Occupational physical activity and risk of ischaemic heart disease in women – the modifying effect of leisure time physical activity, hypertension and influence at work

The Danish Nurse Cohort Study

Karen Allesøe 2017

Men – high occupational physical activity and risk of CVD, IHD or MI

Year	Study	Protective effect	0-effect	Adverse effect
1982	Salonen	XX		
1985	Menotti	XX		
1986	Kannel			
1987	Sobolski			
1988	Salonen	XX		
1988	Johansson			
1992	Seccareccia	XX		
1995	Eaton			
1997	Foelsom			
1997	Rosengren			
2000	Kristall-Boneh			X
2003	Yu			X
2004	Barengo	XX		
2006	Virtanen			
2006	Virkunnen			X
2007	Graf-Iversen	XX		
2007	Hu	XX		
2010	Holtermann			XX
2012	Petersen	XX		
2012	Holtermann			XX
2013	Hu			XX
2013	Clays			X
2015	Krause			XX
2015	Harari			XX

X = trend XX = statistically significant

Women - high physical activity at work and risk of CVD, IHD or MI

Year	Study	Protective effect	0-effect	Adverse effect
1982	Salonen	XX		
1986	Lapidus	X		
2003	Foelsom			
2004	Barengo	XX		
2007	Graf-Iversen			
2007	Hu	XX		
2012	Petersen			X
2012	Holtermann (CCHS)			
2013	Hu			X

Prospective studies analysing men and women seperately

X = trend XX = statistically significant

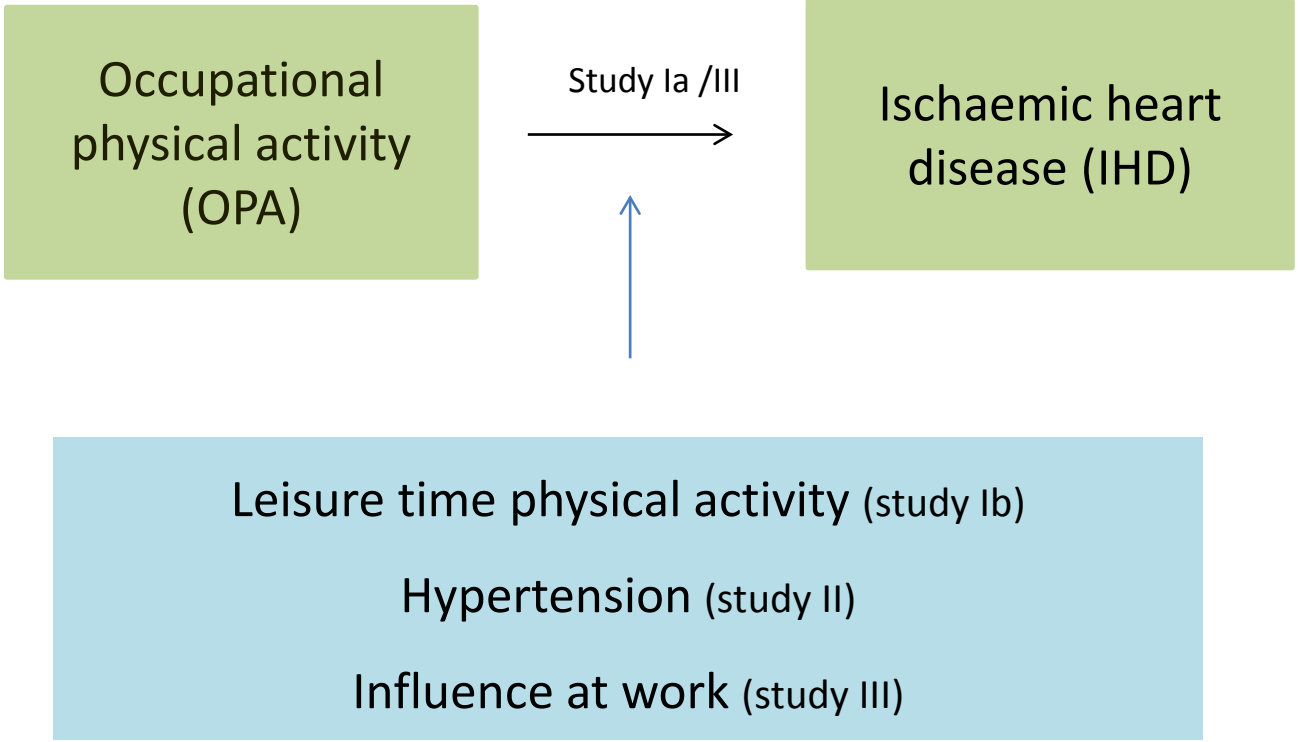
Modifying factors

- Risk modifyers potentially counteracting a higher risk of IHD from high OPA
  - A high level of leisure time physical activity
    - Modifying effect of high leisure time physical activity and physical fitness (men) (Holtermann, 2010 & 2012; Wang, 2016; Harari, 2015; Kristall-Boneh, 2000)
  - A high level of influence at work
    - No modifying effect of job influence (Clays, 2016)

Modifying factors

- Risk modifyer potentially further increasing the risk of IHD from high OPA:
  - Hypertension
    - Very few studies have investigated the joint effect on risk of IHD of hypertension and high OPA (Virkkunen, 2007; Holtermann, 2010) and none among women

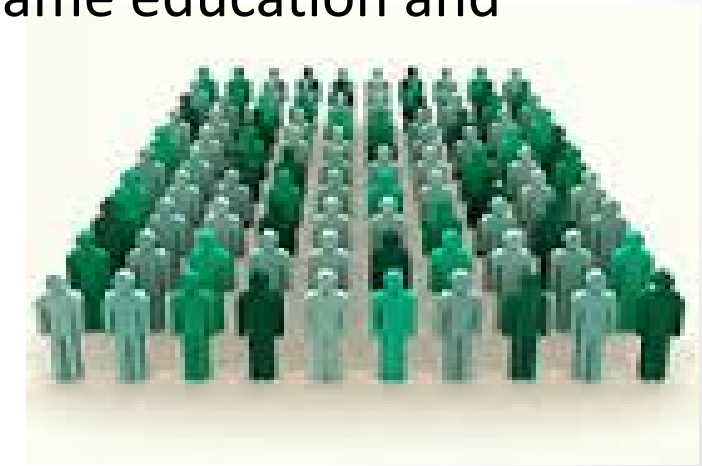
Aim


Occupational physical activity (OPA)
Study Ia /III
Ischaemic heart disease (IHD)
Leisure time physical activity (study Ib)
Hypertension (study II)
Influence at work (study III)

MATERIALS & METHODS

The Danish Nurse Cohort study

- In 1993, members of the Danish Nurses' Association aged 45 or older (n=23,170) received by post a comprehensive, self-administered questionnaire
- 19.898 nurses returned the 1993 questionnaire (86%)
- A large cohort of women with the same education and profession



Study population & baseline

- Study population:12.093 nurses actively employed, aged 45 – 64
- Questionnaire-based information at baseline in 1993

Physical activity at work (OPA)

1. Sedentary OPA: mainly sedentary work without any physical exertion.

2. Moderate OPA: work that to a large extent is carried out standing or walking, but is otherwise not physically exerting.

