

Designing an Exercise Program to Maximize Health and Well-Being



Robert E. Sallis, MD, FAAFP, FACSM

Director
Sports Medicine Fellowship
Kaiser Permanente Medical Center
Fontana, California, USA

Chairman
Exercise Is Medicine
Advisory Board

Clinical Professor
Family Medicine
UC Riverside
School of Medicine

Every Body WALK!
The Campaign to Get America Walking

Exercise
is **Medicine™**

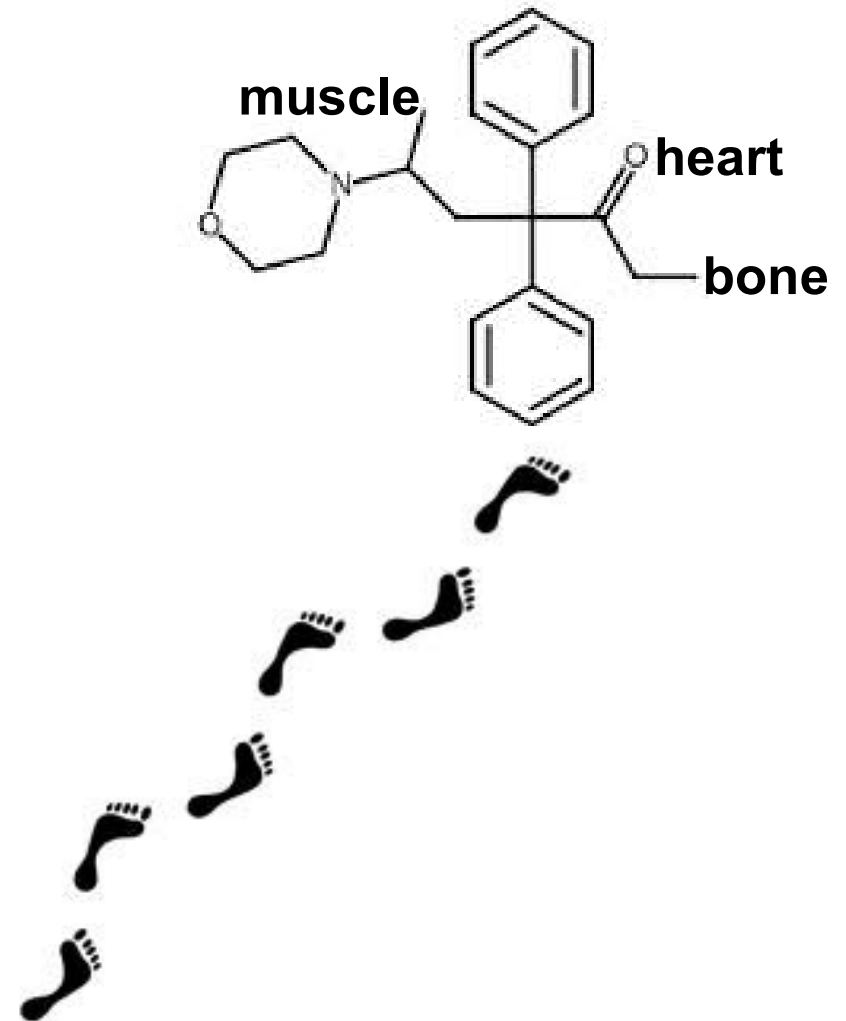
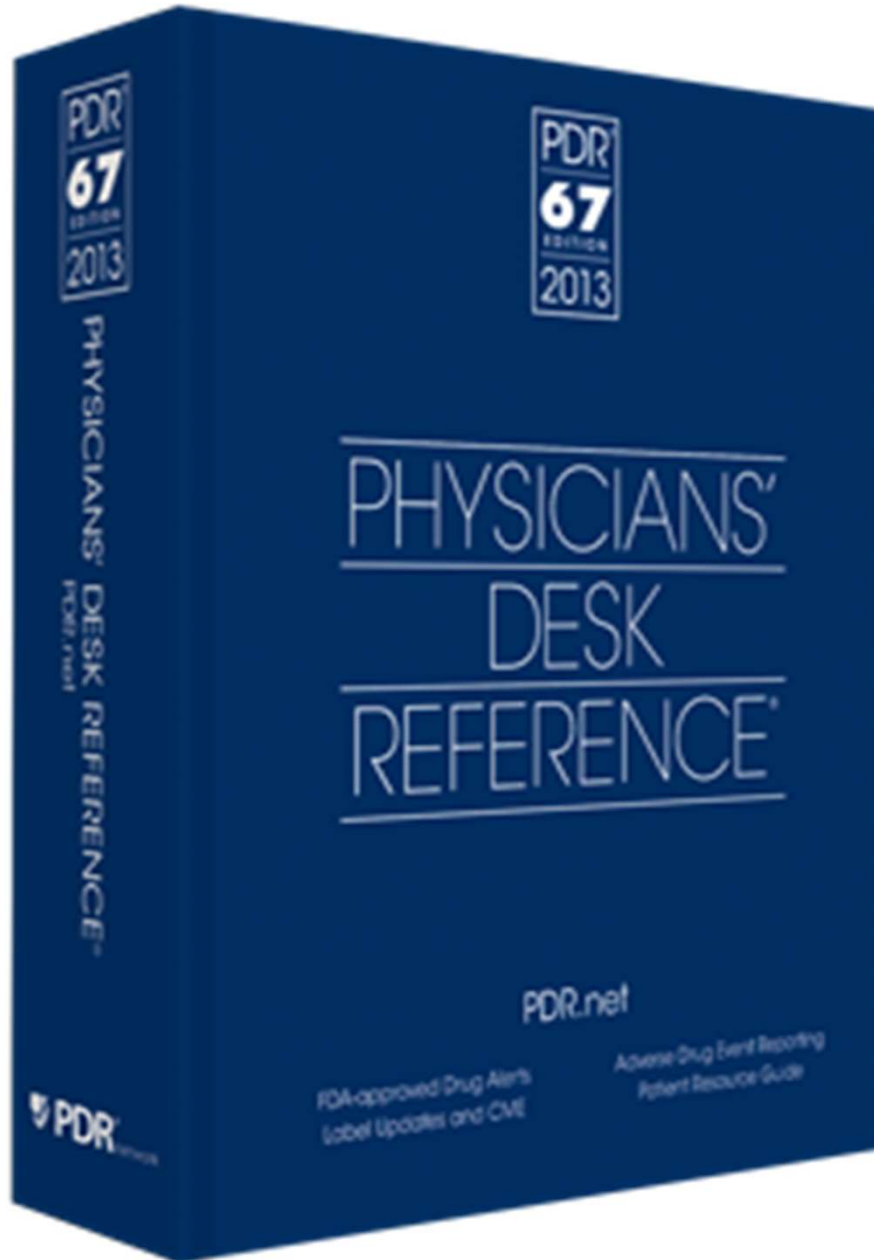
 **KAISER PERMANENTE®**

Conflict of Interest Disclosure

Robert Sallis

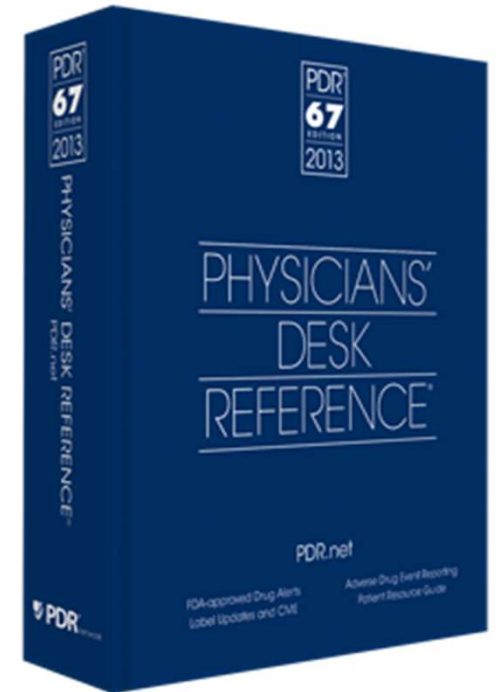
- Has no actual or potential conflict of interest in relation to this presentation
- Will be discussing the use an off-label and unapproved drug called Exercise in this presentation

A Drug Called Exercise



A Drug Called Exercise

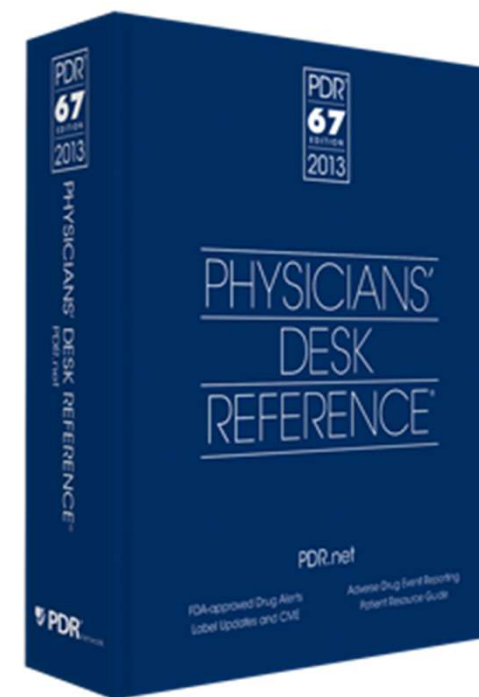
- **Generic name:** physical activity
- **Other Brand names:** jogging, hiking, rolling, swimming, aerobics, biking, tennis, basketball, soccer, dancing, gardening, etc.
- **Dosage:** optimum 150 minutes per week in adults; 60 min per day in children has proven efficacy. Even low doses have been shown to have benefit. Advise to start with low dose and advance as tolerated.
- **Pregnancy and Lactation:** completely safe. Good for mother and baby.



