

Session V - Part I
**Empirical findings: Psychosocial
workplace factors and health
outcomes**

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UCLA Work and Health
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OCCUPATIONAL STRESS AND HEALTH

WORK ORGANIZATION and JOB DESIGN

Job demands
Skill levels
Decision authority
Social support
Job security
TAV
ERI
Shift Work
Long Working Hours
Physical environment
Technology



DISEASE OUTCOMES

Cardiovascular Disease
Psychological Distress
Musculoskeletal Disorders
Others

Empirical findings: Psychosocial workplace factors and health outcomes

CARDIOVASCULAR DISEASE

- Job strain studies
 - Cornell NYC Work Site Blood Pressure Study
- Effort-reward imbalance studies
- Shiftwork, overtime
- Threat-avoidant vigilant work
- Population attributable risk for workplace risk factors

PSYCHOLOGICAL DISTRESS

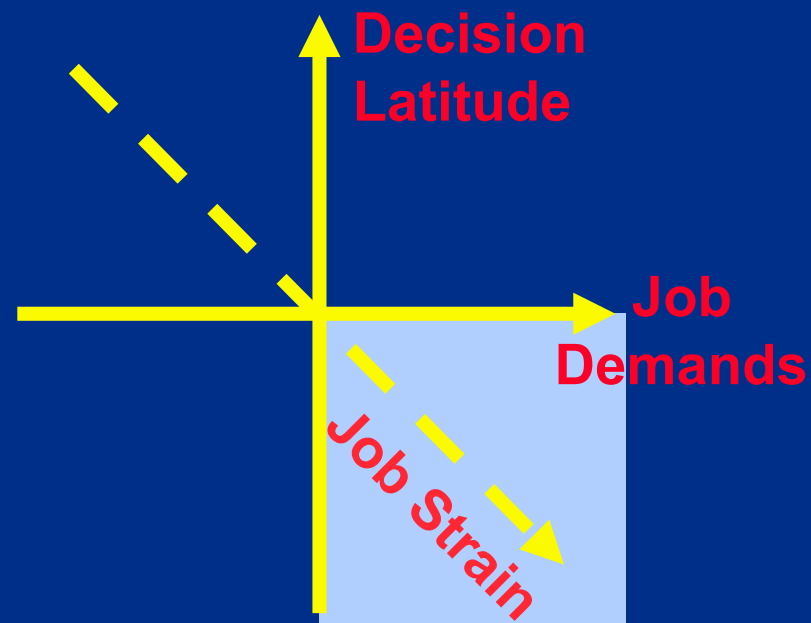
MUSCULOSKELETAL DISORDERS

CURRENT TRENDS: Job strain, CHD

CRITERIA FOR EVALUATING RESEARCH STUDIES

Job Strain (Karasek)

Definition: The combination of HIGH Job Demands and LOW Decision Latitude



Studies of Job Strain and Ambulatory Blood Pressure (updated 6/2006)

	<u>Significant positive associations</u>	<u>Mixed positive and null associations</u>	<u>Total # of studies</u>
Ambulatory BP	9	16	25
men	4	6	10
women	3	4	7
both	2	6	8

Belkić K, Landsbergis P, Schnall P, Baker D, Theorell T, Siegrist J, Peter R, Karasek R. Psychosocial factors: Review of the empirical data among men. *Occupational Medicine: State of the Art Reviews* 2000;15(1):24-46.

5

Brisson C. Women, work, and CVD. *Occupational Medicine: State of the Art Reviews* 2000;15(1):49-57.

Studies of Job Strain and Coronary Heart Disease

- 34 studies published between 1981 and 2002
 - 16 from Sweden (many using national data bases)
 - 7 from U.S. (2 using national data bases)
 - Also: Czech Republic, Denmark, England, Finland, Japan

	Significant positive associations	Mixed positive and null associations	Total # of studies
Cohort studies	8	3	17
Case-control studies	6	0	9
Cross-sectional studies	4	0	8

Job Strain and Cardiovascular Risk Factors other than Blood Pressure

(n=15 total studies)

	<u>Significant positive associations</u>	<u>Mixed positive and null associations</u>	<u>Total # of studies</u>
cigarette smoking	3	6	11
serum cholesterol or high fat intake	0	2	7
sedentary behavior	1	1	3
body mass index	1	2	5
plasma fibrinogen	2	1	4 ⁷

Population attributable risk % for CVD due to Job Strain

<u>Study population</u>	<u>Study Years</u>	<u>Outcome</u>	<u>% Job Strain Exposure</u>	<u>RR</u>	<u>PAR%</u>
New York City men	1985-8	High BP	21	2.8	27.4
U.S. men - HES	1960-2	MI	21.8	2.48	24.4
U.S. men - HANES	1971-5	MI	23.2	3.28	34.6
Swedish men	1976-86	CVD	20	1.9	15.3
European men and women	1996	CVD	30	1.5-2.0	13-23
			<u>%exposed</u>		
Swedish men	1977-90	CVD	75 ¹	1.72	35
Danish men	1991	CVD	6 ²	2	6
Danish women	1991	CVD	16 ²	2	14

¹ exposed to medium and low work control

² exposed to monotonous high-paced work

New York City Worksite Ambp Study

1985-2001

**Dr. Thomas Pickering
Dr. Peter Schnall
Dr. Joseph Schwartz
Dr. Paul Landsbergis**

The New York City Work Site Blood Pressure (BP) Study

- Based at Weill Medical College of Cornell University-New York Hospital
- Began in 1985 as a case-control study
- 283 men initially enrolled at 8 large NYC work sites
- Funding became available (after studying 7 sites) to:
 - conduct a prospective study (evaluate Ss every 3-4 yrs)
 - enroll women
- Currently, 472 subjects enrolled at 10 sites (38% women)
 - maximum of 4 evaluations & 10 years of follow-up

The New York City Work Site BP Study:

First 8 participating work sites

- **Newspaper typography department**
- **Federal health agency**
- **Stock brokerage firm**
- **Liquor marketer**
- **Private hospital**
- **Sanitation collection and repair facility**
- **Department store warehouse**
- **Insurance company**

