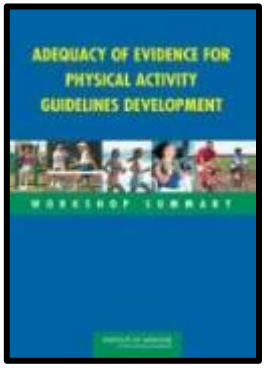
RELATIONSHIP OF ACCELEROMETER-ASSESSED PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR WITH PREDICTED CVD RISK IN OLDER WOMEN

Results from the OPACH Study

Michael J. LaMonte, PhD[1], Eileen Rillamas-Sun, PhD[2], Kelly R. Evenson, PhD[3], I-Min Lee, MD, ScD[4], Dori E. Rosenberg, PhD[5], Chongzhi Di, PhD[2], David M. Buchner, MD, MPH[6], John Bellettiere, MS[7], Andrea Z. LaCroix, PhD[7]

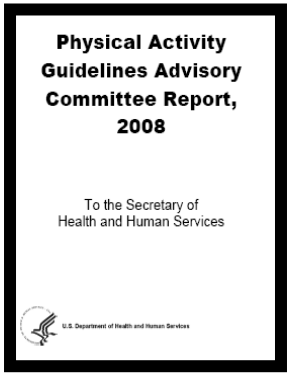
[1]University at Buffalo, [2]Fred Hutchinson Cancer Research Center, [3]University of North Carolina, Chapel Hill, [4]Harvard University, [5]Group Health Research Institute, [6]University of Illinois, Urbana-Champaign, [7]University of California, San Diego

IOM 2007



Background

HHS 2008



- Low physical activity (PA) and prolonged sedentary behavior (SB) contribute to high **CVD burden** in older adults.
- **Assessing** PA and SB is challenging in older adults.
  - Most prospective studies use questionnaires (prone to **misclassification**).
  - Prevalence of adults ≥60 years old meeting PA Guidelines:

    40% (BRFSS: self report), **2.4%** (NHANES: accelerometer)
  - Mean SB (sitting time): **4 hr/day** (self-report), **8 hr/day** (accelerometer)
- **Use of accelerometers** to objectively measure PA and SB could improve understanding of associations with CVD risk factors and events.

Gaps in Knowledge

- Need data using **objective** measures - few studies on cardiovascular health in older adults have use objective measures of both PA and SB.
- Need data on **light-intensity** PA – accounts for largest portion of daily PA.
- An **Overall Goal of OAPCH:** To provide evidence on what levels of PA and SB are associated with more favorable levels of CVD factors, predicted and observed CVD risk, and thus better cardiovascular health in late life.

Study Aims

Among older community-living women in OPACH:

1. Examine the relationships of **accelerometer-measured** PA and SB with predicted CVD risk in 4,870 race-ethnically diverse women, ages 63-99.

2. Determine if the relationships **differ by age or race-ethnicity** subgroups.

Methods

- **Triaxial accelerometer** worn at hip for up to 7 consecutive days monitoring.
- Output → integrated **vector magnitude** ("counts/15 sec interval") …intensity
- **Analysis limited to** women without known CVD and:

  (1) at least 4 days with ≥10 hours of accelerometer wear, and

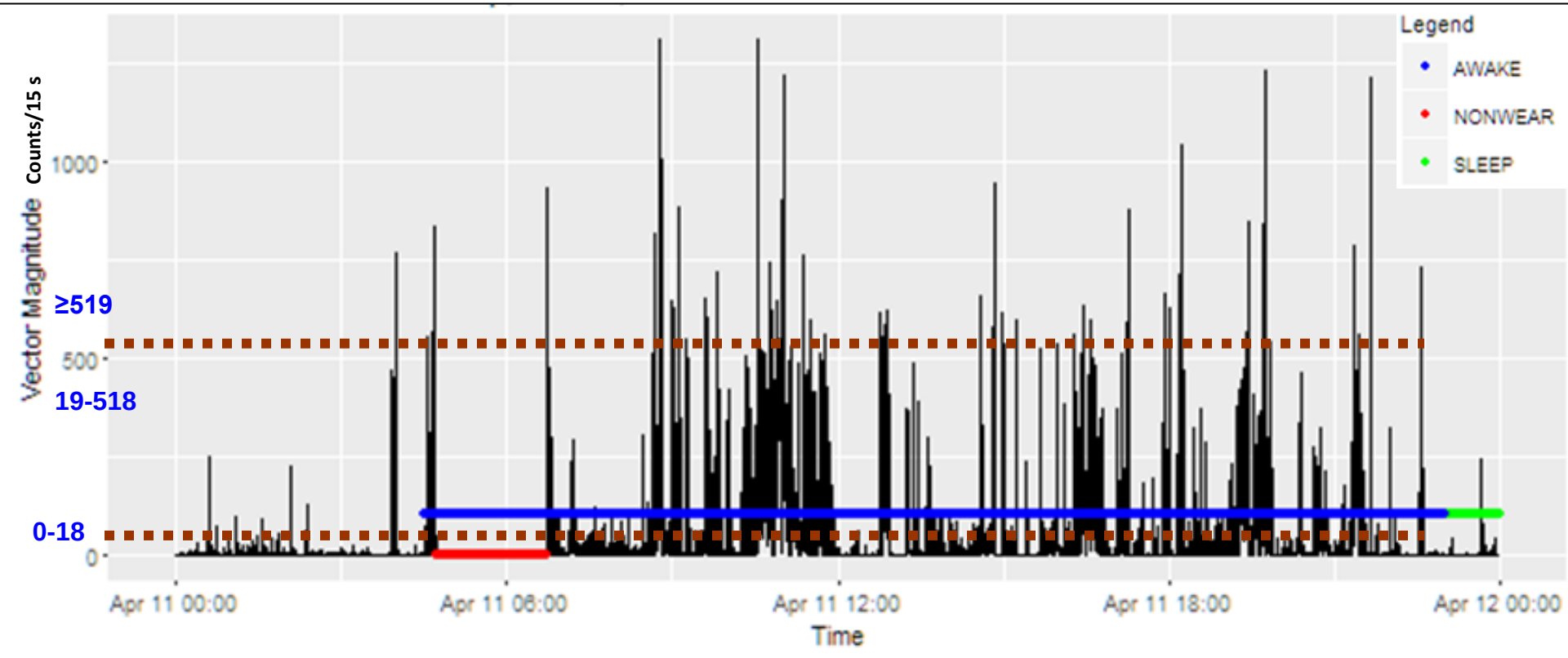
  (2) complete information on risk factors needed to compute the Reynolds Risk Score (10-year predicted CVD risk).

- **PA and SB time** (hours/day) based on OPACH study calibration cutpoints: (*Evenson et al. 2015*)
  - Sedentary … (0-18 counts/15 sec)
  - Low light-intensity PA … (19-225)
  - High light-intensity PA … (226-518)
  - Moderate-to-vigorous intensity PA (MVPA) … (≥519)