A Drug Called Exercise

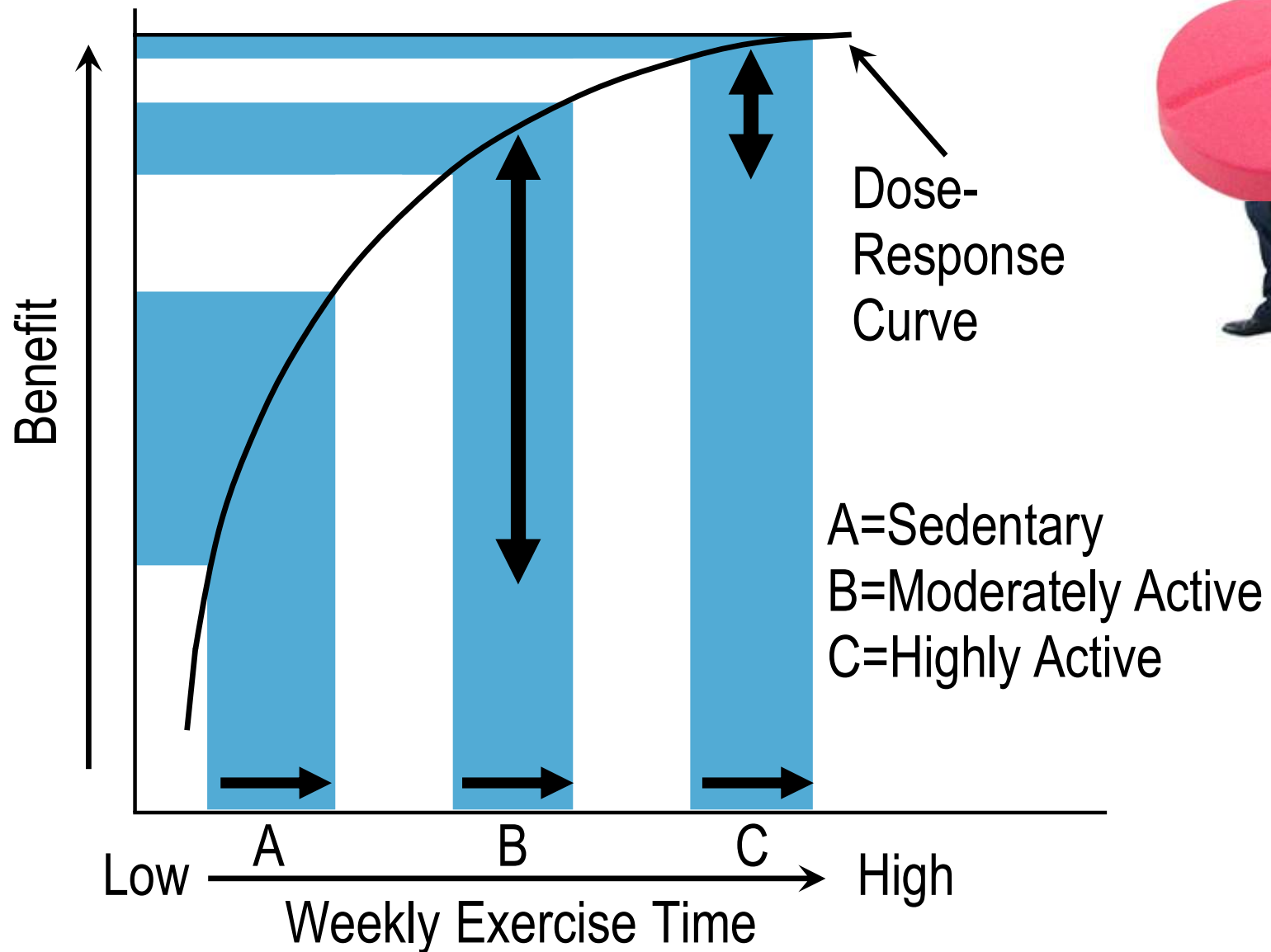
■ Indications and Usage:

- Prevent obesity and mitigate its risks
- Reduce development and improve management of diabetes
- Prevent and treat heart disease
- Lower risk of cancer (breast and colon)
- Treatment of hypertension
- Prevent osteoporosis and fractures
- Manage depression and anxiety
- Reduce risk of dementia
- Recreational uses



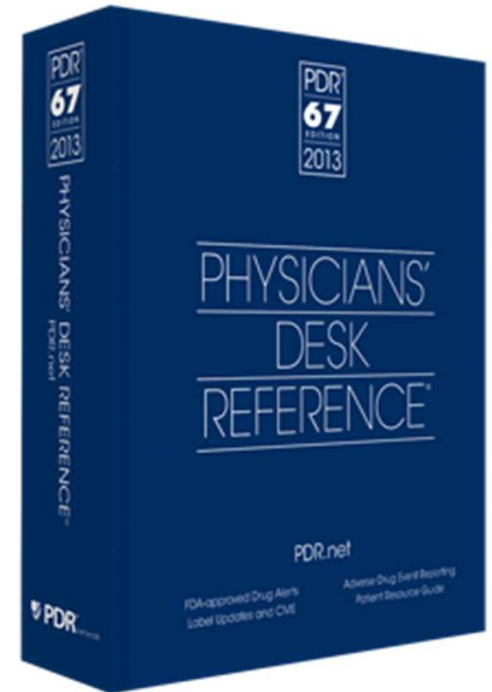
****Decrease risk of dying from COVID-19**

A Drug Called Exercise Dose-Response Curve



A Drug Called Exercise

- **Side effects:** decreased BP, pulse and blood sugar; stronger muscles & bones, weight loss; improved mood, confidence, self esteem and concentration; Bowel & sleep habits improved; Look & feel better.
- **Adverse Reactions:** sweating, injury (overdose), sudden death (extremely rare).
- **Administration:** self administer or with others. Start off slowly, add minutes and intensity PRN. Change formulations to decrease boredom & improve compliance. Take outdoors or indoors any time of day.



Exercise is a wonder Drug

We all need to take it and prescribe to our Patients!

- ***Exercise is Medicine*** that can prevent & treat chronic disease and those who take it **LIVE LONGER.**
- If we had a pill that conferred the proven health benefits of exercise, physicians would prescribe it to every patient and healthcare systems would find a way to make sure every patient had access to this wonder drug.



Components of an Exercise Program

- Aerobic Exercise
- Strength Exercises
- Flexibility Exercises
- Warm up/Cool down



What is the Optimal Dose of Exercise?

2018 US Physical Activity Guidelines

- 150 minutes per week of moderate to vigorous PA (like a brisk walk) in adults.
 - 30 minutes walking on 5 days per week.
 - Activity bouts of any duration count!
- 75 minutes per week of vigorous exercise (like running).
- 60 minutes per day in kids (half at vigorous intensity).



The Exercise Prescription

“Think FITT”

F = Frequency

Most days of the week; 5 or more.

I = Intensity

Moderate; 50-70% of max HR or use “sing-talk” test.

T = Type

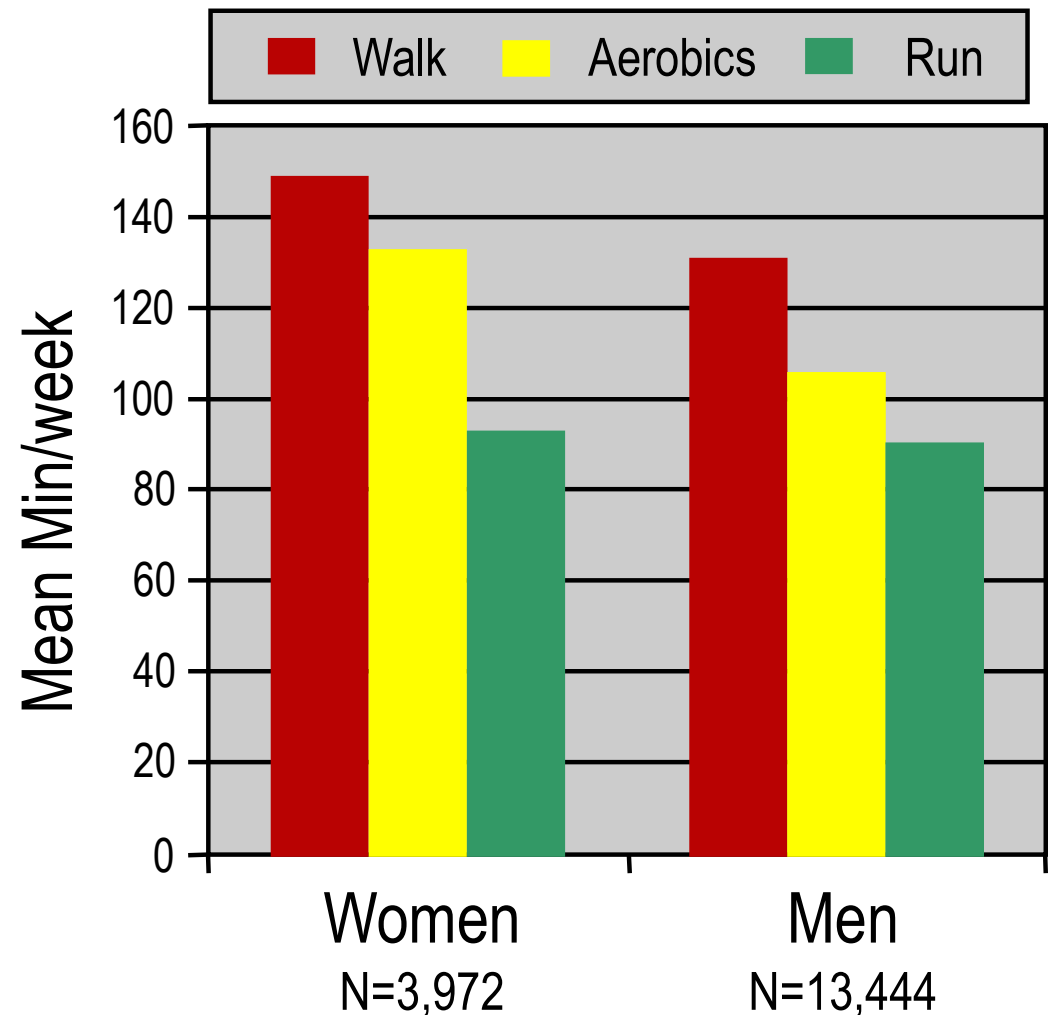
Use large muscle groups; something enjoyable.

T = Time

30 minutes.

