

Exercise Studies Where Walking is Better than Running: Does Intensity Matter?

Frontiers in Medicine

The Forest

24 September 2018

William E. Kraus, M.D.



Exercise Intensity and Volume Effects: Confounded?

- To really understand intensity effects, one must match for amount.
- Effects of exercise intensity, matched for amount on insulin sensitivity, serum triglycerides.
- Effects of intensity and amount on HDL cholesterol.

**Volume
or Energy Expenditure**

Intensity

Duration & Frequency



Volume
or Energy Expenditure

Intensity

Duration & Frequency

STRRIDE

Studies of a Targeted Risk Reduction Intervention with Defined Exercise

STRRIDE I

NHLBI: HL-57453

NCT00200993

STRRIDE AT/RT

NHLBI: HL-57453

NCT00275145

STRRIDE-PD

NIDDK: DK-081559

NCT00962962

STRRIDE: Eligibility Criteria

Age: 40 - 65

Body Composition: $25 \leq \text{BMI} \leq 35$

Lipids: $130 \leq \text{LDL} \leq 190$ or $\text{HDL} \leq 40 \text{ M}$ and $\leq 45 \text{ W}$

Glucose: fasting $\leq 140 \text{ mg\%}$; fasting insulin $\geq 10 \text{ IU/ml}$

Blood pressure: $\leq 160/90 \text{ mmHg}$

Menstrual status: postmenopausal ($\text{FSH} \geq 40$) \pm HRT \geq
6 months

Demographics: equal genders, 30% minority

Activity: “sedentary”, peak $\text{VO}_2 \sim 29 \text{ mL/kg/min}$ (8.3 METS)

Medications: nothing that is known to influence skeletal muscle or exercise training responses (e.g. ACE inhibitors, β -blockers) and stable for 6 months

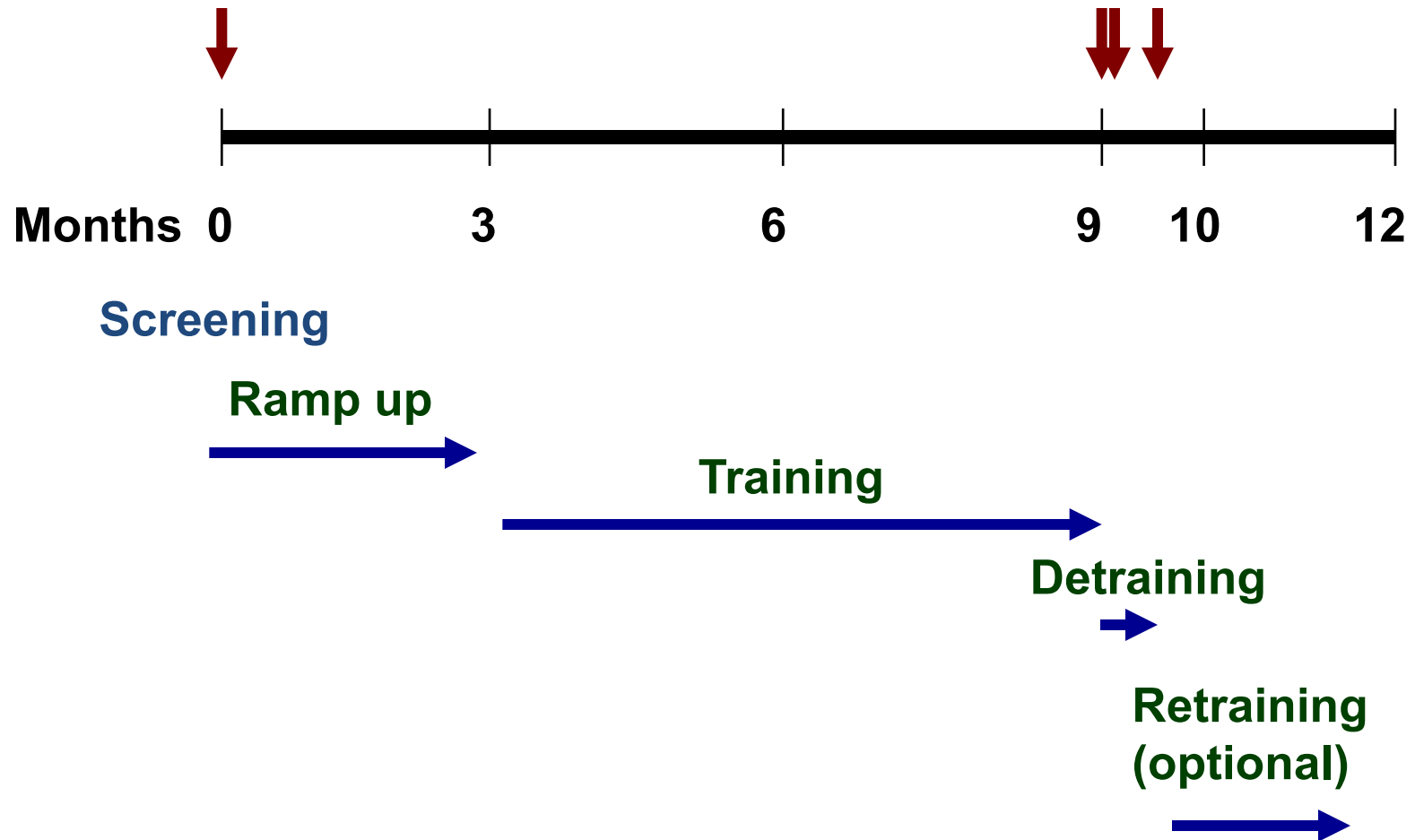
STRRIDE - Training Protocols

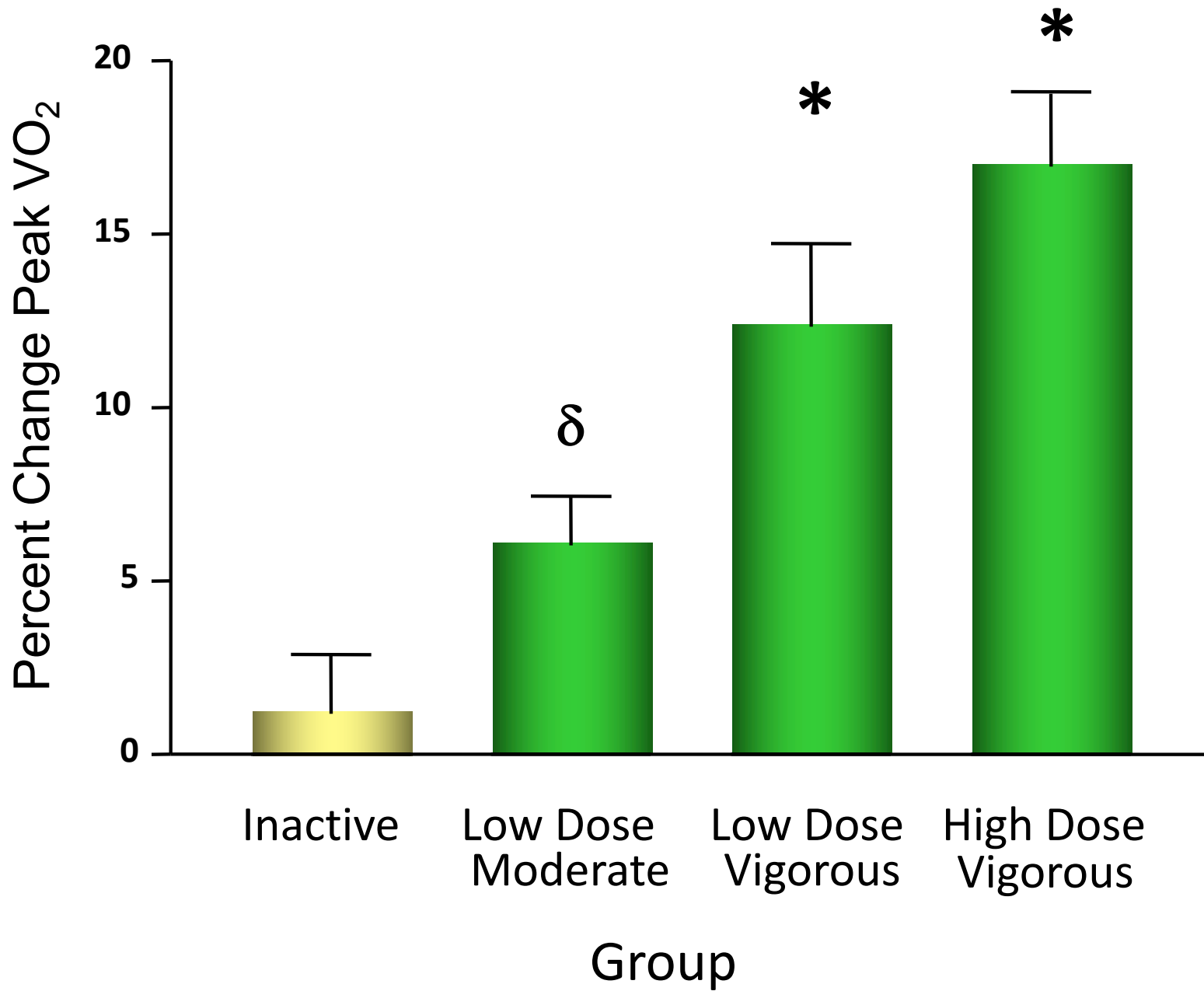
<u>Intensity</u> (peak VO_2)	<u>Amount</u> (kcal/wk)	<u>Time/wk</u> (min per wk)
Brisk Walking	13 miles/week	170
Jogging	13 miles/week	120
Jogging	22 miles/week	170
Inactive	None	None