Hip Worn Accelerometer Energy Expenditure

Calibrating Counts/15 second with Intensity

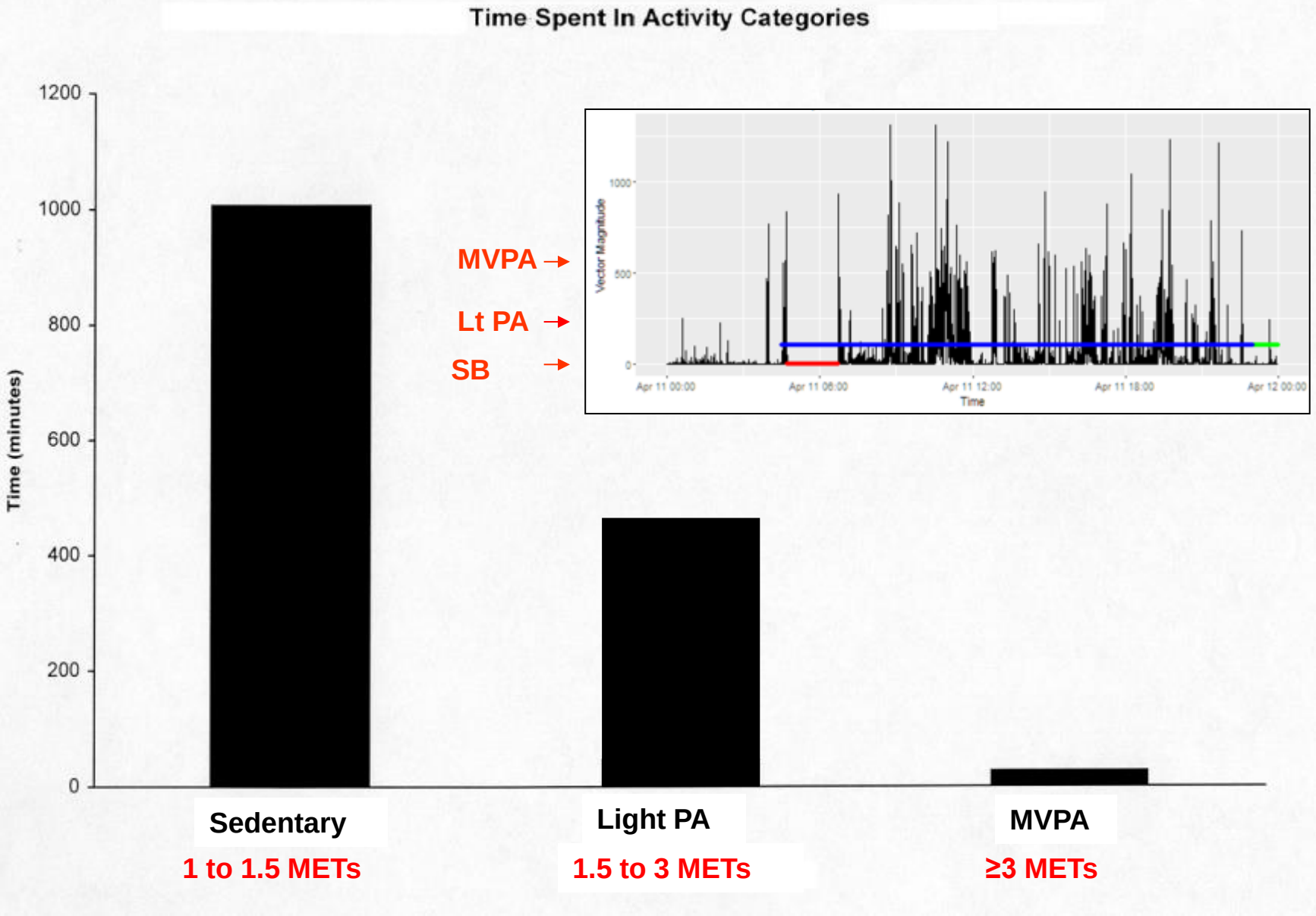
(*Evenson et al. 2015*)



Sedentary (0-18), Light intensity PA (19-518), Moderate-Vigorous intensity PA (≥519)

Tracing courtesy of John Bellettiere, MS

Accelerometer Energy Expenditure



Methods

- Cardiovascular Health assessed using **Reynolds Risk Score** (RRS).
- **Computed using:** Age, Systolic BP, hs-CRP, Total Cholesterol, HDL-C, Diabetes status, HbA1c (if diabetic), Smoking status, Family Hx of MI.
- RRS has better discrimination and calibration of actual CVD events than Framingham Risk Score in WHI-OS (Cook et al. 2012)
- **Higher RRS** reflects higher 10-year predicted risk (%) of a first CVD event.
- **Statistical analyses** were conducted using generalized linear regression models to determine relationships between PA or SB and RRS, adjusting for wear time.

Participant Characteristics at LLS Visit

Variable	Mean (SD), or %
Age, years	78.9 (6.6)
Caucasian	52.4%
Current smoker	2.3%
Diabetes	27.8%
BMI, kg/m^2	27.9 (5.7)
Systolic BP, mmHg	125.7 (14.2)
Total Cholesterol, mg/dL	197.5 (39.7)
HDL-C, mg/dL	60.4 (14.9)
hs-CRP, mg/L	3.6 (8.2)
RRS	13.7 (11.8) range: 0.8 - 94.3

Spearman Correlations for CVD factors with PA & SB

Variable	Wear time adjusted correlation (r)	
	Total PA	SB
Age	-0.25	0.24
BMI	-0.26	0.25
Systolic BP	-0.11	0.11
Total Cholesterol	0.11	-0.10
HDL-C	0.21	-0.19
hs-CRP	-0.16	0.15
RRS	-0.33	0.31
SB	-0.91	