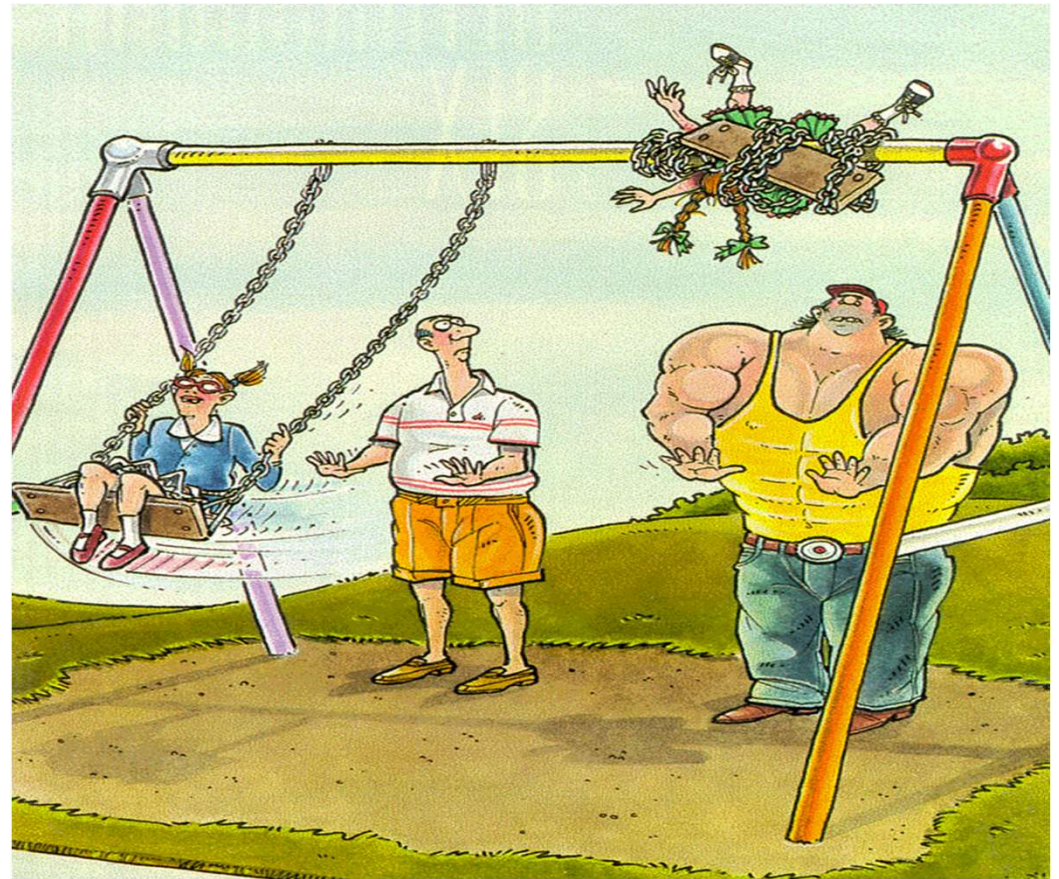
How Much Exercise do You Need to be Moderately Fit?

- Detailed physical activity assessments in women and men who then completed a maximal exercise test.
- Average min/week for the moderately fit who only reported each specific activity.



Muscle Strength and Endurance

- 2-3 nonconsecutive days per week of resistance training.
- Select 8-10 exercises that incorporate major muscle groups.
- One set of 8 - 12 reps for each exercise at 40%-80% of a one-rep max.

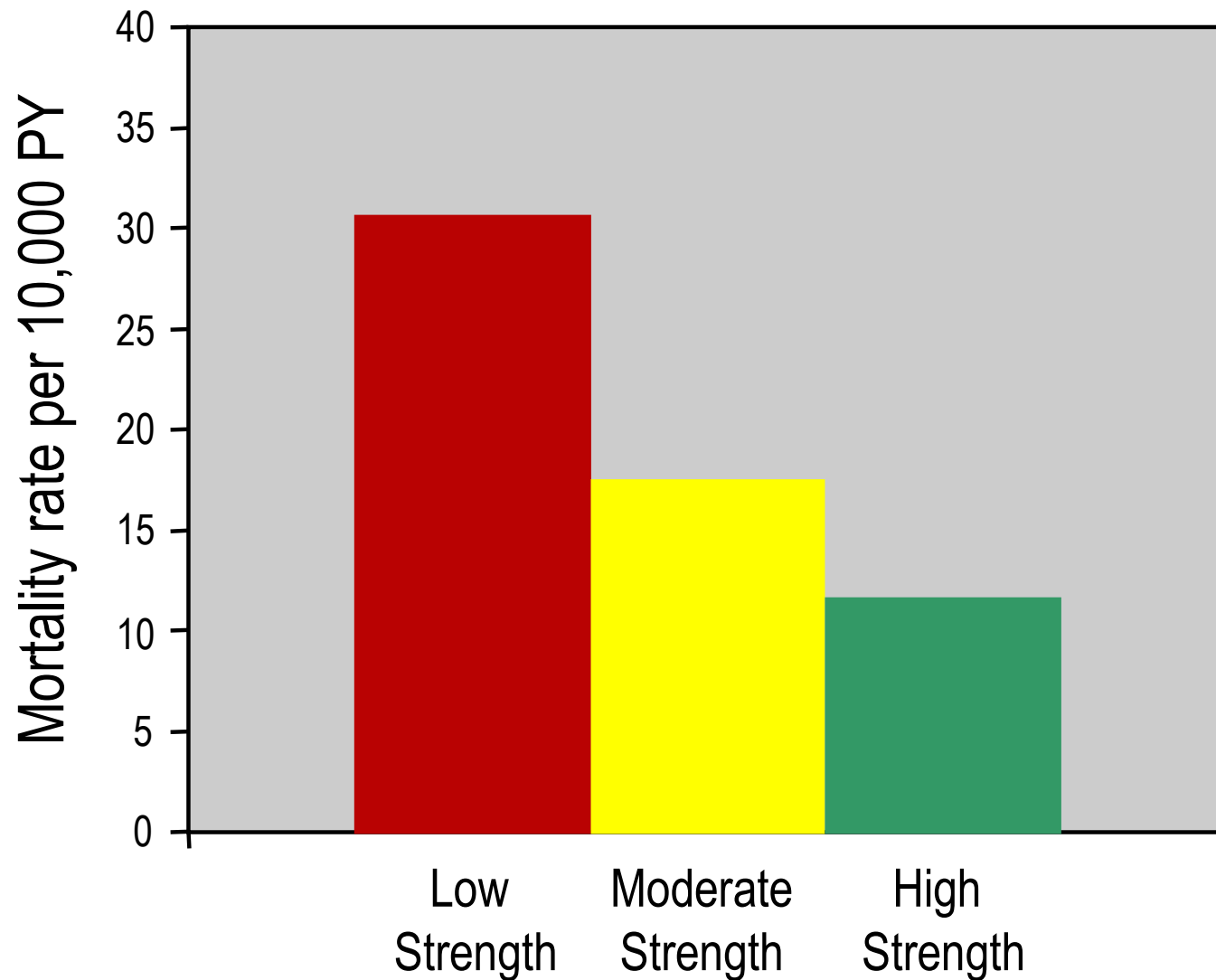


Muscle Loss With Age

- Sarcopenia is a major concern with aging, especially in women:
 - 15% per decade after age 50
 - 30% per decade after age 70
- Results in loss of strength:
 - Age 65; 45% of women can't lift 10 lbs
 - Age 75; 65% of women can't lift 10 lbs
- A resistance training program can counteract age-related changes in skeletal muscle.



Mortality Rates by Musculoskeletal Fitness Category



Flexibility

- Especially important as we age.
- Emphasis should be on developing and maintaining full range of motion.
- Stretch major muscle groups at least 2-3 days per week.

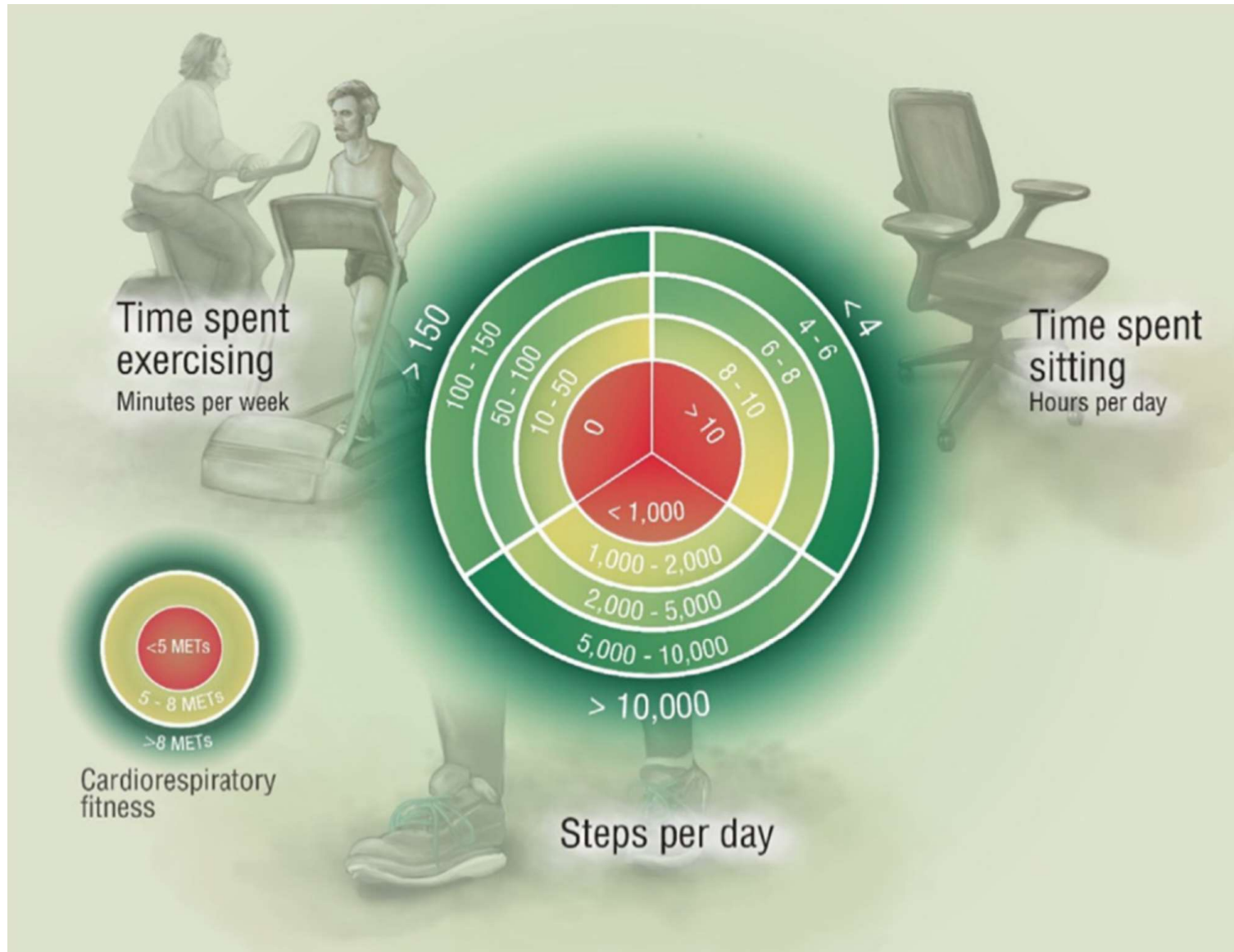


Warm Up and Cool Down

- Exercise is best preceded by a warm-up and followed by a cool down.
 - Warm-up usually involves doing the planned exercise at a lower intensity.
 - Cool Down usually involves slowly tapering down intensity to aid recovery.
- Both warm-up and cool down often involve stretching



Goals for Physical Activity



What is the best exercise program?

- The most effective exercise program is the one you'll do!
- I-Min Lee's top 5 exercises
 - 1. Walking
 - 2. Strength training
 - 3. Yoga
 - 4. Swimming
 - 5. Biking



I-Min Lee, PhD
*Professor of Medicine
Harvard Medical School*

Which exercise is better for you - Aerobic or Resistance Exercise?