The New York City Work Site BP Study:

Enrollment procedures

Initial BP screening

- 3 sitting readings of BP using the AHA protocol (used average of last 2 readings)
- $\geq 75\%$ of employees in a dept had to participate in order to be eligible for the study
- eligibility determined

Recruitment BP measurements (4-6 weeks later)

- to confirm **cases** (>85 DBP on both occasions or meds) and **controls** (≤ 85 DBP on both occasions)

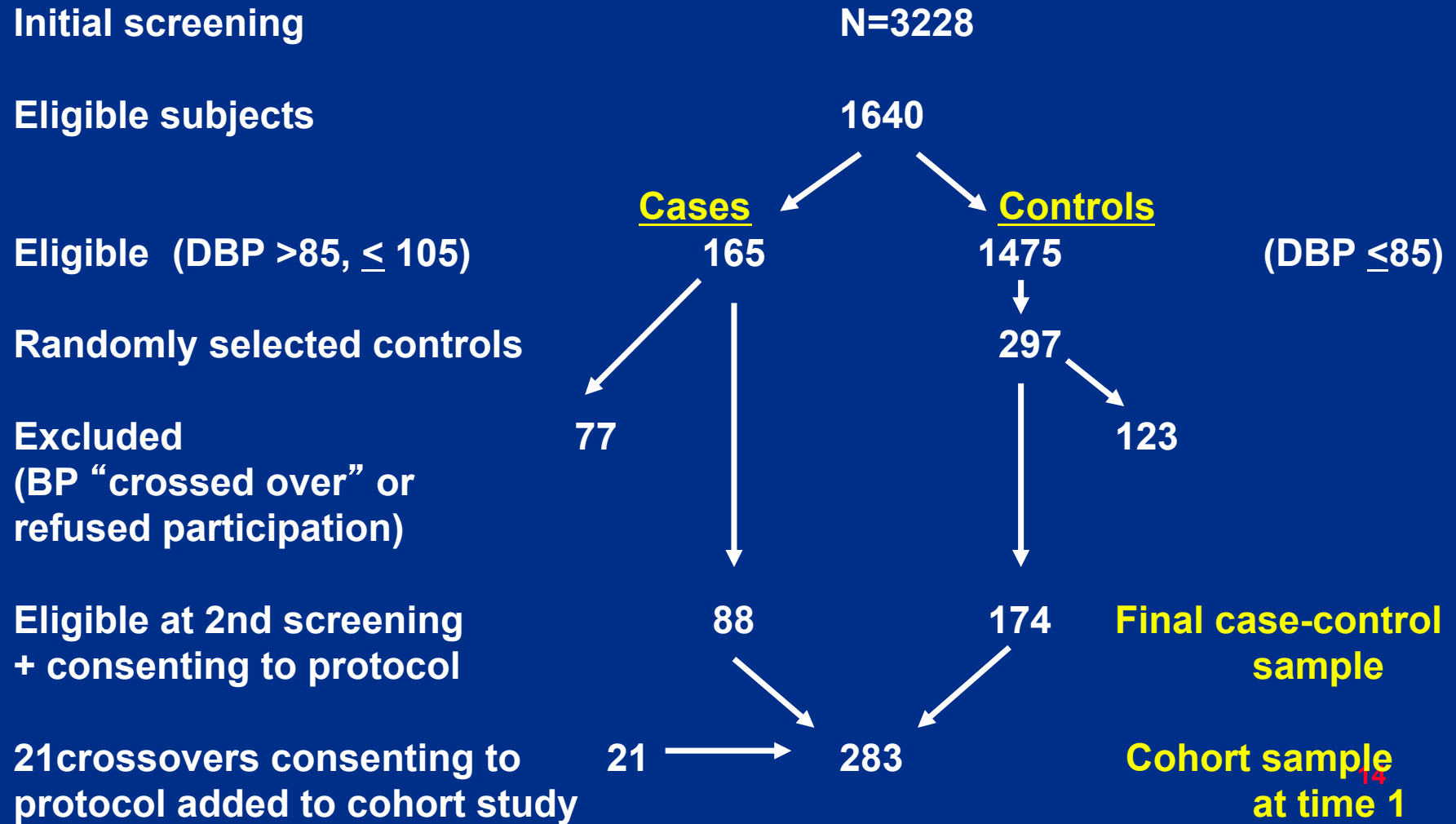
Stratified sampling of cases (only first 7 sites)

- All cases & a random sample of controls
- case-control ratio 2:3

The New York City Work Site BP Study: Eligibility criteria

- aged 30-60 at recruitment
- full-time employee (30+ hours/wk)
- no second job requiring more than 15 hours/wk
- no evidence of CHD
- screening BPs less than 160/105 mm Hg
- able to read and speak English
- body mass index ≤ 32.5 kg/m² at screening
- at current worksite ≥ 3 yrs before recruitment and before Dx of high BP (only 1 yr at 8th site)

The New York City Work Site BP Study: Men selected from first 8 work sites



Potential effects of sample selection on study results

Temporal bias

- Hypertensives select into high strain jobs?
 - 3 yr job tenure requirement
 - selection out of high stress jobs

Selection bias

- Due to non-participation
 - comparison of participants & non-participants
 - 75% of dept screening requirement

Reduced statistical power

- Reduced variation in
 - exposure (mgmt resistance, logistics, language)
 - outcome (exclude severe HPTs, CHD, high BMI)

