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Foundations of Cardiometabolic Health Certification Course

Certified Cardiometabolic Health Professional (CCHP)

Physical Activity

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Introduction to Physical Activity and Cardiometabolic Health

- Outline of Topics
  - Prevalence of Physical Activity and Physical Inactivity
  - History of Physical Activity Guidelines
  - Physical Activity vs. Fitness
  - Assessment of Physical Activity and Fitness
  - Physical Activity Effects on Aspects of Cardiometabolic Health
  - Physical Activity Recommendations

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Prevalence of Physical Activity and Physical Inactivity

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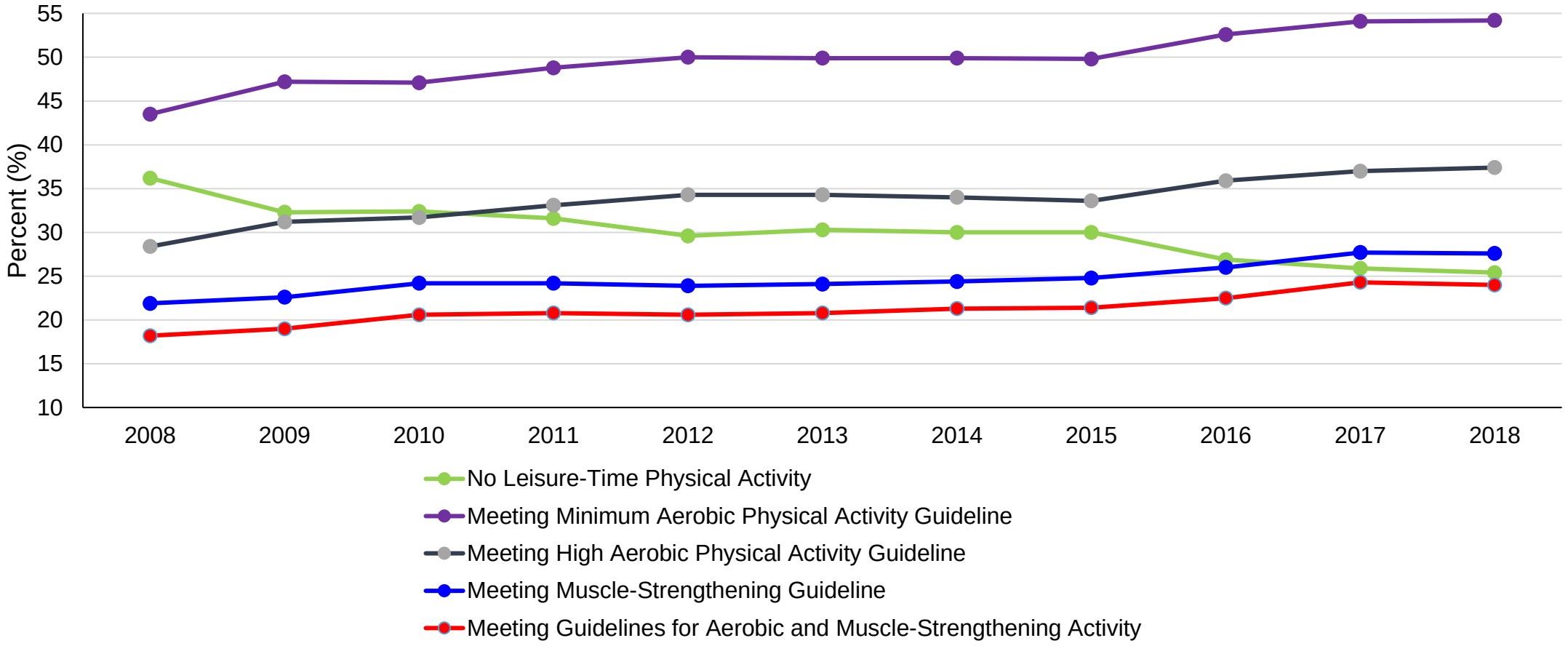
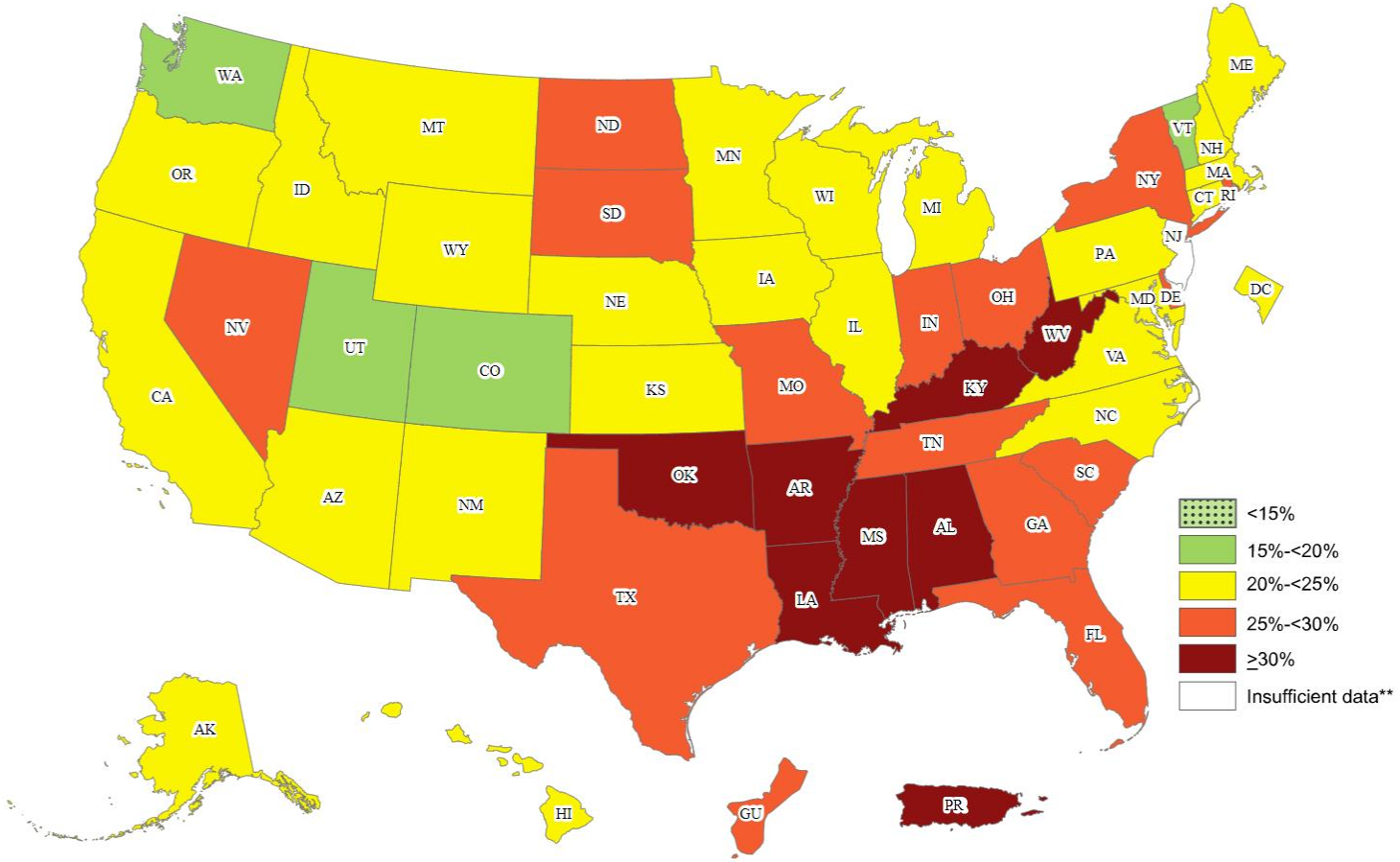
Prevalence of Physical Activity in US Adults National Health Interview Survey (NHIS) 2008-2018



Prevalence of Self-Reported Physical Inactivity* Among US Adults by State and Territory, BRFSS**, 2017–2020

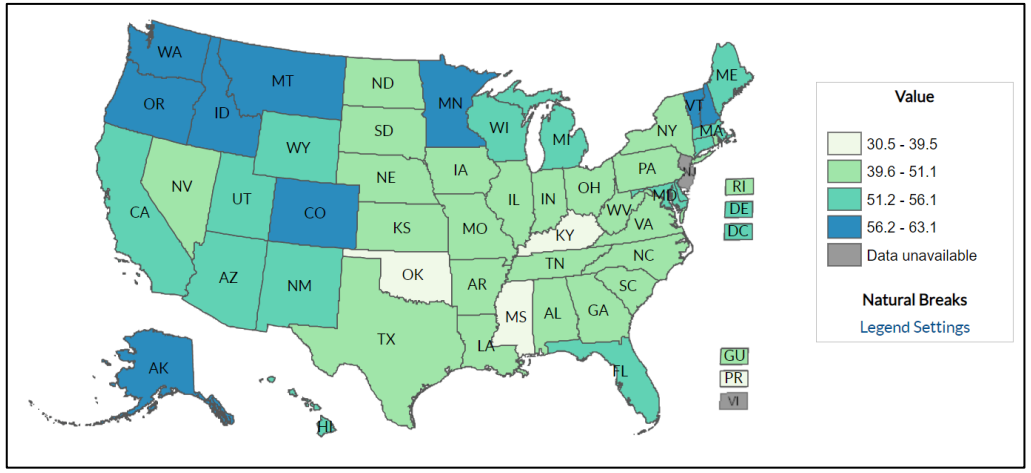


* Respondents were classified as physically inactive if they responded “no” to the following question: “During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?”

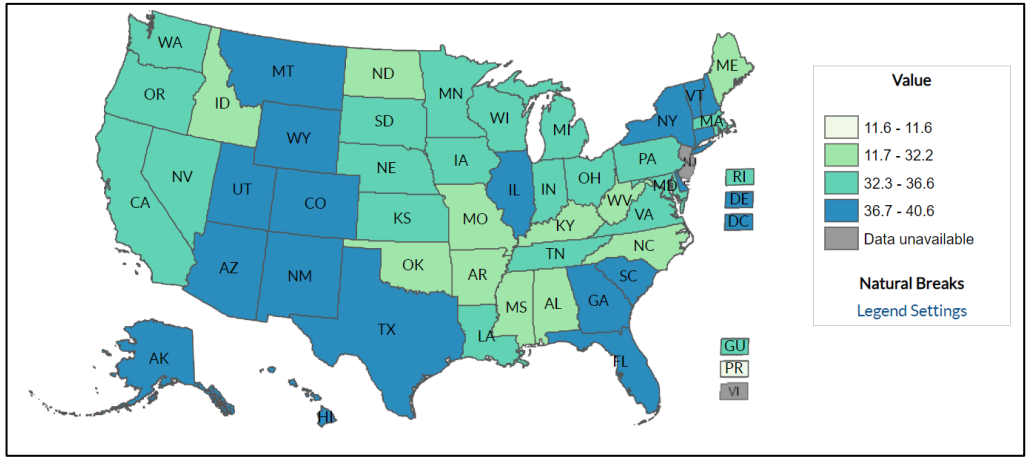
**BRFSS = Behavioral Risk Factor Surveillance Survey

Prevalence of Self-Reported Physical Activity Among US Adults by State and Territory, BRFSS**, 2019

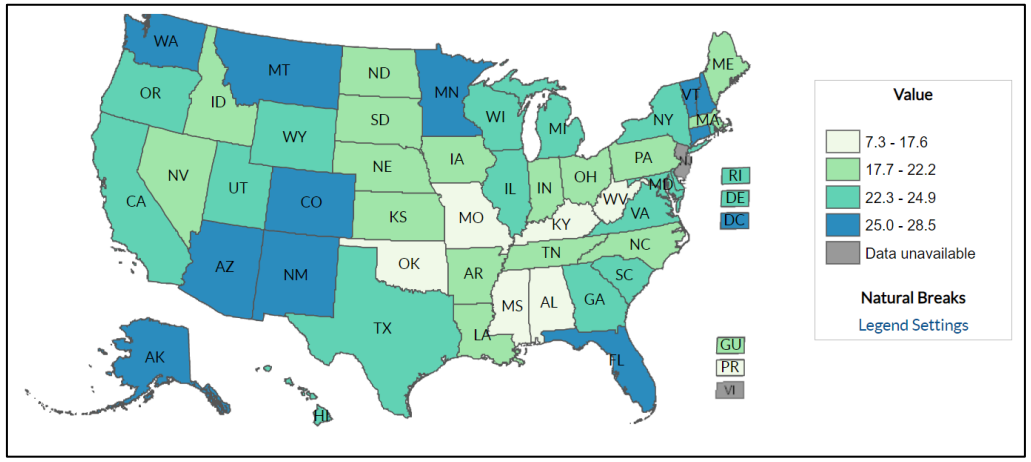
Percent of adults who achieve at the recommended level of aerobic activities



Percent of adults who achieve at the recommended level of muscle-strengthening* activities



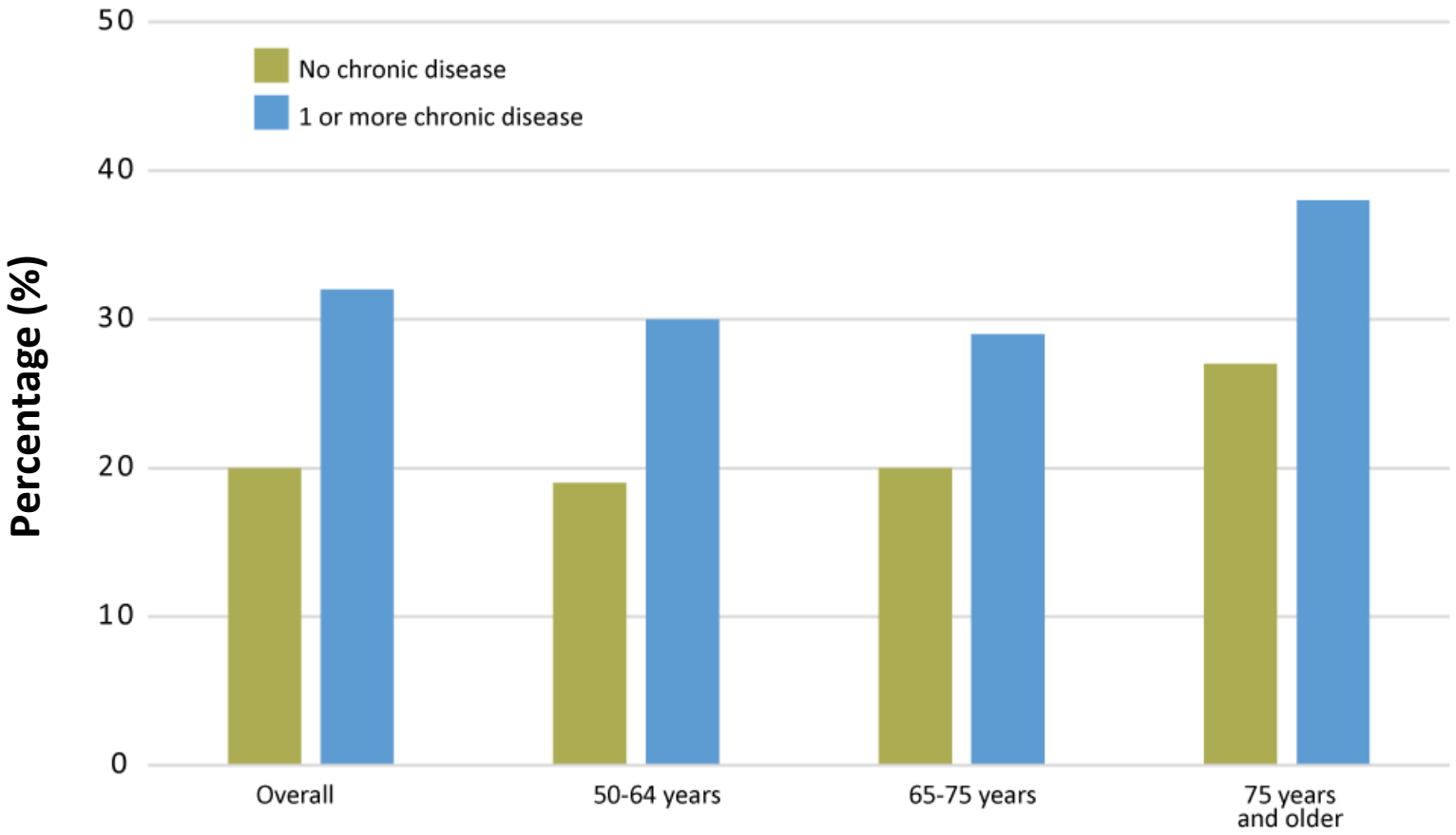
Percent of adults who achieve at the recommended level of both aerobic and muscle-strengthening* activities