3. Demanding OPA: standing or walking work that involves some lifting or carrying (high)

4. Strenuous OPA: heavy or fast and physically exerting work (high)

(Saltin & Grimby, 1968)

Leisure time physical activity (LTPA)

1. Sedentary LTPA: Read, watch television or engaged in other sedentary activity

2. Moderate LTPA: Go for a walk, use your bicycle, or perform light physical activity

3. Are an active athlete or performing heavy gardening, housework, etc. for at least four hours per week

3 and 4: Vigorous

4. Wigorous training and participation in competitive sports several times a week

Hypertension

Are you now suffering from, or have you previously suffered from hypertension?

Influence at work

What level of influence do you normally have on the organisation of your daily work?

1. High influence
2. Some influence
3. Very low influence
4. No influence

High

Low

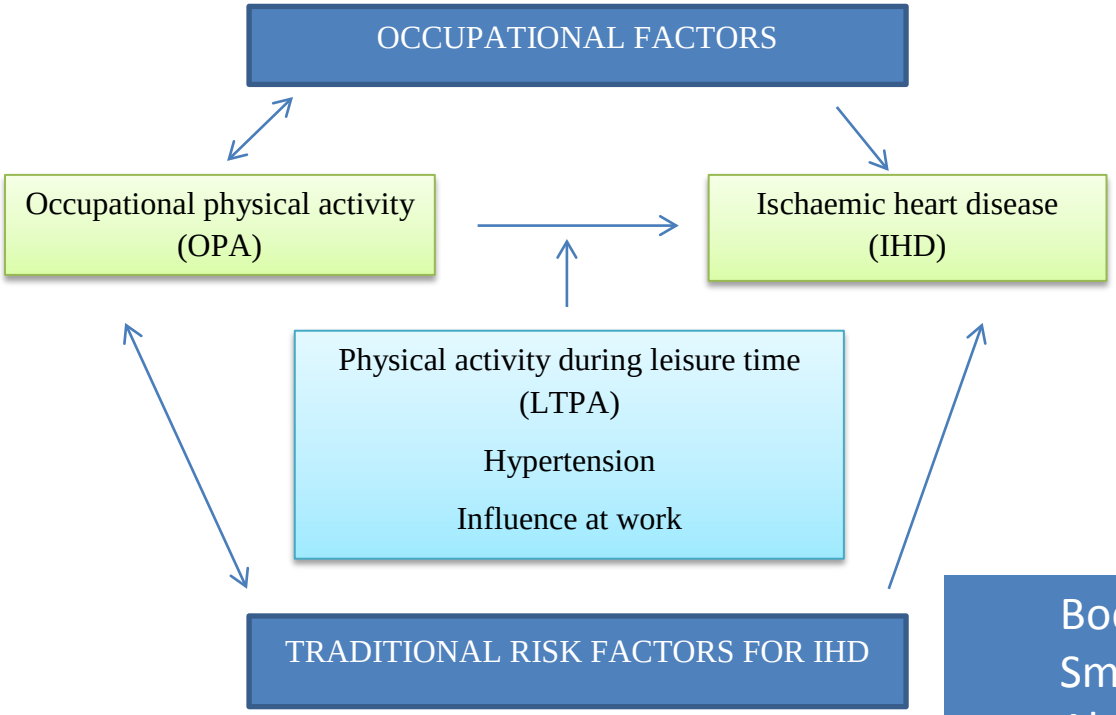
Outcome: Ischaemic heart disease

- The outcome in all three studies was incident hospitalisation with Ischaemic heart disease*
- Individual linkage to the Danish National Patient Registry
- Follow-up time: 15 years (study I and II) and 20 years (study III)

*MI (410 in ICD-8 and I21-23 in ICD-10), other acute or chronic IHD (411-412 in ICD-8 and I24-25 in ICD-10), angina (413 in ICD-8 and I20 in ICD-10) or electrocardiographically-diagnosed heart disease (414 in ICD-8).

Covariates

Work pressure
Work hours per week
Shift work



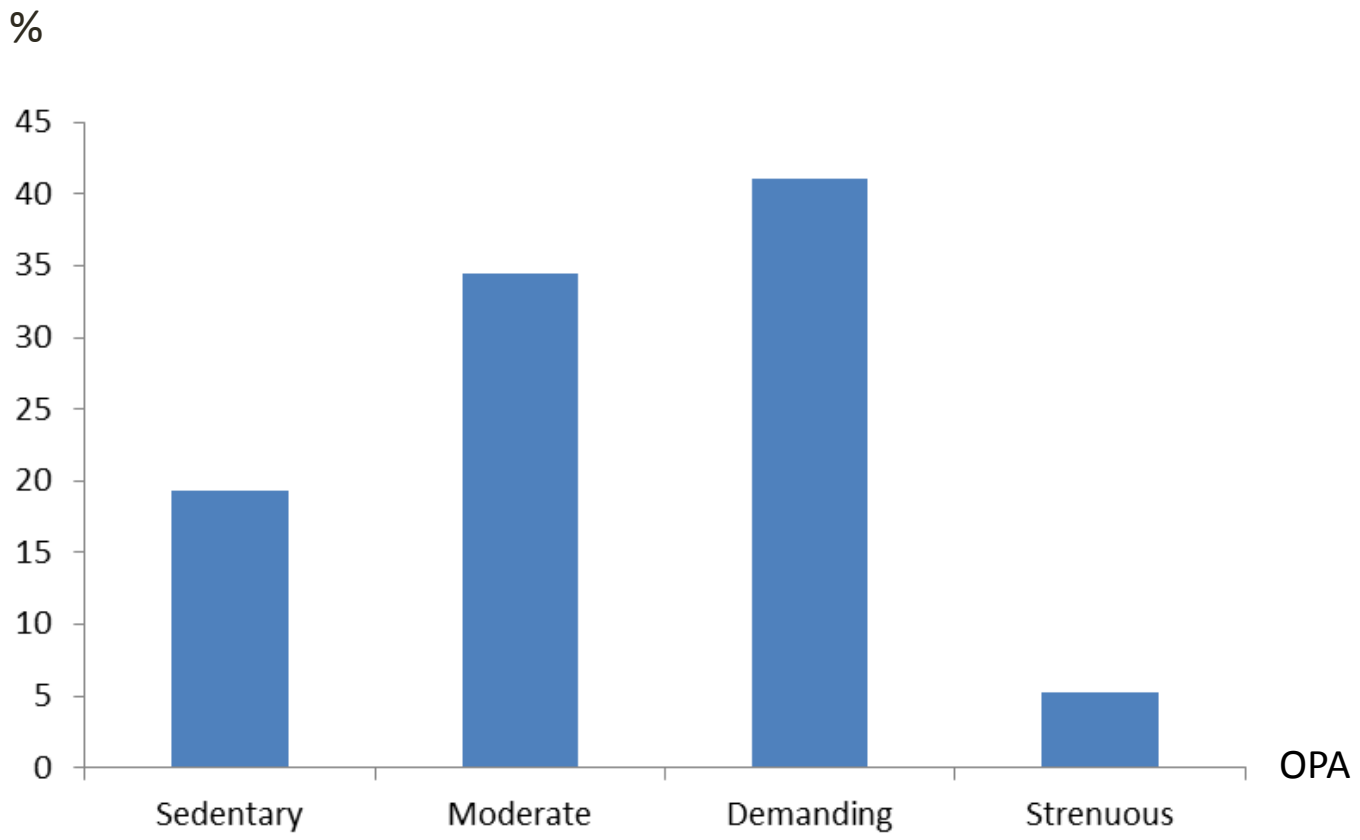
Body mass index (BMI)
Smoking
Alcohol intake per week
Family history of heart disease
Diabetes