Study Aims

1. **Examine the relationships of accelerometer-measured PA and SB with predicted CVD risk in 4,870 race-ethnically diverse women, ages 63-99.**

2. Determine if the relationships differ by age or race-ethnicity subgroups.

Wear Time Adjusted Mean Time (hr/d) spent in PA & SB According to Decile of RRS

	Reynolds Risk Score deciles (n=487 each; 1 = lowest risk, 10 = highest risk)										
	1	2	3	4	5	6	7	8	9	10	P-Trend
Total PA	6.9	6.6	6.5	6.2	6.2	5.8	5.6	5.7	5.3	5.0	<.001
Low light PA	3.6	3.5	3.5	3.4	3.4	3.3	3.2	3.2	3.1	3.1	<.001
High light PA	1.9	1.9	1.8	1.8	1.8	1.7	1.6	1.6	1.5	1.4	<.001
MVPA	1.3	1.2	1.1	0.9	0.9	0.8	0.7	0.7	0.6	0.6	<.001
SB	12.0	12.0	11.9	12.5	12.5	12.9	12.7	12.7	12.9	13.3	<.001

Linear Regression of RRS on PA & SB

	β	95% CI	P-value
Low light PA	**-1.8**	**-1.4, -2.2**	**<.001**
High light PA	**-4.4**	**-3.8, -4.9**	**<.001**
MVPA	**-5.1**	**-4.5, -5.7**	**<.001**
SB	**1.9**	**1.6, 2.1**	**<.001**

Regression coefficient (β) is the mean difference in RRS for a 1 hour/day greater time spent in PA or SB. All models adjusted for wear time, race-ethnicity, education, and reported general health status, and mutually adjusted for the PA variables and SB.

Because smoking status is highly correlated with PA and SB, and is part of the RRS, the analysis was repeated **excluding current smokers**; little change was noted.