- Who is healthier and lives longer?
 - Hulk – he does only resistance training and has superior muscular strength
 - Flash – he does only aerobic exercise and has superior cardiorespiratory fitness



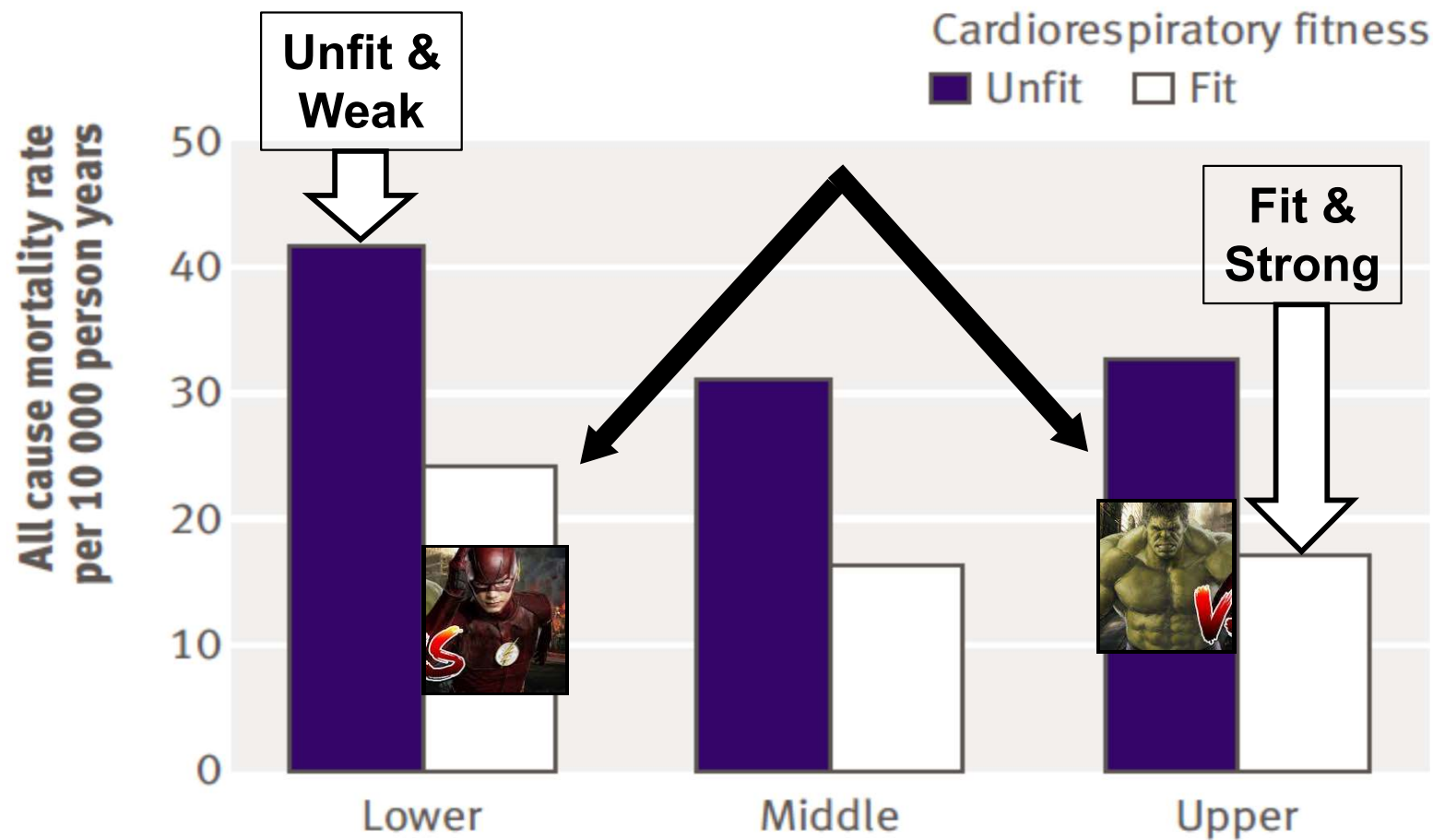
Association between muscular strength and mortality in men: prospective cohort study

BMJ | 12 JULY 2008 | VOLUME 337

BMJ

Jonatan R Ruiz, research associate,^{1,2} Xuemei Sui, research associate,³ Felipe Lobelo, research associate,³ James R Morrow Jr, professor,⁴ Allen W Jackson, professor,⁴ Michael Sjöström, associate professor,¹ Steven N Blair, professor^{3,4}

8,762 Men (20-80 years, mean age 42), *Aerobics Center Longitudinal Study*



Adjusted for age

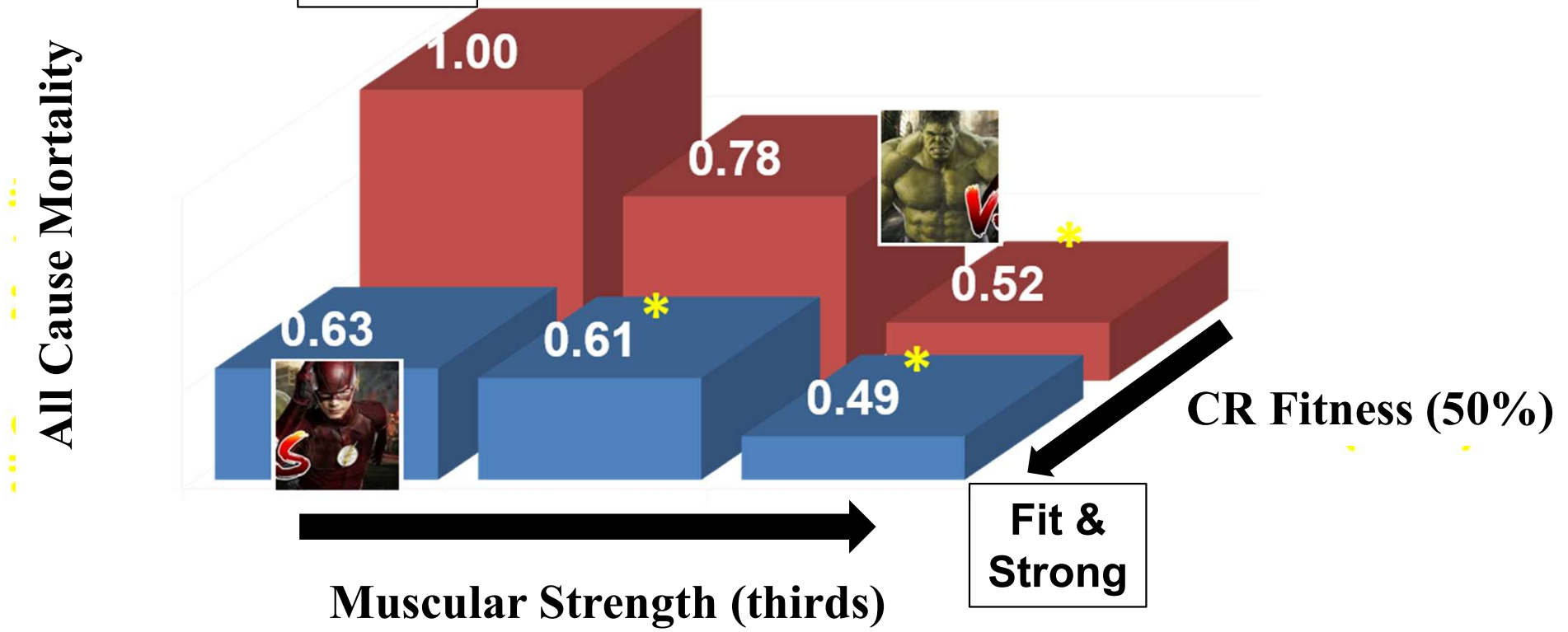
Muscular Strength (thirds)

A Prospective Study of Muscular Strength and All-Cause Mortality in Men With Hypertension

Enrique G. Artero, PhD,*† Duck-chul Lee, PhD,† Jonatan R. Ruiz, PhD,§|| Xuemei Sui, MD,† Francisco B. Ortega, PhD,*§ Timothy S. Church, MD, PhD,¶|| Carl J. Lavie, MD,# Manuel J. Castillo, MD, PhD,* Steven N. Blair, PED†‡

1,506 hypertension men (mean age 50 years),
 Veterans Affairs Center Longitudinal Study

Unfit & Weak



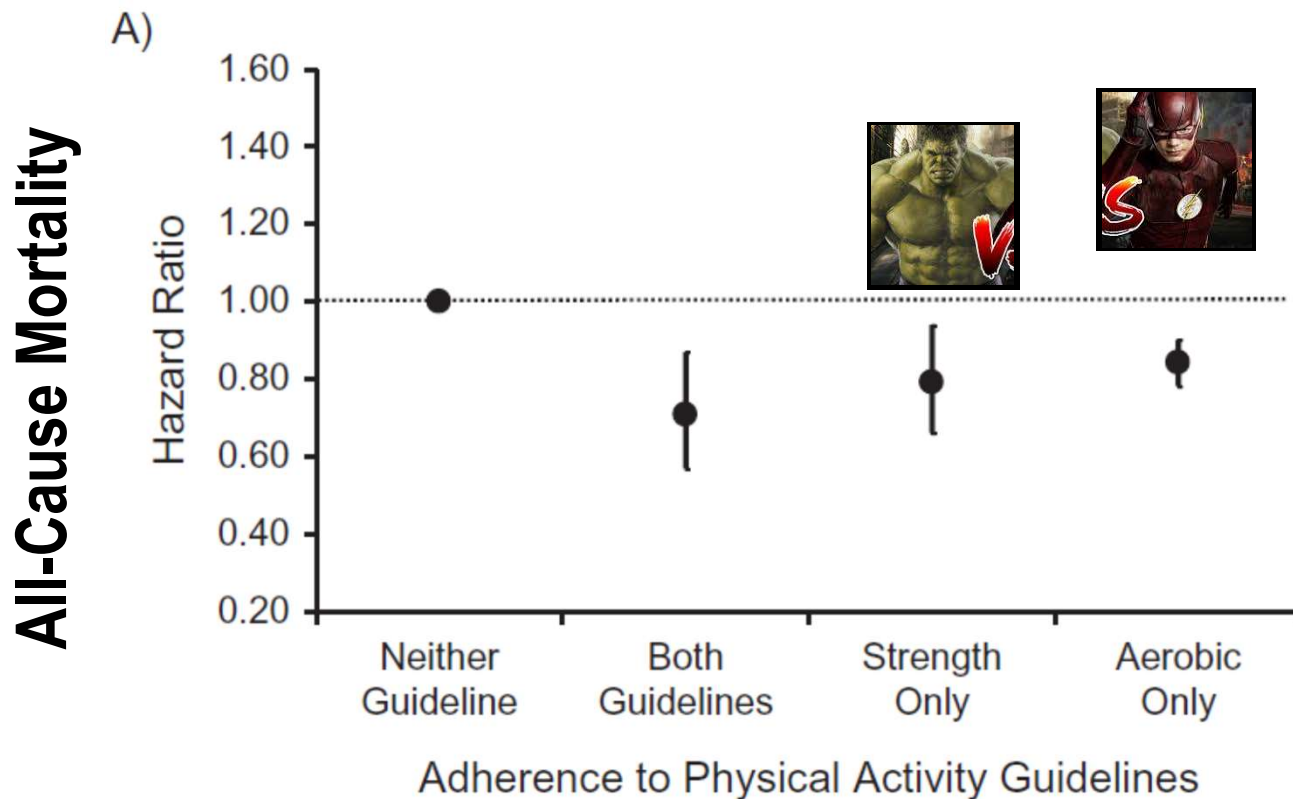
Adjusted for age, physical activity, smoking, alcohol, BMI, blood pressure, total cholesterol, diabetes, abnormal ECG, and parental CVD. *P<0.05.