Main statistical methods

- Cox Proportional hazards regression analysis
  - Test for multiplicative interaction
- Additive hazards model
  - Test for additive interaction

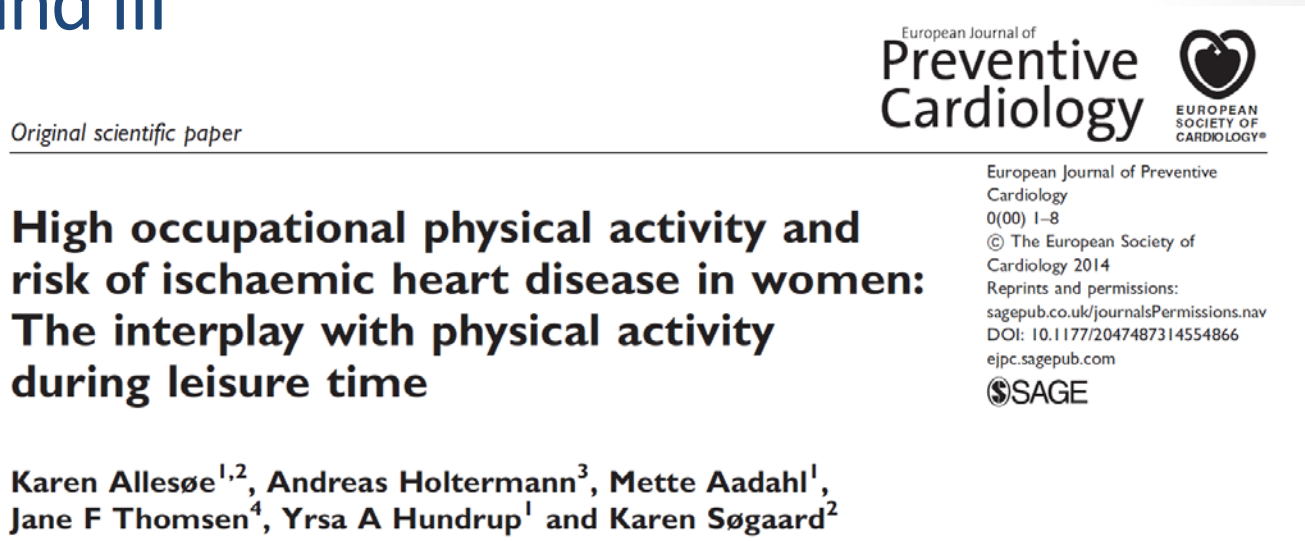
RESULTS

Occupational physical activiy at baseline



n=12,093

Study I and III



European Journal of Preventive Cardiology

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Original scientific paper

High occupational physical activity and risk of ischaemic heart disease in women: The interplay with physical activity during leisure time

Karen Allesøe[1,2], Andreas Holtermann[3], Mette Aadahl[1], Jane F Thomsen[4], Yrsa A Hundrup[1] and Karen Søgaard[2]