The New York City Work Site BP Study: Protocol

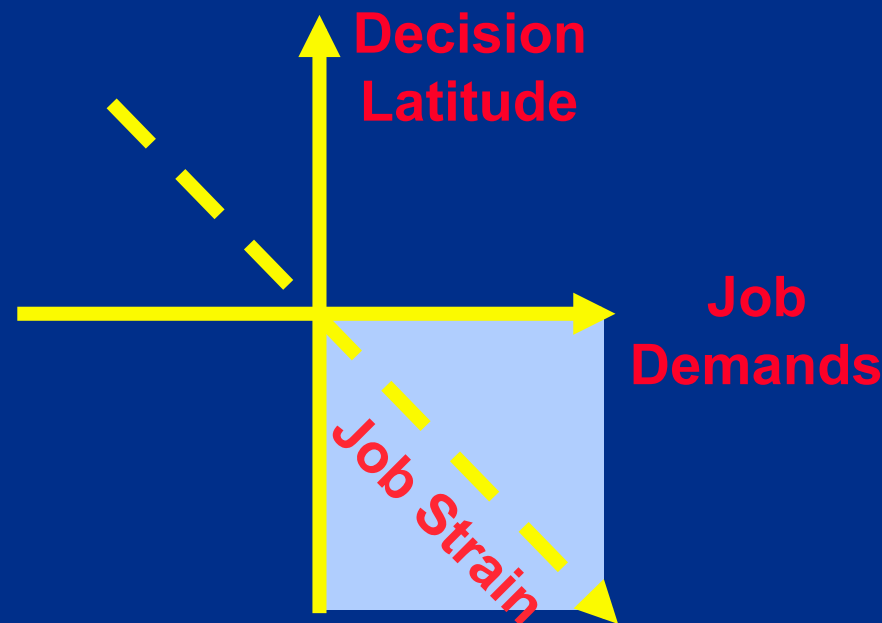
- 1. Job Content Questionnaire (Karasek) + detailed psychosocial + health behavior questionnaire**
- 2. Wear an ambulatory BP monitor for 24 hours, including a work shift, plus diary**
- 3. Complete cardiovascular work-up**
 - physical exam**
 - blood sample (cholesterol)**
 - EKG**
 - echocardiogram**
 - exercise stress test**

Ambulatory BP monitoring: Improving validity of outcome measures

1. The portable monitor automatically records BP every 15 min. during waking hours, and every 30 min. during sleep.
2. Ambulatory BP (AmBP) is more reliable and valid than casual (office) BP measurements.
 - a. Reliability:
 - no observer bias
 - increased number of readings
 - b. Validity:
 - BP measured during normal daily activities
 - AmBP more highly correlated with target organ damage (e.g, LVH) & CVD

Job Strain

Combination of HIGH Psychological Job Demands + LOW Job Decision Latitude (decision-making authority and skill use)



Job Content Questionnaire Items (Karasek)

Definition: Job Strain is the combination of
HIGH Job Demands and LOW Job Decision Latitude

Psychological Workload Demands

1. My job requires working very fast
2. My job requires working very hard
3. I am not asked to do an excessive amount of work *
4. I have enough time to get the job done*
5. I am free from conflicting demands others make*

* item reverse coded

Job Content Questionnaire (cont' d)

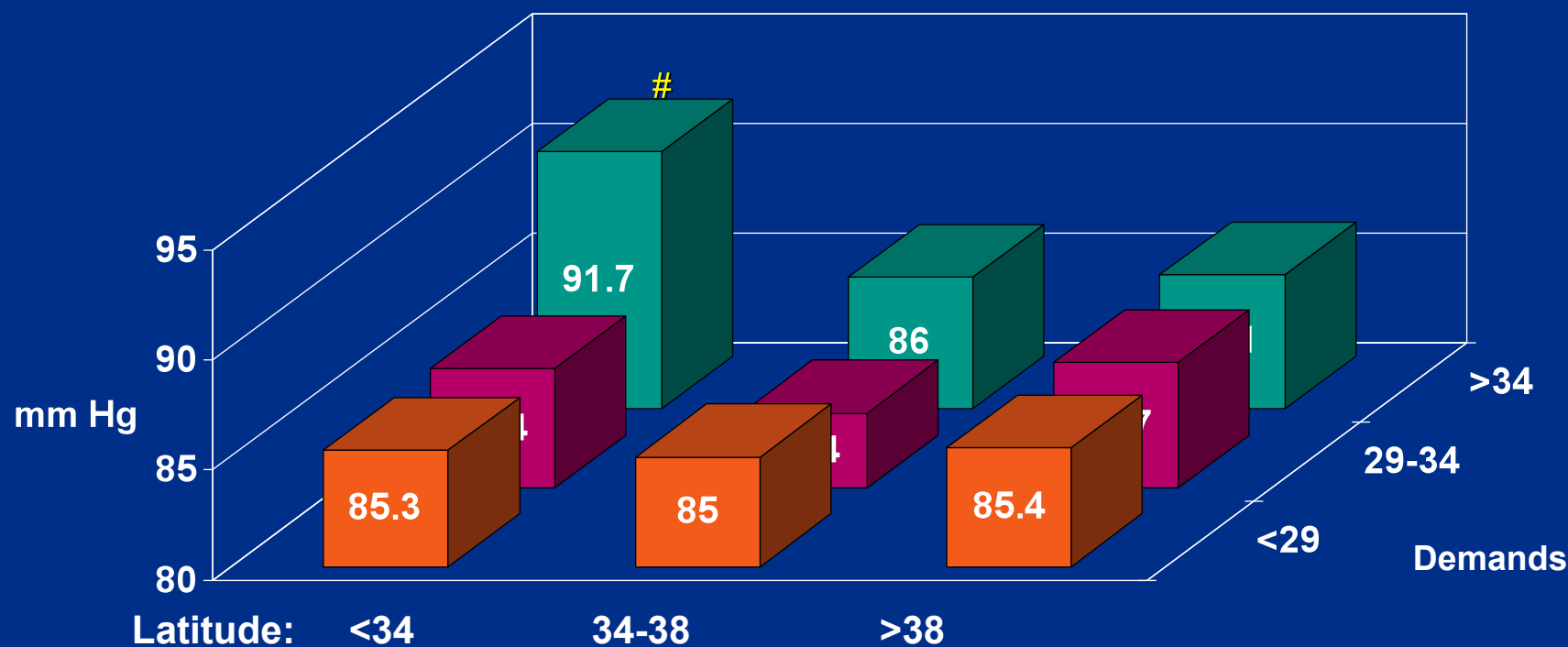
Job Decision Latitude

1. My job requires that I learn new things
2. My job requires me to be creative
3. My job requires a high level of skill
4. I get to do a variety of things on my job
5. I have a lot to say about what happens on my job
6. My job involves a lot of repetitive work *
7. My job allows me to make a lot of decisions on my own
8. On my job, I am given a lot of freedom to decide how I do my work
9. I have a lot to say about what happens on my job