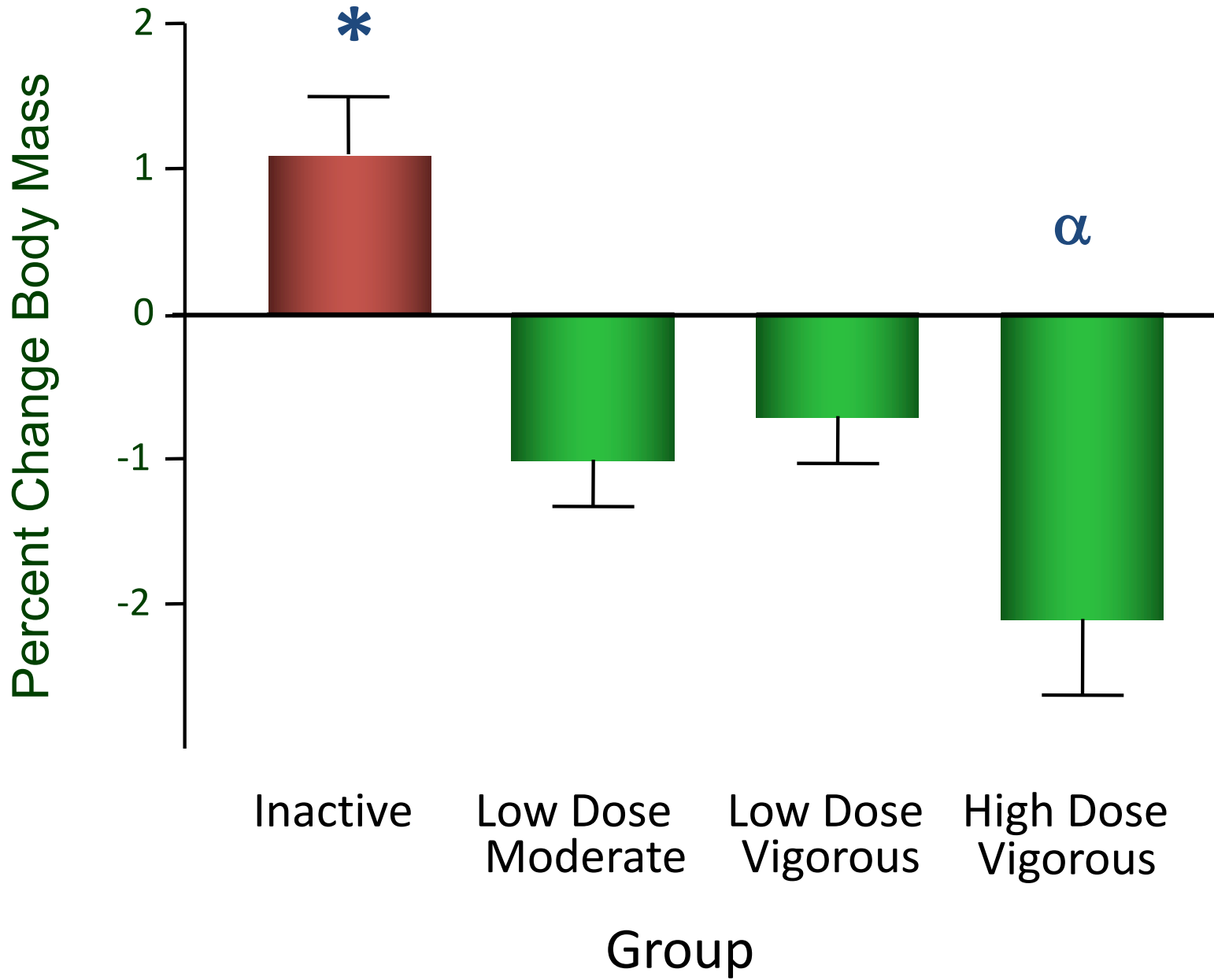
STRRIDE - Training Protocols

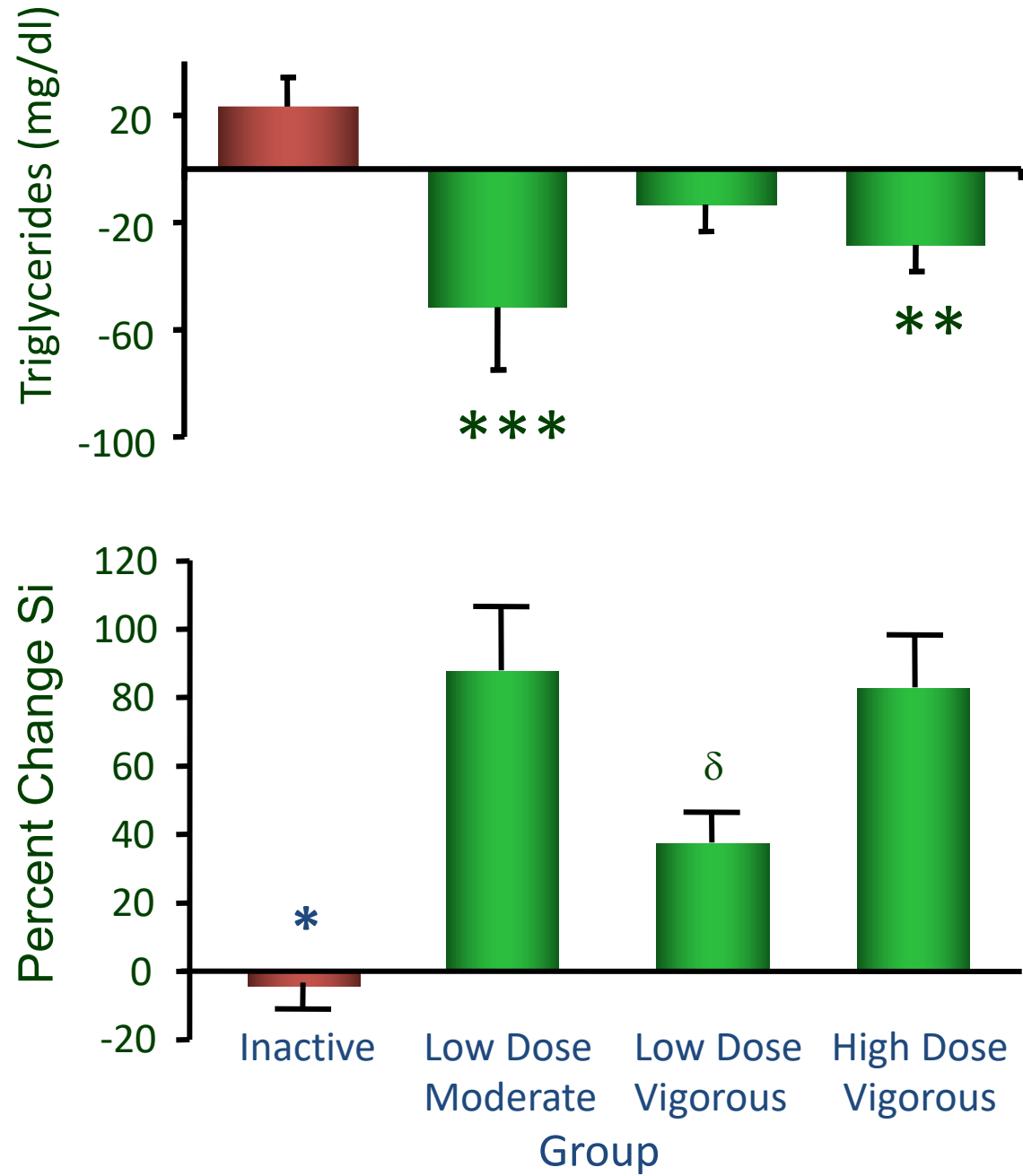
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STRRIDE - Study Design