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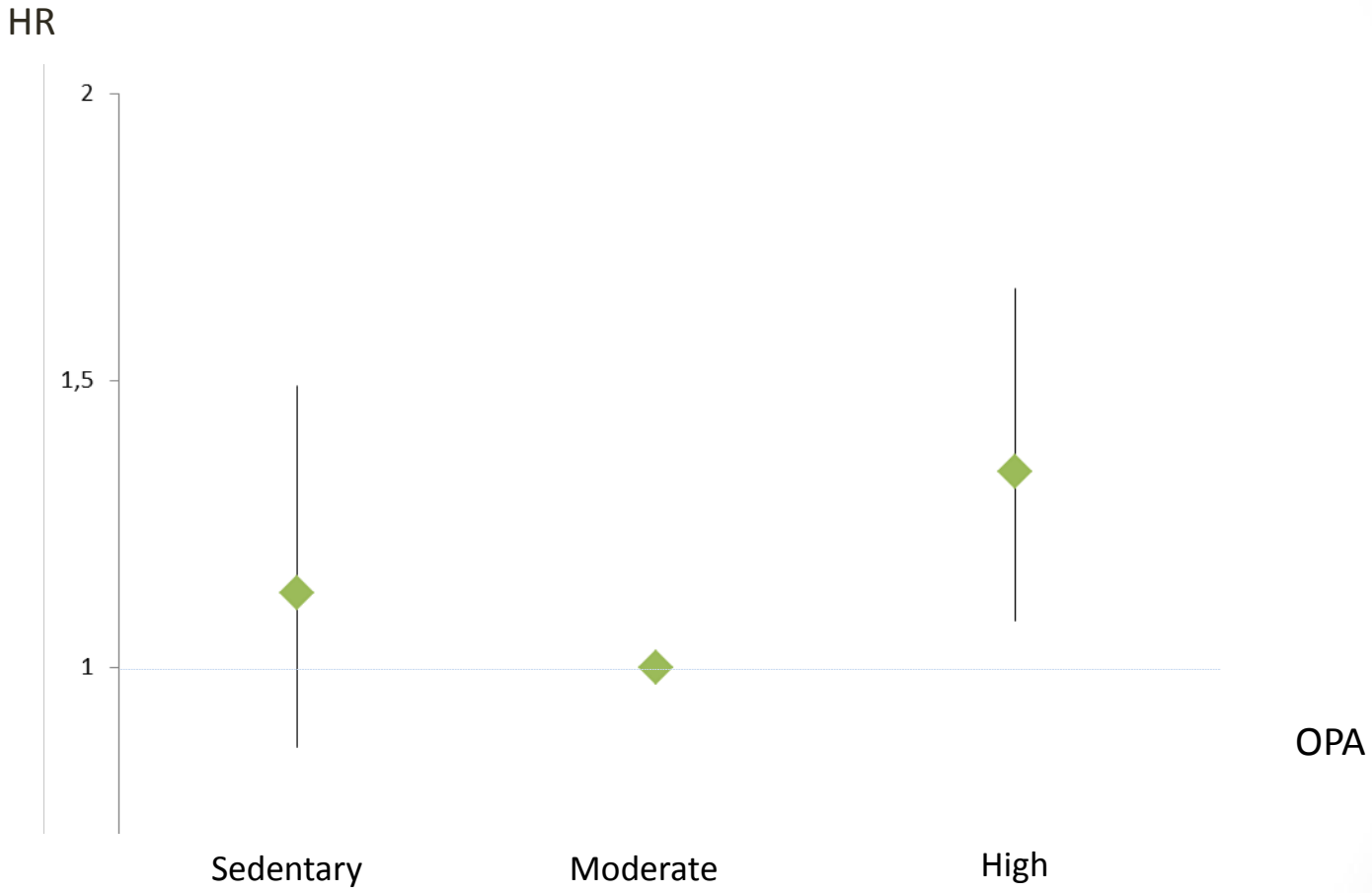
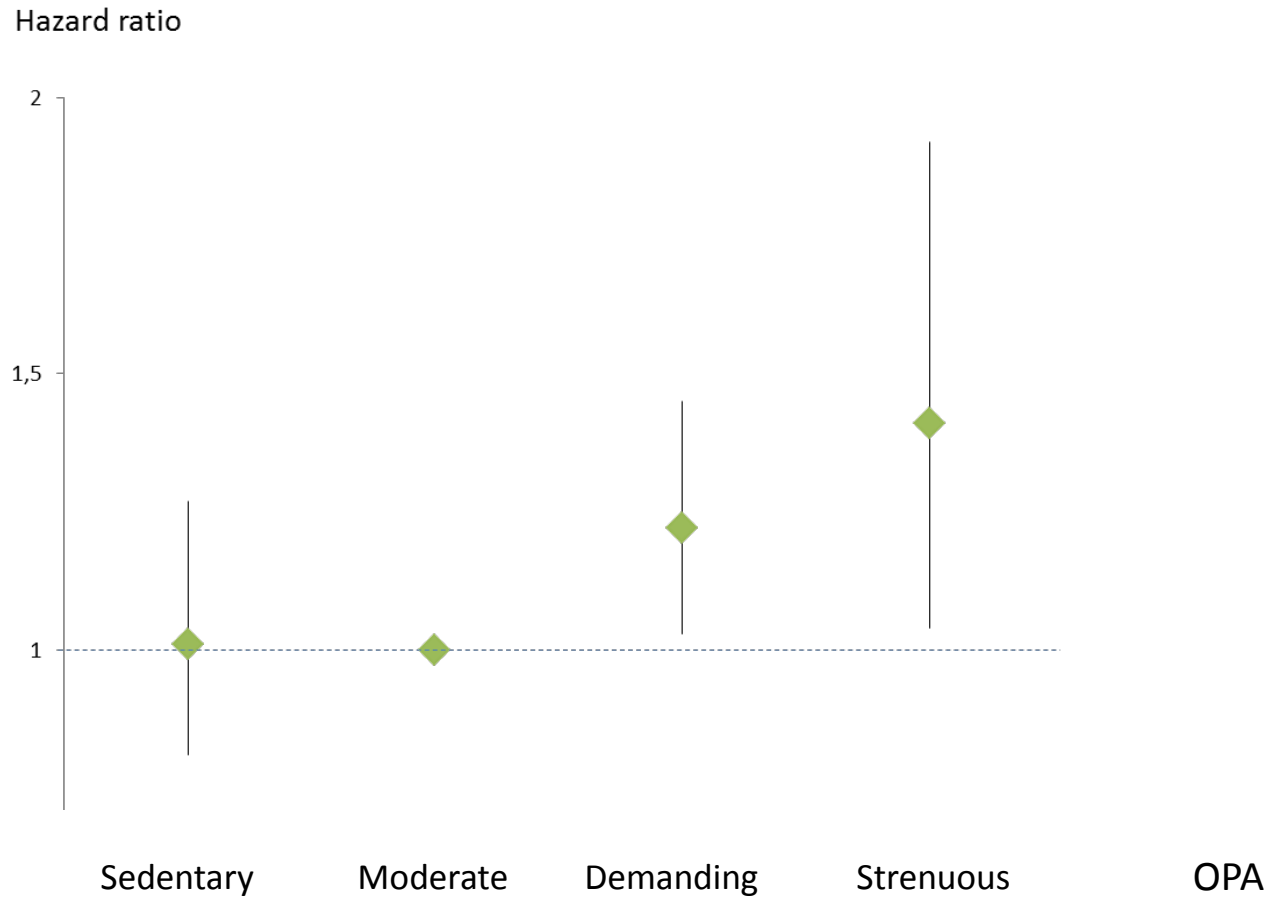
Occupational physical activity → Study Ia / III → Ischaemic heart disease

Occupational physical activity and risk of ischaemic heart disease - 15 years follow-up - study Ia



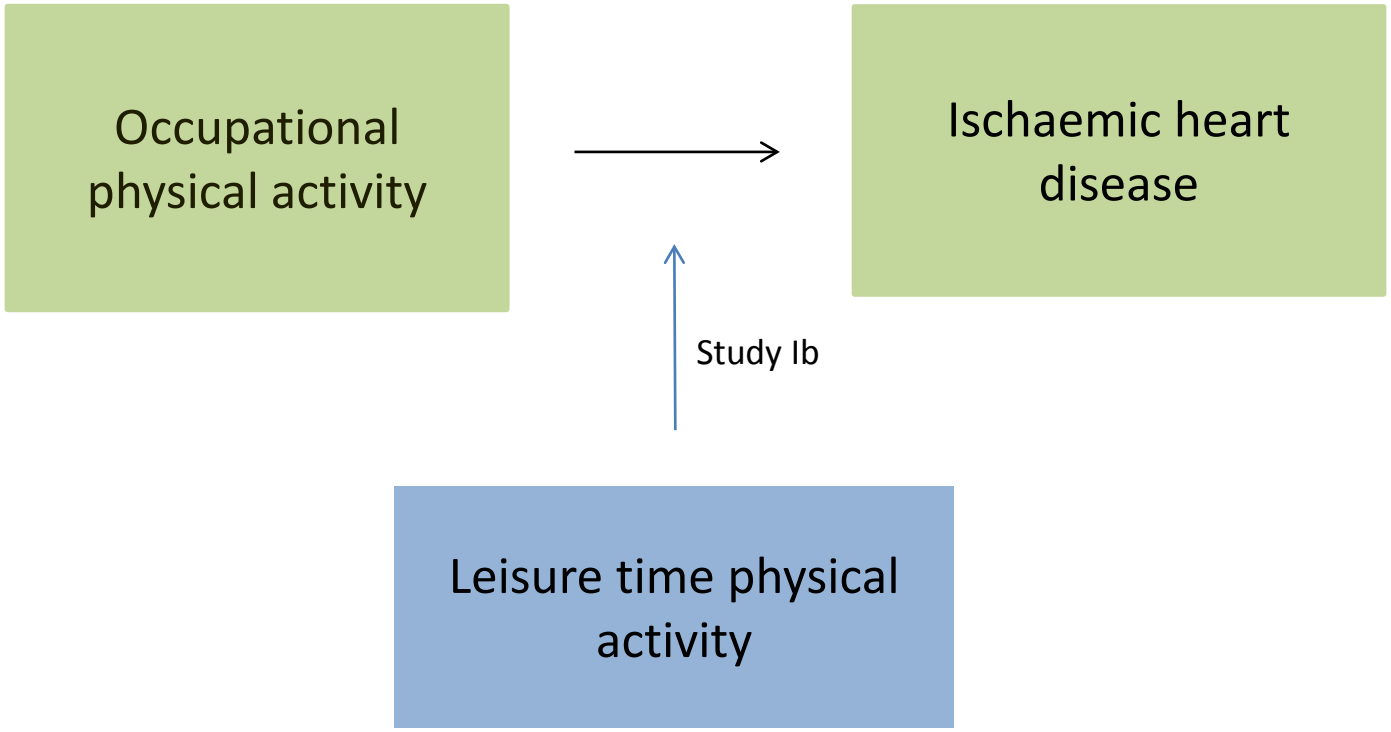
*Adjusted for age, risk factors for IHD (family history of IHD, diabetes, BMI, smoking and alcohol consumption), work pressure, influence at work, work hours per week and shift work (*Allesøe et al. Eur. J. Prev. Med. 2015)