Does Strength-Promoting Exercise Confer Unique Health Benefits? A Pooled Analysis of Data on 11 Population Cohorts With All-Cause, Cancer, and Cardiovascular Mortality Endpoints

Emmanuel Stamatakis*, I.-Min Lee, Jason Bennie, Jonathan Freeston, Mark Hamer, Gary O'Donovan, Ding Ding, Adrian Bauman, and Yorgi Mavros

Am J Epidemiol. 2018;187(5):1102–1112

80,306 adults (≥ 30 years) from 11 cohorts



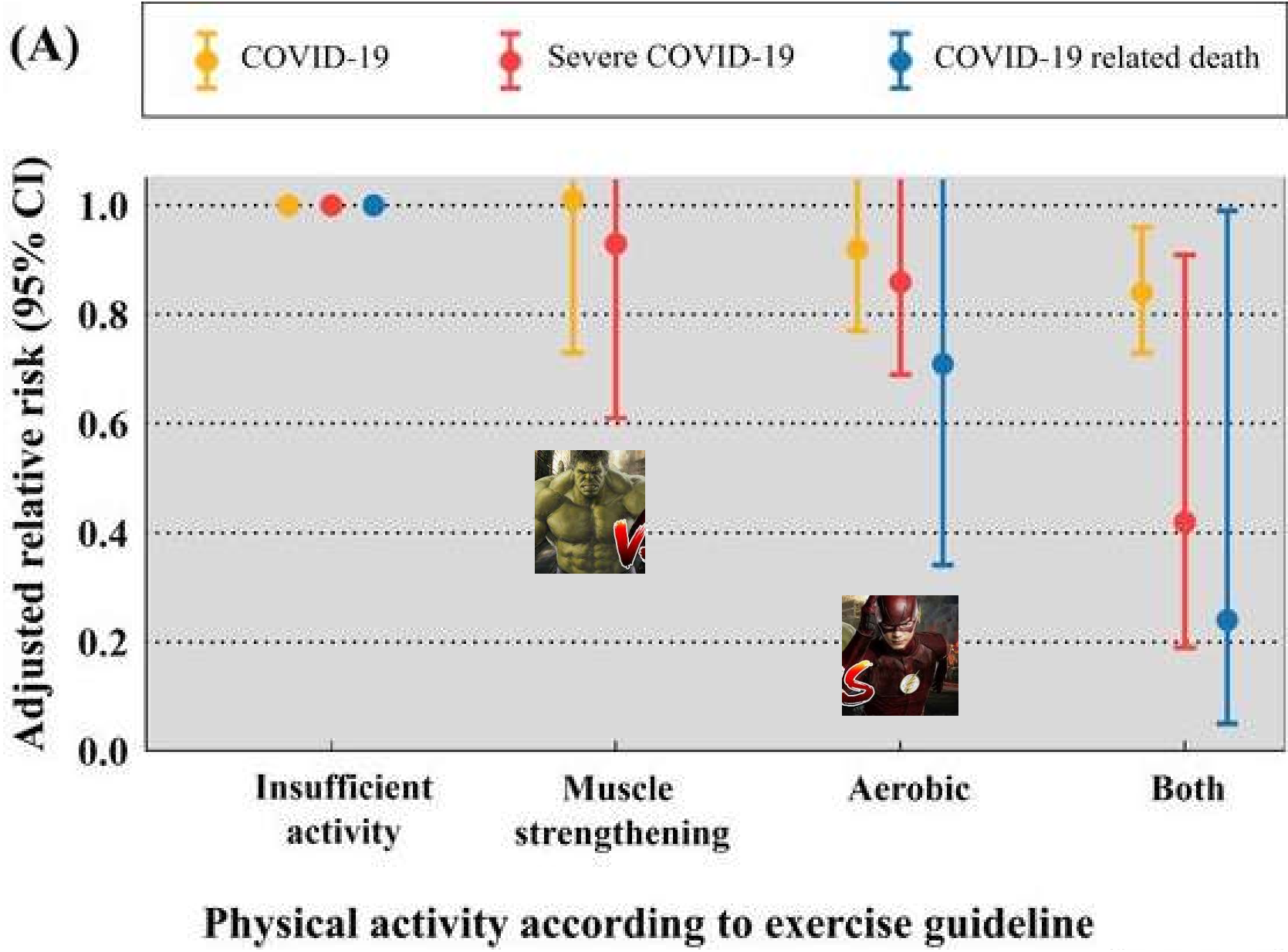
- **Aerobic guideline** as ≥ 150 min/week of moderate-intensity or ≥ 75 min/week of vigorous-intensity activity or equivalent combinations of both.
- **Strength guideline** as reporting participation in ≥ 2 sessions/week.

Adjusted for age, body mass index, education, illness, alcohol intake, smoking habits, psychological distress/depression, total volume of physical activity.

Physical activity and the risk of SARS-CoV-2 infection, severe COVID-19 illness and COVID-19 related mortality in South Korea: a nationwide cohort study

FREE

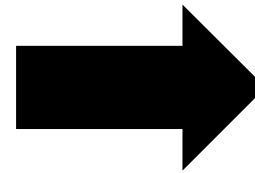
Seung Won Lee¹, Jinhee Lee², Sung Yong Moon¹, Hyun Young Jin¹, Jee Myung Yang³, Shuji Ogino^{4, 5}, Mingyang



Hulk vs. Flash: *Who is healthier and lives longer?*



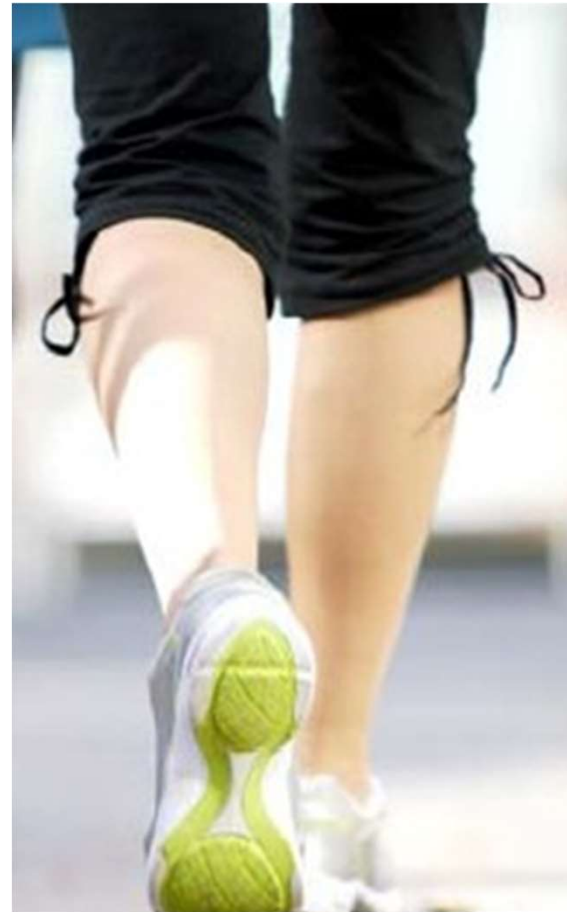
+



The one who is both ***strong*** and ***fast*** (fit)!

What is the Minimal Amount of Exercise I can Do and be Healthy?