* item reverse coded

Work Ambulatory Diastolic BP by Job Demands and Job Decision Latitude

(n=208 men, Time 3)



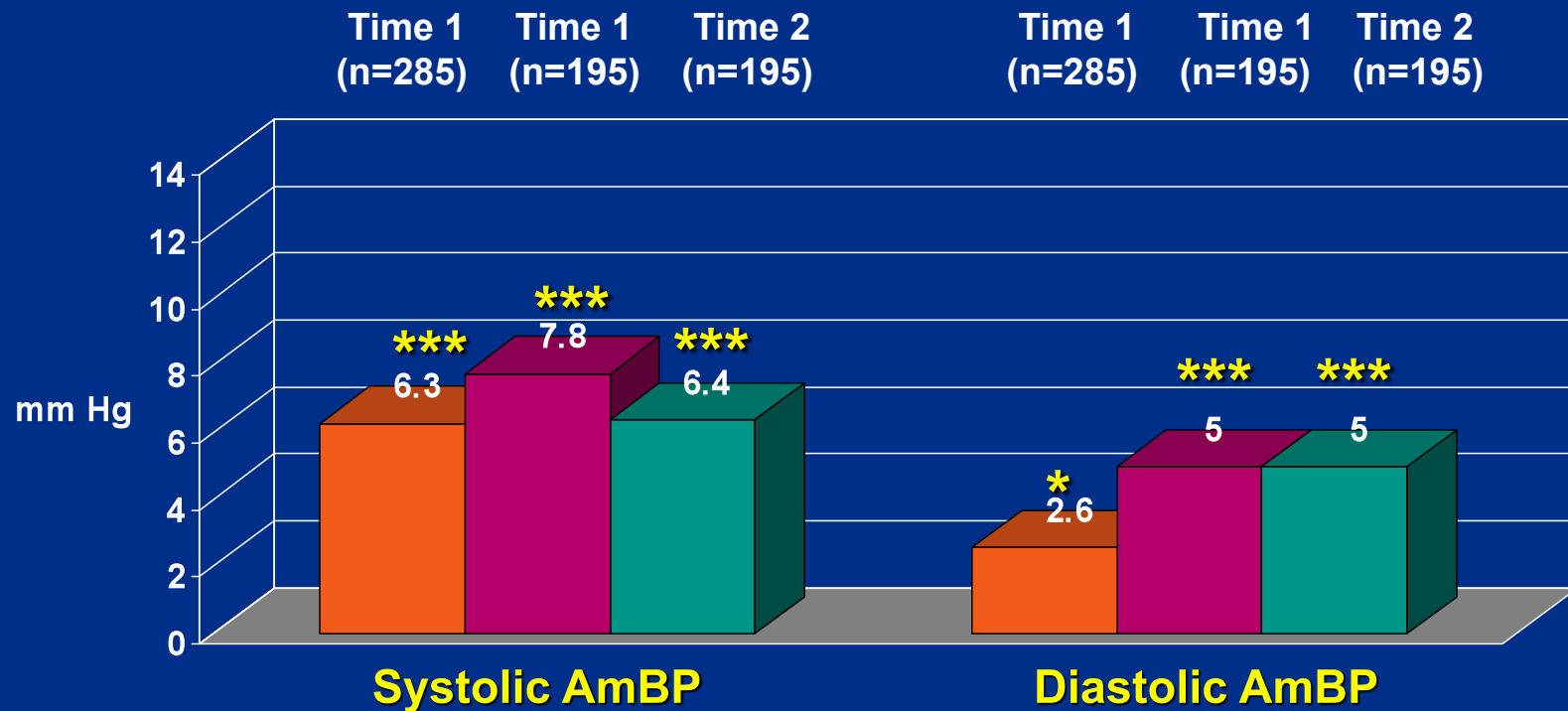
controlling for age, body mass index, race, education, smoking, alcohol use and work site

[#]p<.10 (vs mean of other 8 cells)

The New York City Work Site BP Study: Cohort study sample, time 1 to time 2

Eligible at time 1	283 men	
Ineligible at time 2	-24	3 deceased 6 CVD 15 unemployed, disabled, retired
Lost to follow-up	-64	10 could not be located 44 refused 10 did not complete protocol
Cohort sample with complete data	<u>195</u>	

Effect of Job Strain on Work Ambulatory BP (men, Time 1 and Time 2)



controlling for age, education, body mass index, race, smoking, alcohol use, work site