*Muscle-strengthening includes activities such as yoga, sit-ups or push-ups and those using weight machines, free weights, or elastic bands

**BRFSS = Behavioral Risk Factor Surveillance Survey

Percentage of Self-reported Physical Inactivity Among Adults 50 Years and Older by Chronic Disease Status and Age Group, Behavioral Risk Factor Surveillance System 2014



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History of Physical Activity Guidelines

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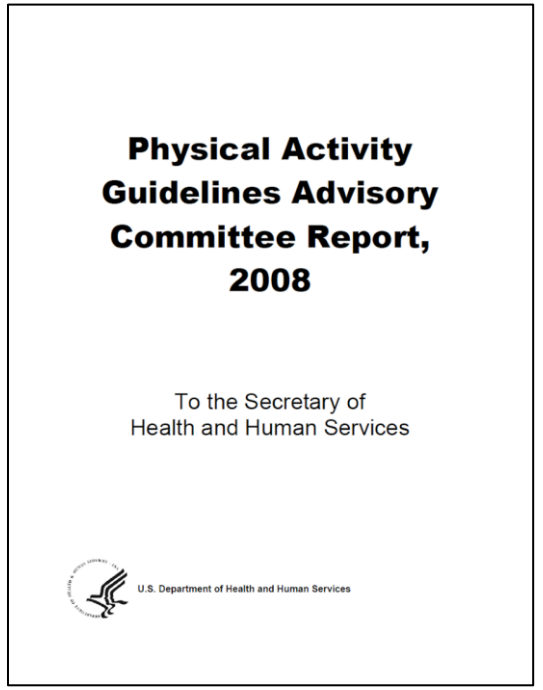
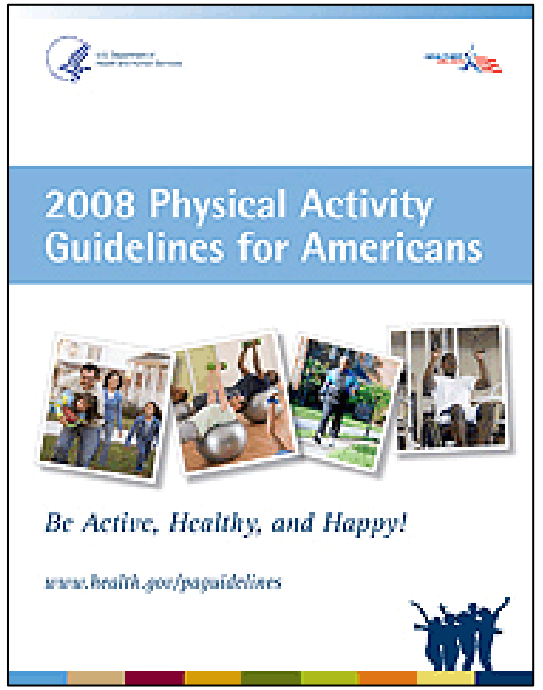
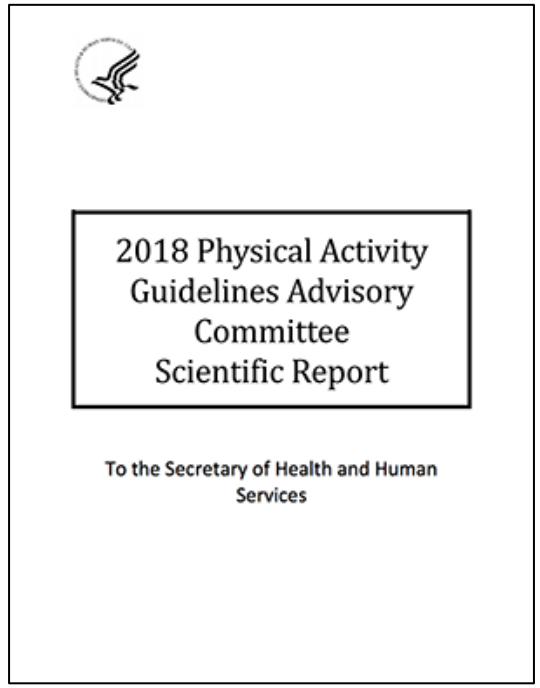
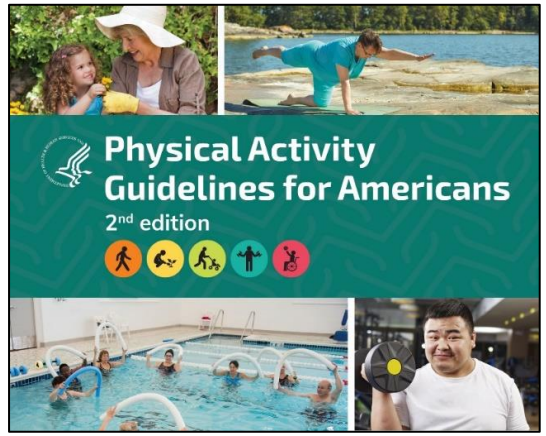
History of Physical Activity Guidelines









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Physical Activity vs. Fitness

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What is “Physical Activity”?

Physical Activity

is bodily movement produced by skeletal muscles that results in energy expenditure.

versus

Exercise

is physical activity that is planned, structured, repetitive, and designed to improve or maintain physical fitness, physical performance, or health.

Assessing Physical Activity

- Leisure-time Physical Activity
  - Performed at one's discretion when one is not working, transporting to a different location, and not doing household chores.
- Occupational Physical activity
  - Performed while one is working.
- Transportation Physical Activity
  - Performed in order to get from one place to another.
- Household Physical Activity
  - Done in or around one's home. It includes household tasks such as cooking, cleaning, home repair, yardwork, or gardening.

Questionnaires and Recalls

Instructions: Considering a typical 7-day period over the previous 3 months, how many times on average per week do you engage in at least 10 minutes of each of the categories of exercise listed below?

	Episodes per Week	Average Minutes per Episode	Total Minutes per Week
Vigorous Activity (i.e., running/jogging, basketball game, cross-country skiing, inline skating, vigorous cycling, etc.)			
Moderate Activity (i.e., brisk walking, tennis, dancing, cycling for leisure, alpine skiing)			
Light Activity (i.e., stetching, yoga, easy walking, bowling, fishing)			

Adapted from Godin G and Sheppard RJ. *Can J Appl Sport Sci*. 10: 141-146, 1985

SECTION I: ACTIVITY AT WORK OR SCHOOL (occupational or job-related)

Think first about the time you spend doing work/school. Think of work/school as the things that you have to do such as paid or unpaid work.

1. Does your work/school involve vigorous-intensity activity that causes large increases in breathing or heart rate *(like carrying or lifting heavy loads, digging or construction work)* for at least 10 minutes continuously?
   - ☐ Yes
   - ☐ No *If 'No', skip to question 4 of this section*
2. In a typical week, on how many days do you do vigorous intensity activities as part of your work/school?
   _____ days
3. How much time do you spend doing vigorous-intensity activities at work/school on a typical day?
   _____ *hours: minutes*
4. Does your work/school involve moderate-intensity activity that causes small increases in breathing or heart rate *(such as brisk walking or carrying light loads)* for at least 10 minutes continuously?
   - ☐ Yes
   - ☐ No *If 'No', skip to Section II*
5. In a typical week, on how many days do you do moderate intensity activities as part of your work/school?
   _____ days
6. How much time do you spend doing moderate-intensity activities at work on a typical day?
   _____ *hours: minutes*

SECTION III: TRAVEL TO AND FROM PLACES

The next questions exclude the work/school and household activities that you have already mentioned above. Now I would like to ask you about the usual way you travel to and from places. For example: to work, for shopping, to market, to place of worship.

1. Do you walk or use a bicycle *(pedal cycle)* for at least 10 minutes continuously to get to and from places?
   - ☐ Yes
   - ☐ No *If 'No', skip to Section IV*
2. In a typical week, on how many days do you walk or bicycle for at least 10 minutes continuously to get to and from places?
   _____ days
3. How much time do you spend walking or bicycling for travel on a typical day?
   _____ *hours: minutes*

Activity Trackers

What is “Fitness”?

- Physical Fitness
  - A physiological attribute determining a person’s ability to perform muscle-powered work
- Traditionally viewed from the perspective of “cardiorespiratory fitness”
- Fitness is a multi-component construct
    - Cardiorespiratory Fitness (endurance, aerobic power)
    - Musculoskeletal Fitness
    - Flexibility
    - Balance
    - Speed of Movement

Components of Physical Fitness

Fitness Components	Description/Definition
Cardiorespiratory Endurance	The ability to perform large-muscle, whole-body exercise at moderate to high intensities for extended periods of time.
Musculoskeletal Fitness	The integrated function of muscle strength, muscle endurance, and muscle power to enable performance of work.
Flexibility	The range of motion available at a joint or group of joints.
Balance	The ability to maintain equilibrium while moving or while stationary.
Speed	The ability to move the body quickly.

Components of Physical Fitness

Fitness Components	Description/Definition
Cardiorespiratory Endurance	***The ability to perform large-muscle, whole-body exercise at moderate to high intensities for extended periods of time.***
Musculoskeletal Fitness	***The integrated function of muscle strength, muscle endurance, and muscle power to enable performance of work.***
Flexibility	The range of motion available at a joint or group of joints.
Balance	The ability to maintain equilibrium while moving or while stationary.
Speed	The ability to move the body quickly.

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Assessing Cardiorespiratory Fitness

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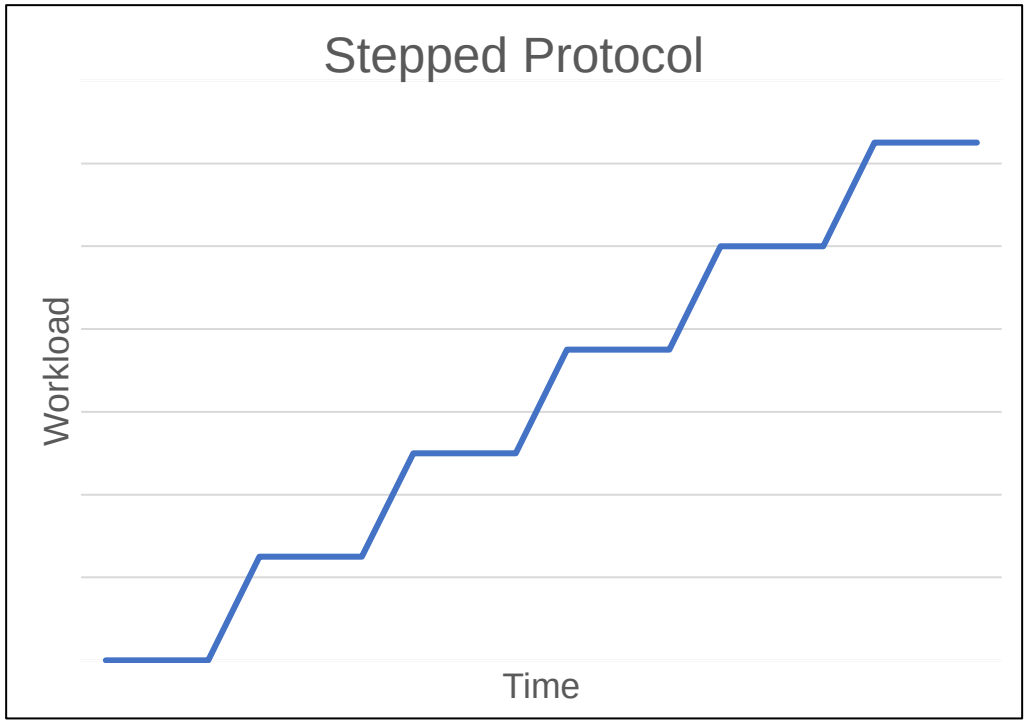
Selecting the Appropriate Cardiopulmonary Exercise Test (CPET) Modality

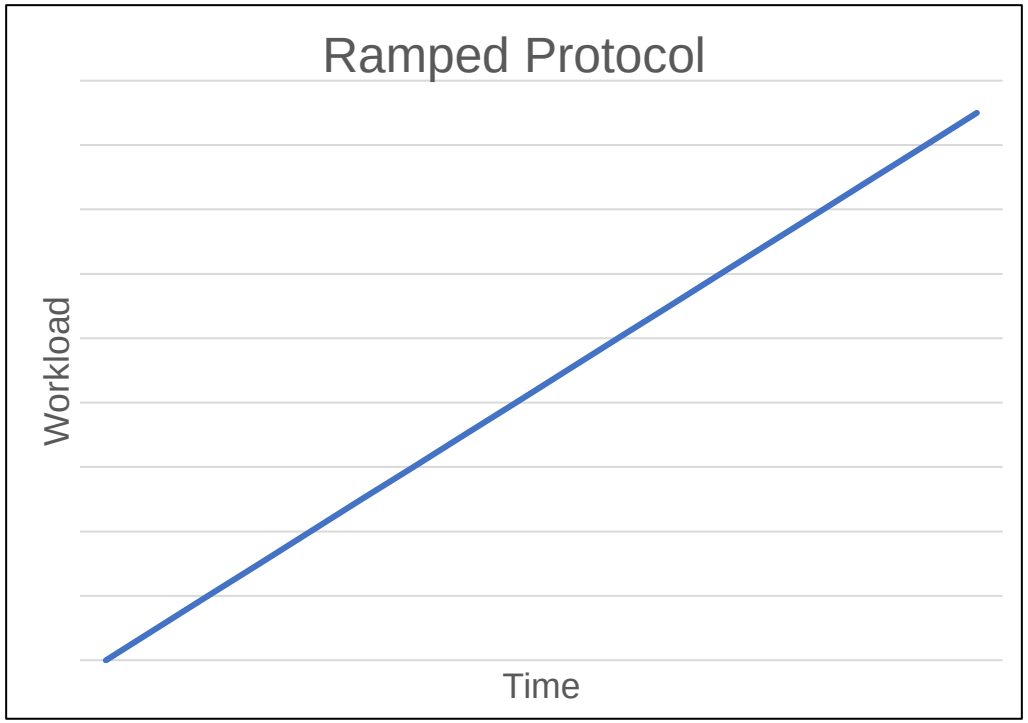
Treadmil
l

Cycle Ergometer

Selecting the Appropriate CPET Protocol

Stepped/Staged Protocol vs. Ramped Protocol





Considerations for Selecting the Appropriate CPET Protocol

- Physical activity level of participant/patient
  - Will determine the work level progressions across the evaluation
- Physical limitations of the participant/patient
  - Ambulatory limitations
  - Lower leg mobility limitations
  - Balance concerns
- Purpose of the evaluation
  - Clinical evaluation for cardiac condition or other health condition
  - Sport/Fitness performance evaluation
- Test should be approximately 8-12 minutes in duration

Assessing Cardiorespiratory Fitness without Exercise Testing

- Estimate based on:
  - Gender/Sex
  - Age
  - Body Mass Index
  - Resting Heart Rate
  - Physical Activity Score

Assessing Cardiorespiratory Fitness Without Performing Exercise Testing

Radim Jurca, PhD, Andrew S. Jackson, PED, Michael J. LaMonte, PhD, MPH, James R. Morrow Jr., PhD, Steven N. Blair, PED, Nicholas J. Wareham, MBBS, PhD, William L. Haskell, PhD, Willem van Mechelen, MD, PhD, Timothy S. Church, MD, MPH, PhD, John M. Jakicic, PhD, Raija Laukkanen, PhD

Background: Low cardiorespiratory fitness (CRF) is associated with increased risk of chronic diseases and mortality; however, CRF assessment is usually not performed in many healthcare settings. The purpose of this study is to extend previous work on a non-exercise test model to predict CRF from health indicators that are easily obtained.