Running vs Walking



Let's Start With Running

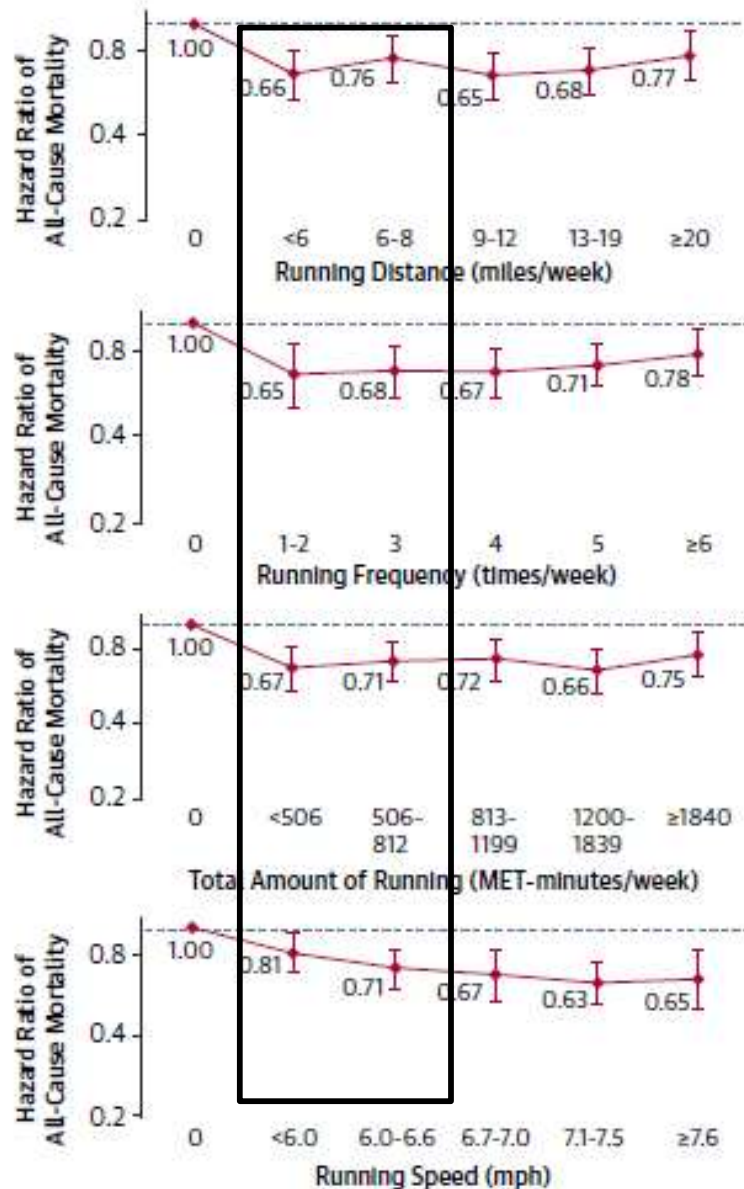


Affect of Leisure-time Running on All-cause and Cardiovascular Mortality Risk

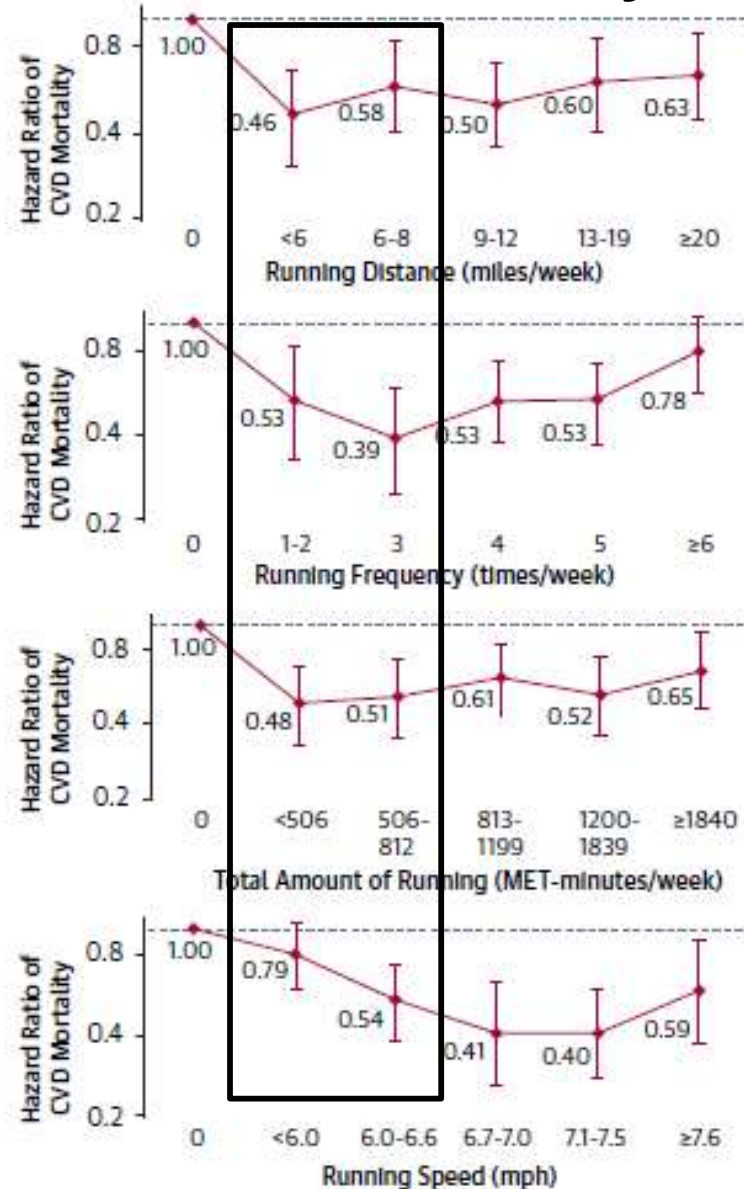
- Most data on PA and mortality has focused on moderate intensity exercise (walking).
- Examined association of running with all-cause and CV mortality risks in 55,137 adults, 18 to 100 yrs. (mean 44 yrs., 26% female); ACLS data.
 - Compared non-runners to runners in 5 quintiles of **distance** (miles/wk), **frequency** (times/wk) , **amount** (MET-min/wk) and **speed** of running (mph).
 - Also looked at effects of a change in running habits over time in sub-group (20,647) who had ≥ 2 exams.

All-Cause and CV Mortality by Running Distance, Frequency, Total Amount, and Speed

All Cause Mortality



CVD Mortality



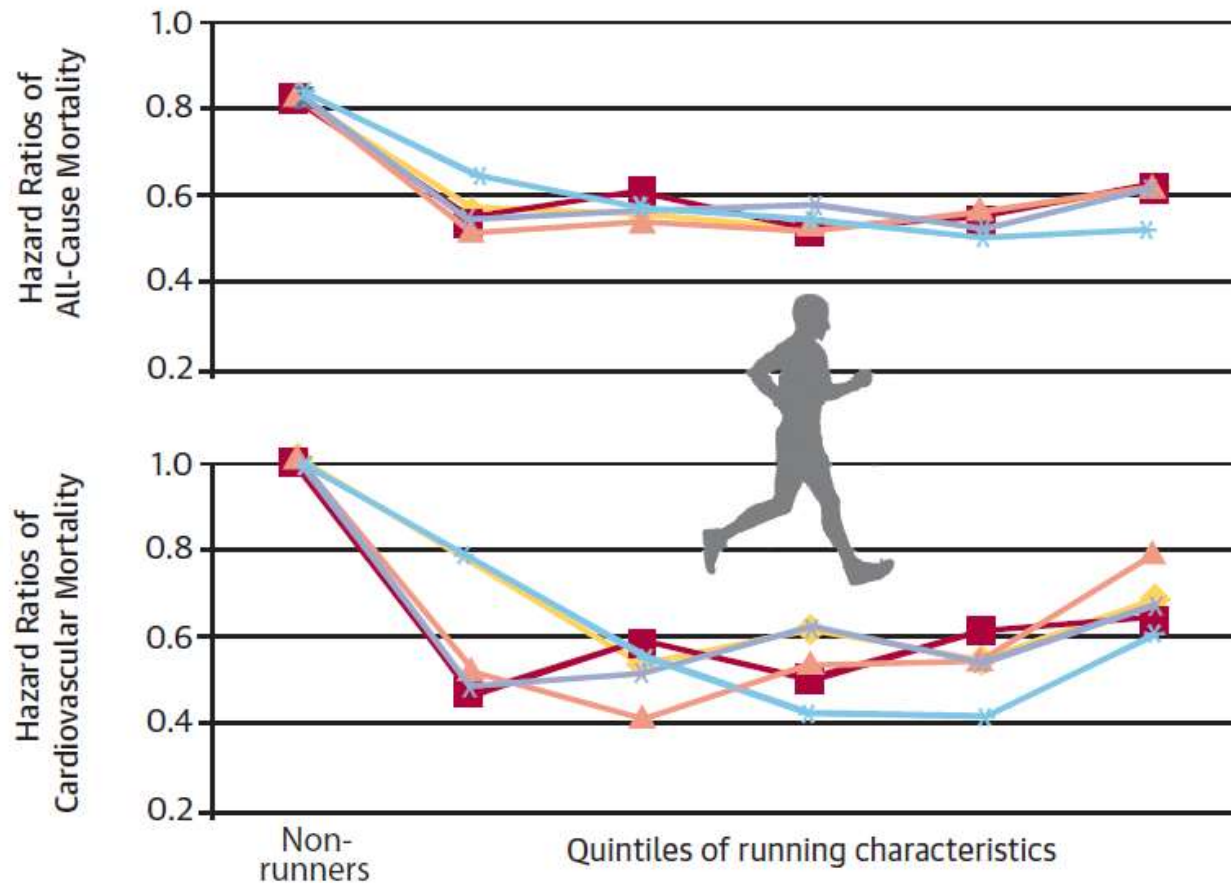
Distance






Frequency

Amount

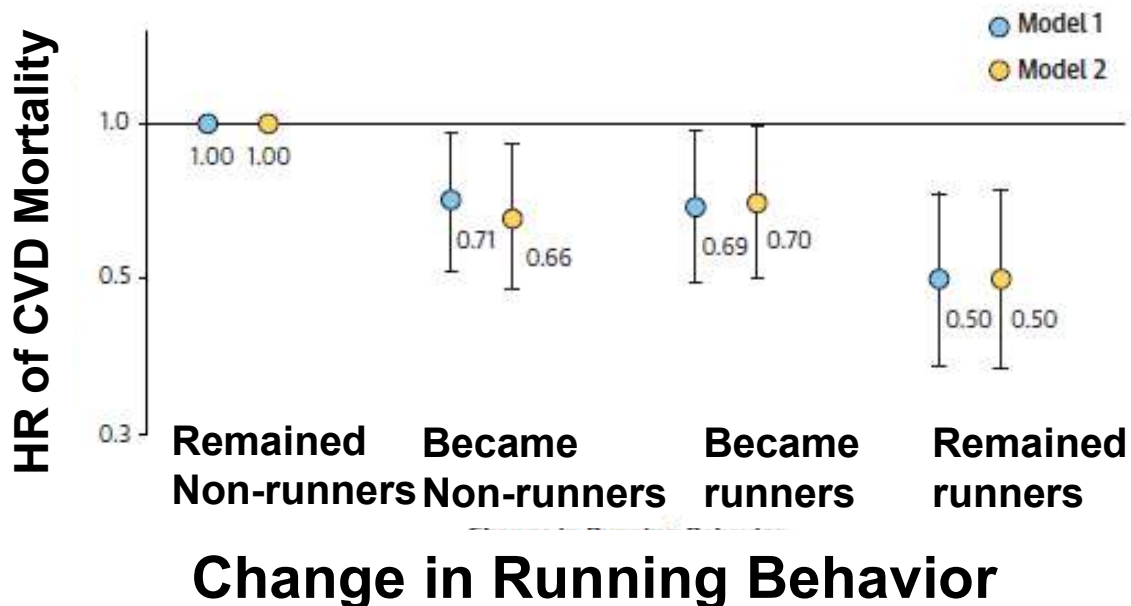
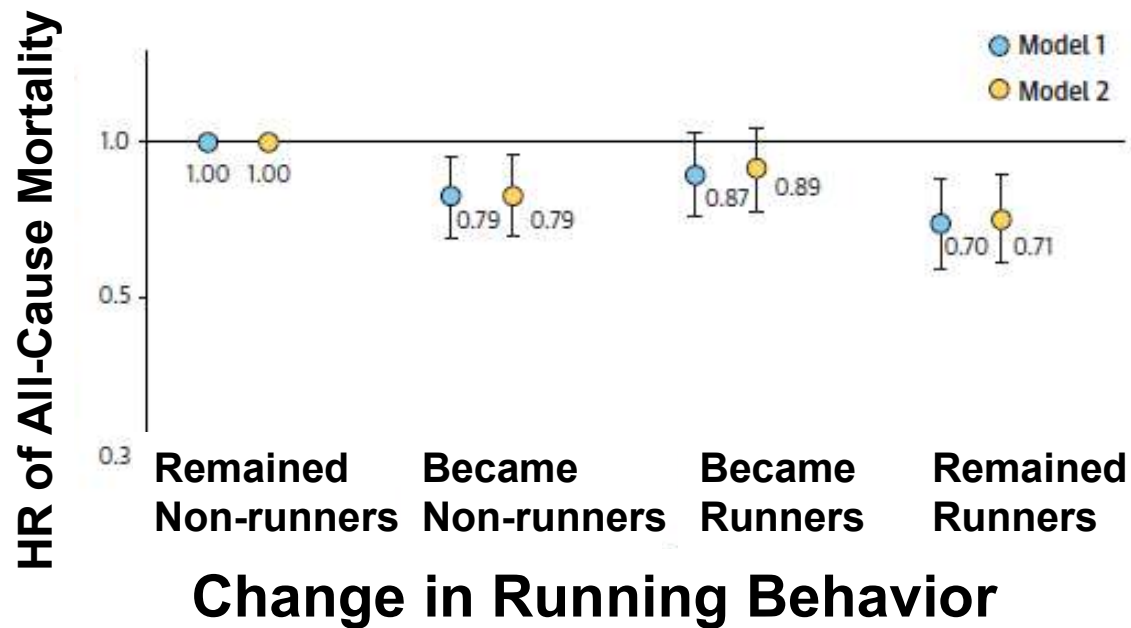
Speed