Occupational physical activity and risk of ischaemic heart disease - 20 years follow-up

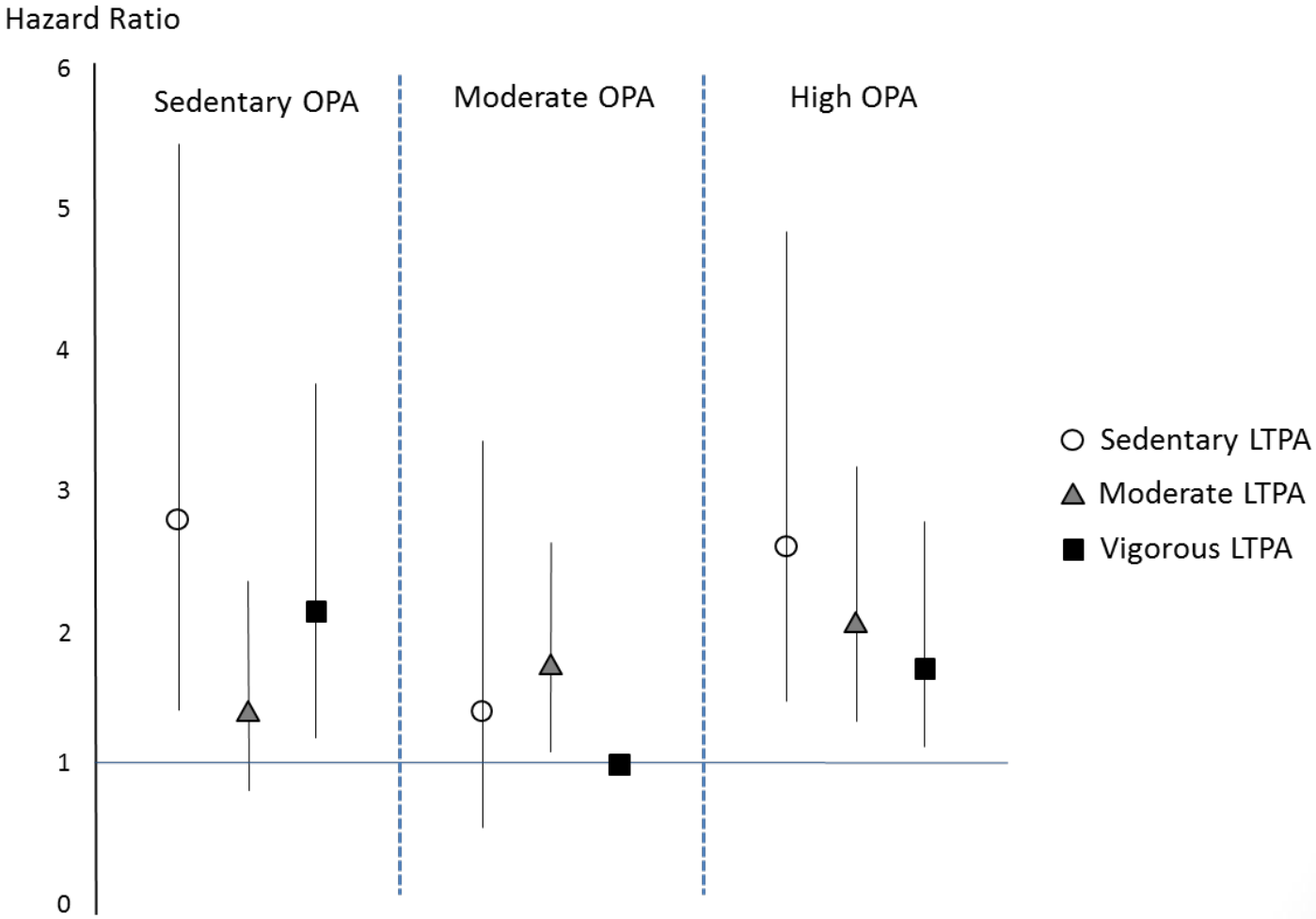


*Adjusted for age, risk factors for IHD (family history of IHD, diabetes, BMI, smoking and alcohol consumption), work pressure, influence at work, work hours per week and shift work (*Allesøe et al. Int Arch Occup Environ Health 2017).

Study Ib:


Occupational physical activity
Ischaemic heart disease
Study Ib
Leisure time physical activity

Combined effect of OPA and leisure time physical activity (LTPA) and the risk of IHD – Cox PH model



*Adjusted for age, risk factors for IHD (family history of IHD, diabetes, BMI, smoking and alcohol consumption), work pressure, influence at work, work hours per week and shift work (*Allesøe et al. Eur. J. Prev. Med. 2015).

Study II

European Journal of Preventive Cardiology

Original scientific paper

Are hypertensive women at additional risk of ischaemic heart disease from physically demanding work?

Karen Allesøe[1,2], Karen Søgaard[1], Mette Aadahl[2,3], Eleanor Boyle[1,4] and Andreas Holtermann[1,5]