Methods: Participants were men and women aged 20 to 70 years whose CRF level was quantified with a maximal or submaximal exercise test as part of the National Aeronautics and Space Administration/Johnson Space Center (NASA, $n=1863$), Aerobics Center Longitudinal Study (ACLS, $n=46,180$), or Allied Dunbar National Fitness Survey (ADNFS, $n=1706$). Other variables included gender, age, body mass index, resting heart rate, and self-reported physical activity levels.

Results: All variables used in the multiple linear regression models were independently related to the CRF in each of the study cohorts. The multiple correlation coefficients obtained within NASA, ACLS, and ADNFS participants, respectively, were 0.81, 0.77, and 0.76. The standard error of estimate (SEE) was 1.45, 1.50, and 1.97 metabolic equivalents (METs) (1 MET=3.5 ml O_2 uptake · kilograms of body mass^{-1} · minutes^{-1}), respectively, for the NASA, ACLS, and ADNFS regression models. All regression models demonstrated a high level of cross-validity ($0.72<R<0.80$). The highest cross-validation coefficients were seen when the NASA regression model was applied to the ACLS and ADNFS cohorts ($R=0.76$ and $R=0.75$, respectively).

Conclusions: This study suggests that CRF may be accurately estimated in adults from a non-exercise test model including gender, age, body mass index, resting heart rate, and self-reported physical activity.

(Am J Prev Med 2005;29(3):185–193) © 2005 American Journal of Preventive Medicine

Clinical relevance of selected maximal MET levels of cardiorespiratory fitness[b]

1 MET	Resting metabolic rate; sitting quietly in a chair
<3 METs	Severely limited functional capacity; a criteria for placement on a heart transplant list
3–5 METs	Poor prognosis in coronary patients; highly deconditioned individual
10 METs	Good prognosis in coronary patients on medical therapy; approximate maximal capacity expected in regularly active middle-aged men and women
13 METs	Excellent prognosis regardless of disease status
18 METs	Elite endurance athletes
20 METs	World-class athletes

American College of Sports Medicine (ACSM) Risk Stratification for Patients not Currently Participating in Regular Exercise*

Medical History	Medical Clearance	Physical Activity Recommendations
No cardiovascular, metabolic, or renal disease **AND** no signs or symptoms suggestive of cardiovascular, metabolic, or renal disease	Medical clearance** not necessary	• Light to Moderate Intensity Recommended • May gradually progress to Vigorous Intensity following ACSM Guidelines
Known cardiovascular, metabolic, or renal disease **AND** asymptomatic	Medical clearance** recommended	• Following medical clearance, light to moderate intensity recommended. • May gradually progress as tolerated following ACSM Guidelines
Any signs or symptoms suggestive of cardiovascular, metabolic, or renal disease (regardless of disease status)	Medical clearance** recommended	• Following medical clearance, light to moderate intensity recommended. • May gradually progress as tolerated following ACSM Guidelines

* Regular exercise is defined as performing planned, structured physical activity for at least 30 minutes at moderate intensity on at least 3 days per week for at least the last 3 months

** Indicates: Approval from a health care professional to engage in exercise

ACSM's Guidelines for Exercise Testing and Prescription, 11th Edition

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Assessing Musculoskeletal Fitness

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Isometric and Isokinetic Testing

Grip Strength

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Health Benefits of Physical Activity

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Overview of Systems Impacted by Physical Activity

INCREASED Body Temperature

INCREASED Brain Activity

HELPS Fat Cell Metabolism

INCREASED Breathing

HELPS Liver Function Metabolism

INCREASED Heart Rate

HELPS GI Action Metabolism

INCREASED Oxygen Content

INCREASED Strain on your Bone

INCREASED Dilation

INCREASED Blood Distribution

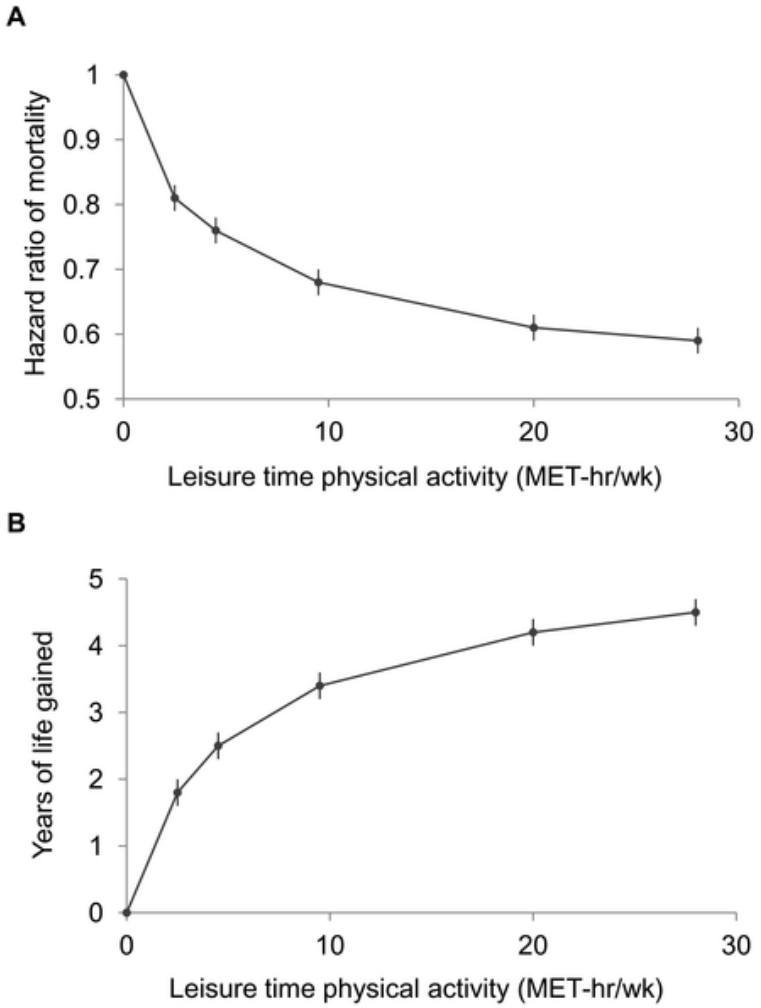
INCREASED Metabolism

ENHANCED Muscle Function and Strength

Cardiometabolic Health Benefits of Physical Activity

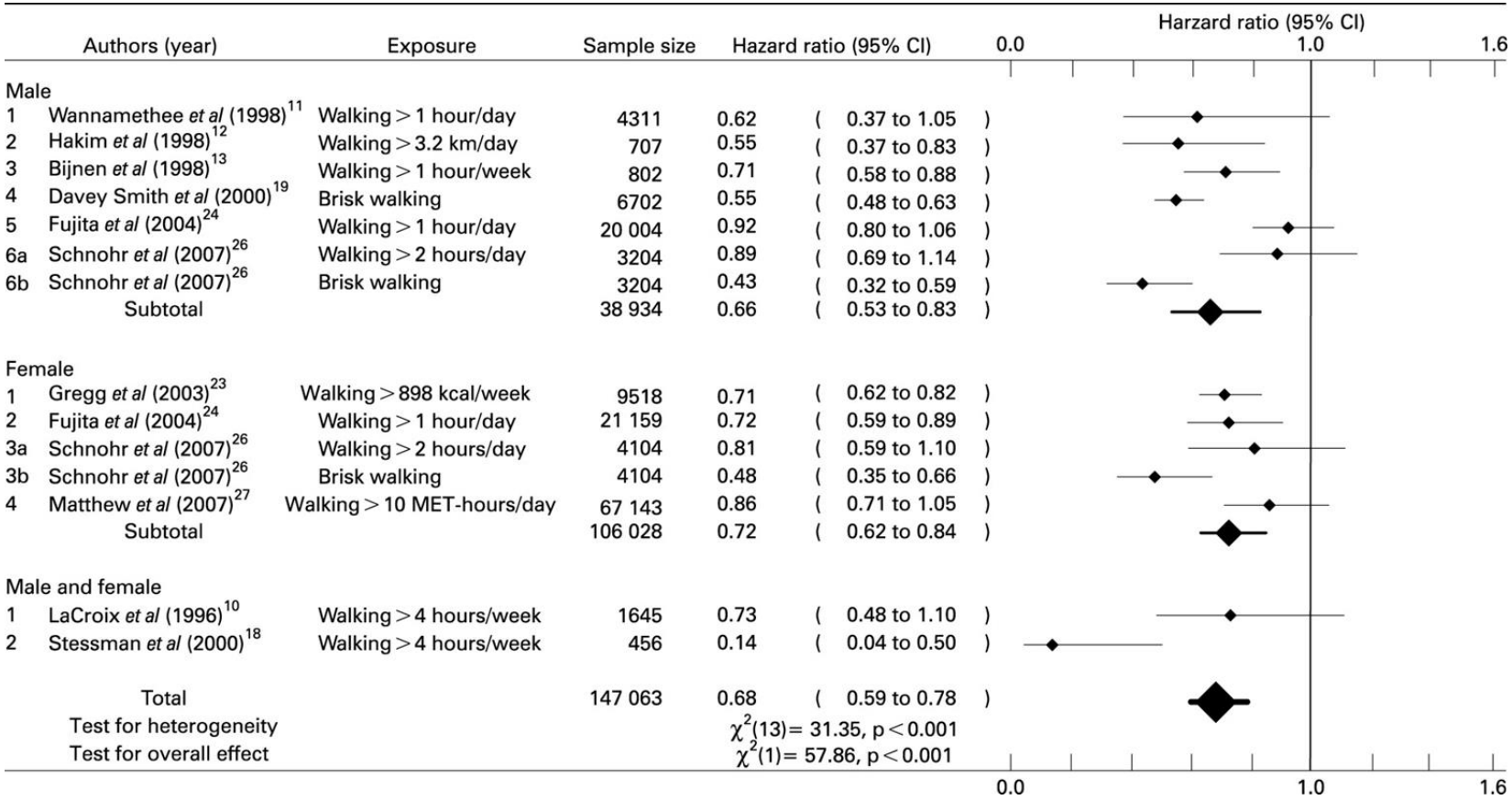
All-Cause Mortality and Cardiovascular Disease

Leisure Time Physical Activity Level and Hazard Ratios for Mortality and Gains in Life Expectancy After Age 40.



Moore SC, Patel AV, Matthews CE, Berrington de Gonzalez A, Park Y, et al. (2012) Leisure Time Physical Activity of Moderate to Vigorous Intensity and Mortality: A Large Pooled Cohort Analysis. PLOS Medicine 9(11): e1001335. doi:10.1371/journal.pmed.1001335 http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1001335

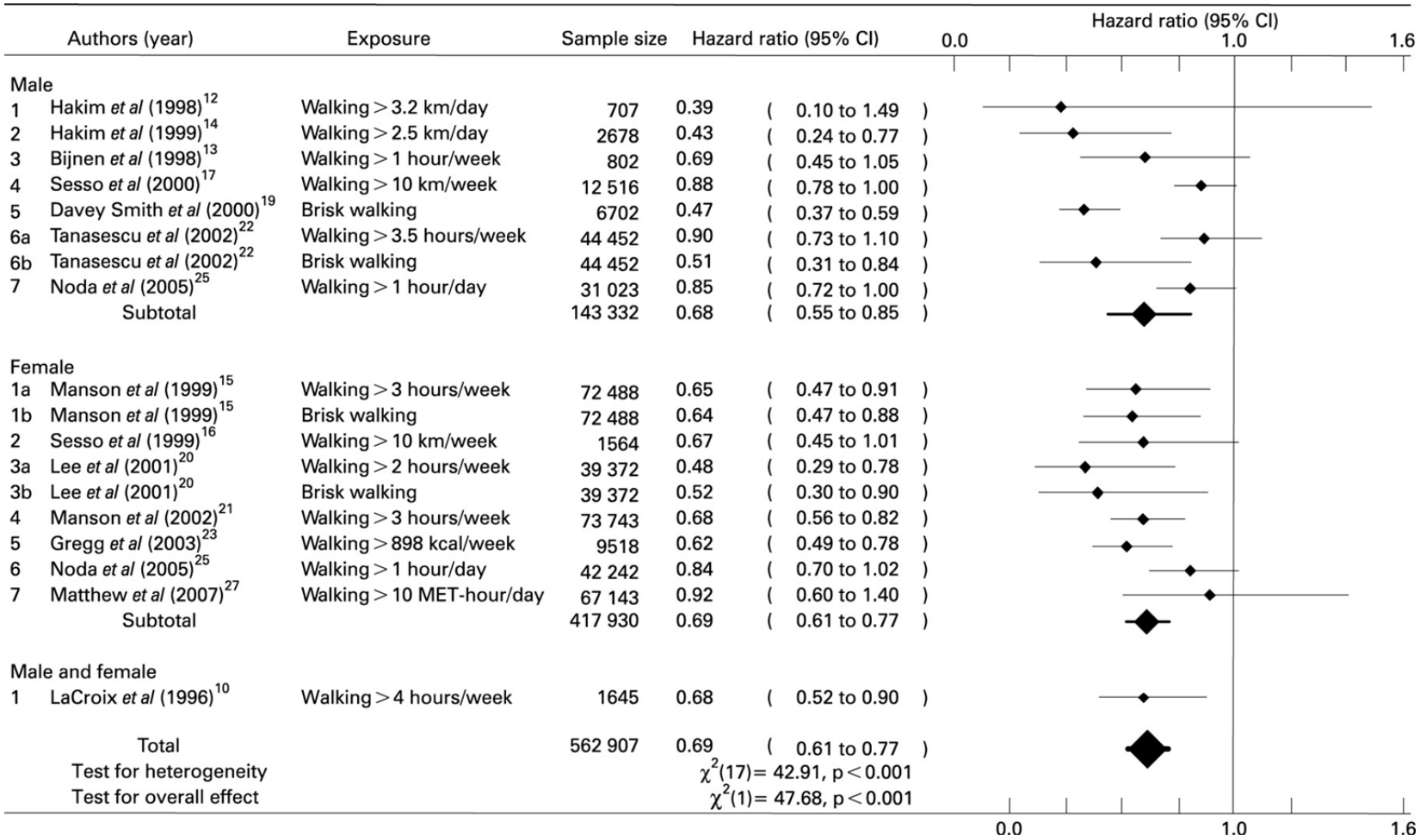
The Association Between Walking and All-cause Mortality in Men and Women.



