

# Occupational vs leisure time physical activity: effect on heart rate variability

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# Background

- Leisure-time physical activity (LTPA) is beneficial for cardiovascular health (e.g. [Warburton 2010](#); [Reiner 2010](#))
- Occupational physical activity (OPA) does not show the same health benefits and may even be detrimental (e.g. [Li 2013](#); [Krause 2015](#)).
- The health paradox of physical activity (e.g. [Holtermann 2012](#)).

# OPA and LTPA can be different

- The nature of OPA and LTPA can be different
  - Type
  - Volume
  - Temporal pattern
  
  - Autonomy
  - Recovery

# Mechanism?

- The physiological pathways underlying the contrasting effect of OPA and LTPA are unclear.

# The autonomic nervous system (ANS)

- The ANS is a key adaptive system maintaining homeostasis and health (Chrousos 2009).
- ANS imbalance is associated with cardiovascular disease and all-cause mortality, both in clinical and general populations (Task Force 1996; Thayer 2007;2010).
- Daily physical activity and exercise improve ANS function (Sandercock 2004; Soares-Miranda 2014).

# Aim

- To investigate whether objectively measured OPA and LTPA have different effects on autonomic activity (assessed by HRV) during sleep among blue-collar workers.

# The Danish PHysical ACTivity cohort with Objective measurements

## Design

- Cross sectional

## Subjects

- Blue-collar workers (n=514)
- Three sectors: cleaning, manufacturing, transportation

### Questionnaire

- Web-based

### Health check

- BMI, fitness, blood pressure

### Ambulatory monitoring

- Physical activity
- Heart rate variability

# Ambulatory recordings

## Physical activity

- Assessed using multiple accelerometers (Actigraph) across 1-5 days
- Analyzed using the Acti4 software ([Skotte 2014](#)).
- Time (%) in walking, cycling, climbing stairs, and running was determined for work and leisure



# Ambulatory recordings

## Heart rate variability (HRV)

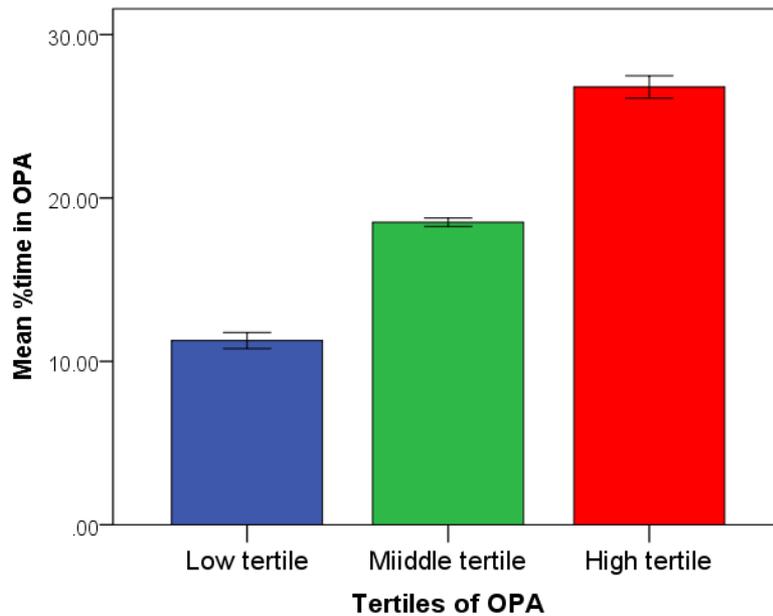
- Assessed using a heart rate monitor (Actiheart) across 1-5 days
- Analyzed in time and frequency domains ([Task Force 1996](#)).
- Determined during nocturnal sleep (i.e. during periods with the lowest heart rate)