Running Reduced All-Cause and CV Mortality Risk



 Time (min/wk)	0	<51	51-80	81-119	120-175	≥176
 Distance (miles/wk)	0	<6	6-8	9-12	13-19	≥20
 Frequency (times/wk)	0	1-2	3	4	5	≥6
 Total amount (MET-min/wk)	0	<506	506-812	813-1199	1200-1839	≥1840
 Speed (mph)	0	<6.0	6.0-6.6	6.7-7.0	7.1-7.5	≥7.6

All-Cause and Cardiovascular Mortality by Change in Running Behaviors



Model 1 adjusted for age, sex, exam year and interval btw exams. Model 2 added smoking, alcohol and PA other than running

Lee, et al, *J Am Coll Cardiol*, 2014

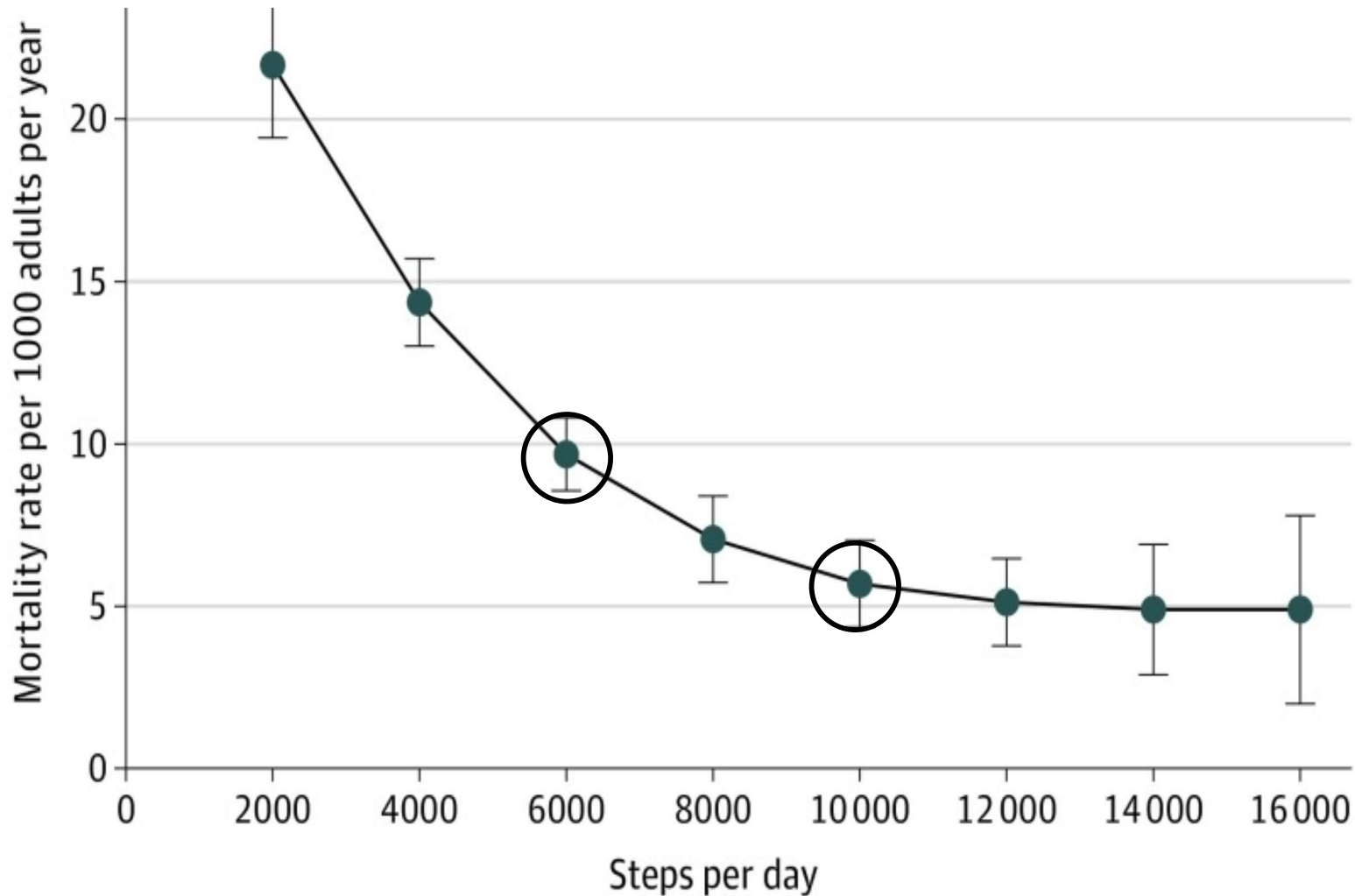
Running Study Conclusions

- Runners had consistently lower risk of all-cause and CVD mortality compared with non-runners.
- Running even at lower doses or slower speeds was associated with significant mortality benefits.
 - 30-59 min per week (5-10 min per day) gave significant benefit!
- Persistent running over time was more strongly associated with mortality reduction, but any history of running gave benefit.

How about walking?

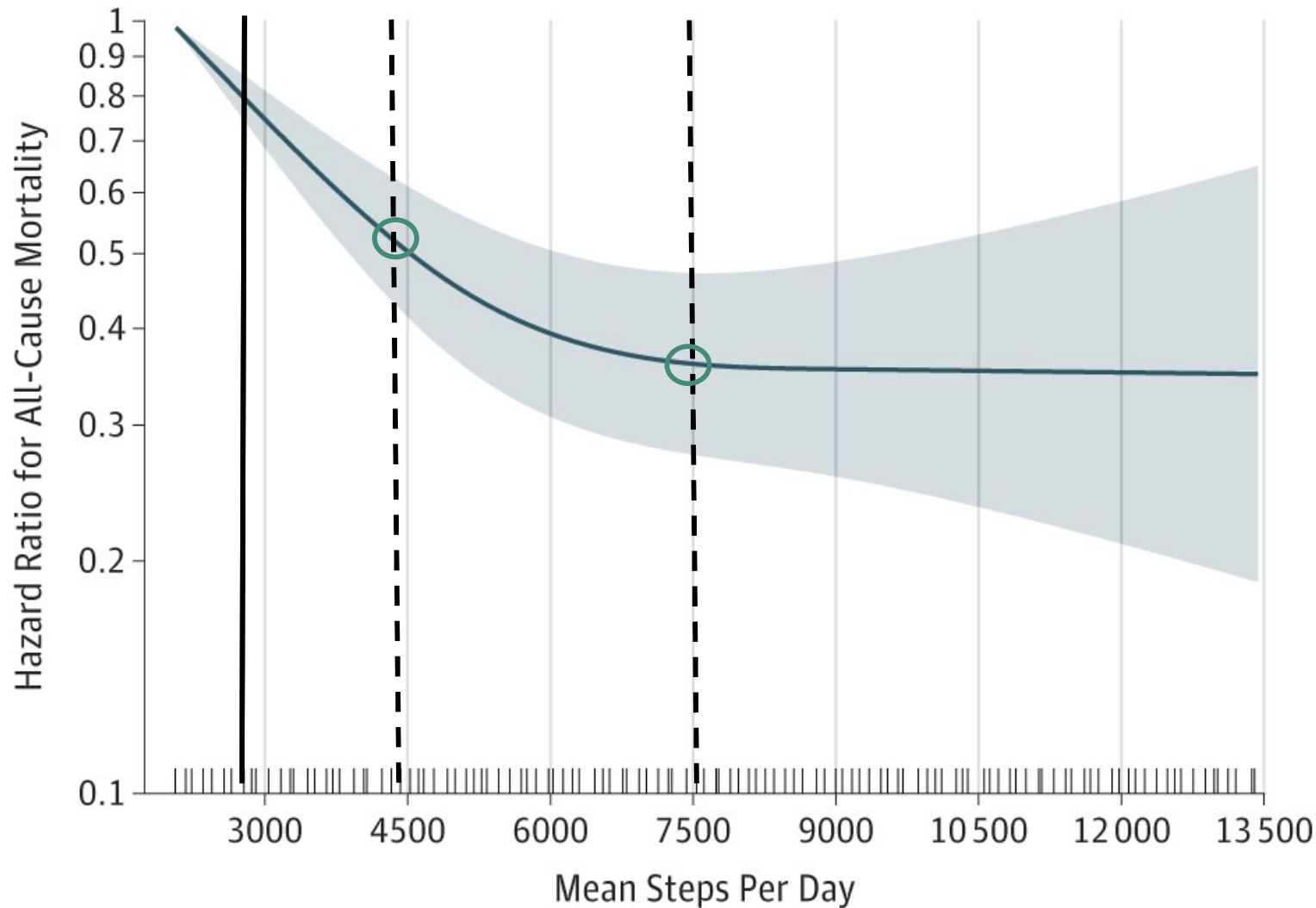


Association of Daily Step Counts and Mortality



- 4440 Adults
- Mean age 57y
- Accelerometer x 7d to measure steps & intensity.
- No association btw intensity and mortality

Even Fewer Steps are Needed as We Get Older!



- 16,741 women
- Mean age of 72 yrs followed 4.3 yrs.
- Those averaging **~4400 steps/d** had significantly lower mortality compared to **~2700 steps/d**
- Mortality rates progressively decreased before leveling at approx **7500 steps/d**.
- Step Intensity not related to mortality

Write a walking Rx for patients!



Name: John W. Smith Age: 30

Walking **R_x** Date: _____

Recommended activity level: Moderate

Minutes per day: 30 minutes

Number of days per week: 5 or more

Intensity: Hard enough that you can't sing,
but not so hard you can't talk during exercise.