	Authors (year)	Exposure	Sample size	Hazard ratio (95% CI)
Male				
1	Wannamethee *et al* (1998)[11]	Walking > 1 hour/day	4311	0.62 (0.37 to 1.05)
2	Hakim *et al* (1998)[12]	Walking > 3.2 km/day	707	0.55 (0.37 to 0.83)
3	Bijnen *et al* (1998)[13]	Walking > 1 hour/week	802	0.71 (0.58 to 0.88)
4	Davey Smith *et al* (2000)[19]	Brisk walking	6702	0.55 (0.48 to 0.63)
5	Fujita *et al* (2004)[24]	Walking > 1 hour/day	20 004	0.92 (0.80 to 1.06)
6a	Schnohr *et al* (2007)[26]	Walking > 2 hours/day	3204	0.89 (0.69 to 1.14)
6b	Schnohr *et al* (2007)[26]	Brisk walking	3204	0.43 (0.32 to 0.59)
	Subtotal		38 934	0.66 (0.53 to 0.83)
Female				
1	Gregg *et al* (2003)[23]	Walking > 898 kcal/week	9518	0.71 (0.62 to 0.82)
2	Fujita *et al* (2004)[24]	Walking > 1 hour/day	21 159	0.72 (0.59 to 0.89)
3a	Schnohr *et al* (2007)[26]	Walking > 2 hours/day	4104	0.81 (0.59 to 1.10)
3b	Schnohr *et al* (2007)[26]	Brisk walking	4104	0.48 (0.35 to 0.66)
4	Matthew *et al* (2007)[27]	Walking > 10 MET-hours/day	67 143	0.86 (0.71 to 1.05)
	Subtotal		106 028	0.72 (0.62 to 0.84)
Male and female				
1	LaCroix *et al* (1996)[10]	Walking > 4 hours/week	1645	0.73 (0.48 to 1.10)
2	Stessman *et al* (2000)[18]	Walking > 4 hours/week	456	0.14 (0.04 to 0.50)
	Total		147 063	0.68 (0.59 to 0.78)
	Test for heterogeneity			$\chi^2(13) = 31.35$, $p < 0.001$
	Test for overall effect			$\chi^2(1) = 57.86$, $p < 0.001$

M Hamer, and Y Chida Br J Sports Med 2008;42:238-243

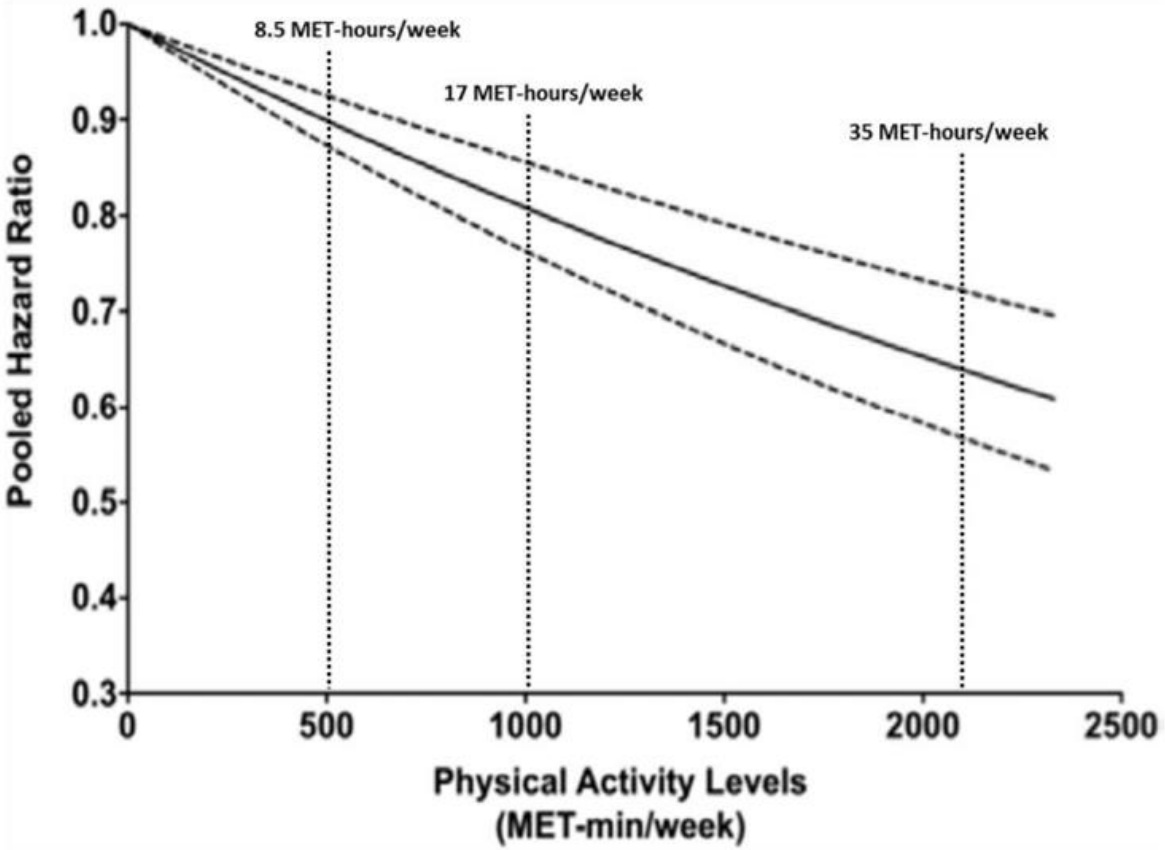
The Association Between Walking and Cardiovascular Risk in Men and Women



	Authors (year)	Exposure	Sample size	Hazard ratio (95% CI)
Male				
1	Hakim *et al* (1998)[12]	Walking > 3.2 km/day	707	0.39 (0.10 to 1.49)
2	Hakim *et al* (1999)[14]	Walking > 2.5 km/day	2678	0.43 (0.24 to 0.77)
3	Bijnen *et al* (1998)[13]	Walking > 1 hour/week	802	0.69 (0.45 to 1.05)
4	Sesso *et al* (2000)[17]	Walking > 10 km/week	12 516	0.88 (0.78 to 1.00)
5	Davey Smith *et al* (2000)[19]	Brisk walking	6702	0.47 (0.37 to 0.59)
6a	Tanasescu *et al* (2002)[22]	Walking > 3.5 hours/week	44 452	0.90 (0.73 to 1.10)
6b	Tanasescu *et al* (2002)[22]	Brisk walking	44 452	0.51 (0.31 to 0.84)
7	Noda *et al* (2005)[25]	Walking > 1 hour/day	31 023	0.85 (0.72 to 1.00)
	Subtotal		143 332	0.68 (0.55 to 0.85)
Female				
1a	Manson *et al* (1999)[15]	Walking > 3 hours/week	72 488	0.65 (0.47 to 0.91)
1b	Manson *et al* (1999)[15]	Brisk walking	72 488	0.64 (0.47 to 0.88)
2	Sesso *et al* (1999)[16]	Walking > 10 km/week	1564	0.67 (0.45 to 1.01)
3a	Lee *et al* (2001)[20]	Walking > 2 hours/week	39 372	0.48 (0.29 to 0.78)
3b	Lee *et al* (2001)[20]	Brisk walking	39 372	0.52 (0.30 to 0.90)
4	Manson *et al* (2002)[21]	Walking > 3 hours/week	73 743	0.68 (0.56 to 0.82)
5	Gregg *et al* (2003)[23]	Walking > 898 kcal/week	9518	0.62 (0.49 to 0.78)
6	Noda *et al* (2005)[25]	Walking > 1 hour/day	42 242	0.84 (0.70 to 1.02)
7	Matthew *et al* (2007)[27]	Walking > 10 MET-hour/day	67 143	0.92 (0.60 to 1.40)
	Subtotal		417 930	0.69 (0.61 to 0.77)
Male and female				
1	LaCroix *et al* (1996)[10]	Walking > 4 hours/week	1645	0.68 (0.52 to 0.90)
	Total		562 907	0.69 (0.61 to 0.77)
	Test for heterogeneity			$\chi^2(17) = 42.91$, $p < 0.001$
	Test for overall effect			$\chi^2(1) = 47.68$, $p < 0.001$

M Hamer, and Y Chida Br J Sports Med 2008;42:238-243

Dose-Response Relationships Between Moderate-to-Vigorous Physical Activity and Risk of Incident Heart Failure



Note: For reference, shown are the lower end (8.5 MET-hours/week) and upper bounds (17 MET-hours/week) of the 2008 Guidelines for moderate-to-vigorous physical activity. Also indicated is the moderate-to-vigorous physical activity amount associated with normalization of the risk from greater than 8 hours per day of sedentary activity from Ekelund et al., 2016 (17 MET-hours/week).

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Cardiometabolic Health Benefits of Physical Activity

Hypertension

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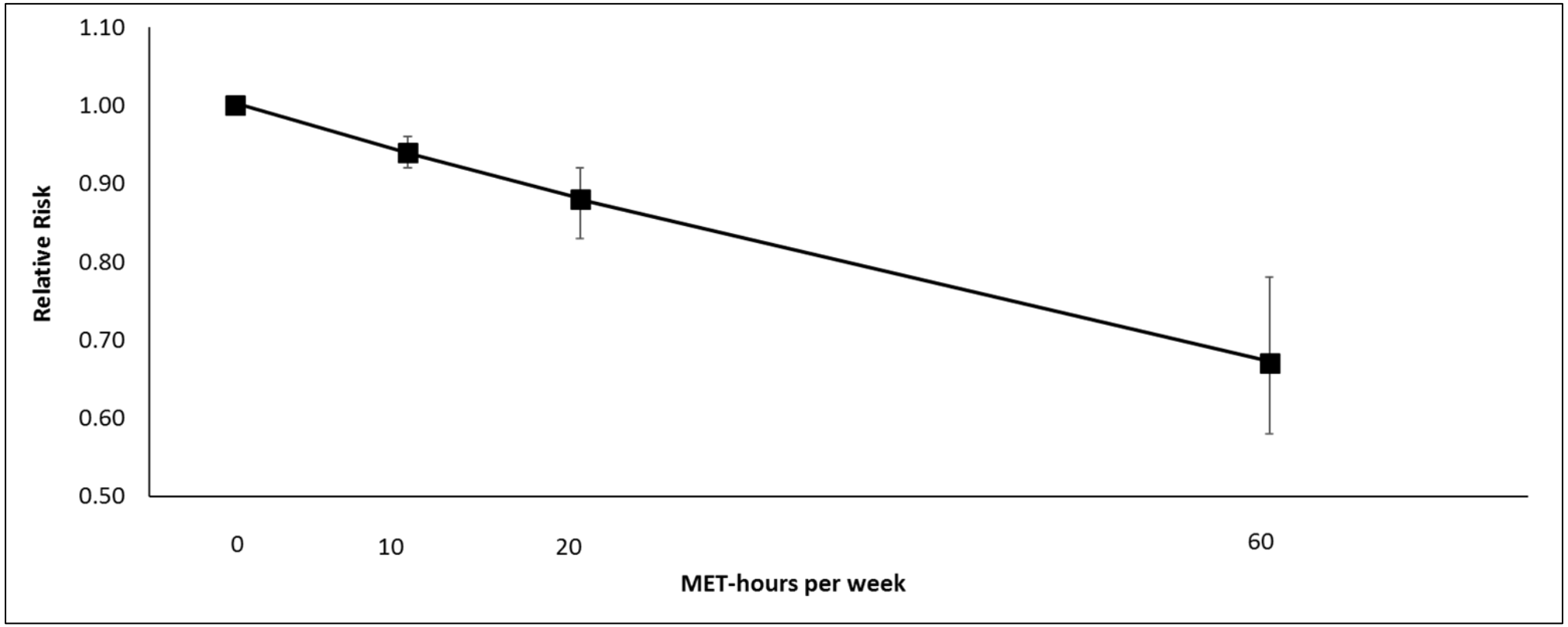
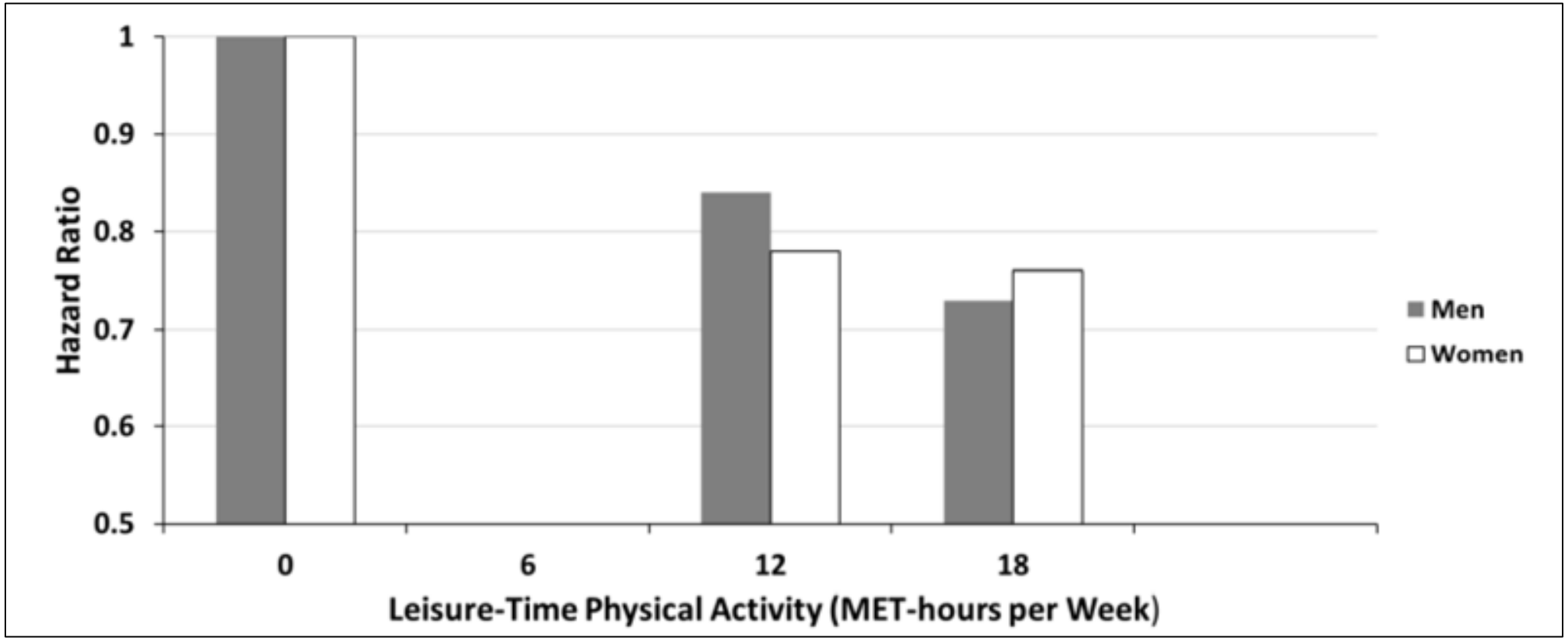
Inverse Relationship Between Incident Hypertension and Leisure-Time Physical Activity, by MET-Hours per Week Among Adults with Normal Blood Pressure