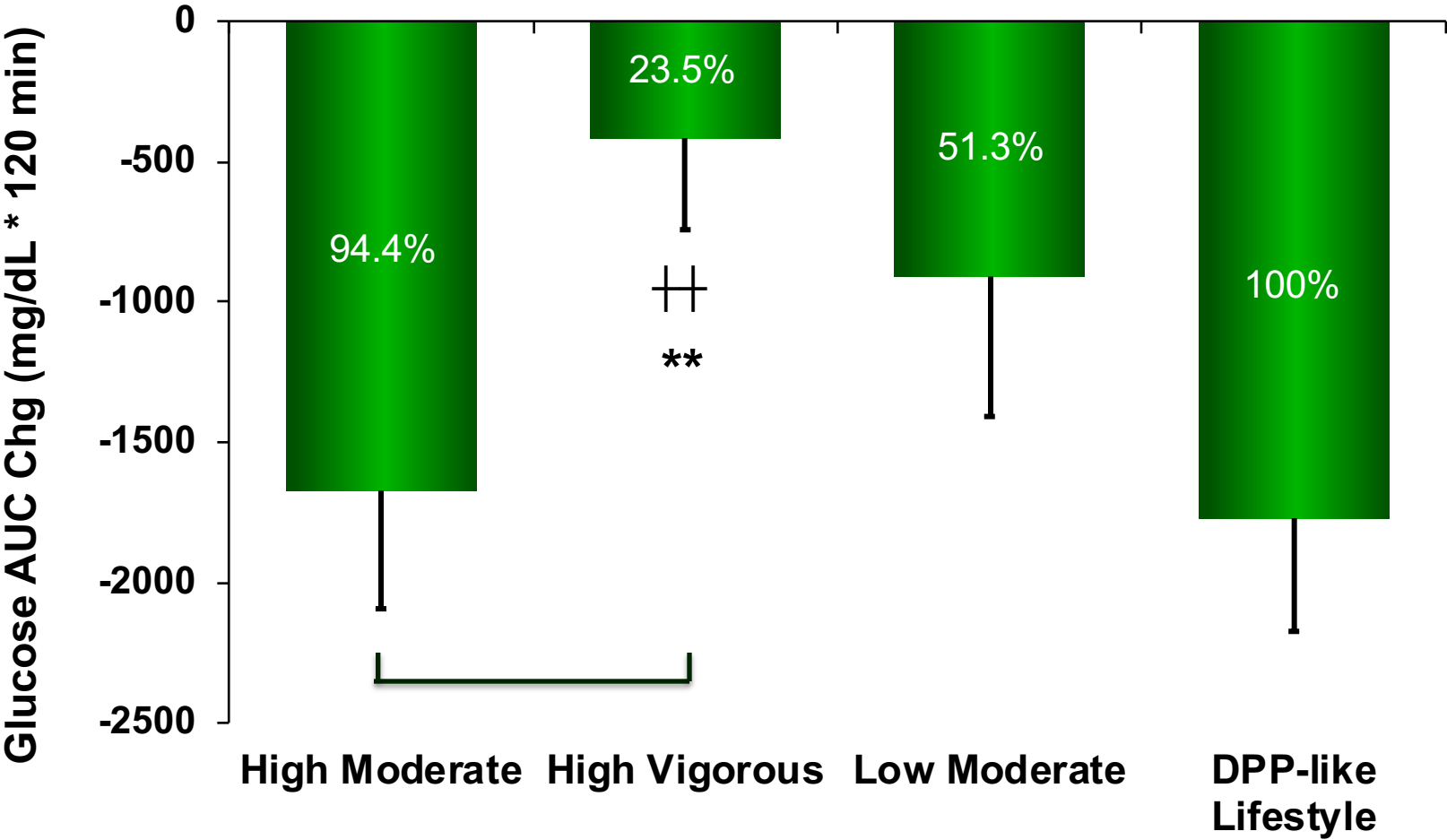


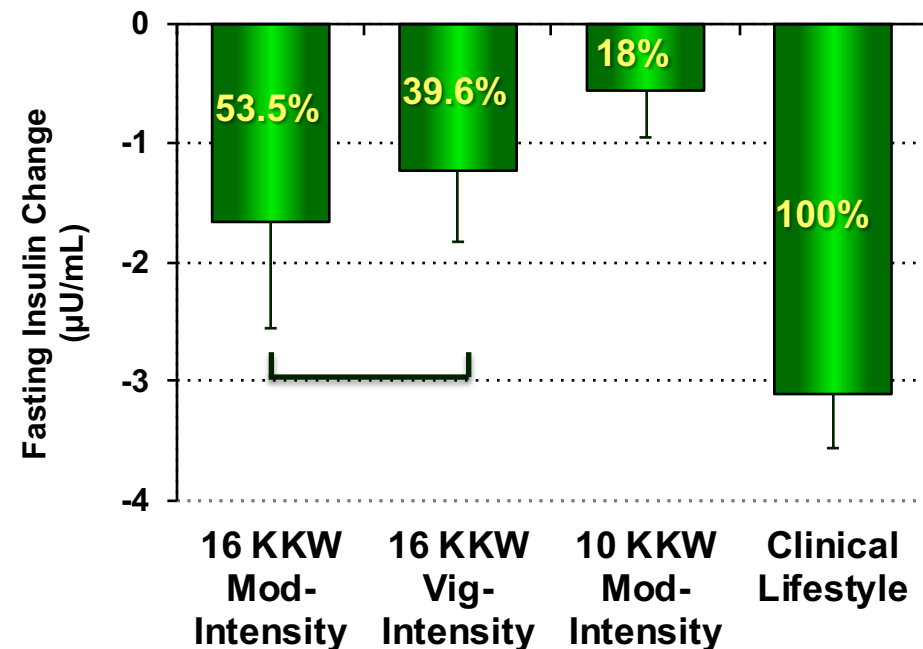
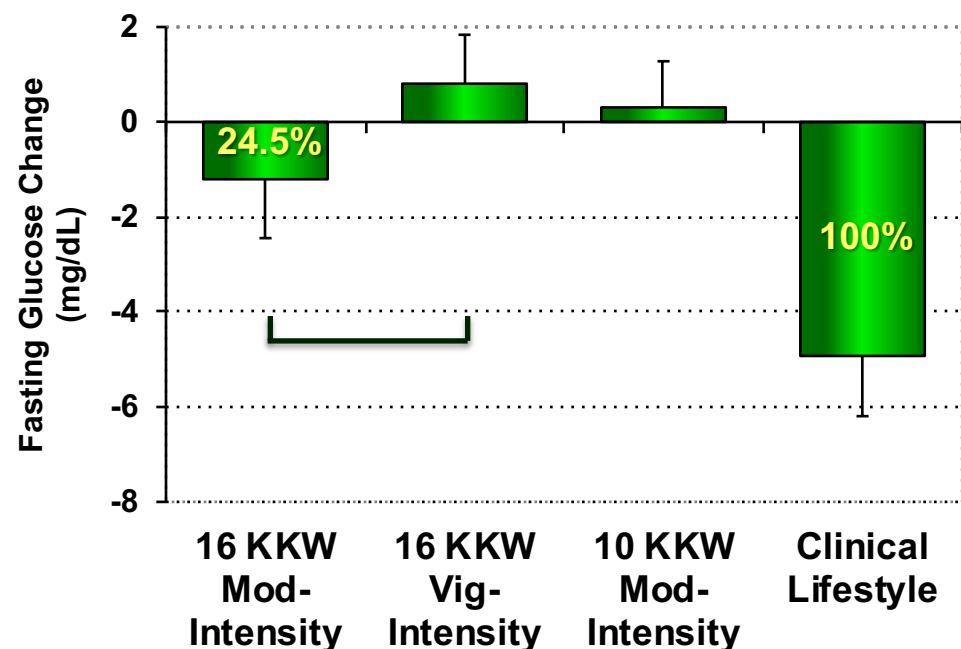
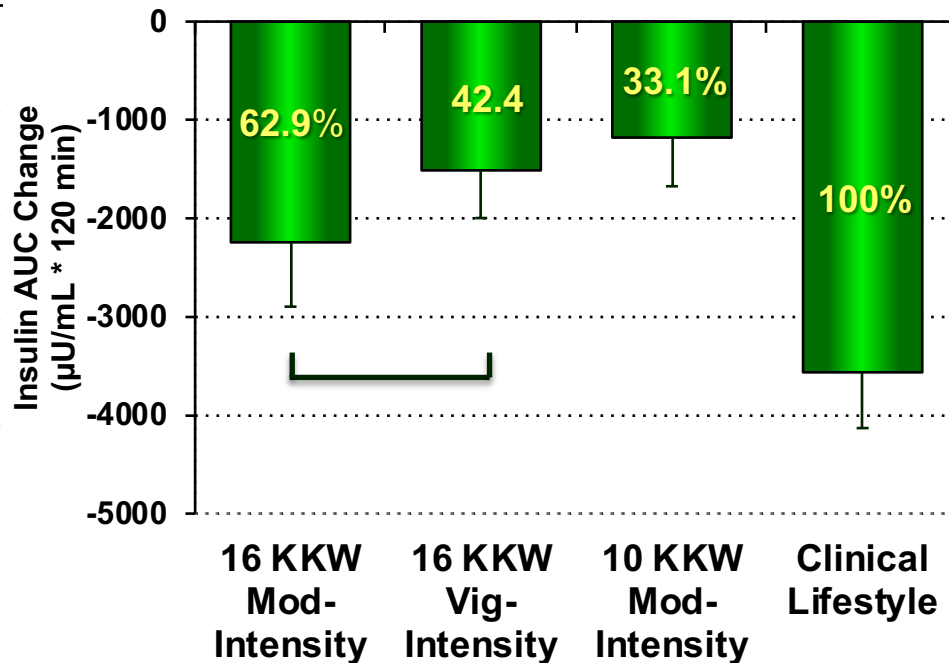
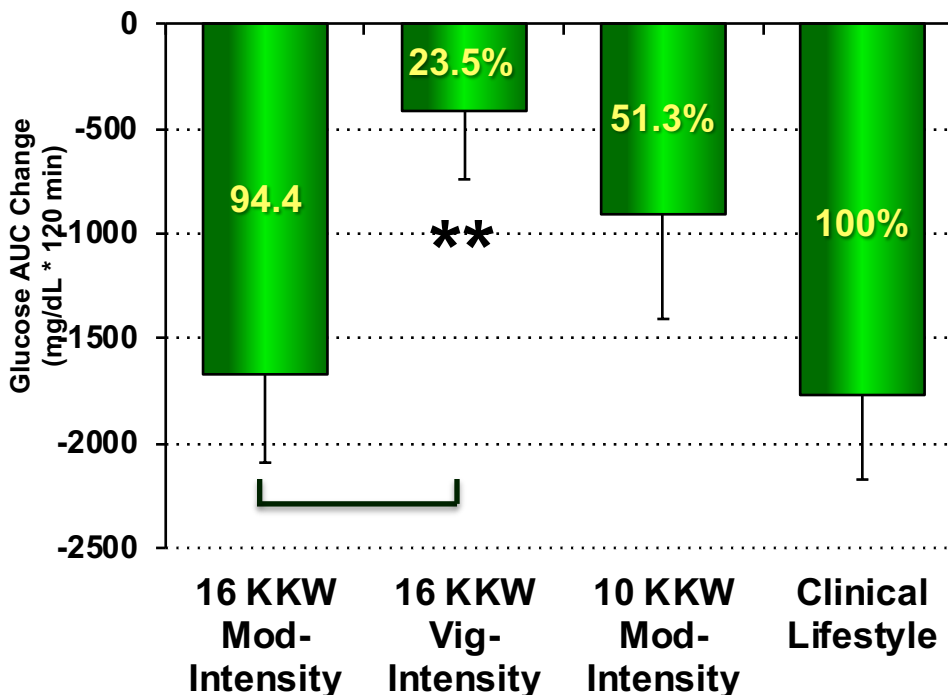




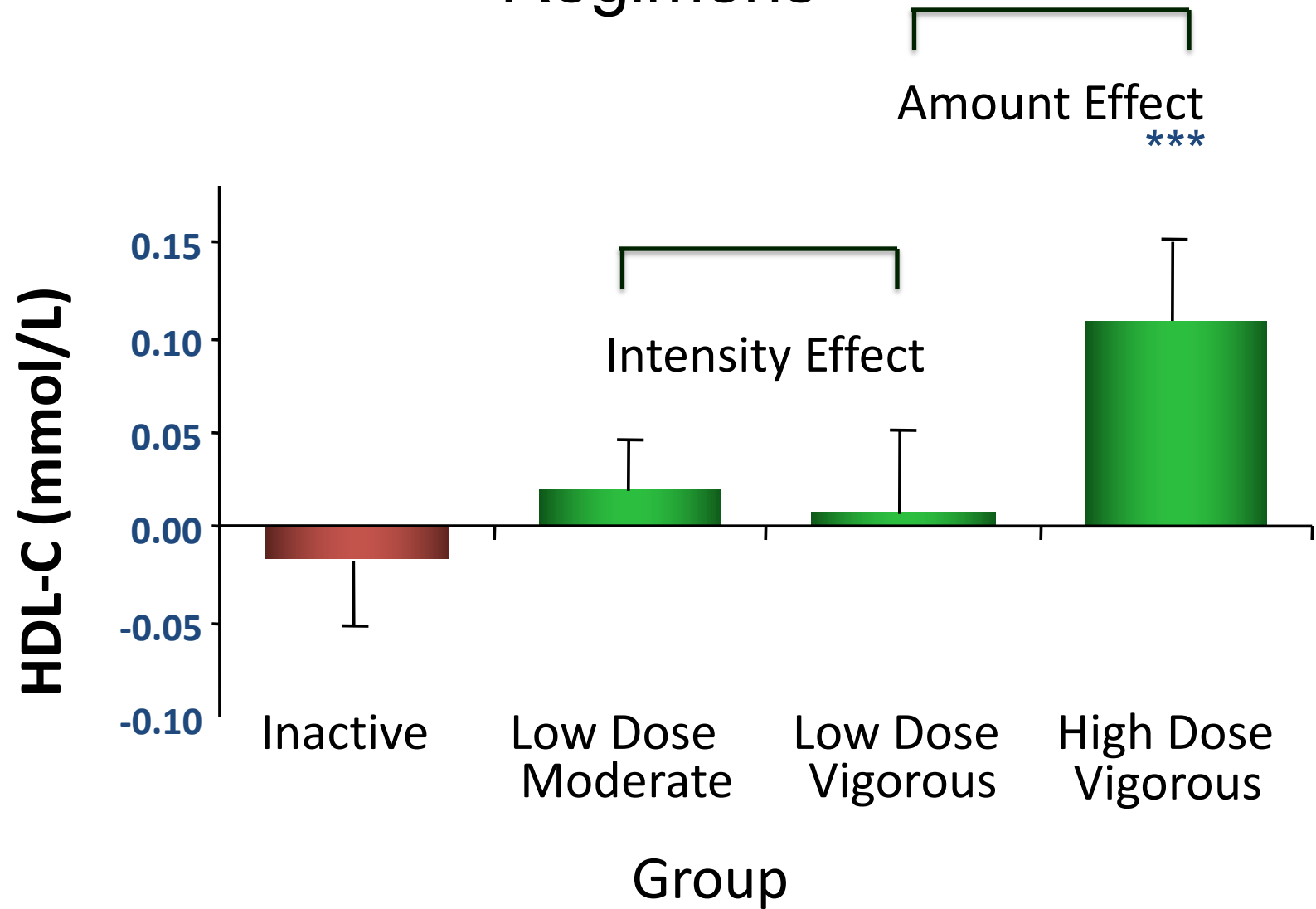


AUC Glucose by Group





Responses of HDL to Various Exercise Regimens



“In general, both HDL cholesterol and serum TG reproducibly and favorably respond to changes in habitual physical activity, with increases in HDL cholesterol and decreases in serum TG, mostly related to the **volume** of exercise training and responding with threshold volumes in the range of 7 to 15 miles per week of regular exercise (equating to an approximate 600 to 800 MET-minutes).”