***p<.001, **p<.01, *p<.05

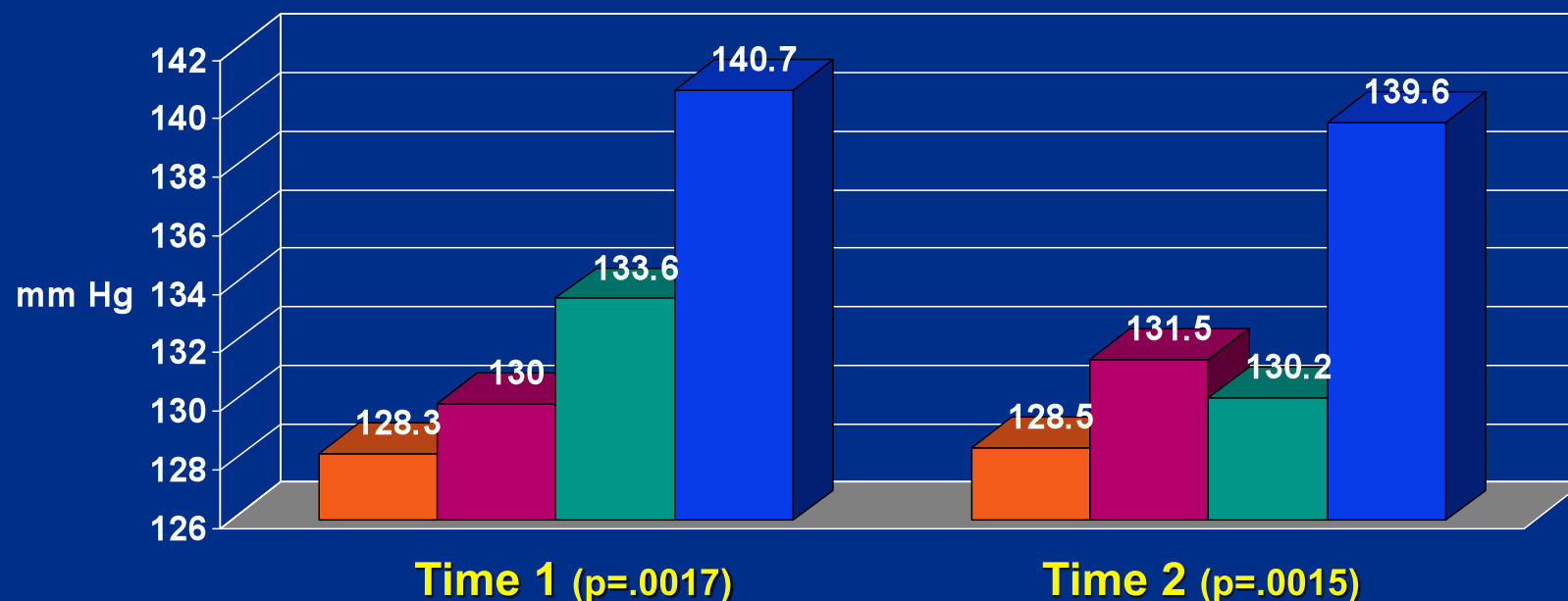
Job Strain Change Variable



Work Site BP Study

Job Strain change and Work Systolic Ambulatory BP (n=195 men, Time 1 and 2)

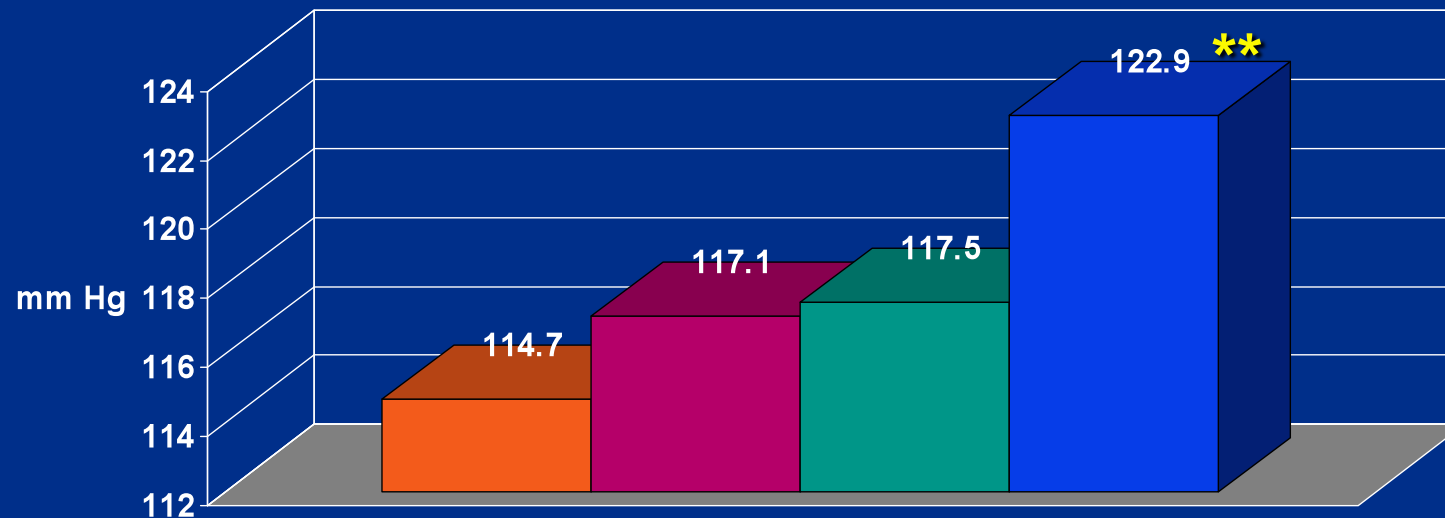
Strain-T1:	no	no	yes	yes		no	no	yes	yes
Strain-T2:	no	yes	no	yes		no	yes	no	yes



controlling for age, education, body mass index, race, smoking, alcohol use, work site

Job Strain change and Time 2 work systolic AmBP (n=71 Quebec white-collar women with a University degree)

Strain-T1:	no	no	yes	yes
Strain-T2 (+14 mon.):	no	yes	no	yes



controlling for age, smoking, OC use

(Laflamme N et al. *Scand J Work, Environ Health* 1998;24(5):334-343.)

**p<.01 vs. ref.

Belstress Study 2007

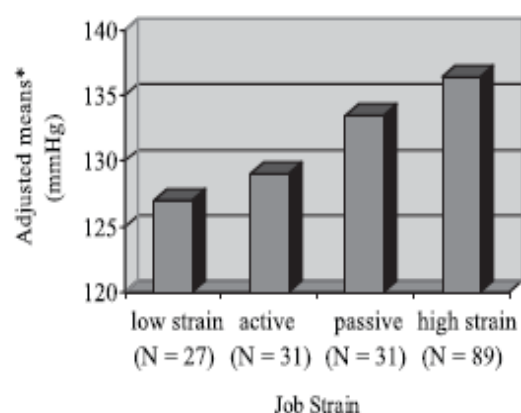


Fig. 1. Adjusted association between quadrant groups of job strain and mean systolic blood pressure at work (mm Hg). *Adjusted for gender, age, body mass index, smoking, high physical demands of the job, high stress outside work, mean level of physical activity prior to blood pressure measurements, and occupation.