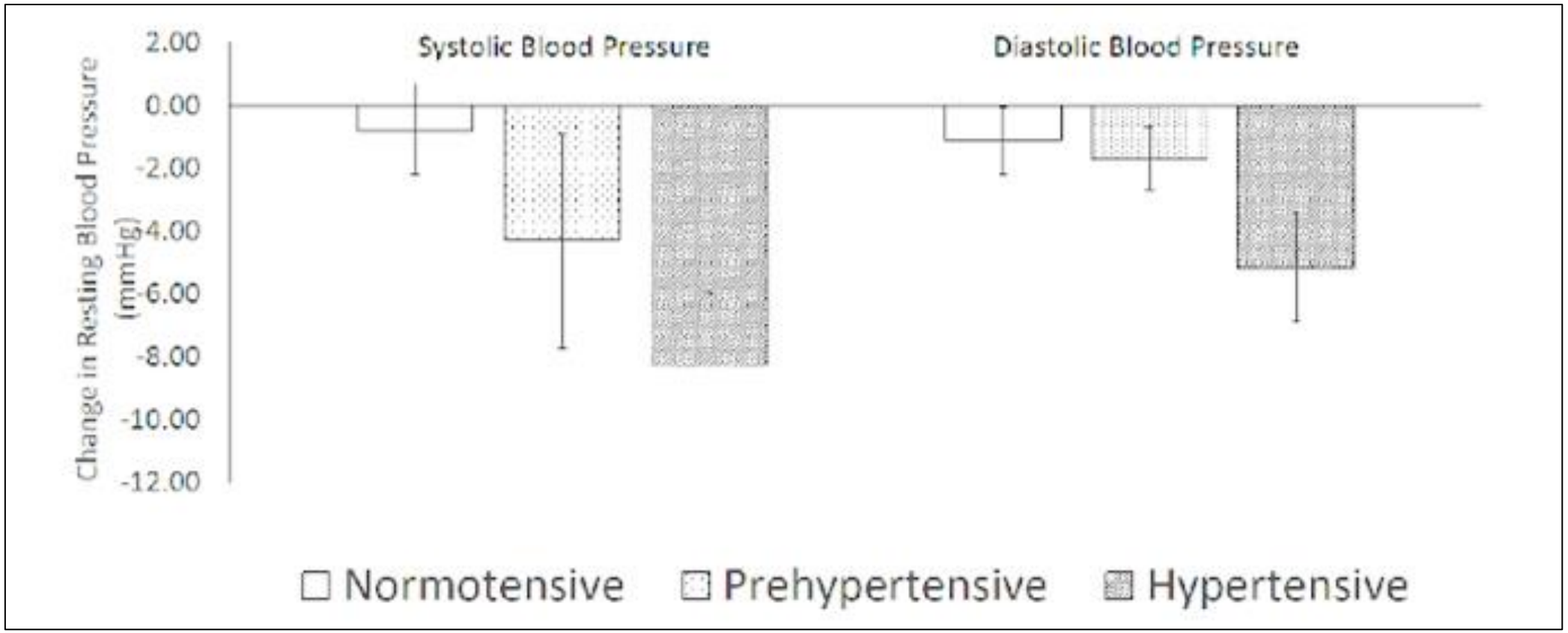
Source: Adapted from data found in Liu et al., 2017.

The Inverse Relationship Between Cardiovascular Mortality and Leisure-time Physical Activity by MET-hours per Week Among Adults with Hypertension



Source: Adapted from data found in Hu et al., 2007
Figure Published in: 2018 Physical Activity Guidelines Advisory Committee Report

Blood Pressure Response to 16 Weeks of Aerobic Exercise Training



Source: Adapted from data found in Cornelissen et al., 2013

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Cardiometabolic Health Benefits of Physical Activity: Blood Lipids

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Physical Activity and Blood Lipids

2013 AHA/ACC Guideline on Lifestyle Management to Reduce Cardiovascular Disease Risk

- Aerobic Physical Activity
  - LDL-C
    - Among adults, aerobic physical activity, compared with control interventions, reduces LDL-C 3–6 mg/dL on average.
    - Strength of Evidence: Moderate
  - Non-HDL-C
    - Among adults, aerobic physical activity alone, compared with control interventions, reduces non–HDL-C 6 mg/dL on average.
    - Strength of Evidence: Moderate
  - Triglycerides
    - Among adults, aerobic physical activity alone, compared with control interventions, has no consistent effect on triglycerides.
    - Strength of Evidence: Moderate
  - HDL-C
    - Among adults, aerobic physical activity alone, compared with control interventions, has no consistent effect on HDL-C.
    - Strength of Evidence: Moderate

- Resistance Exercise Training
  - Among adults, resistance training, compared with control interventions,
    - Reduces LDL-C by 6–9 mg/dL on average
    - Reduces triglycerides by 6–9 mg/dL on average
    - Reduces non–HDL-C by 6–9 mg/dL on average
    - Has no effect on HDL-C. Typical interventions shown to reduce LDL-C,
  - Findings bases on resistance training programs that average 24 wk duration and include 3 d/wk, with 9 exercises performed for 3 sets and 11 repetitions at an average intensity of 70% of 1 maximal repetition.
  - Strength of Evidence: Low

Eckel et al. Journal of the American College of Cardiology. 2014. 63(25): 2960-2984.

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Cardiometabolic Health Benefits of Physical Activity: Type 2 Diabetes

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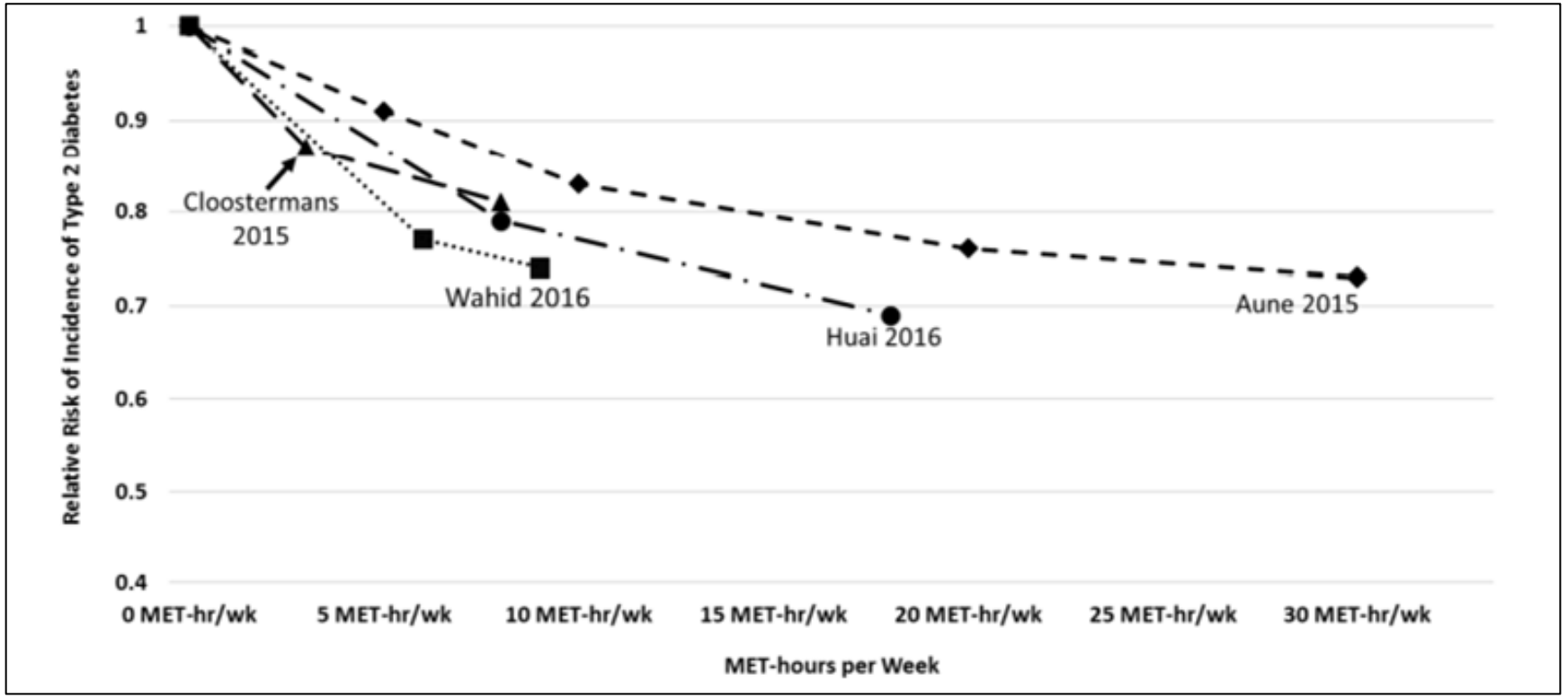
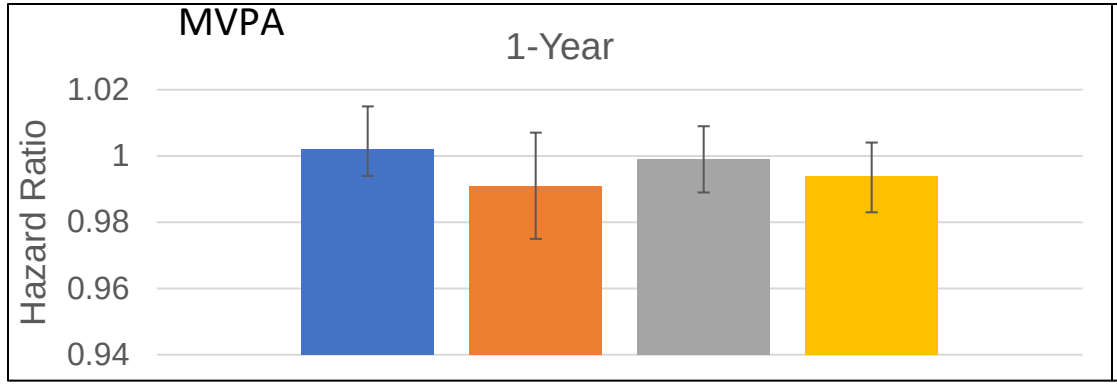
Dose-response Curves for Moderate-to-Vigorous Physical Activity and Relative Risk of Type 2 Diabetes



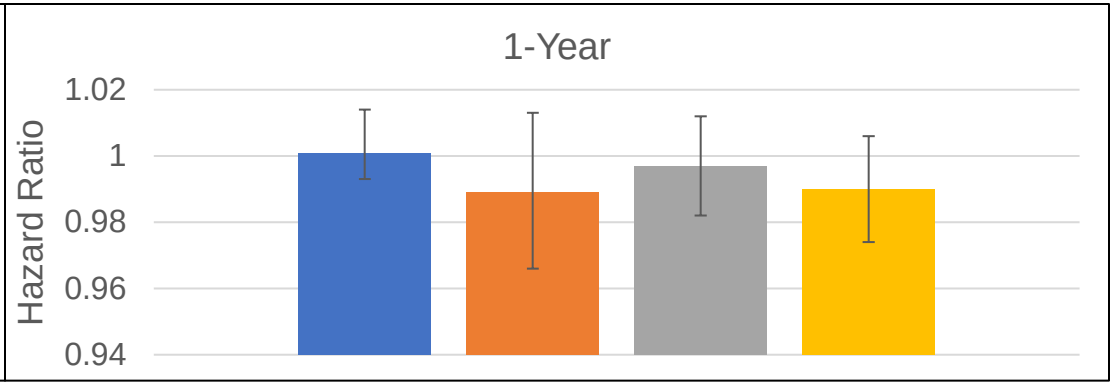
Source: Adapted from data found in Cloostermans et al., 2015; Wahid et al., 2016; Huai et al., 2016; Aune et al., 2015.
Figure Published in: 2018 Physical Activity Guidelines Advisory Committee Report

Hazard Ratios for Primary and Secondary Cardiovascular Disease Outcomes Based on 1-year and 4-year Change in Physical Activity

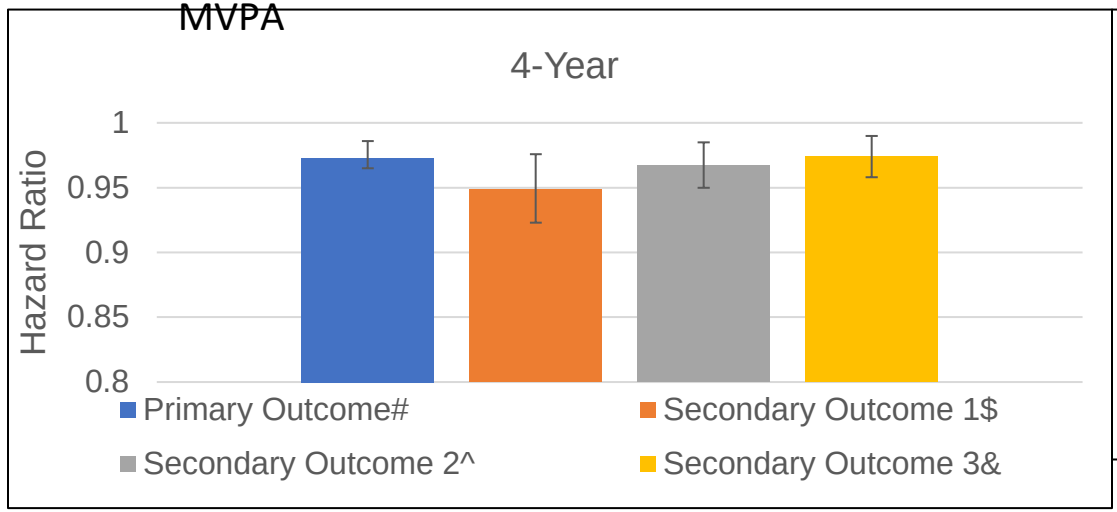
Change per 100 MET-min/wk of Total MVPA



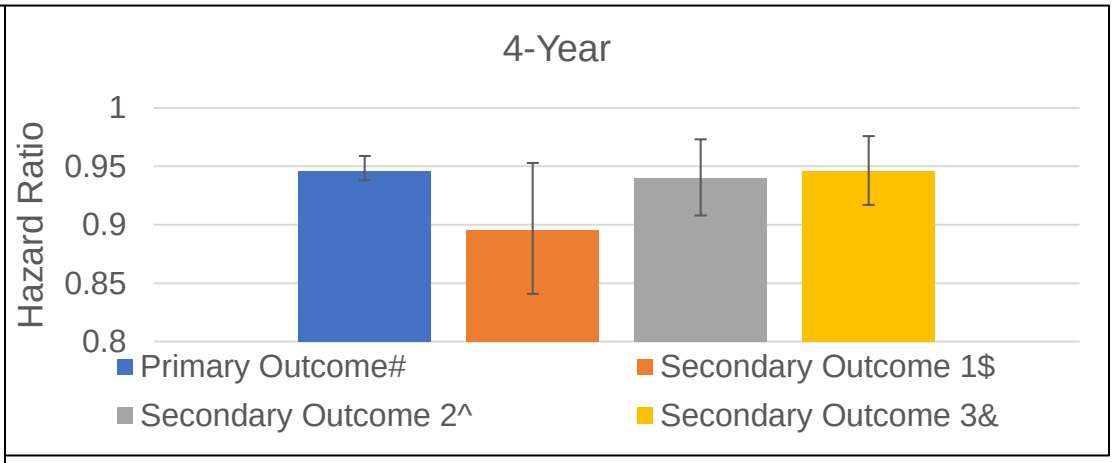
Change per 100 MET-min/wk of MVPA in Bout ≥10 minutes



Change per 100 MET-min/wk of Total MVPA



Change per 100 MET-min/wk of MVPA in Bout ≥10 minutes



Events for 1-Year analyses occurred between Year 1 and a maximum of 13.5 years of follow-up; Events for 4-Year analyses occurred between Year 4 and a maximum of 13.5 years of follow-up.

