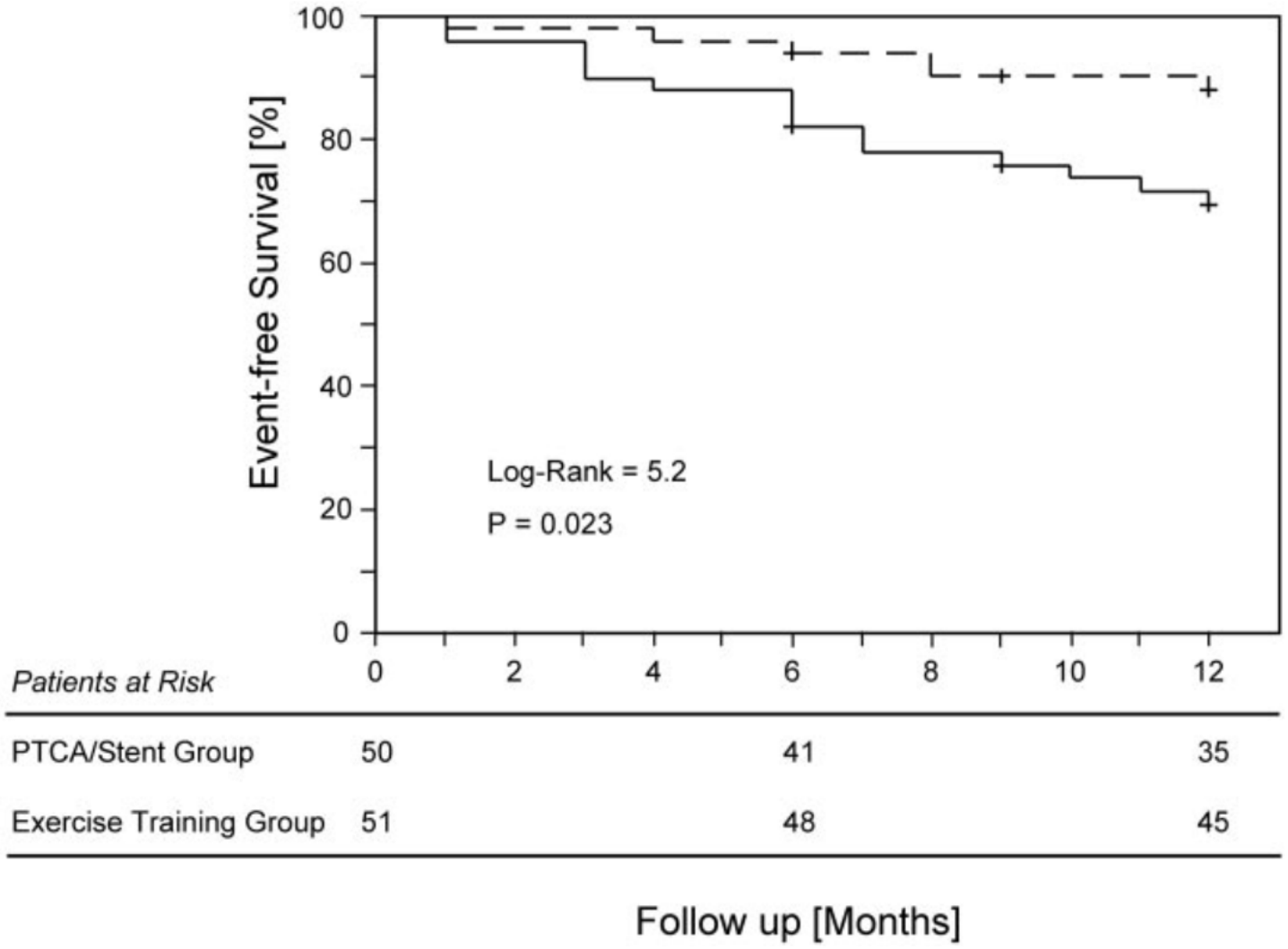


Figure 2. Event-free survival after 12 months was significantly superior in exercise training group versus PCI group (P=0.023 by log-rank test).