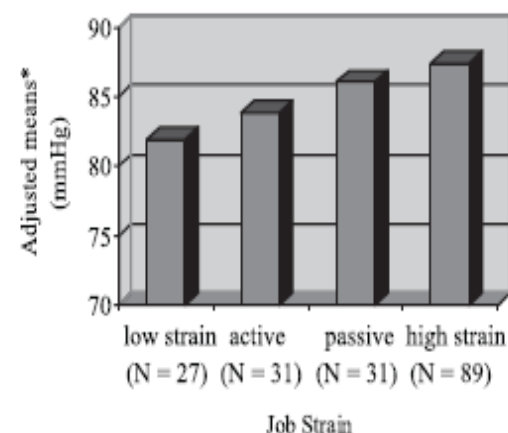
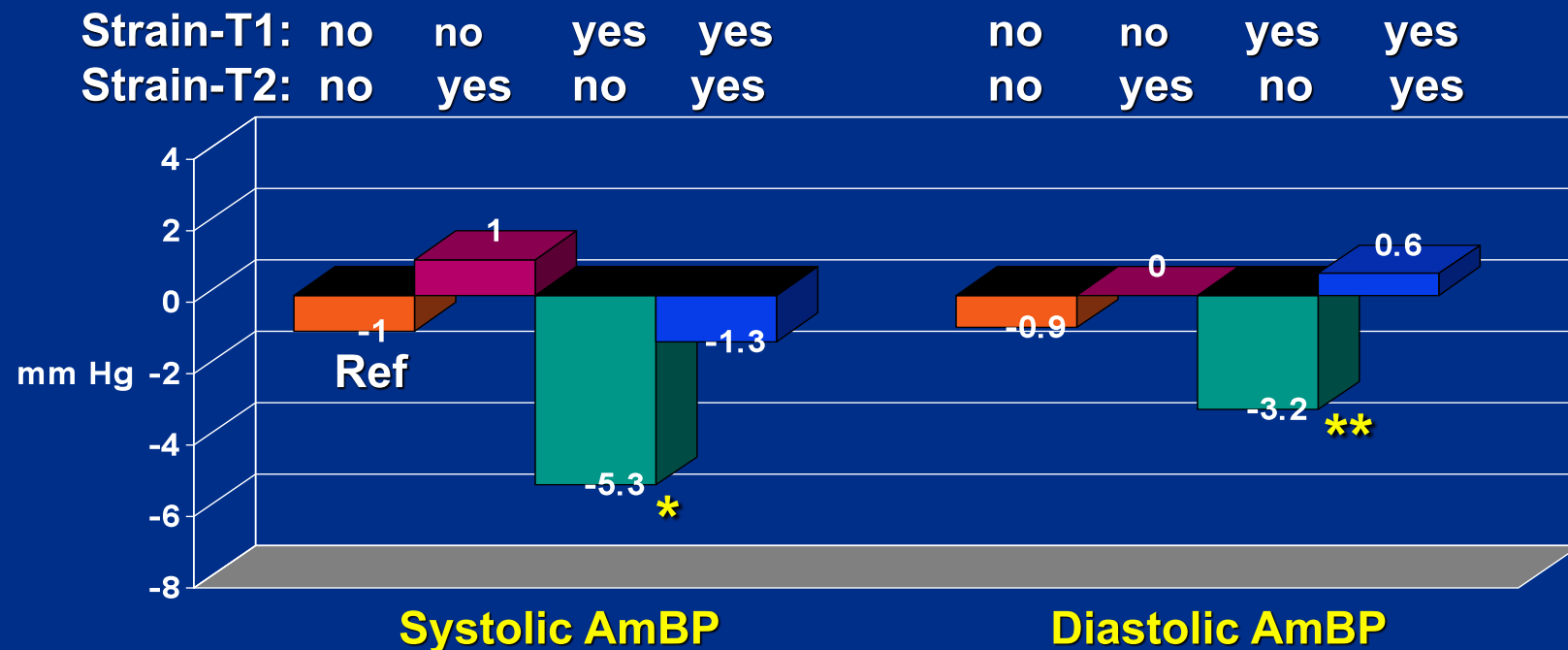


Fig. 2. Adjusted association between quadrant groups of job strain and mean diastolic blood pressure at work (mm Hg). *Adjusted for gender, age, body mass index, smoking, high physical demands of the job, high stress outside work, mean level of physical activity prior to blood pressure measurements, and occupation.

Clays et al. High Job Strain and Ambulatory Blood Pressure in Middle-Aged Men and Women From the Belgian Job Stress Study. JOEM 49(4) April 2007

Job Strain change and 3-yr Work Ambulatory BP change (n=195 men, Time 1-2)



controlling for age, race, body mass index, smoking, alcohol use, work site

p<.05, **p<.01, (vs Ref group)

New hypotheses to be tested

Cumulative exposure (work history substudy)

- H1: The chronic exposure group has a greater history of past job strain than other exposure groups
- H2: Past job strain will be associated with Time 1 BP independent of Time 1 job strain

Job strain-SES interaction

- H3: The association between job strain & BP will be greater among lower SES men (blue-collar, lower education or lower income) than higher SES men
- H4: The association of past job strain with Time 1 BP will be greater among lower SES men

Work history questionnaire: sample of questions from JCQ

Questions asked for every past job (n=379):

“On that job, did you have...”