Physical Activity Guidelines Advisory Committee Science Report,
DHHS, 2008

Exercise Intensity and Volume Effects: Confounded?

- To really understand intensity effects, one must match for amount.
- Effects of exercise intensity, matched for amount on insulin sensitivity, serum triglycerides.
- Effects of intensity and amount on HDL cholesterol.
- Intensity is important, but different for different health benefits ... personalized exercise prescription.

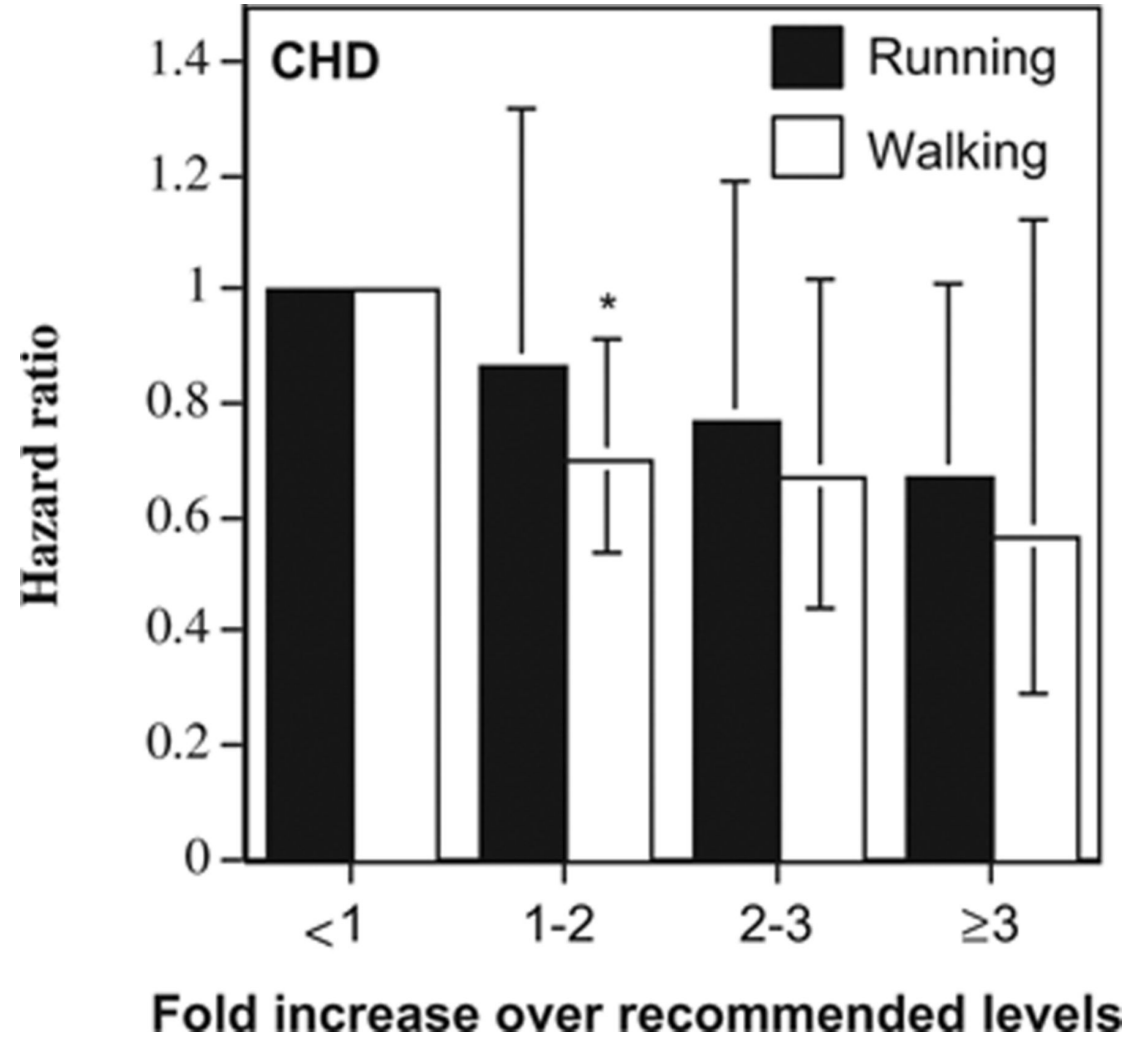
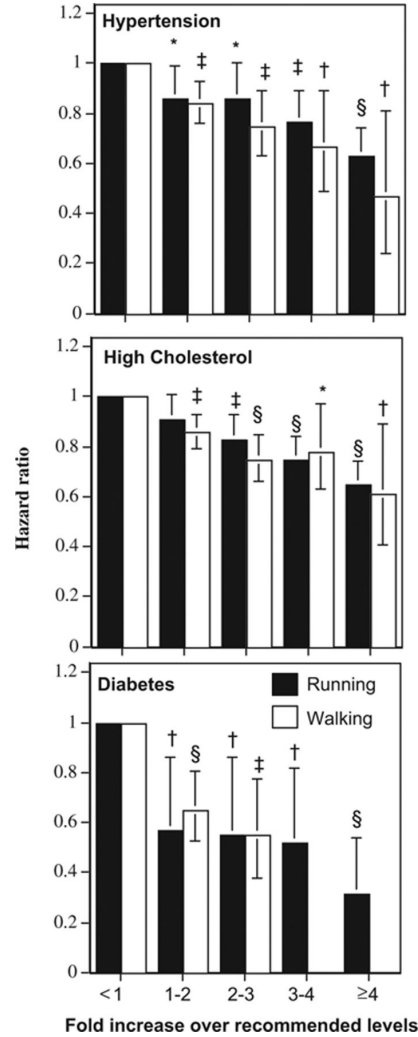
Runners versus Walkers

Walking vs. Running Prospective Cohort Studies

- National Runners' (33,060) and Walkers' (15,945) Health Study Cohorts
- Energy expenditure quantified in METs/d
- Risk reductions in physician-diagnosed hypertension, hypercholesterolemia, diabetes and CHD over 6.2 years of follow-up
- No difference in risk reductions.

Williams PT, Thompson PD. ATVB 33: 1085-91, 2013

Reduction in coronary heart disease (CHD) risks per metabolic equivalent hours per day (METh/d) energy expended by walking or running at baseline.