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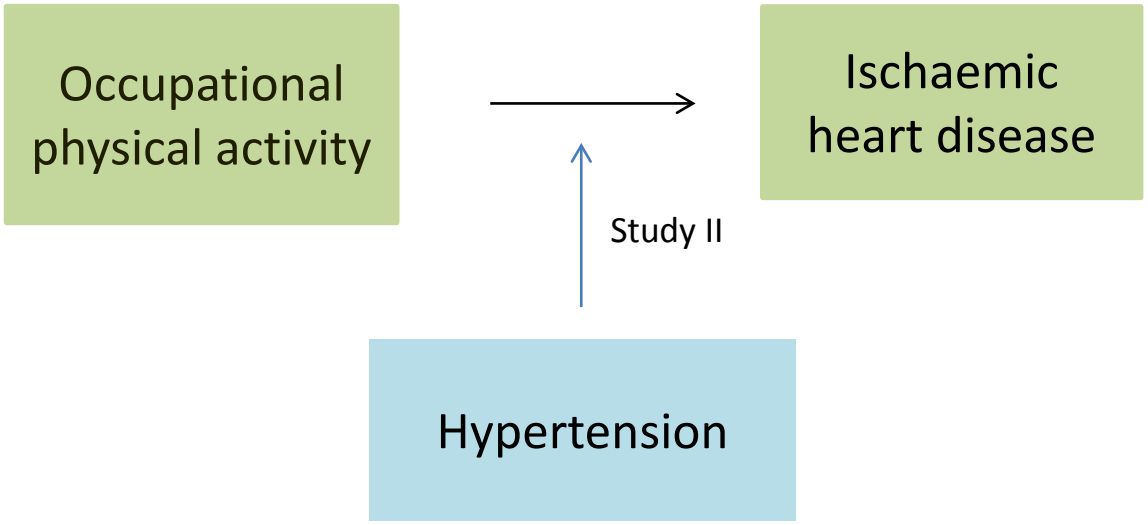
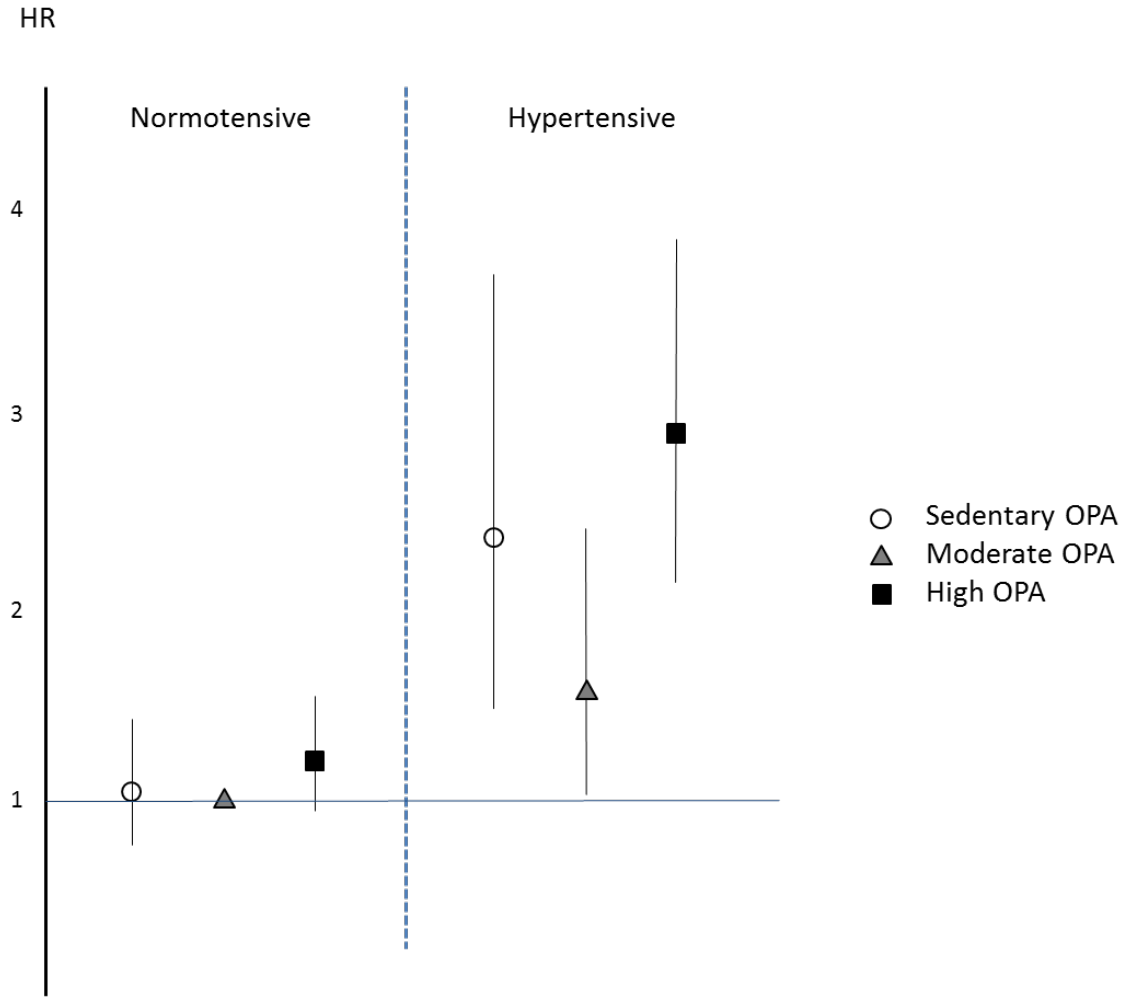
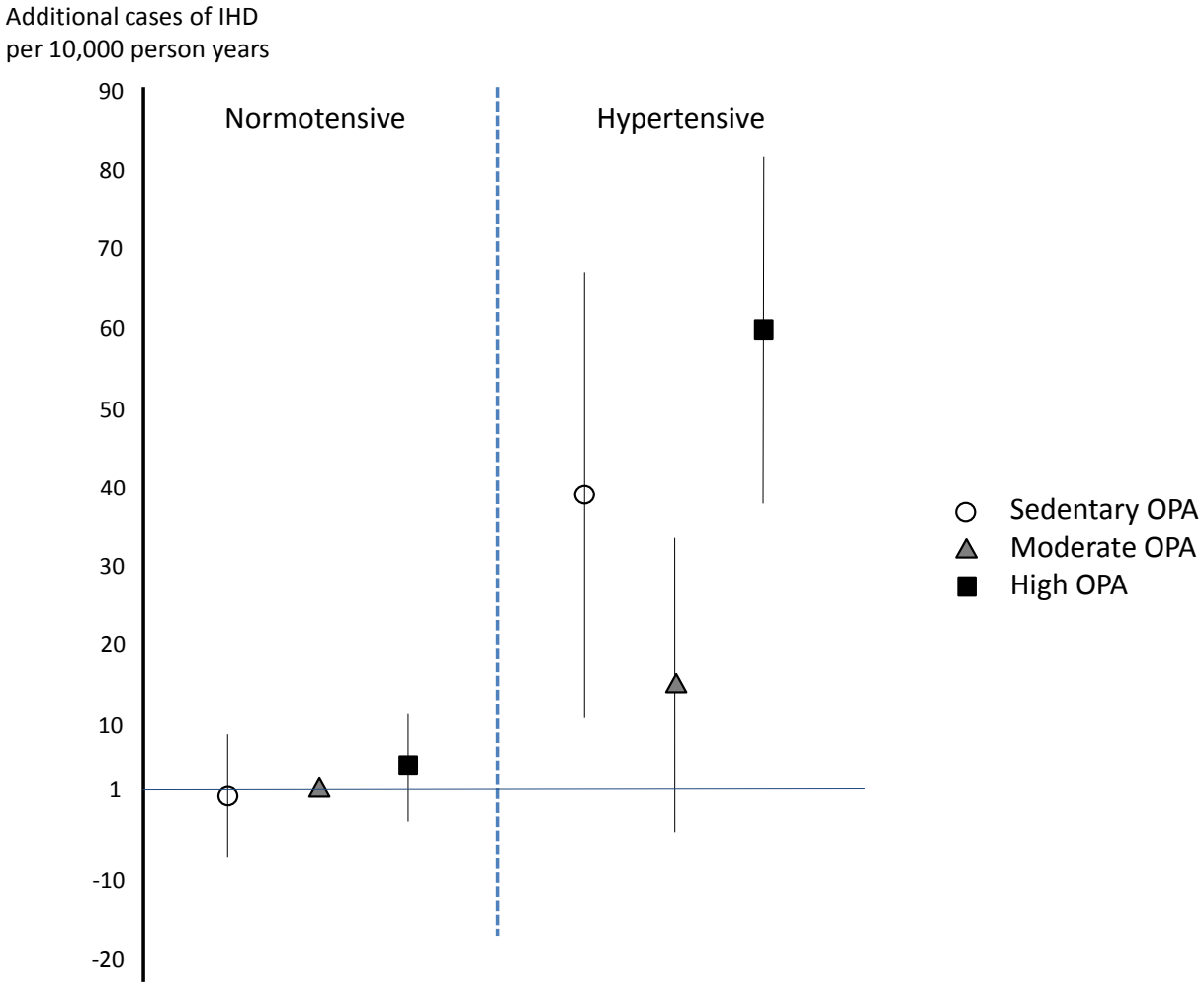