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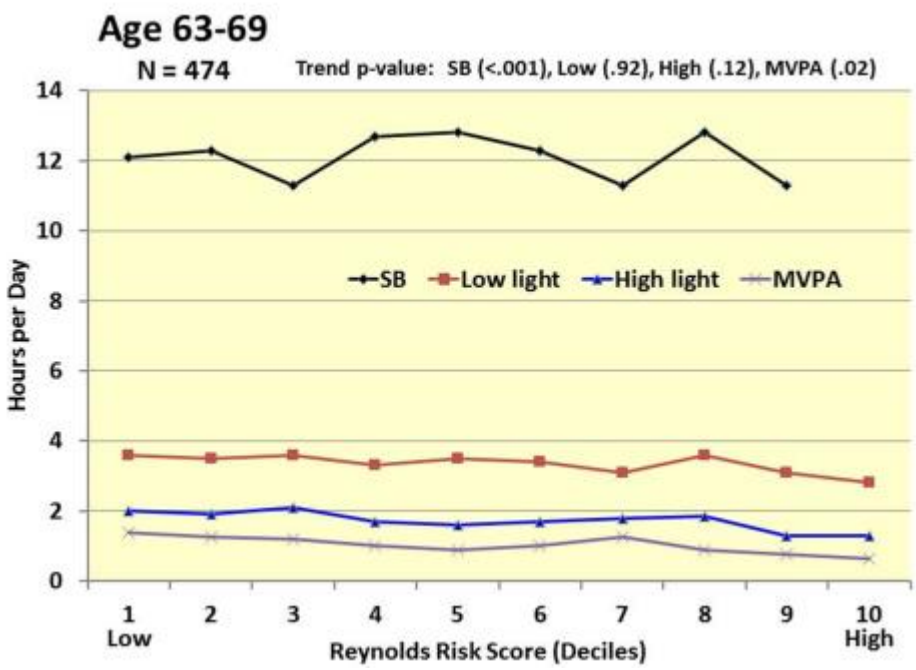
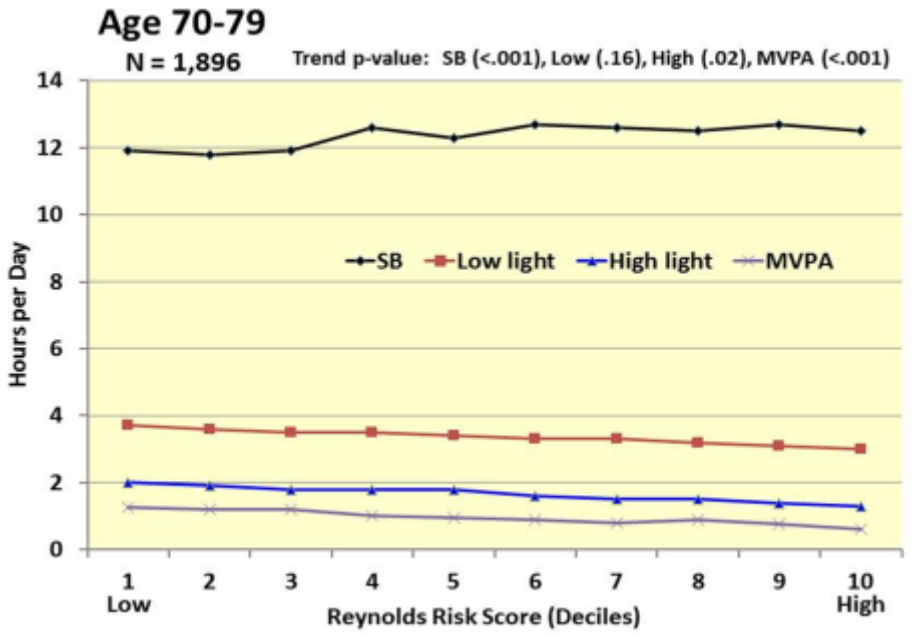