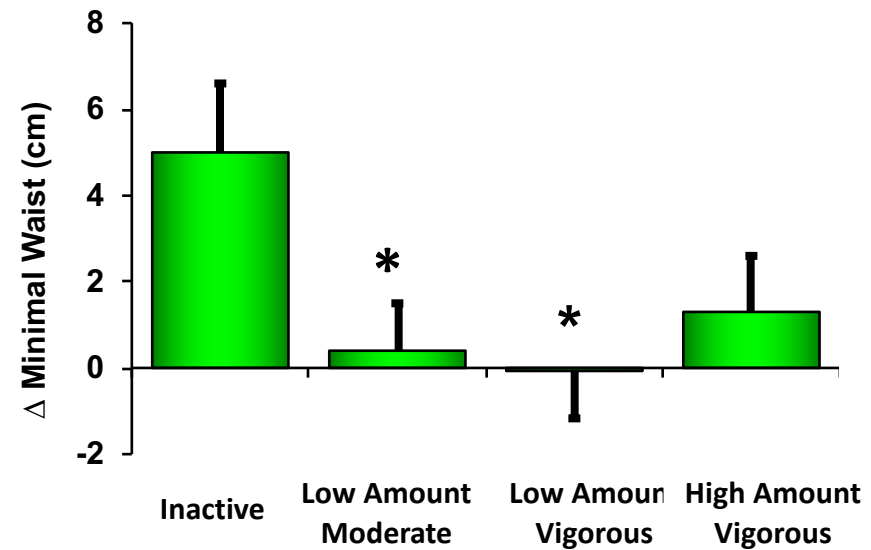
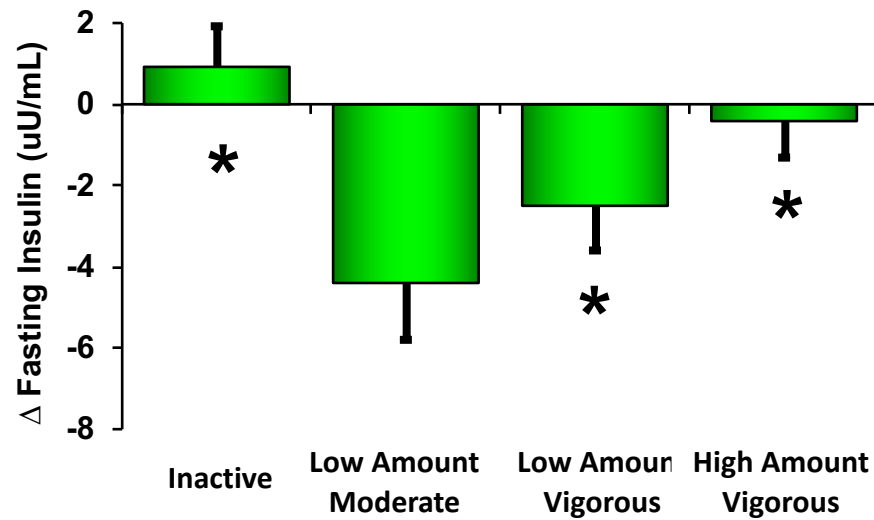
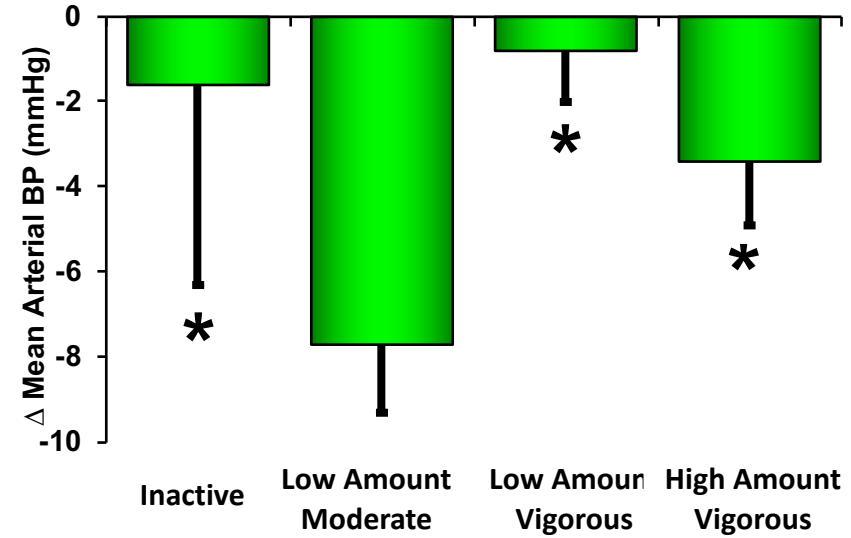
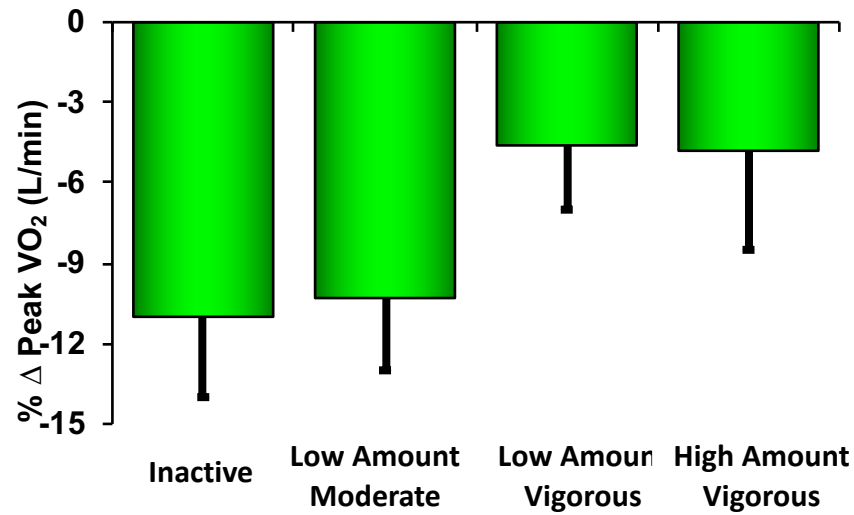
Paul T. Williams, and Paul D. Thompson Arterioscler Thromb Vasc Biol. 2013;33:1085-1091

STRRIDE I 10-year Reunion

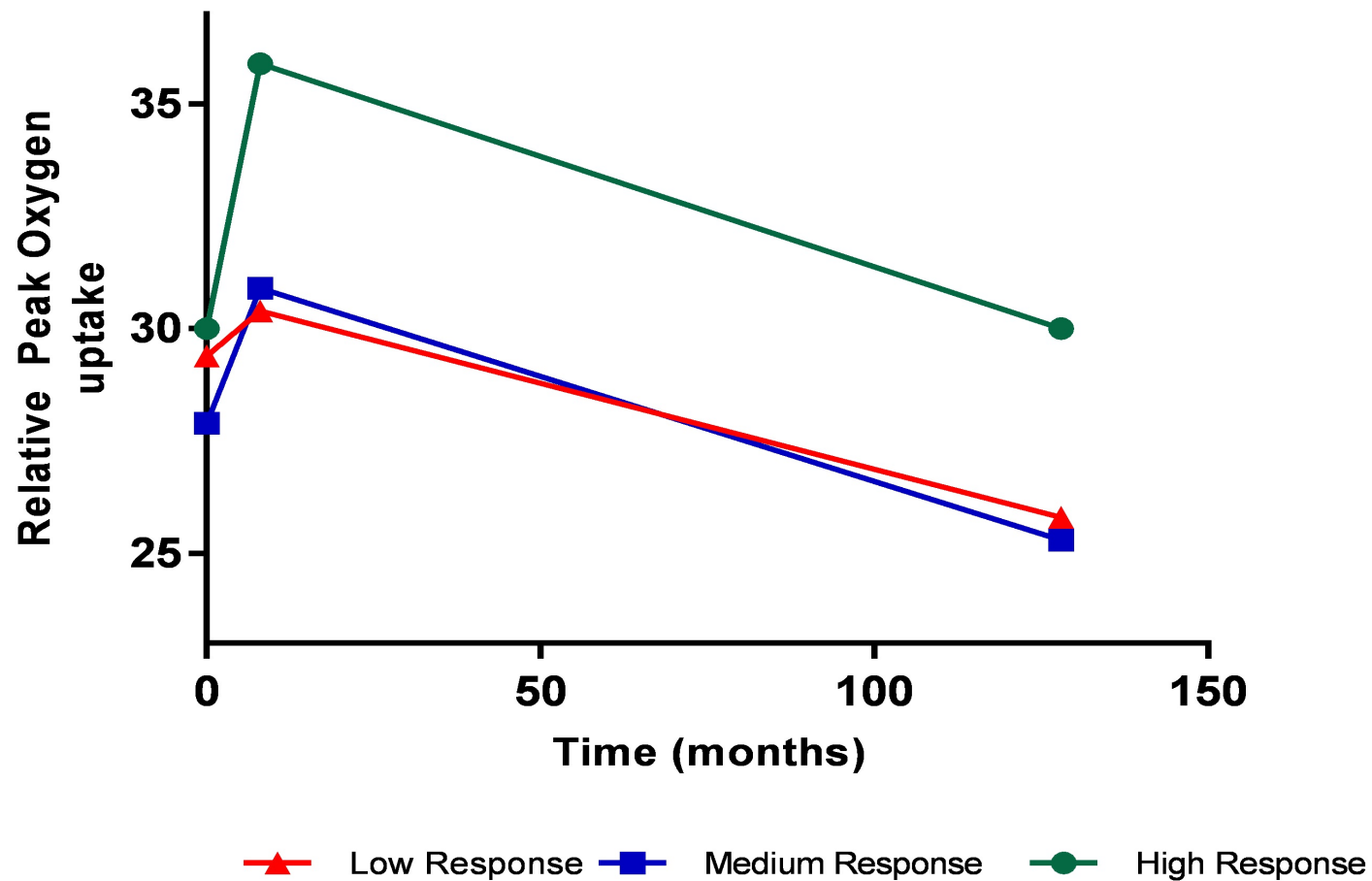
Reunion Protocol

- STRRIDE I participants that finished intervention period—drop outs not invited back.
- 10 years following completion invited back for CPX test, blood work, assessment of BP, lipids, FBG, FI, waist circumference and weight, PA in last three months.
- Comparisons made to pre-intervention assessments.