**Controlling for treatment group, age, baseline physical activity, sex, baseline history of CVD, duration of diabetes at baseline, using insulin or other diabetes medication, baseline weight, and change in weight

First occurrence after study enrollment of non-fatal myocardial infarction or stroke, hospitalized angina, or CVD death

$ CVD death, non-fatal myocardial infarction, or non-fatal stroke

^ All-cause death, non-fatal myocardial infarction, non-fatal stroke, or hospitalization for angina

& All-cause death, non-fatal myocardial infarction, non-fatal stroke, hospitalization for angina; hospitalization for congestive heart failure, coronary artery bypass graph, carotid endarterectomy, or peripheral vascular disease.

Reference: The Look AHEAD Study Group. Association between change in accelerometer-measured and self-reported physical activity and cardiovascular disease in the Look AHEAD Trial. Diabetes Care. In Press.

Disease Progress in Patients with Type 2 Diabetes

- 2018 Physical Activity Guidelines Advisory Committee concluded
  - There is “strong” evidence to demonstrate an inverse association between aerobic activity, muscle-strengthening activity, and aerobic plus muscle-strengthening activity with risk of progression among adults with type 2 diabetes, as assessed by overall effects of physical activity on four indicators of risk of progression:
    - Glycated hemoglobin A1C
    - Blood pressure
    - Body mass index
    - Lipids.

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Cardiometabolic Health Benefits of Physical Activity: Weight Status

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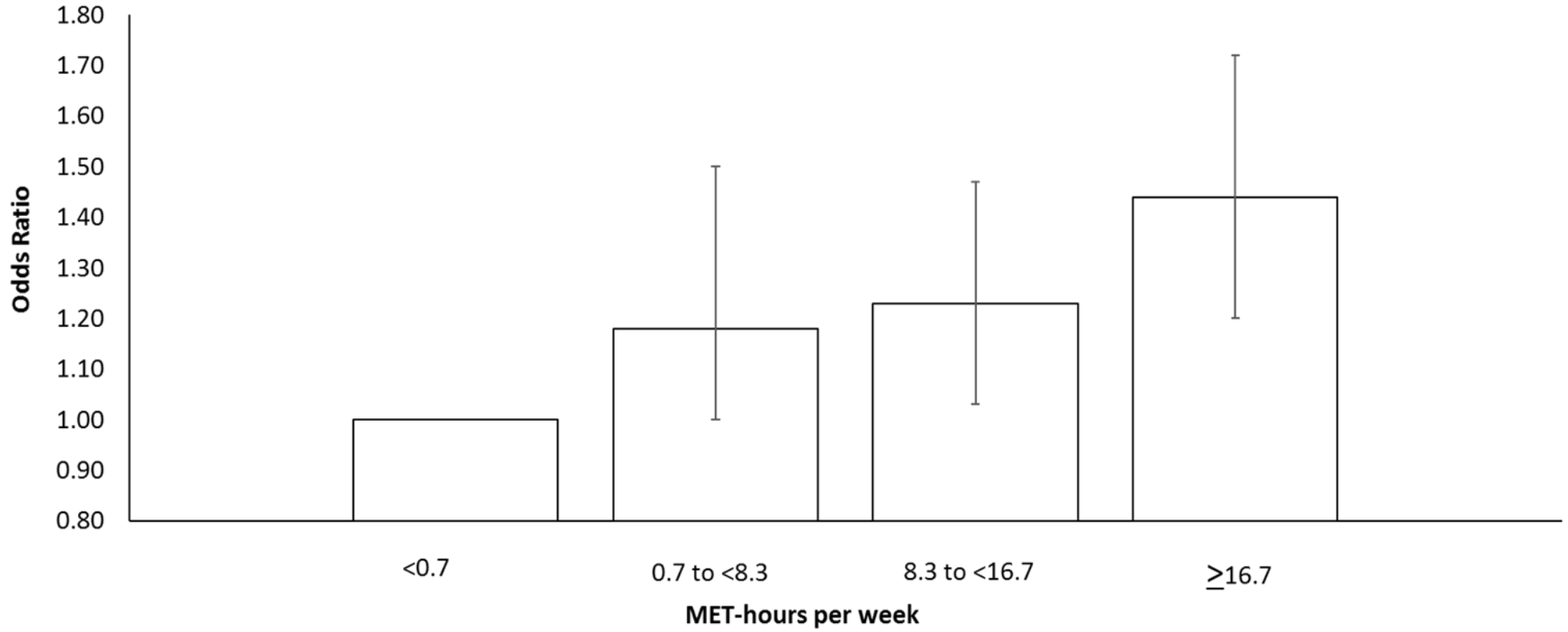
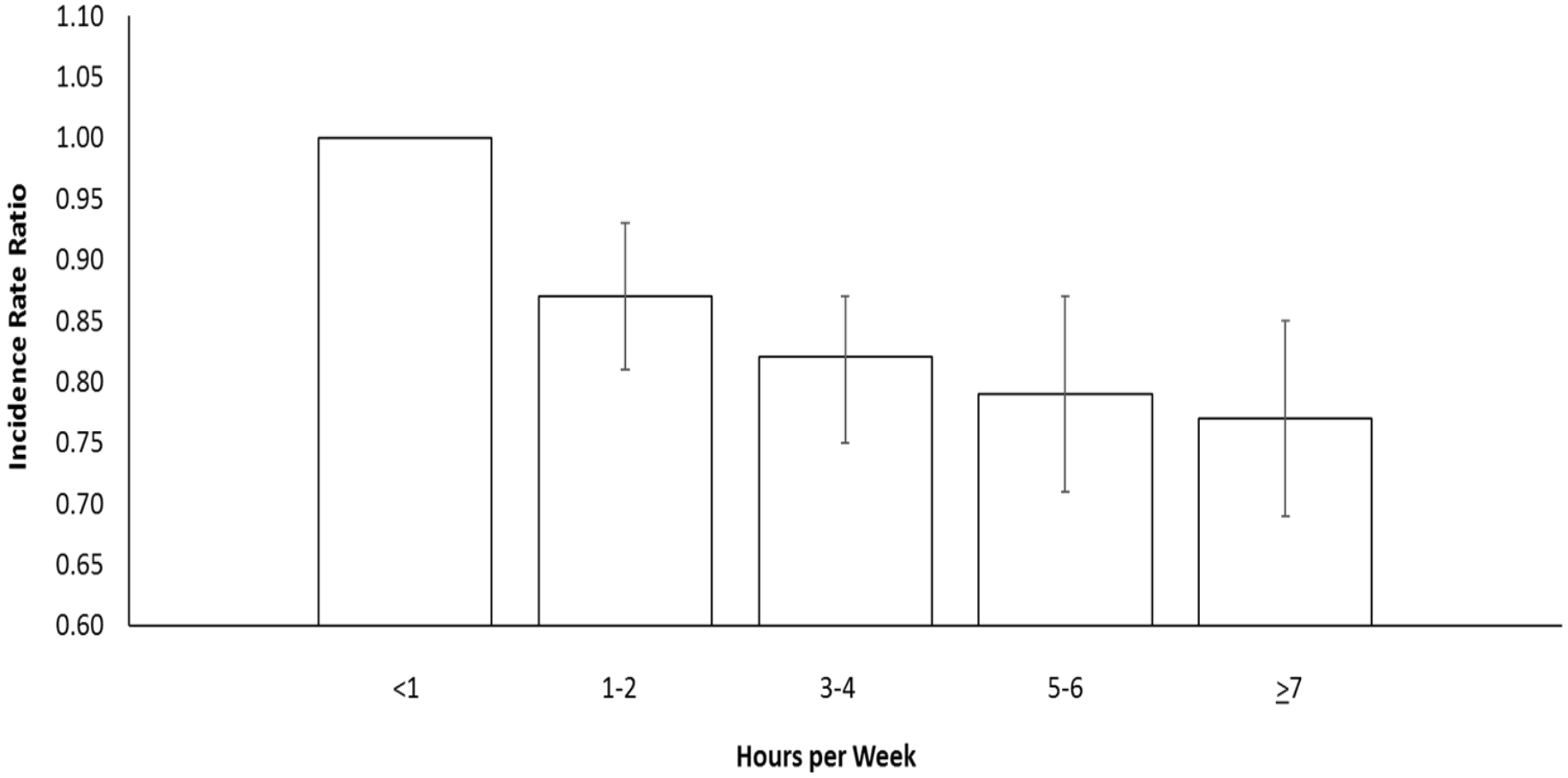
Kansas City, KS

Odds of Maintaining a Healthy Weight by Level of Physical Activity



Source: Adapted from data found in Brown et al., 2016.
Figure Published in: 2018 Physical Activity Guidelines Advisory Committee Report

Incidence Rate Ratio of Developing Obesity at Various Levels of Vigorous Physical Activity



Source: Adapted from data found in Rosenberg et al., 2013.
Figure Published in: 2018 Physical Activity Guidelines Advisory Committee Report

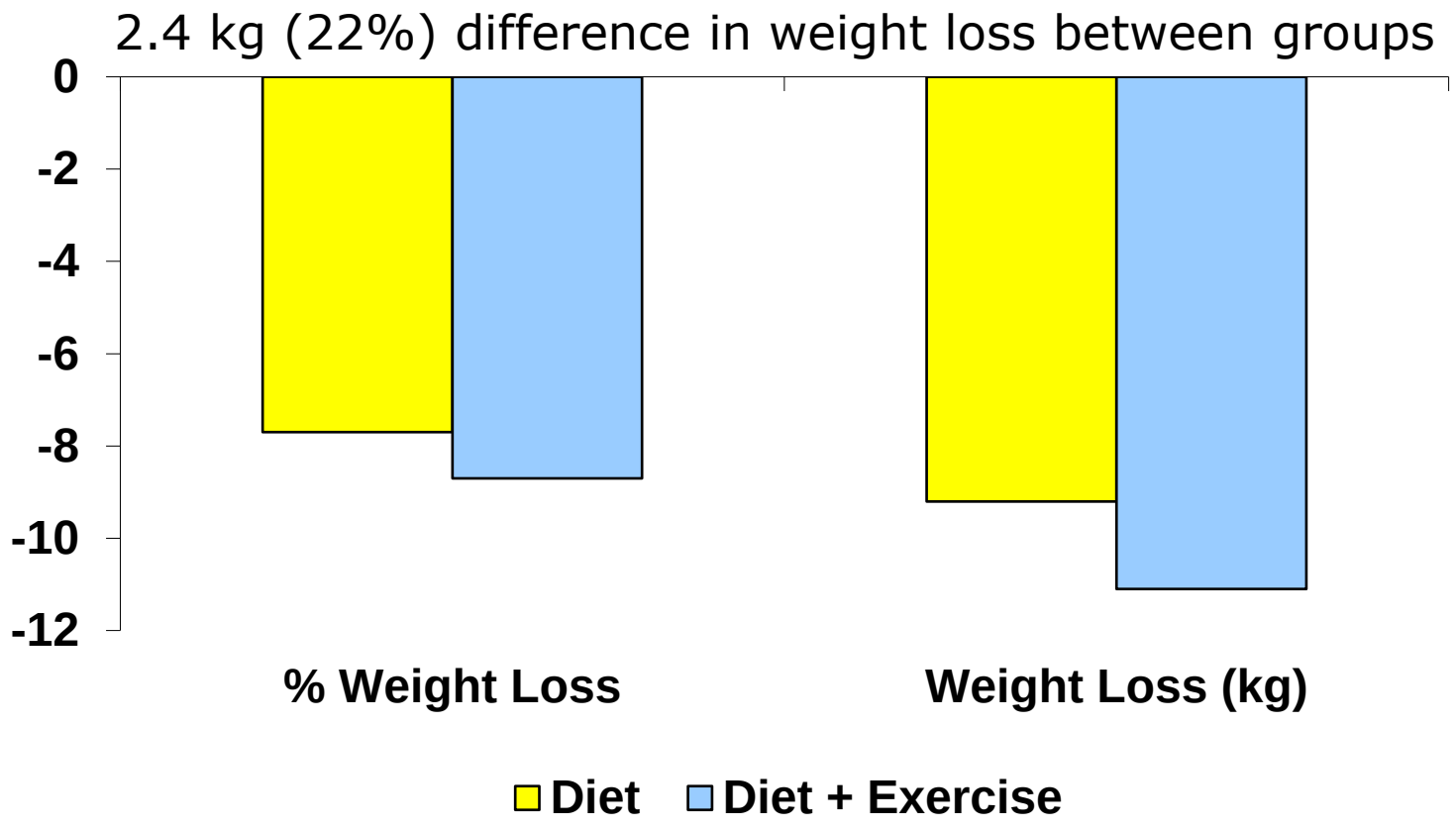
Weight Loss from Physical Activity without Dietary Restriction

- Mean weight loss resulting from physical activity alone
  - Approximately 0.5-3.0 kg.
  - Weight Loss is observed when physical activity is ≥150 min/week

- There appears to be a dose response between Physical Activity and Weight Loss
  - <150 min/week promotes minimal weight loss
  - >150 min/week results in modest weight loss of ~2–3 kg
  - 225-420 min/week results in weight loss of 5-7.5 kg

2008 Physical Activity Guidelines Advisory Committee Scientific Report
Donnelly et al. ACSM Position Stand on Appropriate Physical Activity Intervention Strategies for Weight Loss and Prevention of Weight Regain for Adults. 2009

Short-Term Changes in Body Weight in Response to a Lifestyle Intervention in Class II and III Obesity



Goodpaster et al. JAMA 2010

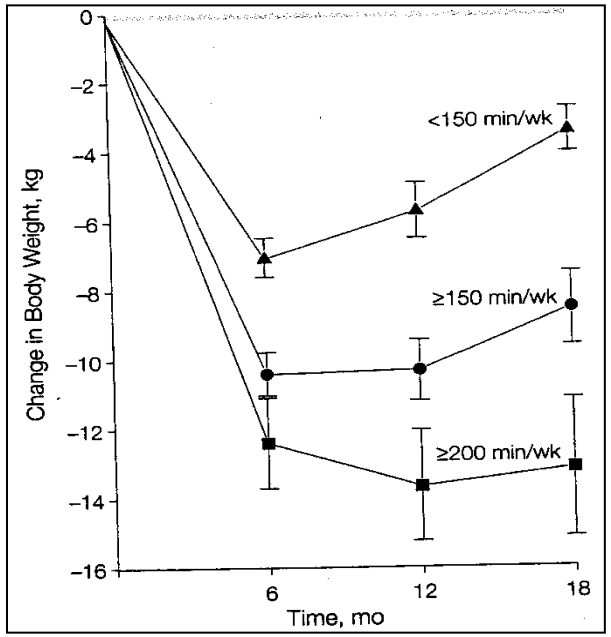
Is Physical Activity Effective for Enhancing Short-Term Weight Loss?