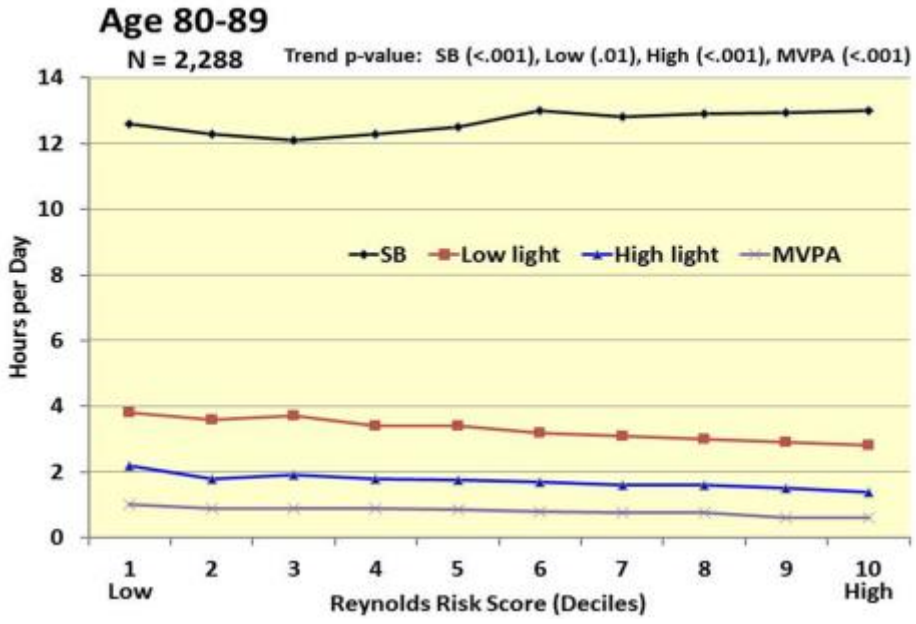
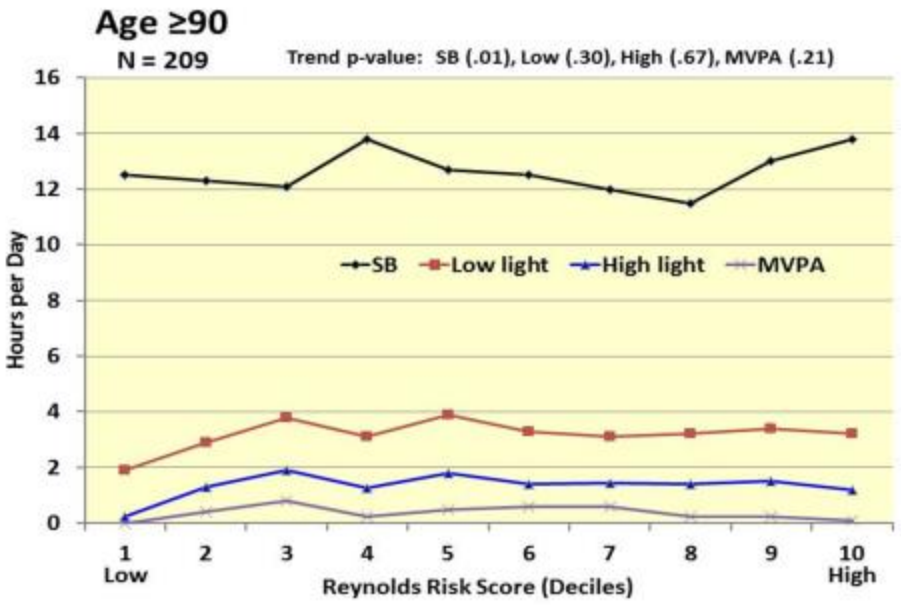
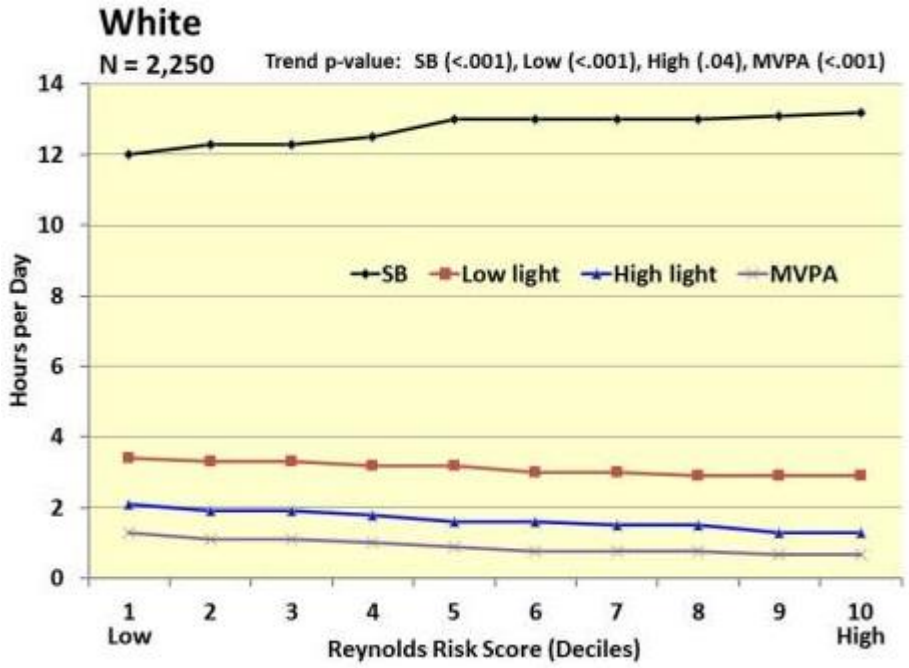
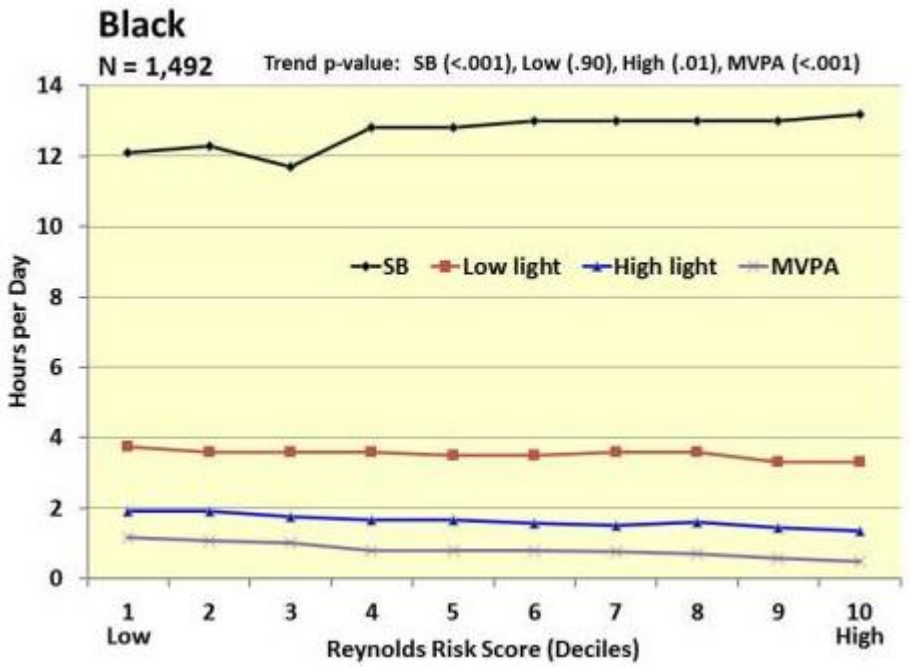