Effect modification by hypertension - Cox PH model



*Adjusted for age, risk factors for IHD (family history of IHD, diabetes, BMI, smoking and alcohol consumption), work pressure, influence at work, work hours per week and shift work (*Allesøe et al. Eur. J. Prev. Med. 2016).

Effect modification by hypertension - additive model



*Adjusted for age, risk factors for IHD (family history of IHD, diabetes, BMI, smoking and alcohol consumption), work pressure, influence at work, work hours per week and shift work (*Allesøe et al. Eur. J. Prev. Med. 2016)
Measure of effect modification OPA × influence at work on an additive scale p= 0.006

Study III

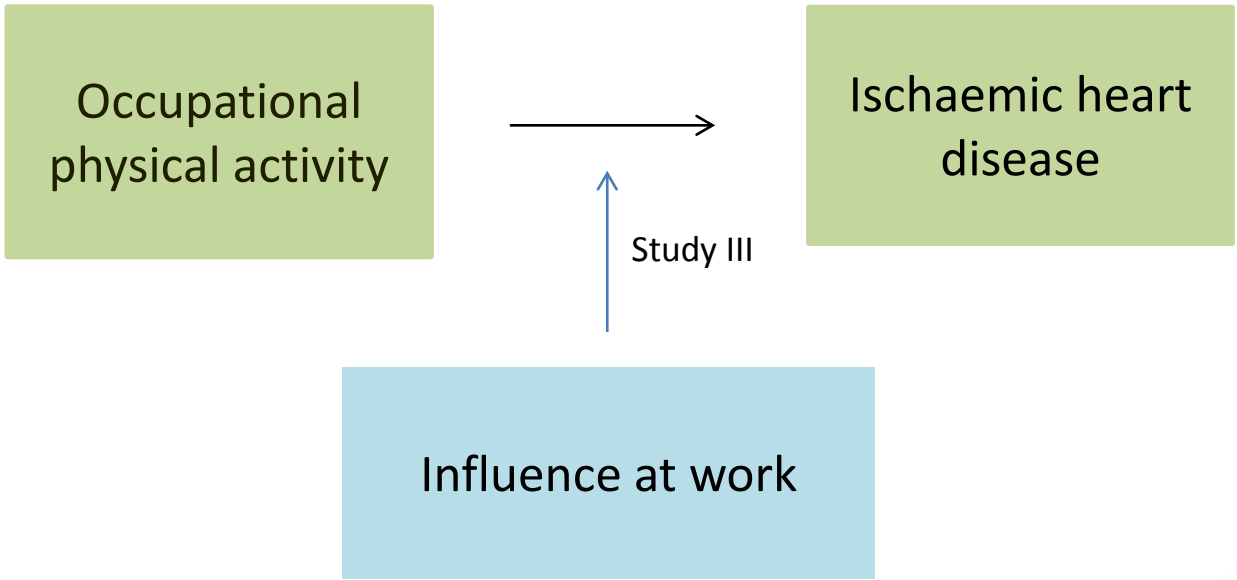
Int Arch Occup Environ Health
DOI 10.1007/s00420-017-1207-1