- With Moderate Dietary Restriction
  - Physical activity will enhance short-term weight loss by 20-25% above what can be achieve with modest dietary restriction alone.

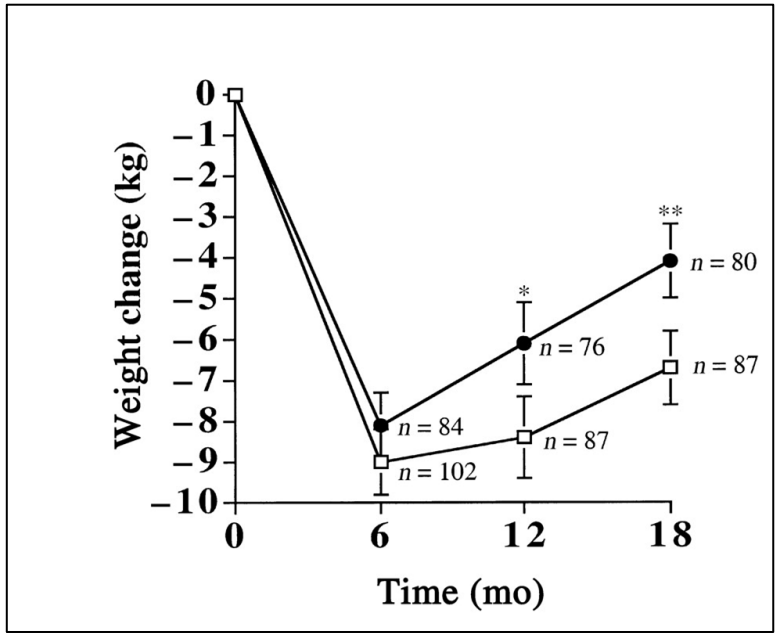
- With Severe Dietary Restriction
  - Physical activity will have minimal impact on additional weight loss above what is achieved with severe dietary restriction (i.e., <kcal/wk needed to meet RMR).

References: Wing et al. 1998; Goodpaster et al. 2010
Reference: Donnelly et al. 2009

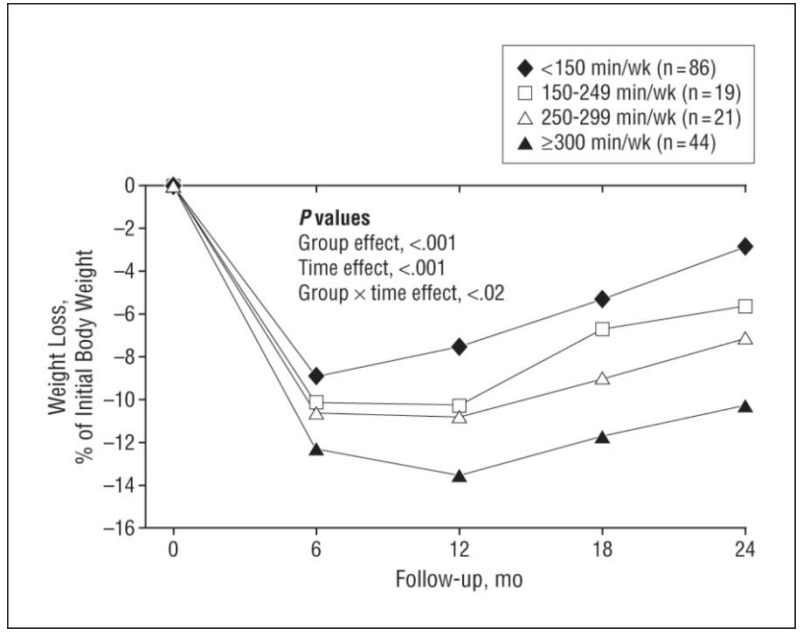
Is Physical Activity Effective for Enhancing Long-Term Weight Loss?



Jakicic, et al. JAMA. 1999

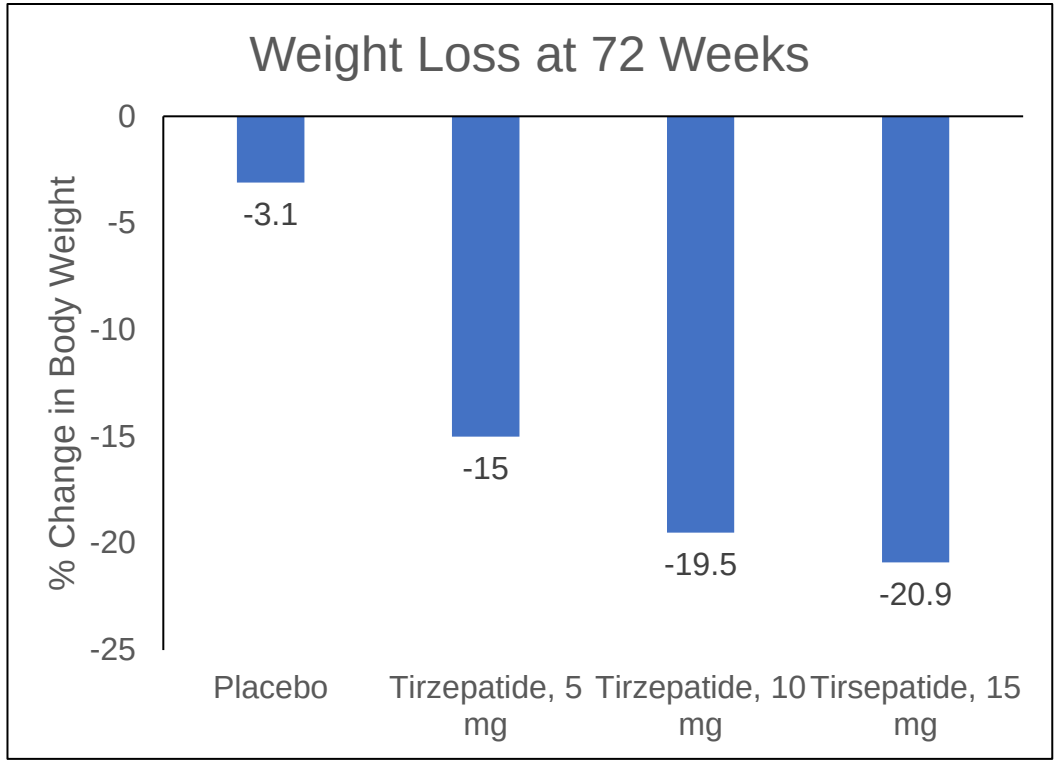


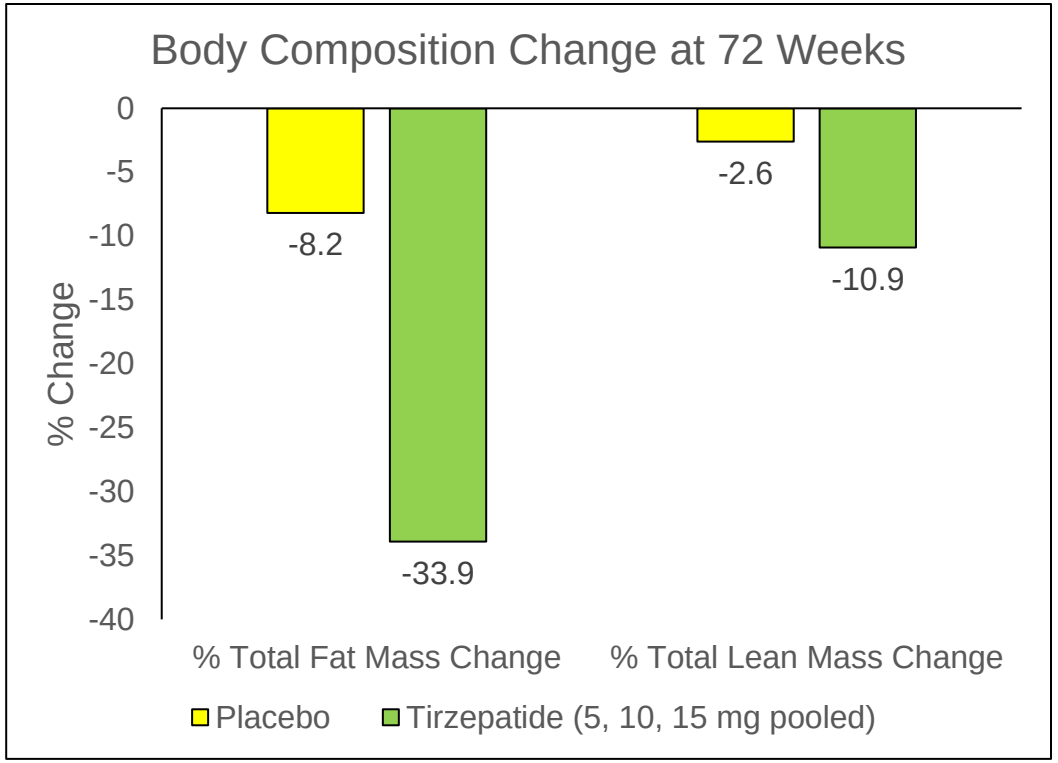
Jeffery R W et al. Am J Clin Nutr. 2003



Jakicic et al. Arch Intern Med. 2008

Is There a Role of Physical Activity Within the Context of Pharmacotherapy for Weight Loss?





Jastreboff AM, Aronne LJ, Ahmad NN, Wharton S, Connery L, Alves B, Kiyosue A, Zhang S, Liu B, Bunck MC, Stefanski A; SURMOUNT-1 Investigators. Tirzepatide Once Weekly for the Treatment of Obesity. N Engl J Med. 2022 Jul 21;387(3):205-216. doi: 10.1056/NEJMoa2206038. Epub 2022 Jun 4. PMID: 35658024.

Is There a Role of Physical Activity Within the Context of Pharmacotherapy for Weight Loss?

- The benefits of adding physical activity to current pharmacotherapies (e.g., e.g., GIP receptor and GLP-1 receptor agonist) is not currently know, and studies are underway.
- Findings to date appear to support the following:
  - There is not conclusive evidence to support that the addition of physical activity to current pharmacotherapies will enhance weight loss or weight loss maintenance.
  - There is not conclusive evidence to support that the addition of physical activity, particularly resistance training, will curtail the reduction in lean body mass observed with current weight loss pharmacotherapies.
  - There may be added cardiometabolic benefits resulting from the addition of physical activity to current pharmacotherapies for weight loss.
- There may be additional health benefits from physical activity that are independent of weight loss resulting from pharmacotherapy that warrants the inclusion of physical activity in patients with overweight or obesity.

Summary of the Cardiometabolic Health Benefits of Physical Activity

- Lower cardiovascular incidence and mortality
  - Including heart disease and stroke
- Lower incidence of hypertension
  - In patients with hypertension:
    - Reduced risk of progression of cardiovascular disease
    - Reduced risk of increased blood pressure over time
- Reduces components of blood lipids that may include LDL-C and non-HDL-C, and may impact triglycerides and HDL-C
- Lower incidence of type 2 diabetes
  - In patients with Type 2 Diabetes:
    - Reduced risk of cardiovascular mortality
    - Reduced progression of disease indicators (HbA1c, blood pressure, blood lipids, BMI)
- Weight Status
  - Reduced risk of excessive weight gain
  - Weight loss and the prevention of weight regain following initial weight loss
  - An additive effect on weight loss when combined with moderate dietary restriction
  - The added effects of physical activity to current pharmacotherapies for weight loss warrant further investigation and there is currently not conclusive evidence available.

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Physical Activity Recommendations

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Target Range of Physical Activity for Health Benefits

- Target Established in 1995
  - Accumulation of at least 30 minutes of moderate-to-vigorous physical activity on most, preferably all, days of the week
    - 30 minutes on at least 5 days per week (150 minutes total)
  - Additional health benefits may be achieved = greater amount of physical activity

- 2008 Physical Activity Guidelines for Americans
  - 150 to 300 minutes
  - moderate-intensity physical activity per week

Target Range of Physical Activity for Health Benefits

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- 2008 Physical Activity Guidelines for Americans
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  - moderate-intensity physical activity per week

- 2018 Physical Activity Guidelines Advisory Committee Report
  - Do not need to reach the lower end of the 150 to 300-minute target range to benefit from regular physical activity.
  - Individuals who exceed the target range usually achieve even greater health benefits.
  - All activity, regardless of bout length, contributes to the health benefits achieved with physical activity

Key Guidelines
2018 Physical Activity Guidelines for Americans

Key Guidelines for Adults

- Adults should move more and sit less throughout the day. Some physical activity is better than none. Adults who sit less and do any amount of moderate-to-vigorous physical activity gain some health benefits.
- For substantial health benefits, adults should do at least 150 minutes (2 hours and 30 minutes) to 300 minutes (5 hours) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) to 150 minutes (2 hours and 30 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Preferably, aerobic activity should be spread throughout the week.
- Additional health benefits are gained by engaging in physical activity beyond the equivalent of 300 minutes (5 hours) of moderate-intensity physical activity a week.
- Adults should also do muscle-strengthening activities of moderate or greater intensity and that involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits.

Physical Activity Guidelines for Americans, 2nd Edition

Key Guidelines
2018 Physical Activity Guidelines for Americans

Key Guidelines for Adults With Chronic Health Conditions and Adults With Disabilities

- Adults with chronic conditions or disabilities, who are able, should do at least 150 minutes (2 hours and 30 minutes) to 300 minutes (5 hours) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) to 150 minutes (2 hours and 30 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Preferably, aerobic activity should be spread throughout the week.
- Adults with chronic conditions or disabilities, who are able, should also do muscle-strengthening activities of moderate or greater intensity and that involve all major muscle groups on 2 or more days a week, as these activities provide additional health benefits.
- When adults with chronic conditions or disabilities are not able to meet the above key guidelines, they should engage in regular physical activity according to their abilities and should avoid inactivity.
- Adults with chronic conditions or symptoms should be under the care of a health care provider. People with chronic conditions can consult a health care professional or physical activity specialist about the types and amounts of activity appropriate for their abilities and chronic conditions.