Age 63-69
N = 474
Trend p-value: SB (<.001), Low (.92), High (.12), MVPA (.02)
Hours per Day
SB
Low light
High light
MVPA
1 Low
10 High
Reynolds Risk Score (Deciles)

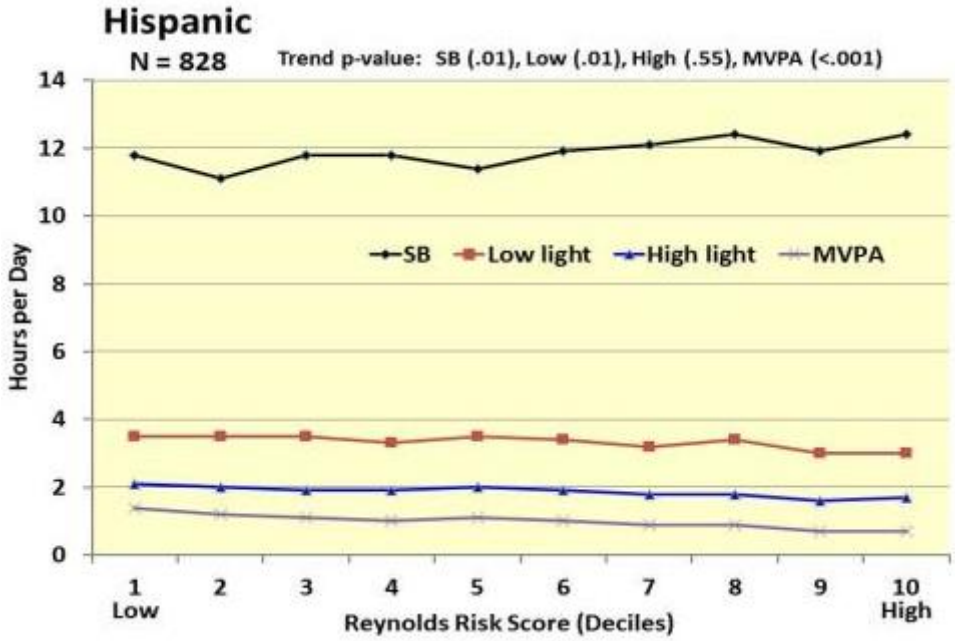

Age 70-79
N = 1,896
Trend p-value: SB (<.001), Low (.16), High (.02), MVPA (<.001)
Hours per Day
SB
Low light
High light
MVPA
1 Low
10 High
Reynolds Risk Score (Deciles)


Age 80-89
N = 2,288
Trend p-value: SB (<.001), Low (.01), High (<.001), MVPA (<.001)
Hours per Day
SB
Low light
High light
MVPA
1 Low
10 High
Reynolds Risk Score (Deciles)


Age ≥90
N = 209
Trend p-value: SB (.01), Low (.30), High (.67), MVPA (.21)
Hours per Day
SB
Low light
High light
MVPA
1 Low
10 High
Reynolds Risk Score (Deciles)


White
N = 2,250
Trend p-value: SB (<.001), Low (<.001), High (.04), MVPA (<.001)
Hours per Day
SB
Low light
High light
MVPA
Low
High
Reynolds Risk Score (Deciles)