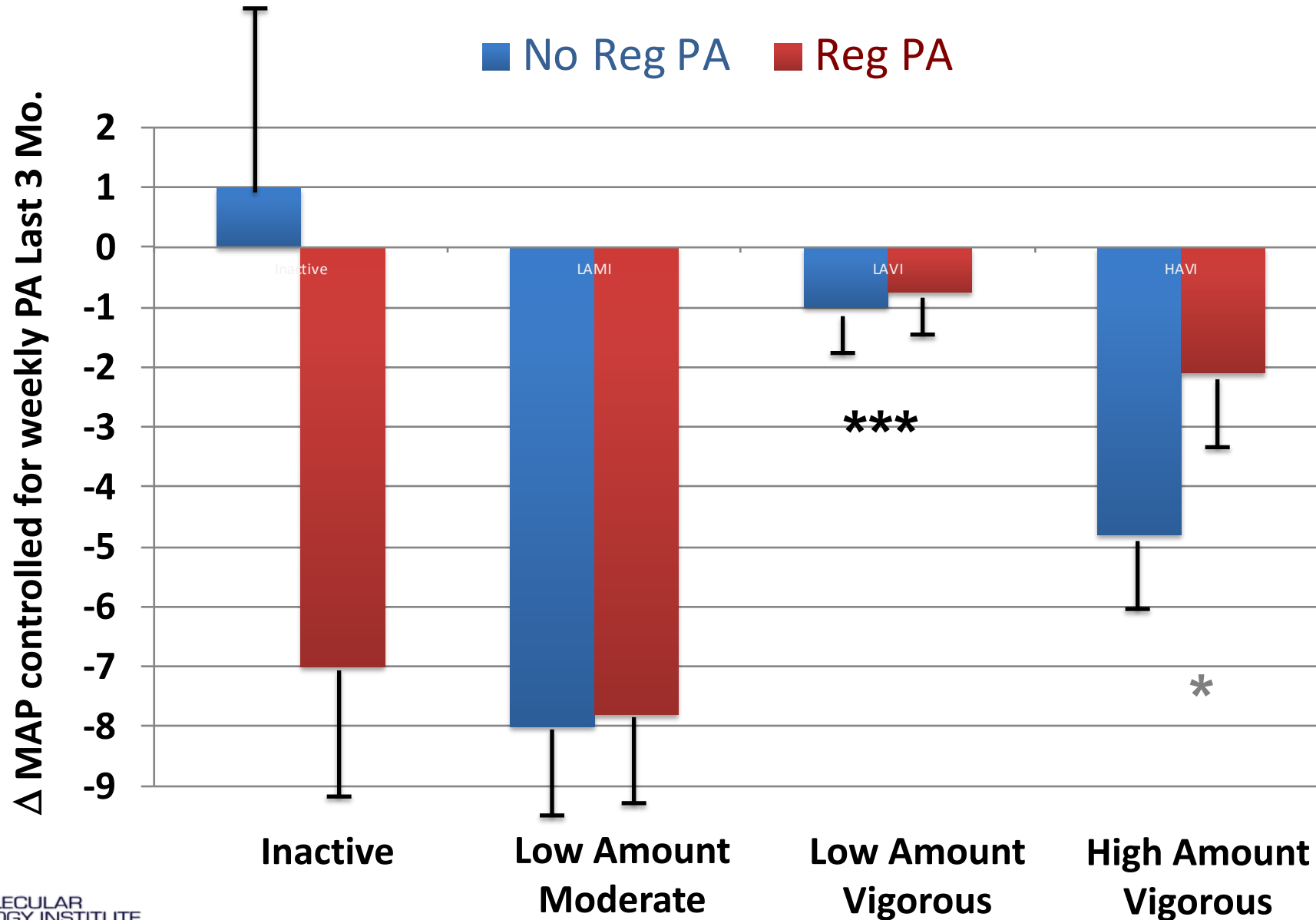
Reunion Results

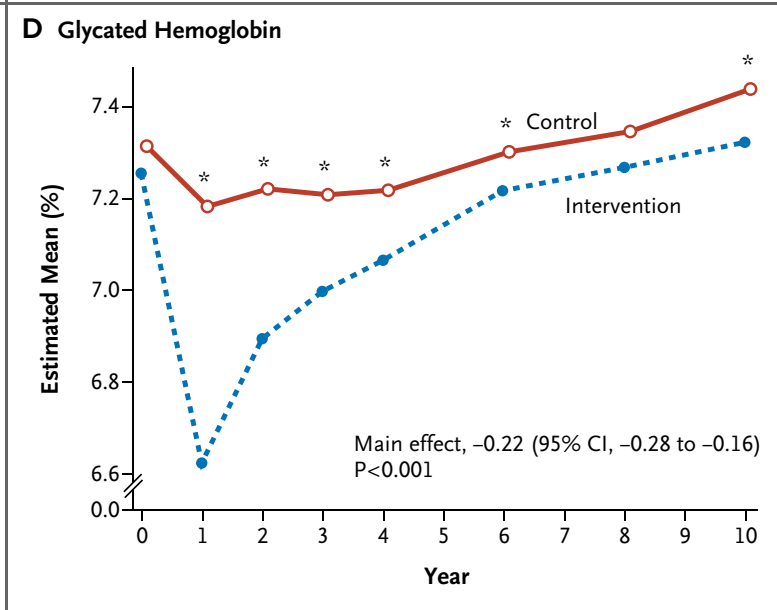
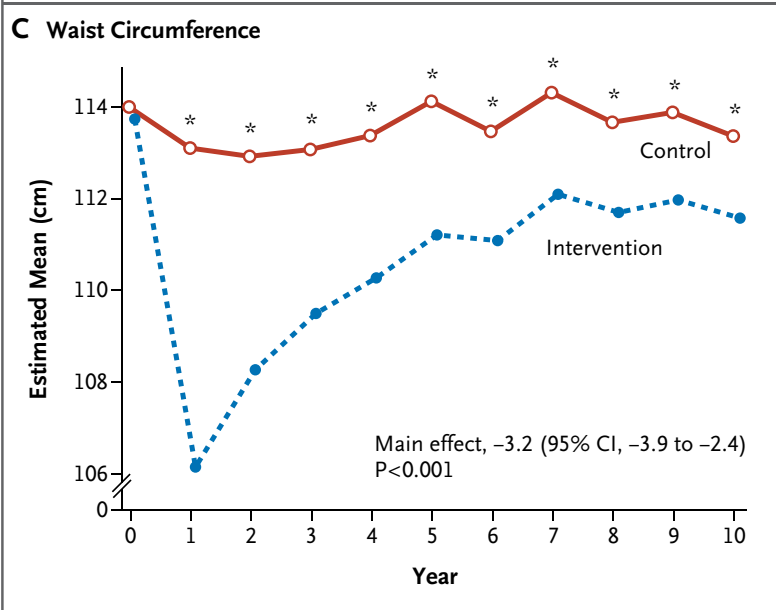
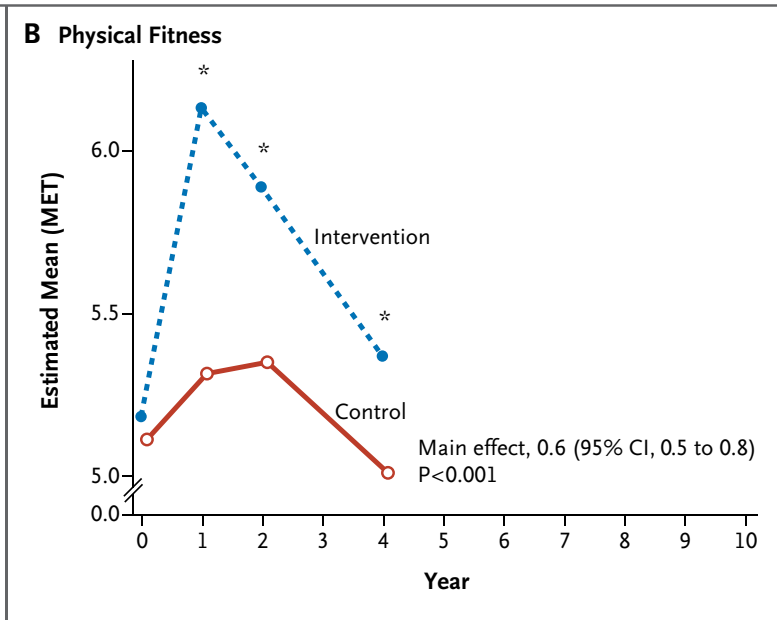
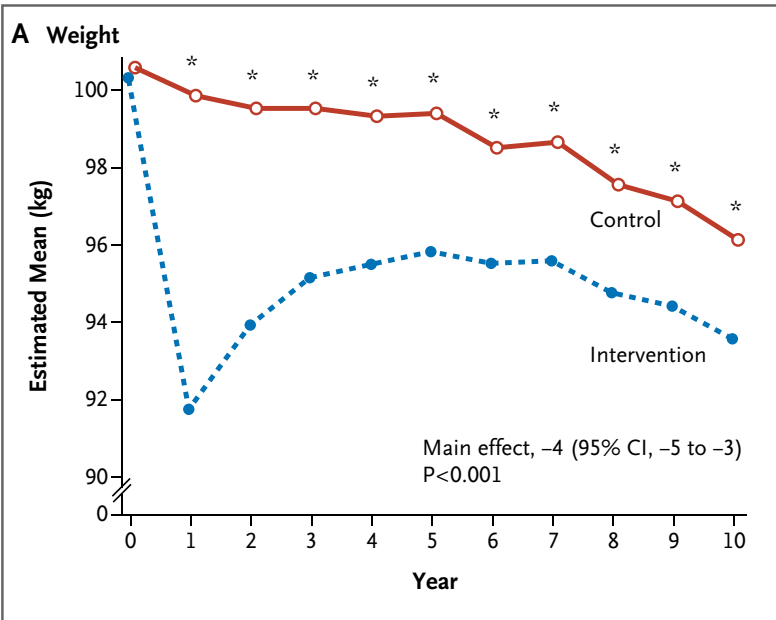