Prognostic Effects of Cardiac Rehabilitation in Patients With Heart Failure (from a Multicenter Prospective Cohort Study)

Takuji Adachi, PhD, PT[a], Naoki Iritani, MSc, PT[b], Kuniyasu Kamiya, PhD, PT[c],

2022

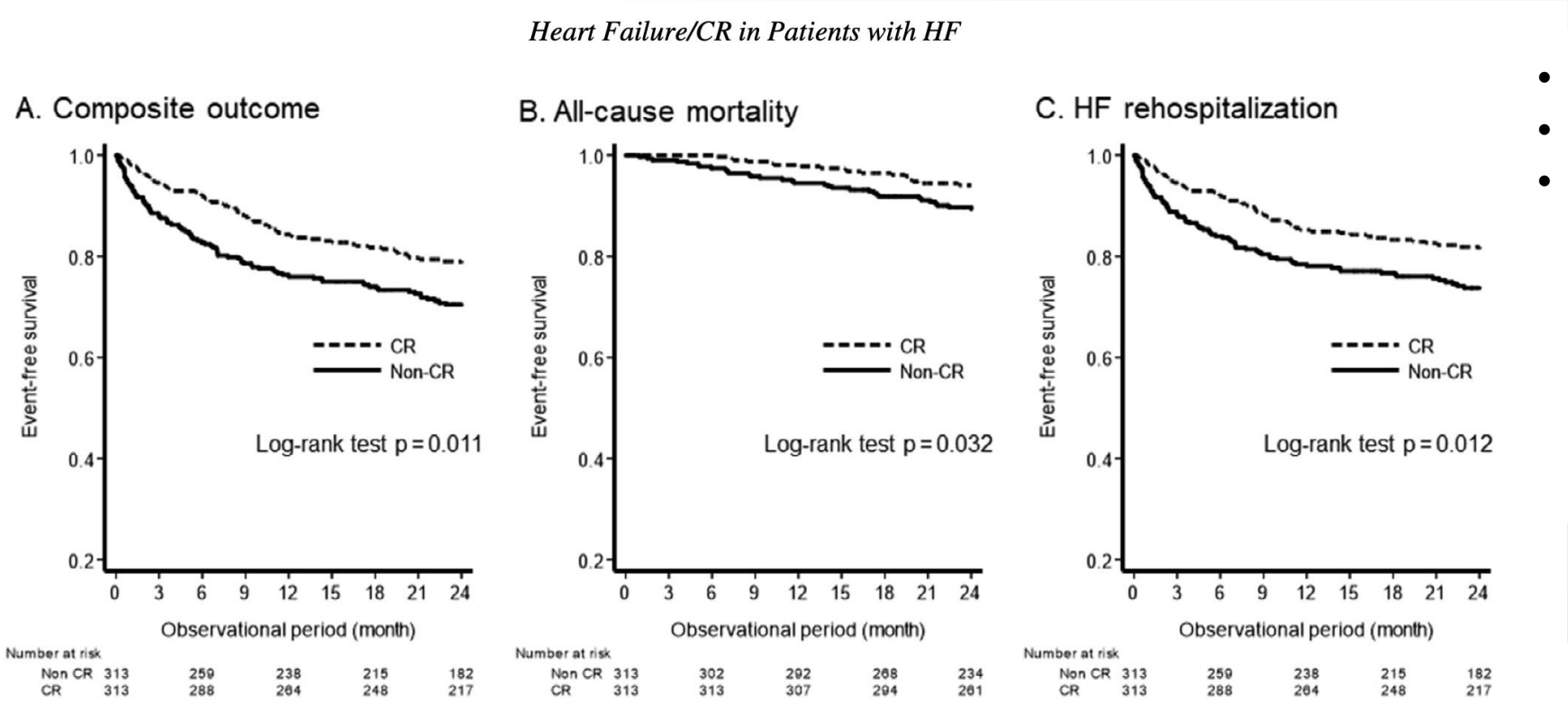


Figure 2. Kaplan–Meier curves for the composite outcome, HF rehospitalization, and all-cause mortality according to cardiac rehabilitation.