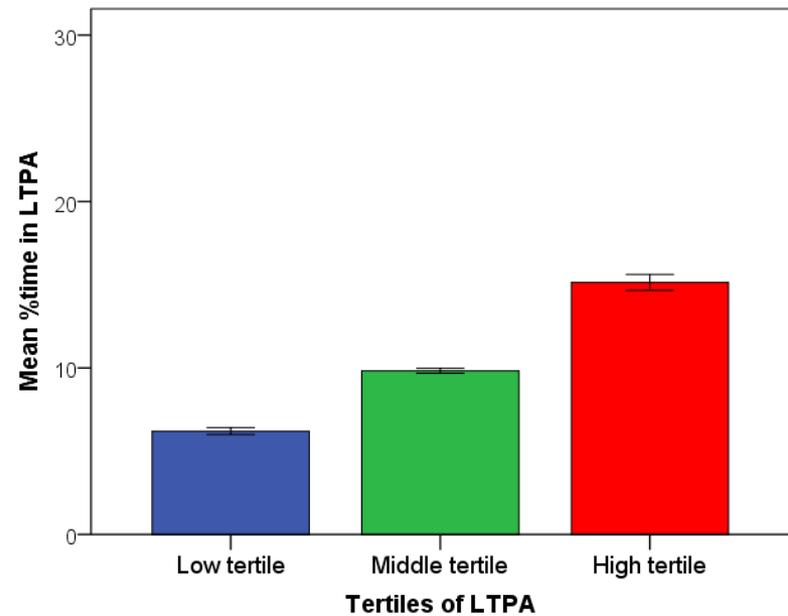
# Results

# Time (%) in OPA and LTPA

## OPA (mean 19%)



## LTPA (mean 10%)

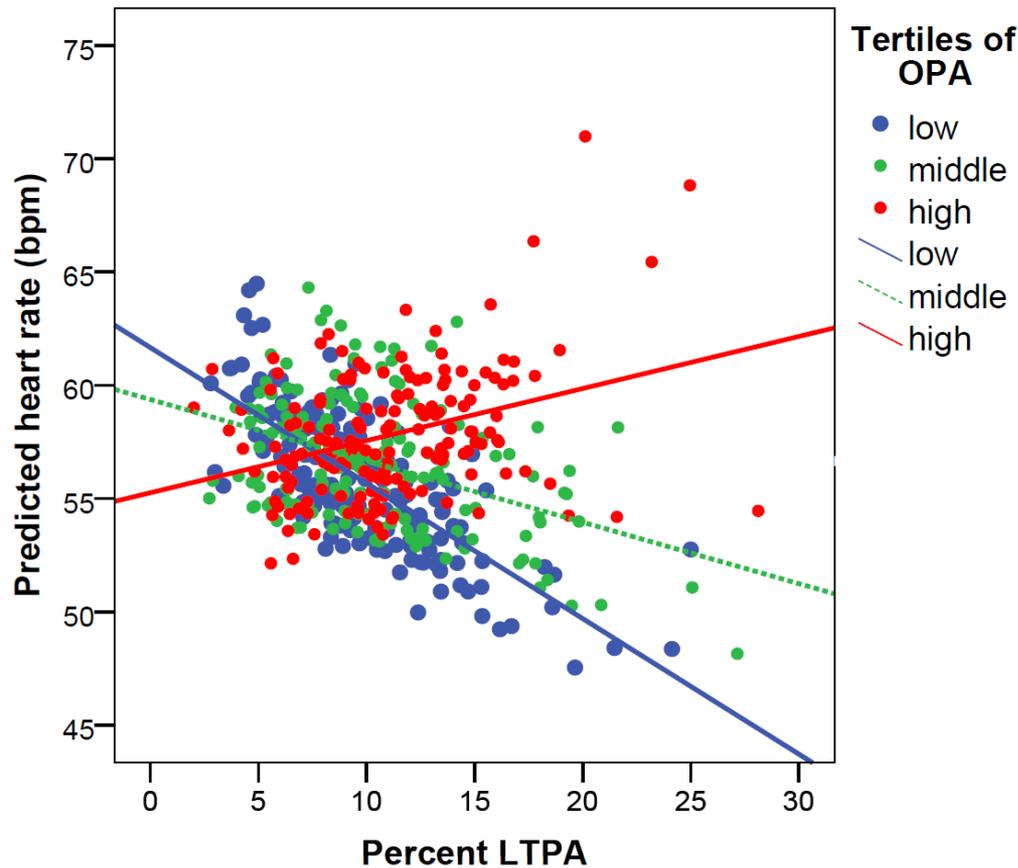


# Interaction between continuous OPA and LTPA on nocturnal HRV

Linear regression	Adjusted model (n=488)		
Interaction OPA*LTPA	B	SE	p