Physical Activity Guidelines for Americans, 2nd Edition

2018 Physical Activity Guidelines for Americans

Older Adults

Adults

Move more and sit less throughout the day

+

Do at least 150 to 300 minutes per week of moderate-intensity aerobic physical activity

- 75 to 150 minutes of vigorous aerobic activity
- Or an equivalent combination of moderate- and vigorous-intensity aerobic activity

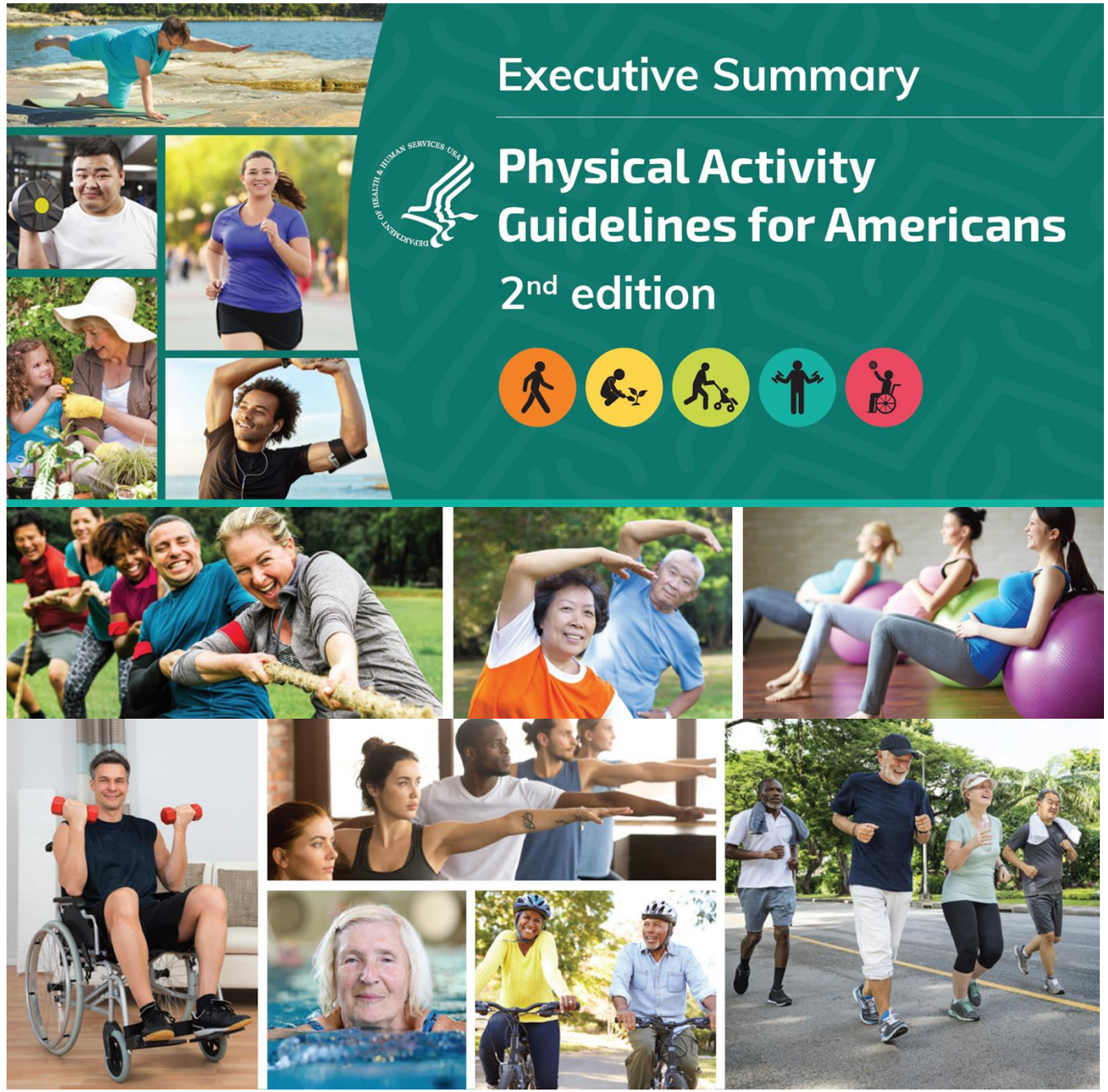
Aerobic activity should be spread throughout the week

+

Do muscle-strengthening activities of moderate or greater intensity that involve all major muscle groups on 2 or more days per week

+

Should also perform balance training


Executive Summary
Physical Activity Guidelines for Americans
2nd edition

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Additional Physical Activity Considerations for Cardiometabolic Health

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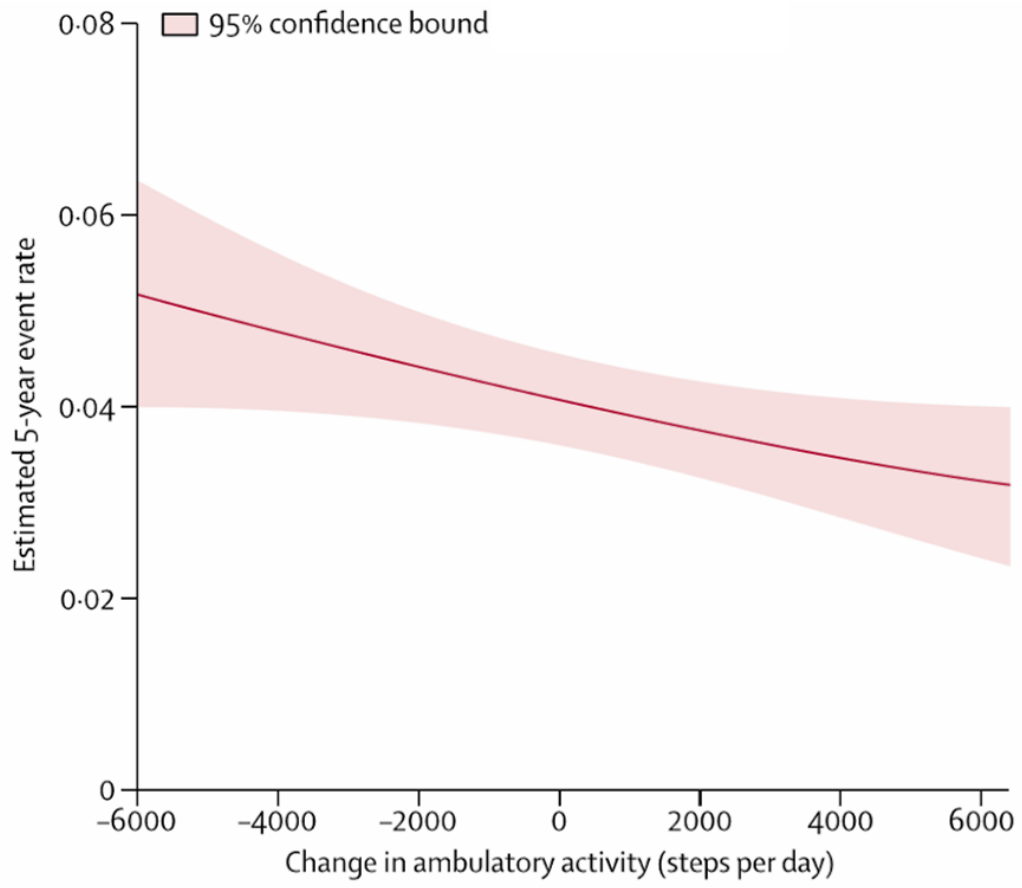
Steps

Association Between Change in Daily Step Count and Cardiovascular Events in Individuals with Impaired Glucose Tolerance



Yates et al. The Lancet. 2014, 383(9922): 1059-1066.

Bout Length of Physical Activity

How Long – Bout Duration?

- Accumulation of at least 30 minutes of moderate-to-vigorous physical activity on most, preferably all, days of the week

- “Intermittent bouts of physical activity, as short as 8 to 10 minutes, totaling 30 minutes or more on most days provided beneficial health and fitness effects.”
- 2008 Physical Activity Guidelines for Americans supported this recommendation
  - “aerobic activity should be performed in episodes of at least 10 minutes”

Pate et al. 1995

How Long – Bout Duration?

- New to the 2018 Physical Activity Guidelines for Americans
  - Elimination of the requirement for physical activity of adults to occur in bouts of at least 10 minutes

How Long – Bout Duration?

- New to the 2018 Physical Activity Guidelines for Americans
  - Elimination of the requirement for physical activity of adults to occur in bouts of at least 10 minutes

- A word of caution
  - Evidence is based on mostly cross-sectional studies

Physical Activity Bout Duration and Health Outcomes

Study Type	WT	BMI	%FAT	Visceral Adiposity	Blood Pressure	Cholesterol	HDL	LDL	Trig	Glucose	Insulin	2-hour Insulin OGTT	HbA1c	Met Syndrome	CRP	Fram. Risk Score
Prospective																
Prospective																
Cross Sectional																
Cross Sectional																
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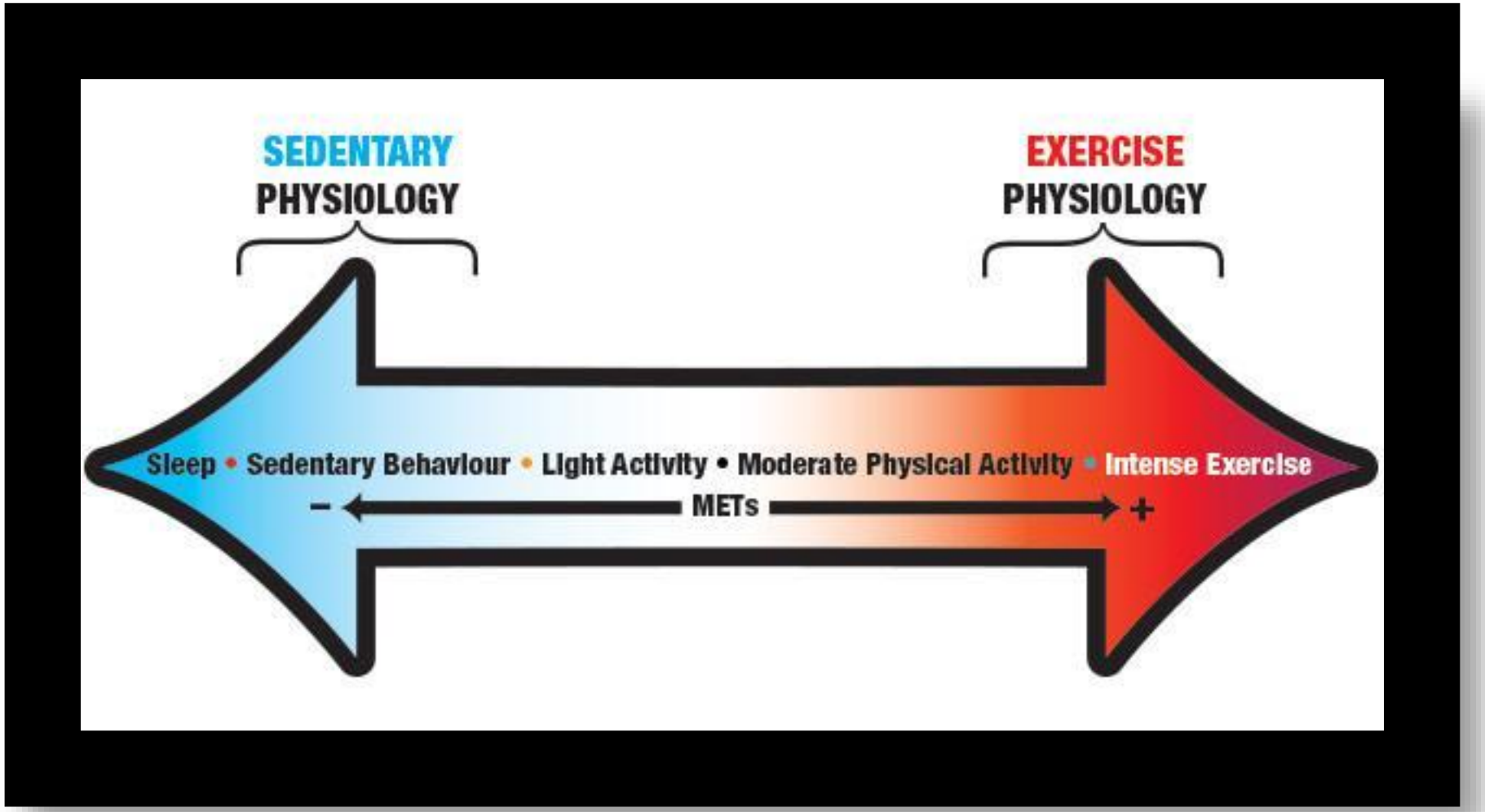
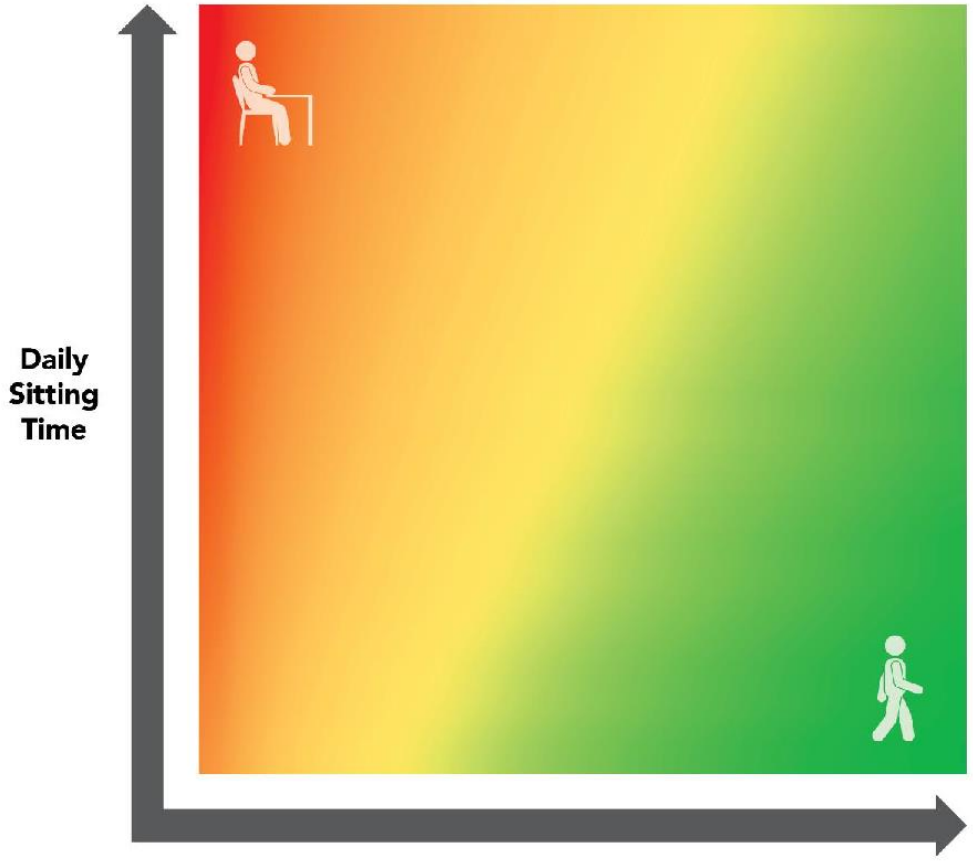
≥10 min <10 min ND effects observed with >32sec - >5 min

The Activity Spectrum



Relationship Among Moderate-to-Vigorous Physical Activity, Sitting Time, and Risk of All-Cause Mortality



Risk of all-cause mortality decreases as one moves from red to green.

Source: Adapted from data found in Ekelund et al., 2016
Figure published in: 2018 Physical Activity Guidelines Advisory Committee Report

Summary

- Sit Less and Move More!
- Some activity is better than no activity
- When possible, progress to engaging in 150 to 300 minutes per week of moderate-to-vigorous intensity* physical activity
  - All activity counts towards achievement of this goal
  - When possible, attempt to achieve as much of this activity as possible in bouts of at least 10 minutes or more in duration
- Engage in muscle-strengthening activity on at least 2 days per week.

*Moderate-intensity activity if the equivalent of walking at a pace knowing that you are going to be late for a meeting unless you hurry.