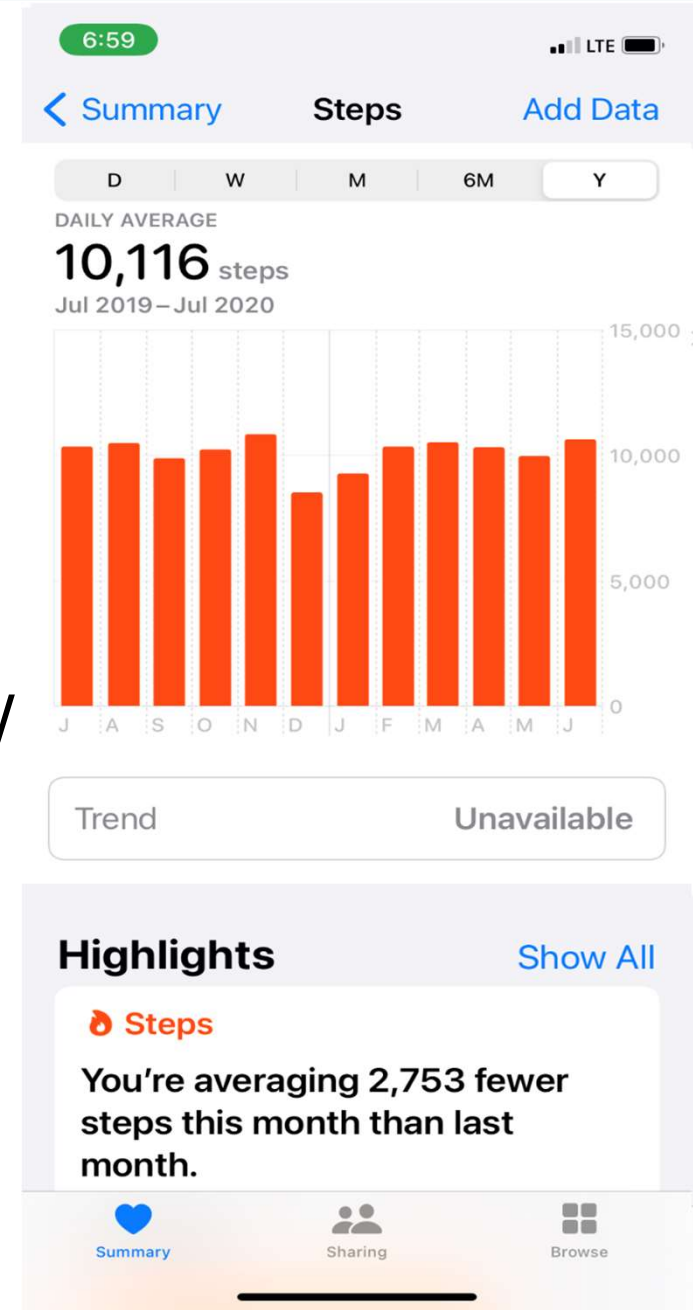
Stop: If you experience chest pain,
excessive shortness of breath or feel ill.

Signature: Robert Sallis, MD

Every Body
WALK!
www.everybodywalk.org

Why I Choose Walking as the Default Exercise Prescription?

- Walking is accessible
 - All ages, fitness level, ability, alone or in groups
- Walking is low cost
 - No gym, no equipment
- Walking is *measurable*
 - Pedometer, stop watch, distance
- Walking is the most common adult activity
 - Good long term adherence
- Walking is proven
 - Multiple studies prove benefit
- Walking is cost saving
 - Health costs lower, its “Green”



How fast do you need to walk; To stay ahead of the Grim Reaper?



- Several studies have shown correlation walking speed and survival.
- 1705 Australia men, age ≥ 70 ; Measured walking speed at usual pace for 6 m (~20 feet); Speed correlated with mortality rates over 5 yrs:
 - Walking speed of 0.82 m/s (2 mph or 3 kph) was most predictive of mortality (i.e. speed of Grim Reaper)
 - No men walking at speeds ≥ 1.36 m/s (3 mph or 5 kph) were caught by Grim Reaper
- Walking faster protects against mortality!

Advancing your Exercise Program

- Progressive Overload is Fundamental Principle – “Start low and go slow!”
 - Emphasize perceived exertion (fairly to somewhat hard)
- Aerobic Exercise
 - **Initial Conditioning Stage** (1 mo): 40% of max HR up to 70%; 3x per week for 12-20 min
 - **Improvement Stage** (4-5 mo): 60-85% max HR; 3-5x per week for 30-45 min
 - **Maintenance Stage** (after 6 mo): 50-85% of max HR; 3-5x per week for 30-35 min

Designing a Strength Training Program

- Types of strength training exercises
 - Bodyweight Exercises (push ups, pull ups, air squats)
 - Resistance Bands (thickness/resistance varies)
 - Dumbbells & Kettlebells (low weight; useful for PT)
 - Weight Training Machines (usually at the gym; safer)
 - Barbells (build muscle with bench press, curl, squats etc.)
- General Guidelines for Beginners
 - 2 to 3 days per week using multiple-joint exercises first
 - Large muscle groups are trained before small muscle groups.

Advancing your Strength Training Program

- Progressive Overload is Fundamental Principle – “Start low and go slow!”
- Strength Training
 - Loads should fall within the 8-12 repetition maximum weight that can be done easily at first
 - Advance load by 2-10% once able to perform the current workload for 1 to 2 reps more than goal (ie, 9 to 14 reps).
 - The number of sets performed should not be increased dramatically.

High-intensity Interval Training (HIIT)

- Broad term for workouts that involve short periods of intense exercise (80% max HR) alternated with recovery periods.
 - Very efficient lasting 10-30 min and gives most improvement in least time
 - Studies suggest greater gains in fitness ($\dot{V}O_2$ max) and reduced risk of CVD
- But even alternating a “relatively” high intensity workout gives benefit.
 - Consider jogging or walking a bit faster for 1 min

Examples of HIIT Training

- 7-minute Workout
 - Made famous by NY Times health writer Gretchen Reynolds
 - 12 exercises deploying only body weight, a chair and a wall
 - One minute warm up followed by doing each exercise for 30 sec at near max intensity
- Combines a long run and a visit to the weight room into about seven minutes of steady discomfort

Examples of HIIT Training



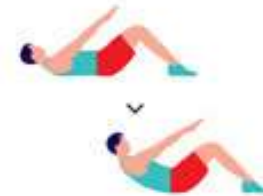
1. Jumping jacks



2. Wall sit



3. Push-up



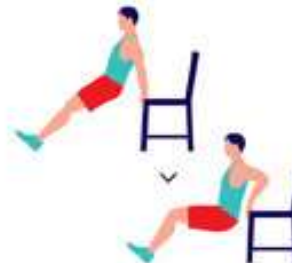
4. Abdominal
crunch



5. Step-up onto
chair



6. Squat



7. Triceps dip
on chair



8. Plank



9. High knees
running in place



10. Lunge



11. Push-up and
rotation



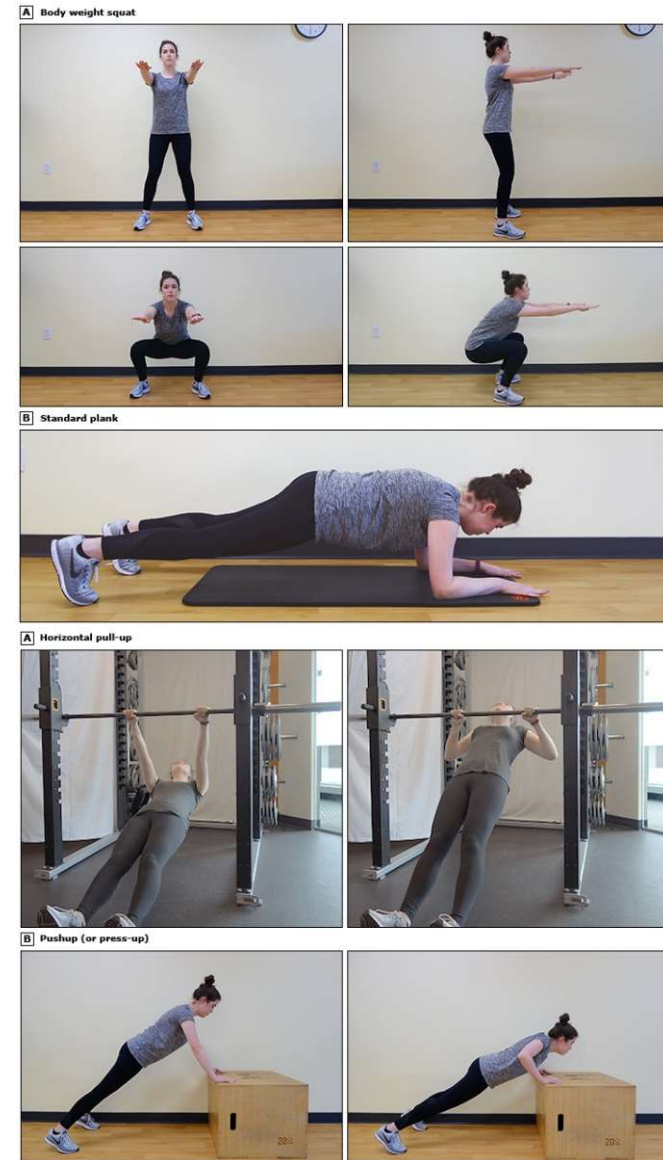
12. Side plank

Other Examples of HIIT Training

- Tabata Workout (8 min)
 - 20 seconds of a very high intensity exercise (e.g., sprints, burpees, squat jumps, etc.)
 - 10 seconds of slow walk or rest
 - Repeat 8 times (2 min warm up + 2 min cool down)
- 10-by-1 (20 min)
 - 10 one-minute bursts of running each followed by one minute of recovery
- 3x per week; Can substitute biking or swimming

A simple exercise routine that I would suggest

- Walk for 30 min on 5 days per week;
Or Jog for 25 min on 3 days per week.
- Do 2 sets each of:
 - Body weight squats x 10
 - Planks x 30 seconds
 - Elevated push-ups x 10
 - Horizontal pullups x 10



Hydration and Nutrition

- On average, endurance exercise leads to ~1L of sweat loss, ~1gm sodium loss and ~80gm carb burned per hour
- Hydration - replacing water is key!
 - For exercise bouts less than 1 hour, drink to thirst
 - If over 1 hour, drink according to your **sweat rate!**
- Nutrition (during, after and in between)
 - For exercise bout less than 1 hour, no need for carbs
 - Need protein supplement within 2 hours to aid recovery

Summary

- Benefits of exercise in treatment and prevention of chronic disease are irrefutable.
- The best exercise routine is one that you will do regularly, but ideally should contain:
 - Aerobic exercise (MVPA) for 150 min each week.
 - Strength training done 2-3 x per week.
 - Flexibility exercises done after each exercise session.
- Keep in mind that the biggest gains from exercise come by doing just a moderate amount.
- Keeping your routine fun and social can help you be more consistent.