Change in Peak VO₂



Change MAP controlled PA





US Physical Activity Guidelines for Americans 2018

Overview and Highlights from the Physical Activity Guidelines Committee

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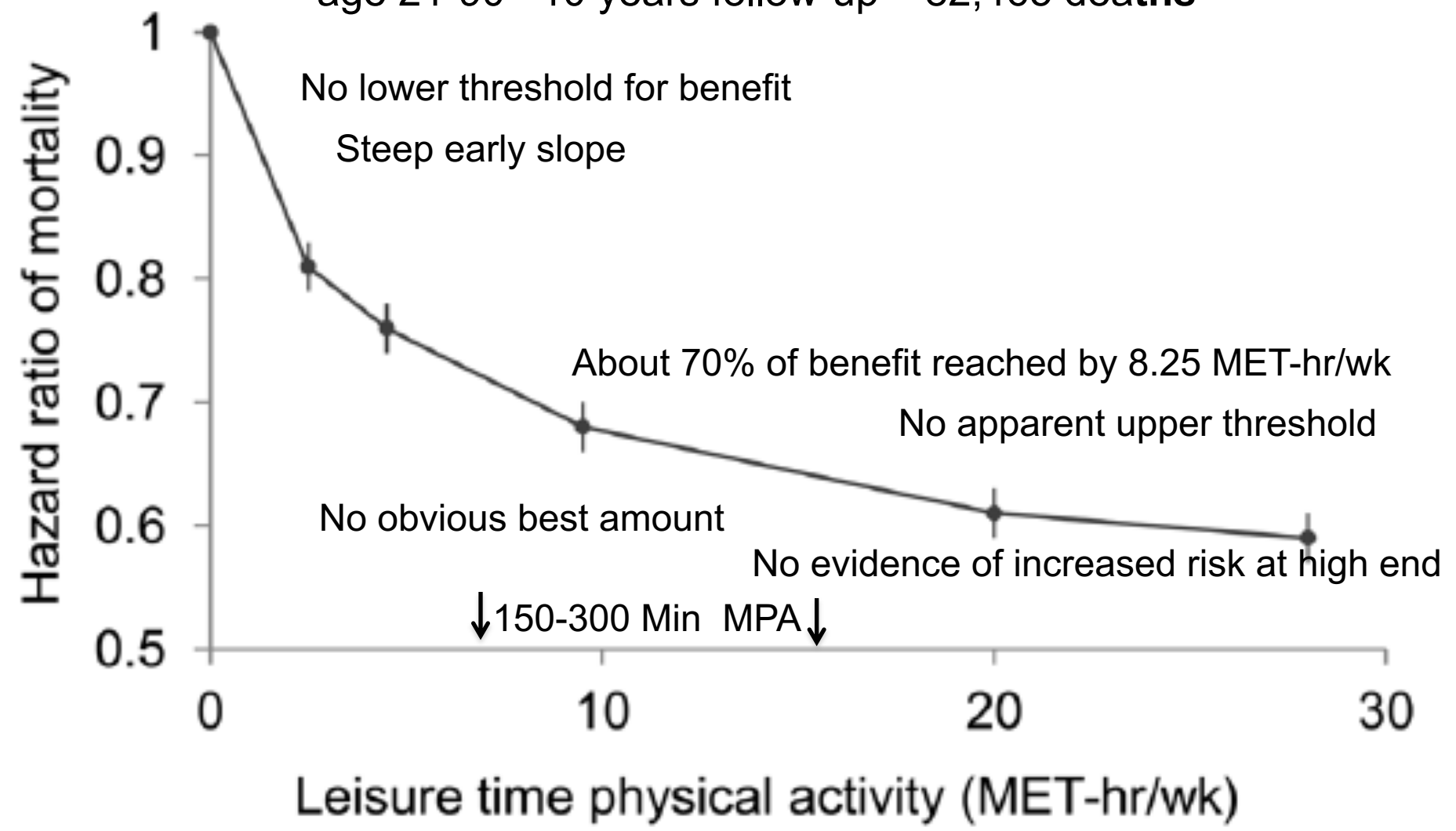
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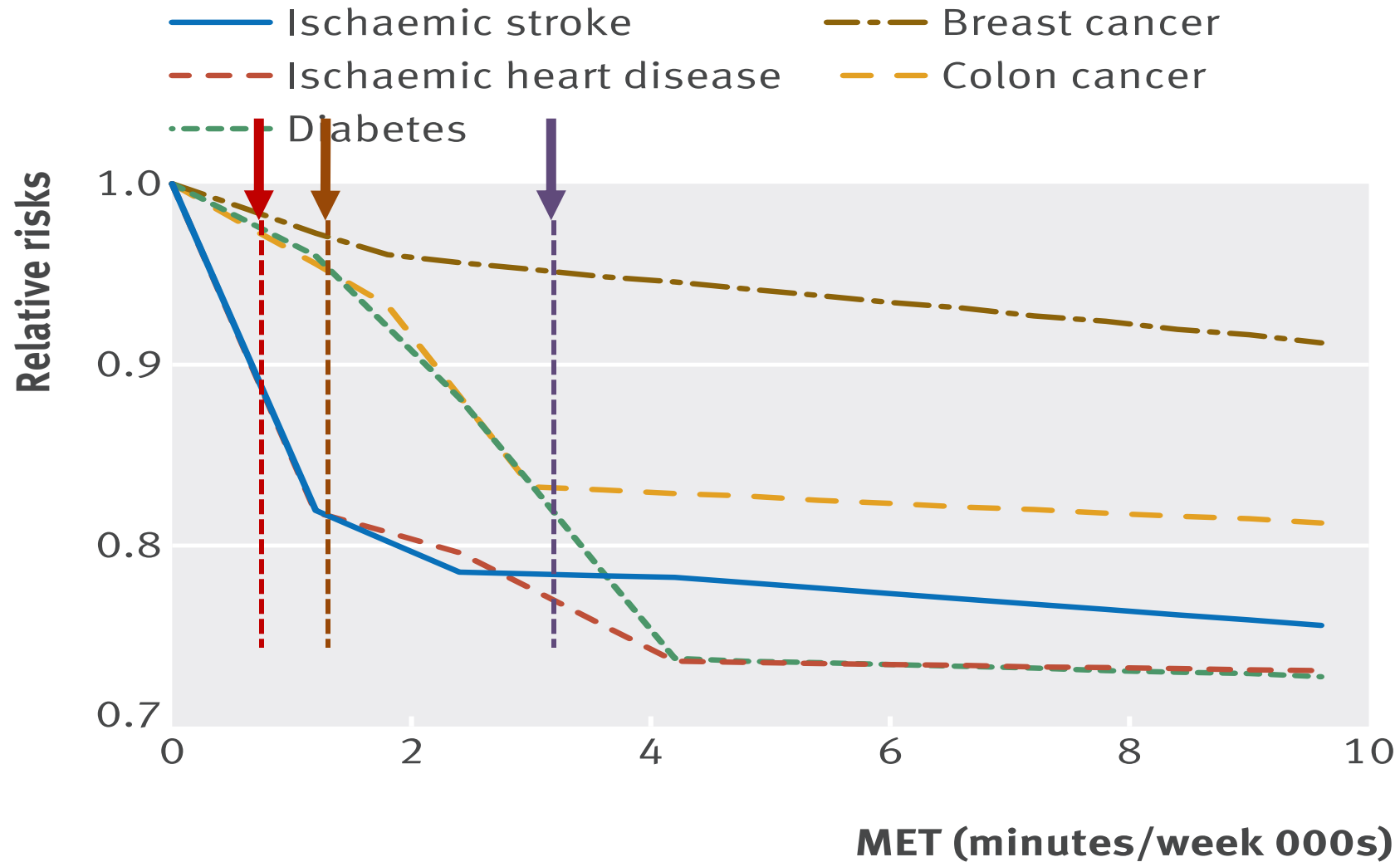


Figure 1

MVPA & All-Cause Mortality in 654, 827 Men & Women

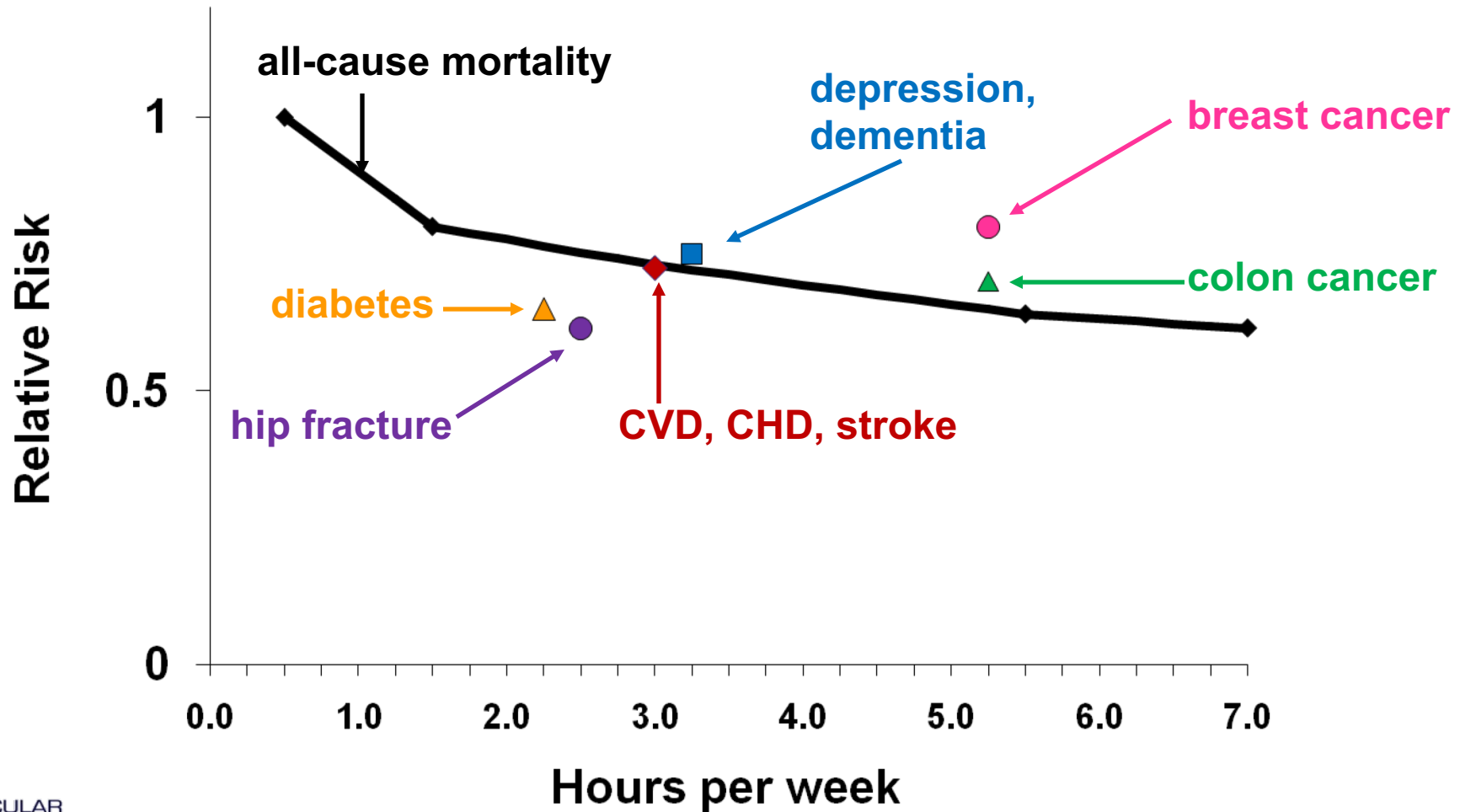
age 21-90 10 years follow-up 82,465 deaths





Kyu HH, Bachman VF, Alexander L *et al.* Physical activity and risk of breast cancer, colon cancer, diabetes, **ischemic heart disease, and ischemic stroke** events: systematic review and dose-response meta-analysis for the Global Burden of Disease Study 2013 *BMJ*, 354.

Figure 2
Risk of selected health events by hours/week of moderate to vigorous physical activity



Steps

Implications

The measure of steps per day has the potential to significantly improve the translation of research findings into public health recommendations, policies, and programs.

Importance

- **Steps are a basic unit of locomotion**
 - Easy to understand metric of ambulation
- **Measuring step counts shown to motivate diverse samples of individuals to increase physical activity levels**
- **Self-assessment of steps through objective, readily obtainable technology**
- **Step counts *per day* provides a comparable denominator to caloric intake *per day***
 - Tool for researchers and the public addressing a variety of health and physical activity issues
- **Steps can be at light-, moderate-, and vigorous-intensity levels**
 - Range of exertion choice for the promotion of walking