Heart rate (bpm)	0.49	0.10	<0.0001
RMSSD (ln ms)	-0.02	0.01	0.004
SDNN (ms)	-0.74	0.31	0.019
LF power (ln ms)	-0.03	0.01	0.033
HF power (ln ms)	-0.04	0.02	0.022

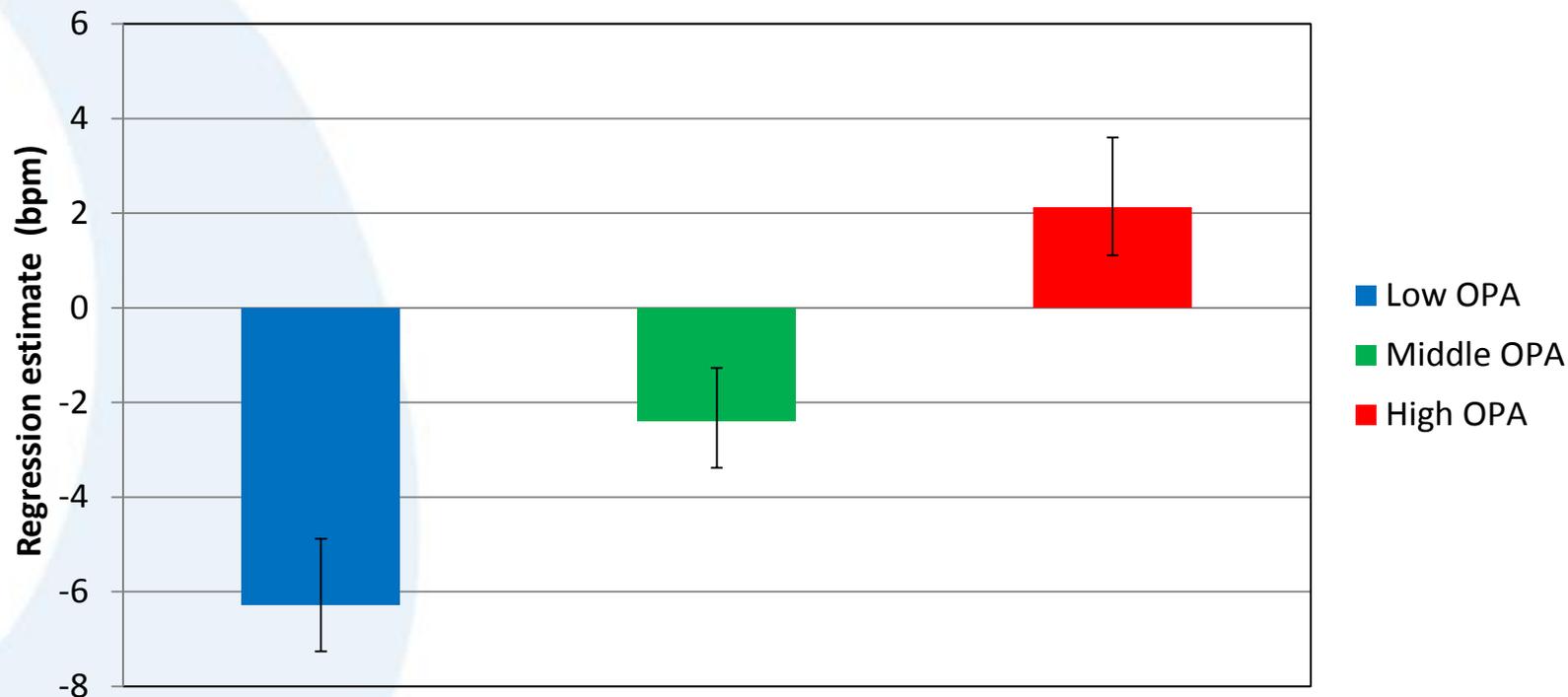
*Adjusted for age, sex, BMI, smoking, job seniority, and social support*