CrossMark

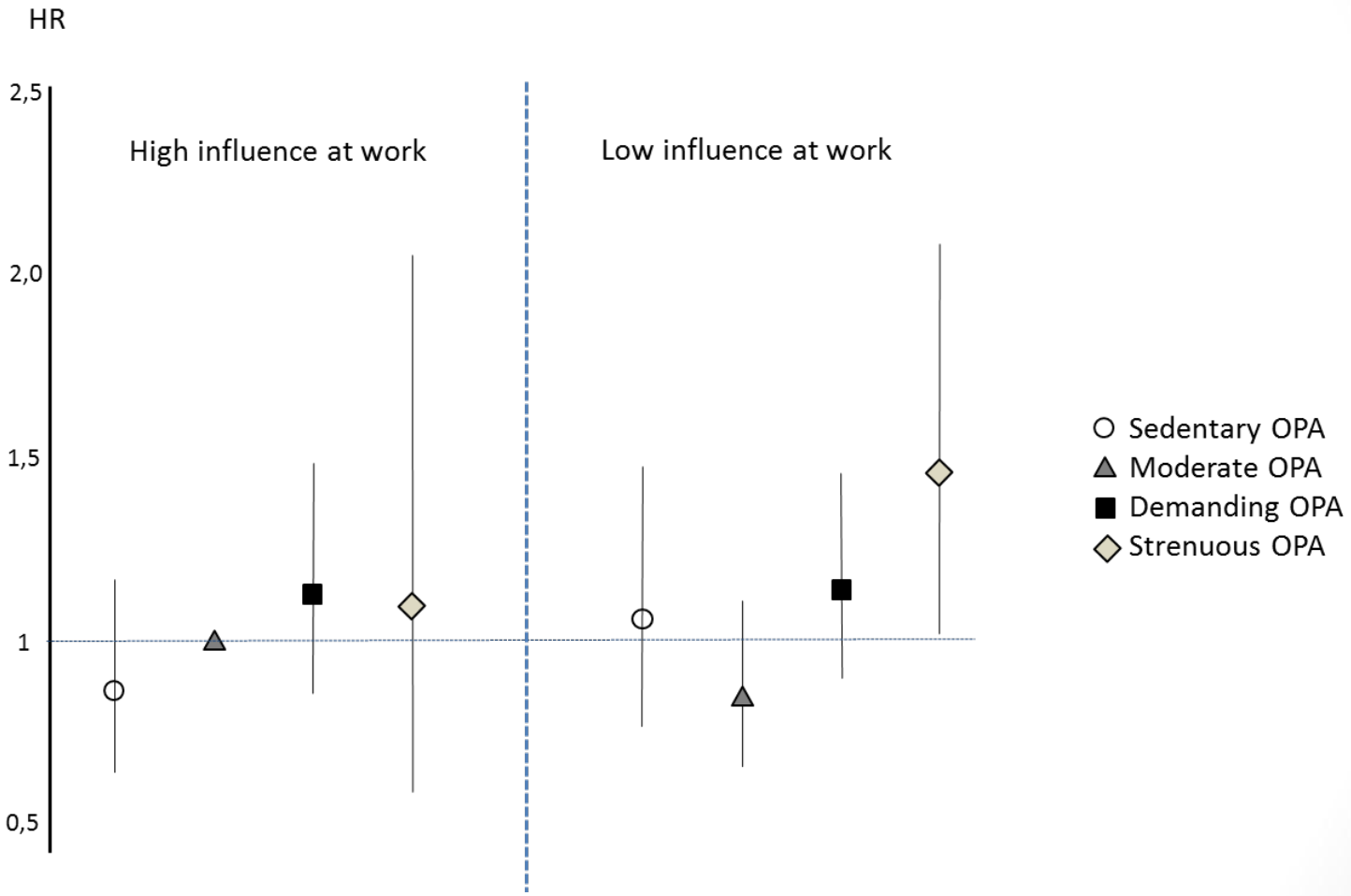
ORIGINAL ARTICLE

Does influence at work modify the relation between high occupational physical activity and risk of heart disease in women?

Karen Allesøe[1,2] · Andreas Holtermann[1,3] · Reiner Rugulies[3,4,5] · Mette Aadahl[2,4] · Eleanor Boyle[1,6] · Karen Søgaard[1]

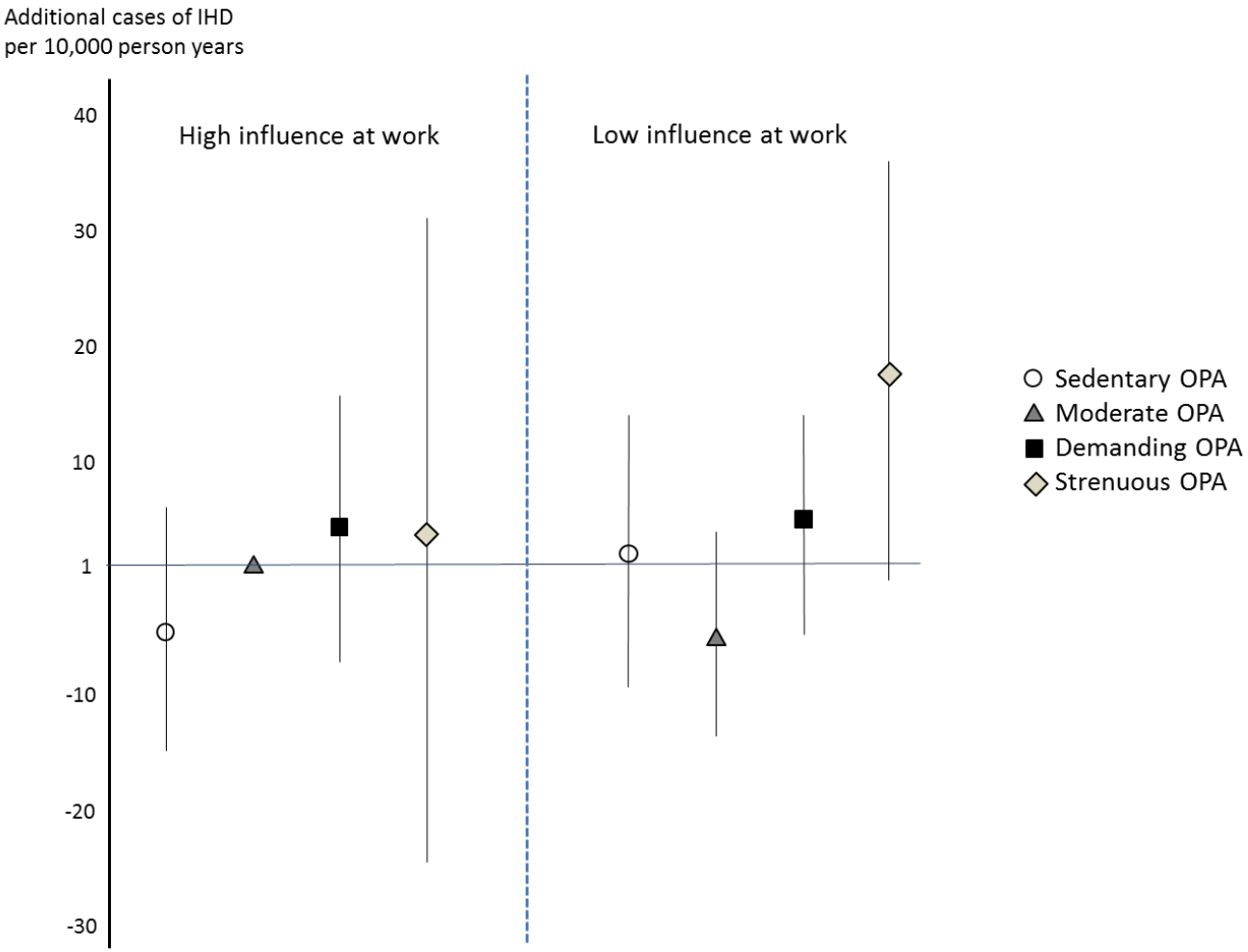


Effect modification by influence at work - Cox PH model



*Adjusted for age, risk factors for IHD (family history of IHD, diabetes, BMI, smoking and alcohol consumption), work hours per week and shift work (*Allesøe et al. Int. Arch. Occup. Environ Health 2017)

Effect modification by influence at work - additive model



*Adjusted for age, risk factors for IHD (family history of IHD, diabetes, BMI, smoking and alcohol consumption), work hours per week and shift work (*Allesøe et al. Int. Arch. Occup. Med. 2017)

DISCUSSION

Is high occuptional physical activity associated with higher risk of ischaemic heart disease?

- Yes high occupational physical activity was associated with higher risk of ischaemic heart disease
- Special working conditions of nurses?

Can vigorous leisure time physical activity counteract an increased risk of IHD associated with high OPA?

Indicated: but vigorous leisure time physical activity did not completely counteract the increased risk of IHD associated with high OPA.

Is the risk of IHD from high OPA higher among women with hypertension than among normotensive women?

- Yes, nurses with hypertension had a high risk of ischemic heart disease from high OPA that was not found among normotensive nurses
- Additive interaction between high OPA and hypertension
- Only few former studies and the first among women

Can high influence at work counteract a detrimental association between high OPA and risk of ischaemic heart disease?

- Indicated: A higher risk of ischaemic heart disease from strenuous OPA was observed among nurses with low and not among those with high influence at work

- A detrimental interaction between strenuous OPA and low influence at work was indicated.

Strenghts

- Large cohort of women and high participation rate
- Registry-based information on incident IHD
- Less confounding from socioeconimic factors

Limitations

- Self-reported measures
- Exposure measured at one point in time
- External validity

Thank you