NAVIGATOR

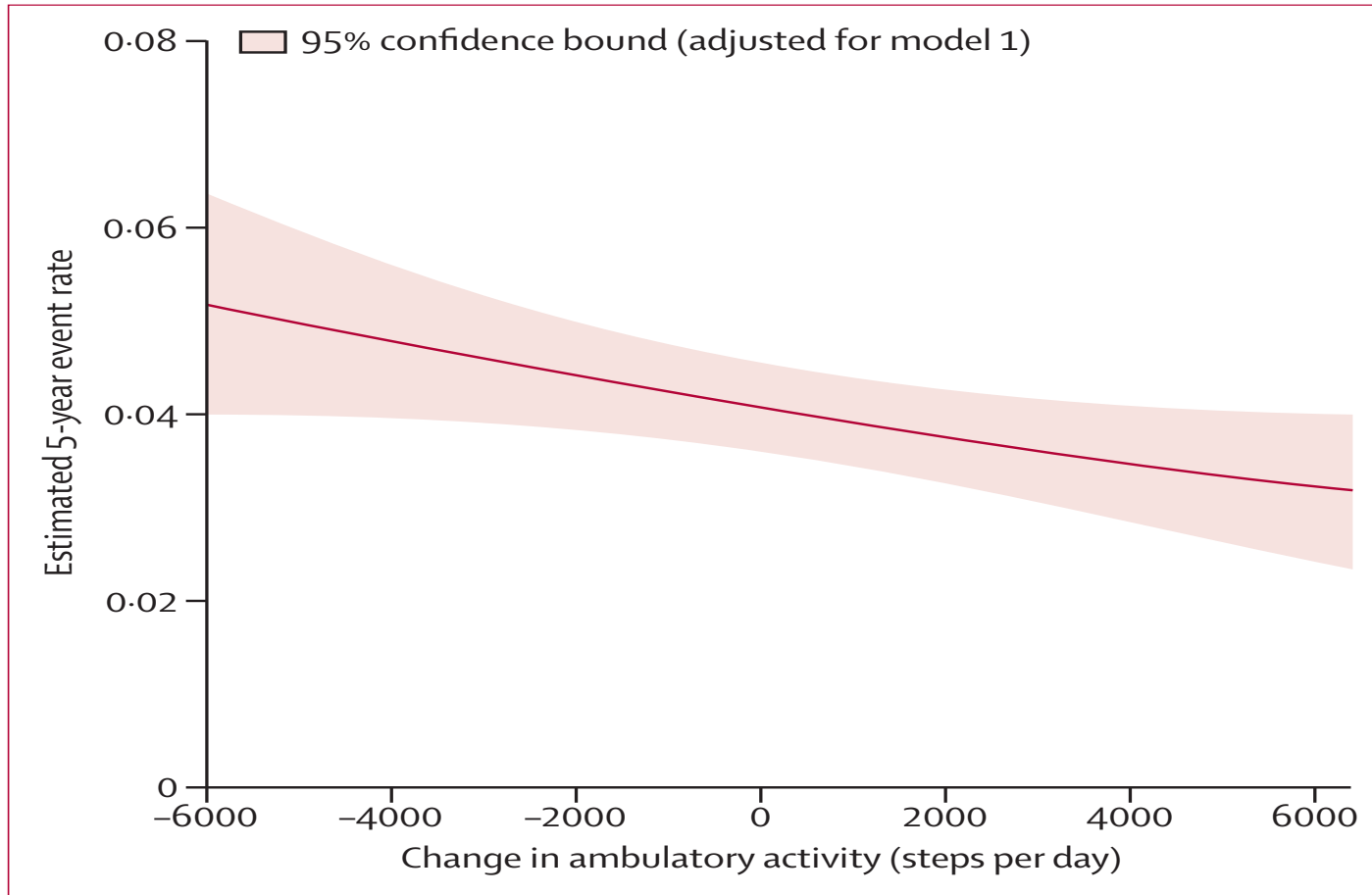
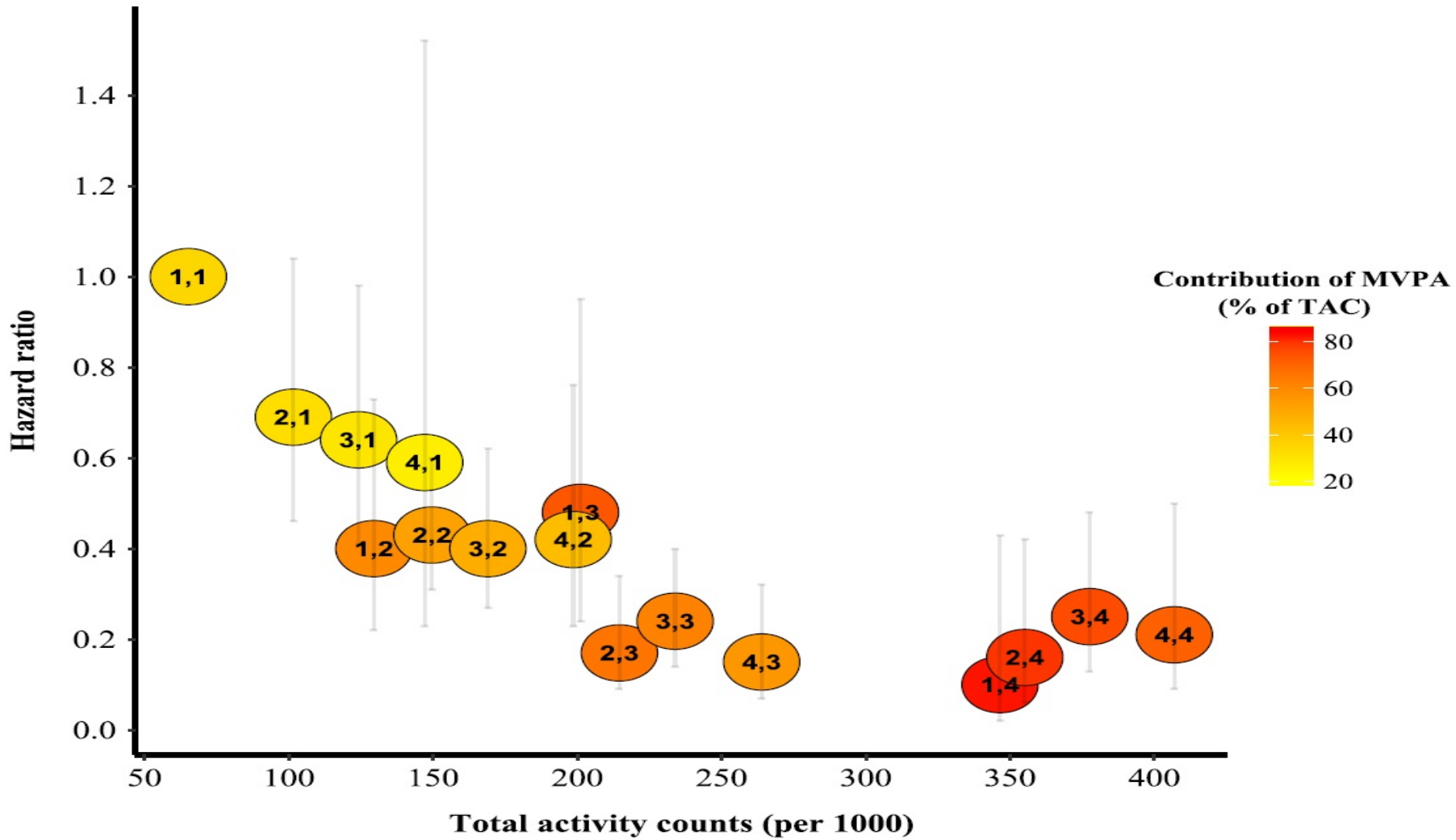


Figure: Relation between change in ambulatory activity and adjusted 5-year cardiovascular event rates

Yates (2014) used Navigator data to show change in steps per day was associated with reduce risk for cardiovascular events, specifically, a yearly 2,000 steps per day increase resulted in an 8% yearly reduction in cardiovascular event rate. The dose-response appeared linear. Baseline level of steps per day was inversely associated with cardiovascular event incidence, specifically at baseline each 2000 steps per day increment was associated with a 10% lower cardiovascular event rate.

Yates 2014

New Data



**Saint-Maurice,
JAHA, 2018**

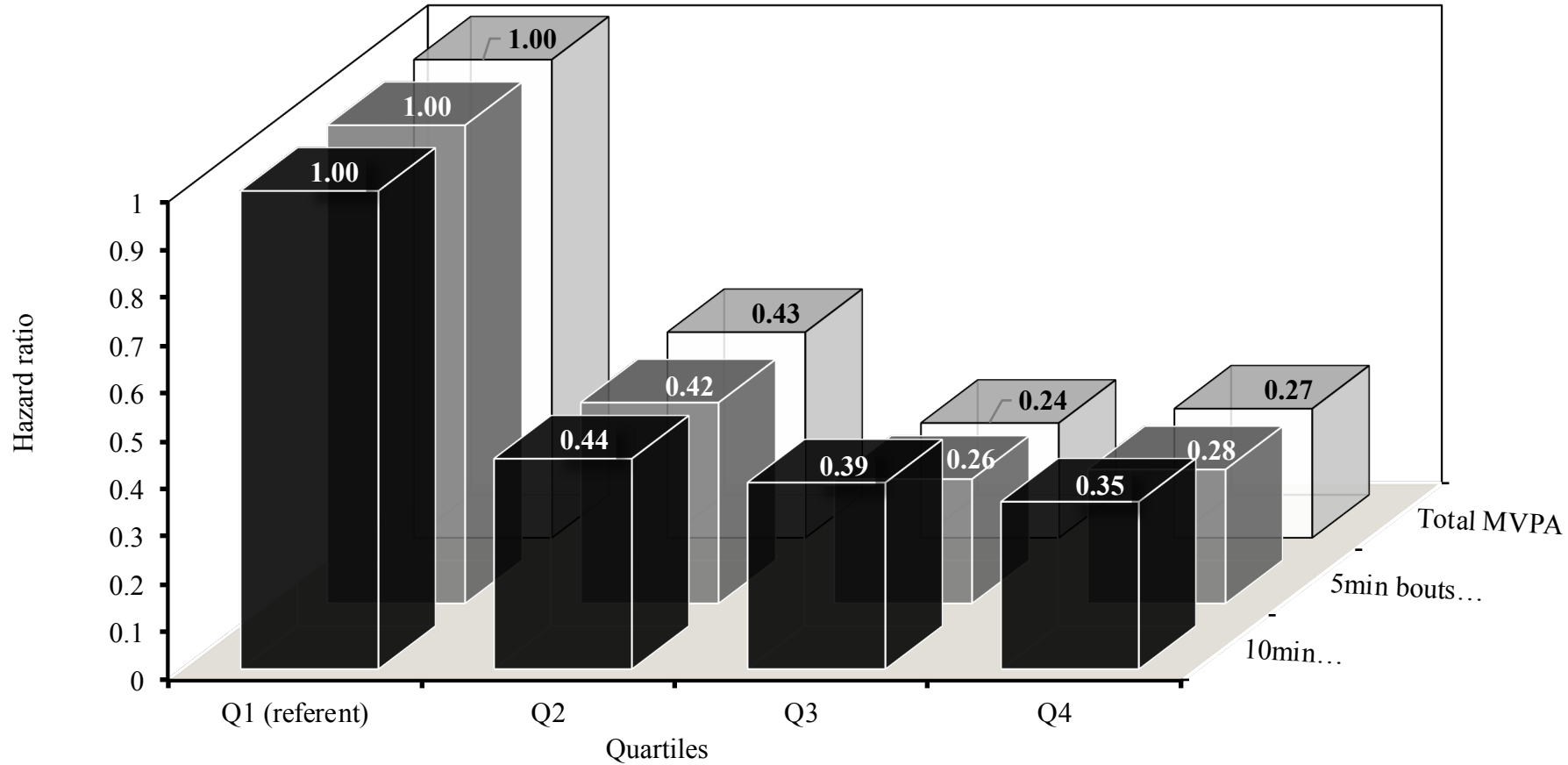
NHANES, 2003-
2006 wave
>40 y
4840 individuals
700 deaths (31
Dec 2011)

100-759 cpm =
light
≥ 760 cpm =
MVPA

Do Bouts Matter?

Whence did this whole idea originate?

New Data



Saint-Maurice,
JAHA, 2018

NHANES, 2003-
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