- n = 626
- CR weekly (x2) x 6 mo vs control
- Acute HF or worsening CHF

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BMJ

RESEARCH

Total mortality after changes in leisure time physical activity in 50 year old men: 35 year follow-up of population based cohort

Liisa Byberg, researcher ,[1] Håkan Melhus, professor ,[2] Rolf Gedeborg, researcher ,[3] Johan Sundström,

2009

- 35 year cohort study
- 50 yo men recruited over a 3 year period
- Survey of physical activity at baseline and at ages 60, 70, 70 and 82
- Mortality data collected
- Classified as low, medium or high PA levels based on these questions:

1. Do you spend most of your time reading, watching TV, going to the cinema, or engaging in other, mostly sedentary activities?
2. Do you often go walking or cycling for pleasure?
3. Do you engage in any active recreational sports or heavy gardening at least 3 hours every week?
4. Do you regularly engage in hard physical training or competitive sport?

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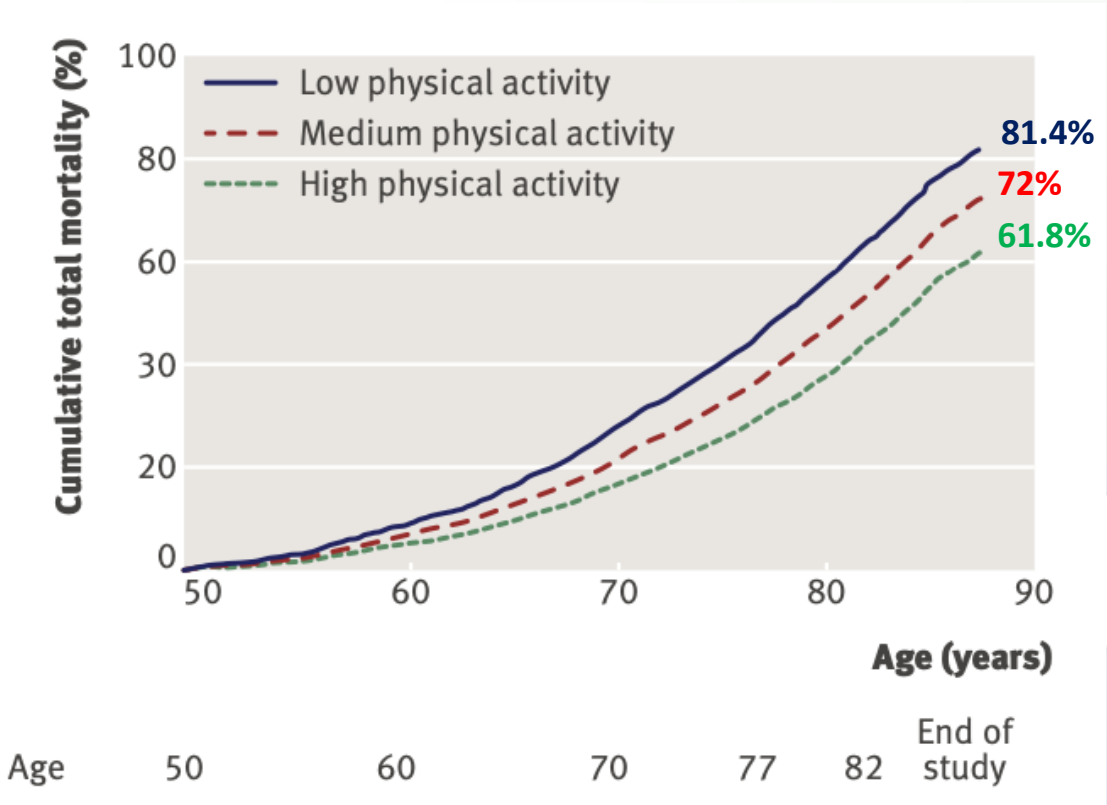
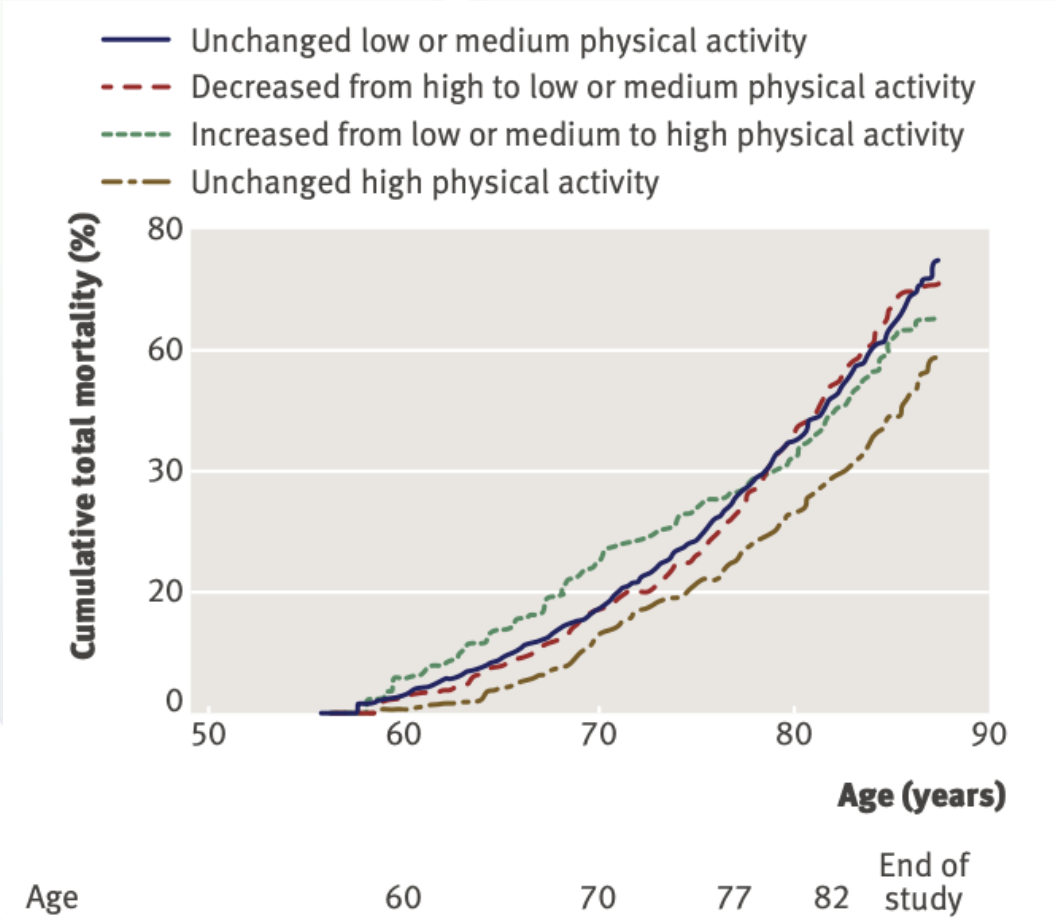
Baseline PA levels High: 49%
Medium: 36%
Low: 15%





Summary findings

- Over 35 yrs, mortality rate was much lower for those with high versus low physically activity levels
- Increasing PA to a high level (either from a low or a medium level) between ages 50-60 yrs eventually led to a 50% reduction in mortality rate (to the same levels seen in those who sustained high levels of physical activity)
- This benefit was similar in magnitude seen in those who stopped smoking
- There was no significant improvement in mortality in those who increased from low to medium PA levels

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Original Investigation | Cardiology

Association of Cardiorespiratory Fitness With Long-term Mortality Among Adults Undergoing Exercise Treadmill Testing

Kyle Mandsager, MD; Serge Harb, MD; Paul Cremer, MD; Dermot Phelan, MD, PhD; Steven E. Nissen, MD; Wael Jaber, MD