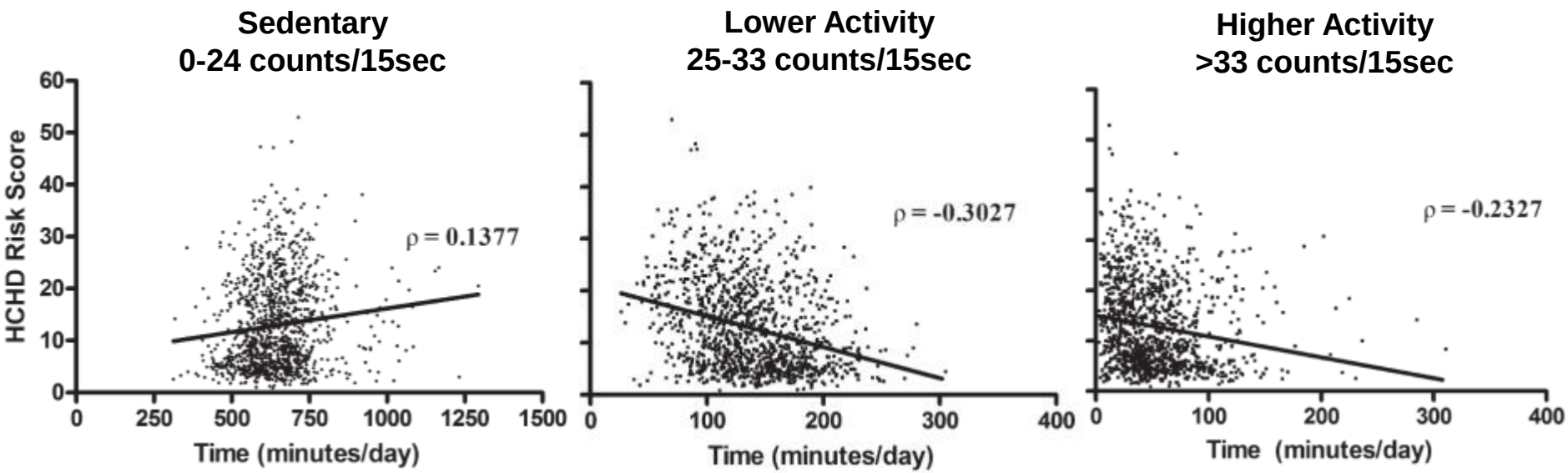

Black
N = 1,492
Trend p-value: SB (<.001), Low (.90), High (.01), MVPA (<.001)
Hours per Day
SB
Low light
High light
MVPA
Low
High
Reynolds Risk Score (Deciles)


Hispanic
N = 828
Trend p-value: SB (.01), Low (.01), High (.55), MVPA (<.001)
Hours per Day
SB
Low light
High light
MVPA
Low
High
Reynolds Risk Score (Deciles)

What Have Other Studies Found?

- **Lifestyle Interventions and Independence for Elders (LIFE) Study**
- **818 mobility limited adults (66% women) >70 years old, without known CVD**
- **Hip worn Triaxial accelerometer; Framingham Score 10-year predicted CHD risk**

FitzGerald et al. J Am Heart Assoc. 2015;4:e001288



<u>OPACH Spearman Correlations with RRS</u>:

Sedentary (0-18 counts/15s)	Light intensity PA (18-518)	MVPA (>518)
r = 0.31	r = -0.23	r = -0.38

Conclusions

Based on objectively measured PA and SB, this study in older women:

- Confirms that **prolonged SB** is adversely related with cardiovascular health.
- Suggests even **light intensity PA** could have cardiovascular benefit.
- Showed similar patterns of relationships in **age** and **race-ethnic subgroups**.

Given the large proportion of daily activity time spent at lower intensity in older adults, these findings suggest important public health implications.

Prospective results are needed to confirm these cross-sectional observations.

The OPACH Team!

WHI-CCC

Eileen Rillamas-Sun
Chongzhi Di
Julie Hunt
Lesley Tinker
Kyle Campbell
Todd Panek
Sheri Greaves
Yuzheng Zhang
Ross Prentice

University of California, San Diego

Andrea LaCroix
John Belletteire

University of Illinois

David Buchner

Harvard University

I-Min Lee
JoAnn Manson

Stanford University

Marcia Stefanick
Stacy Sims
Katelyn Taylor
Bill Haskell

University of North Carolina, Chapel Hill

Kelly Evenson
Molly Wen
Amy Herring
Steve Marshall

University of Alabama, Birmingham

Beth Lewis
Nita Webb

Johns Hopkins

Ciprian Crainiceanu
Jiawei Bai

University at Buffalo

Mike LaMonte