# Interaction between OPA and LTPA on heart rate during sleep

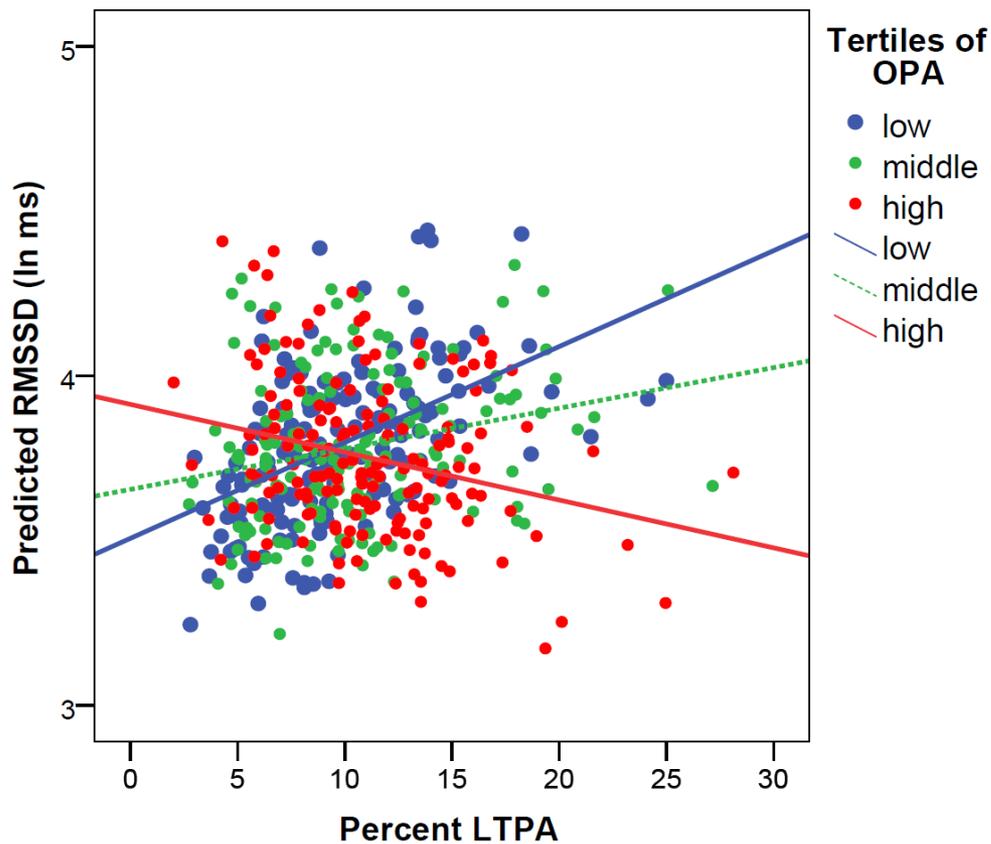


# Association between LTPA and heart rate in tertiles of OPA

Effect of LTPA on heart rate

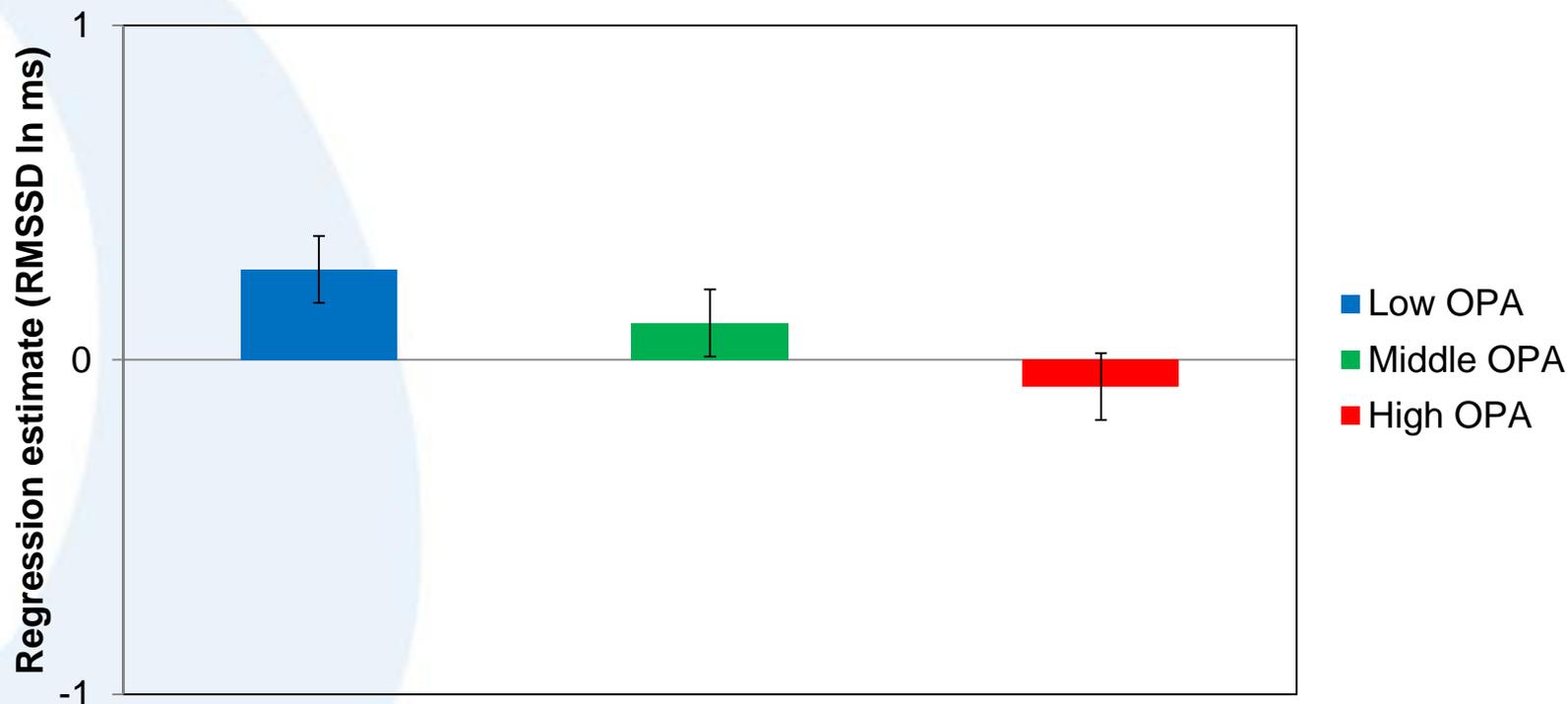


# Interaction between OPA and LTPA on HRV



# Association between LTPA and heart rate in tertiles of OPA

## Effect of LTPA on heart rate variability



# Conclusion

- We found that the beneficial effect of LTPA on nocturnal HR and HRV diminished with high levels of OPA.
- This suggests a contrasting and interactive effect of OPA and LTPA on cardiac autonomic modulation
- Thus, autonomic activity may contribute to the health paradox of OPA and LTPA, which should be confirmed in prospective studies

# Thanks!