- 122,007 patients undergoing treadmill exercise testing, Cleveland
- 1991 – 2014mean age 53 yrs
- 59% male

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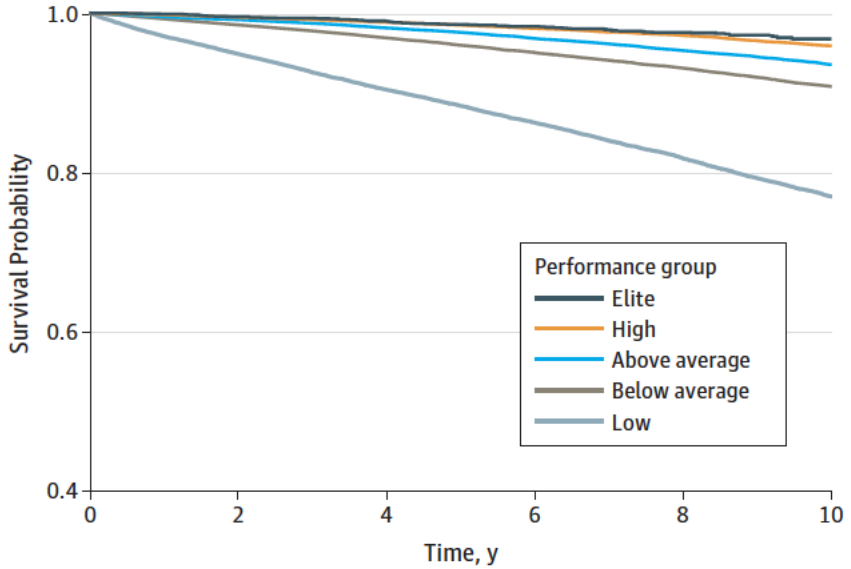
Figure 1. Patient Survival by Performance Group



JAMA Network Open. 2018;1(6):e183605. doi:10.1001/jamanetworkopen.2018.3605

- CR fitness inversely related to all cause mortality
- The increased risk was equal to or greater than the risk associated with some ‘standard’ risks (diabetes, coronary artery disease, smoking)

RESEARCH ARTICLE Open Access

Physical activity and health related quality of life

Nana Kwame Anokye[1*], Paul Trueman[1], Colin Green[2], Toby G Pavey[3] and Rod S Taylor[2] 2012

- National household survey England 2008
- 5,453 adults 40-60 yrs
- HRQoL (EQ-5D Questionnaire)
- PA level
  - subjective (questionnaire)
  - objective (belt-worn actigraph)
- HRQoL higher in those who were physically active
- This applied to sport / exercise and also to walking

The People

- white (91%),
- female (55%),
- married, living with partners (66%),
- educated (81%),
- employed (76%).

- obese (26%)
- smokers (22%)
- 'drinkers of alcohol'. (85%)
- av ann house-hold income was £35,591

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- Exercise and illness
  - Prevention
  - Treatment
- What aspect of exercise matters
- Physiucal activity level
- Fitness

How does exercise help deliver healthy aging?

- Reduced risk of disease
- Protects against cognitive decline
- Enhanced physical function
- Social interaction

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Key impact messages

- All outcomes improve
- They improve quickly (6 weeks)
- The scale of change exceeds MCID for 6MTT and SS
- The greatest relative improvements occur in those who start off the weakest

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How Much Exercise ?

Every little helps (anti-sedentary behaviour)

- 5 x 30 min sessions of moderately vigorous aerobic exercise weekly
- include resistance training at least twice weekly.
- 8-12 reps of 8-10 different exercises that target all major muscle groups.

What Type ?

1. Aerobic
2. Strength
3. Core stability / balance

How Hard?

- Modest breathlessness
- Talk Test

Getting Started

- Make the decision
- Gradual
- Pick something you enjoy
- Group activity has benefits
  - Regular schedule
  - Discipline
  - Supervision
  - Social interaction
- Goal setting

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Summary

- Exercise works for length and quality of life
- Probably the single best intervention for healthy aging
- It’s cheap
- It’s great fun , especially in groups