Job Demands

1. To work very hard
2. An excessive amount of work

Job Decision Latitude

3. A lot of say about what happened on the job
4. A high level of skill

Questions added after pilot testing (n=291):

Job Decision Latitude

5. A lot of freedom to decide how I do my work
6. The chance to be creative

Work history substudy: Description of sample

Full-time employees at 10 New York City work sites

	<u>Men</u>	<u>Women</u>
Avg. number of past full-time jobs at entry into study	4.9	3.8
Length of work history (years)		
Mean	22.6	17.8
Range	6-43	6-43
1-41		
Age (years)		
Mean	44.2	41.7
Range	30-60	30-60

WHQ Reliability

Internal consistency

Job demands: $\alpha = .81$ (2-item)

Job decision latitude: $\alpha = .60$ (2-item)

Job decision latitude: $\alpha = .82$ (4-item)

WHQ Validity

WHQ recall of job at entry into study vs. full JCQ at entry:

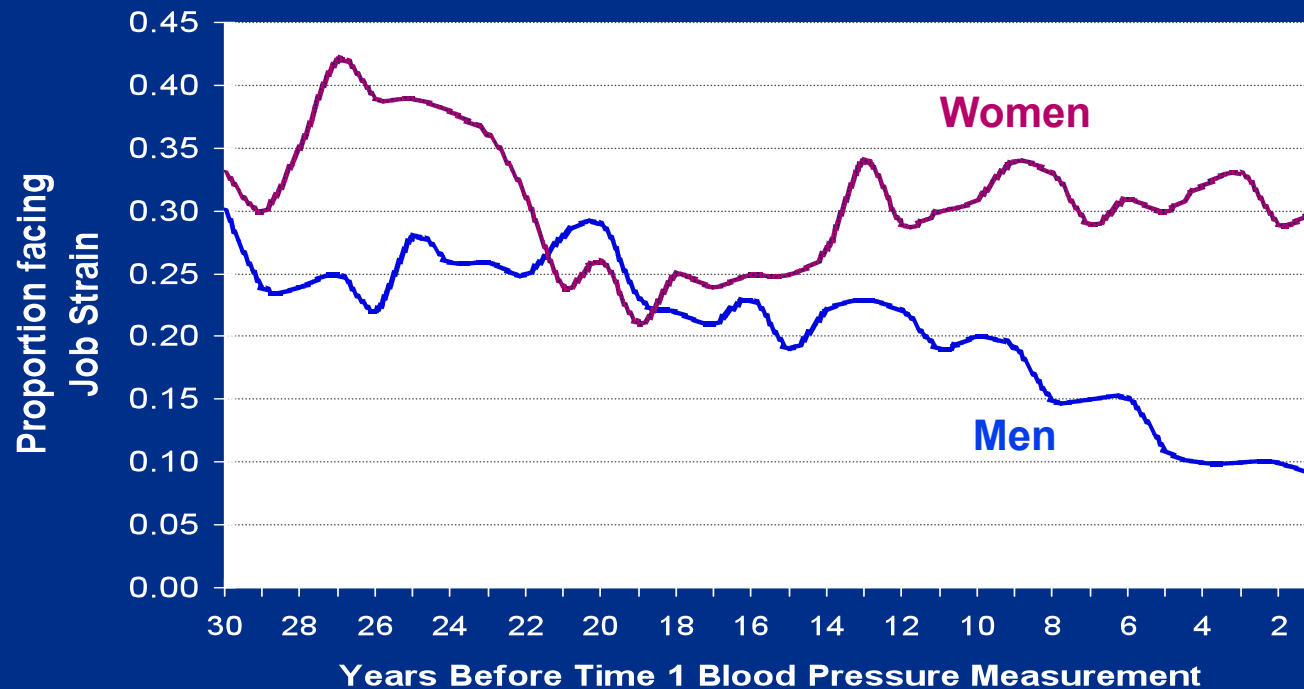
Job demands ($r = .50$)

Job decision latitude: 2-item ($r = .52$); 4-item ($r = .57$)

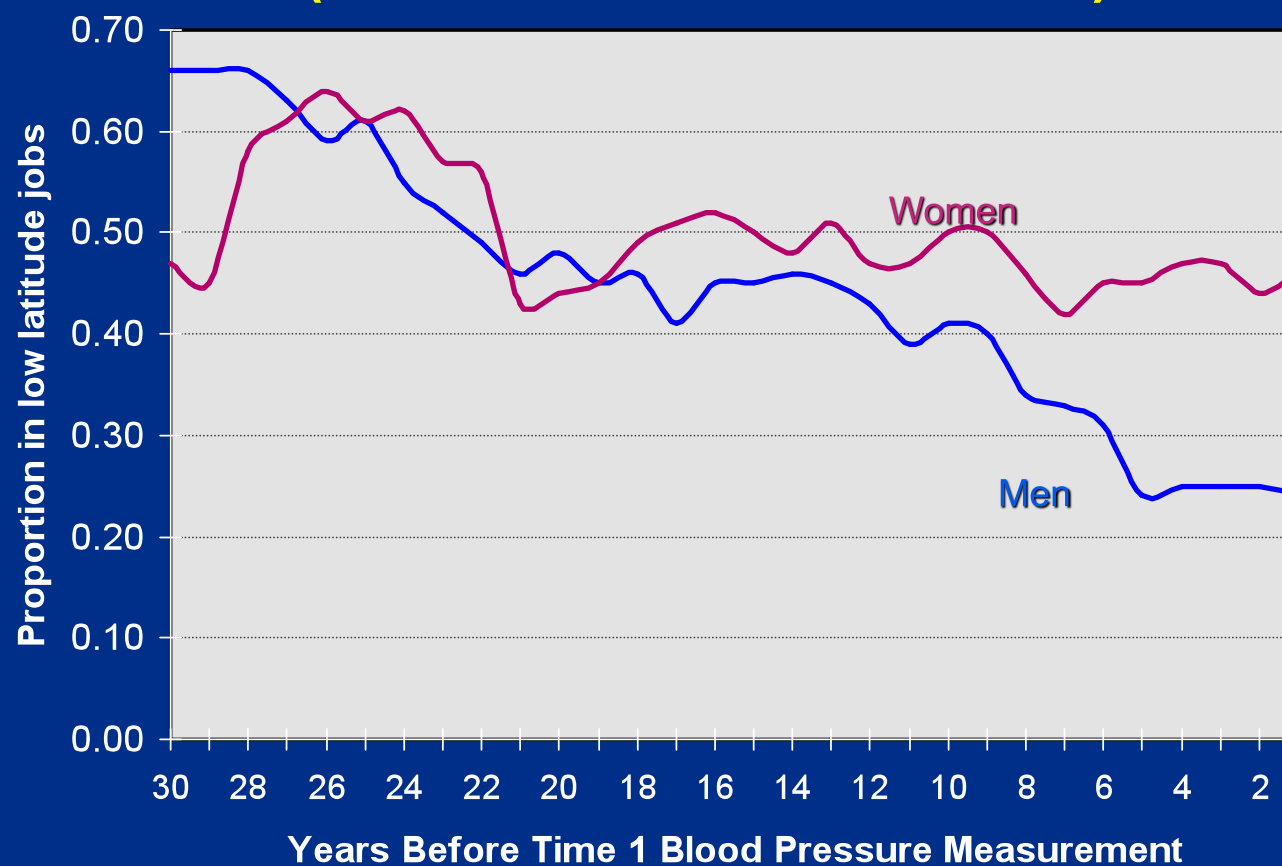
WHQ recall of job strain at entry vs. AmBP at entry:

	<u>Men</u>	<u>Women</u>
Work AmSBP (mm Hg)	5.7	2.3
Work AmDBP (mm Hg)	-0.2	2.3

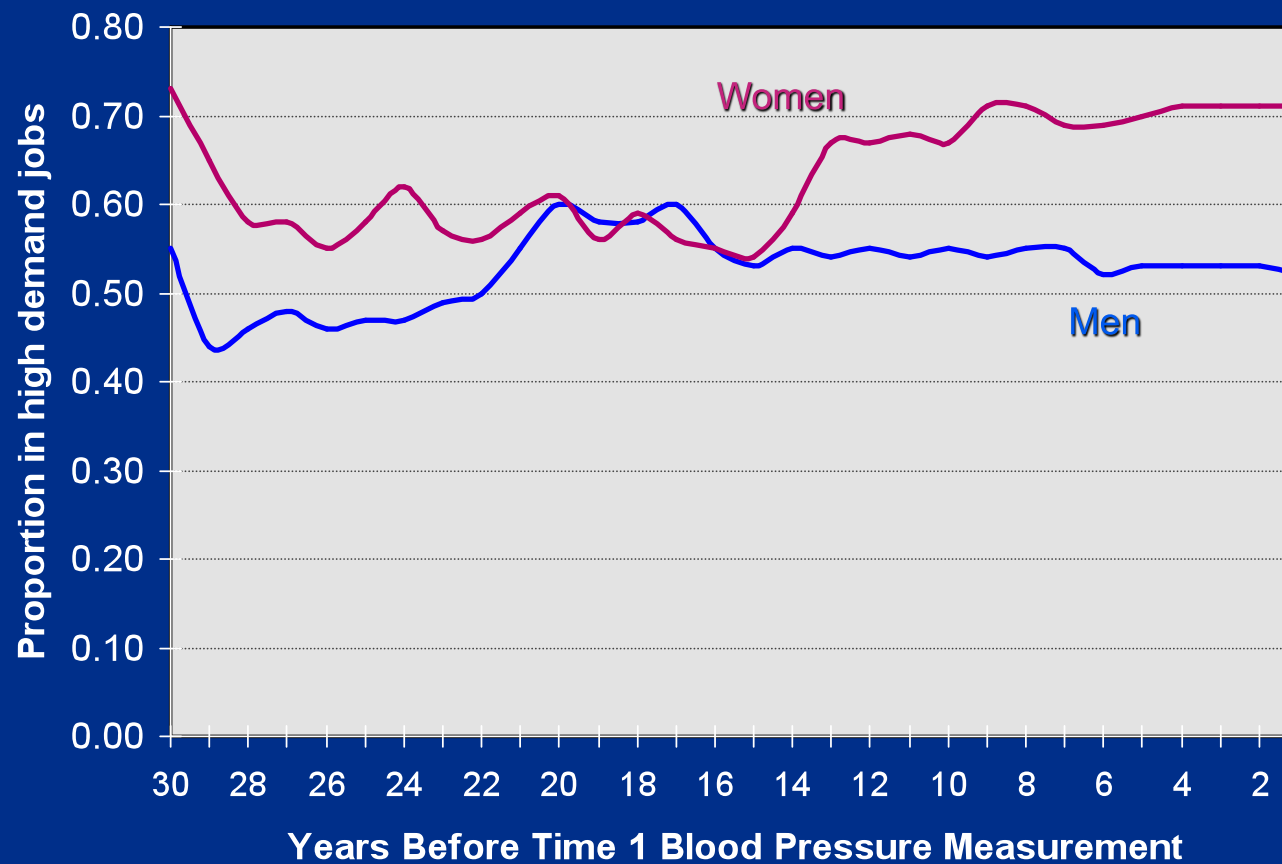
Proportion of participants facing Job Strain in prior jobs (n = 213 men, 157 women)



Proportion of participants facing low latitude in prior jobs (n = 213 men, 157 women)



Proportion of participants facing high demands in prior jobs (n = 213 men, 157 women)



Cumulative burden of exposure: Results

- 1) Little or no association with diastolic BP
- 2) Association with systolic BP, independent of JS at entry
-- but only for men with 20+ years on the job
- 3) Effect of 50% of work life exposed vs. 0% (if employed 25 yrs):
work SBP (mm Hg): 5.2 (+5.5 due to T1 JS = 10.7 combined)
home SBP (mm Hg): 8.2* (+7.2 due to T1 JS = 15.4 combined)
- 4) Stronger associations for low SES vs. high SES men:
-- but not if sample restricted to 25+ yrs employed
 (small sample sizes)
 (few high SES men with exposure & long-term employment)
-- low SES: >N of past yrs exposed, >N yrs employed
 (not necessarily a greater effect per yr exposed)

Induction/Recovery Periods: Results

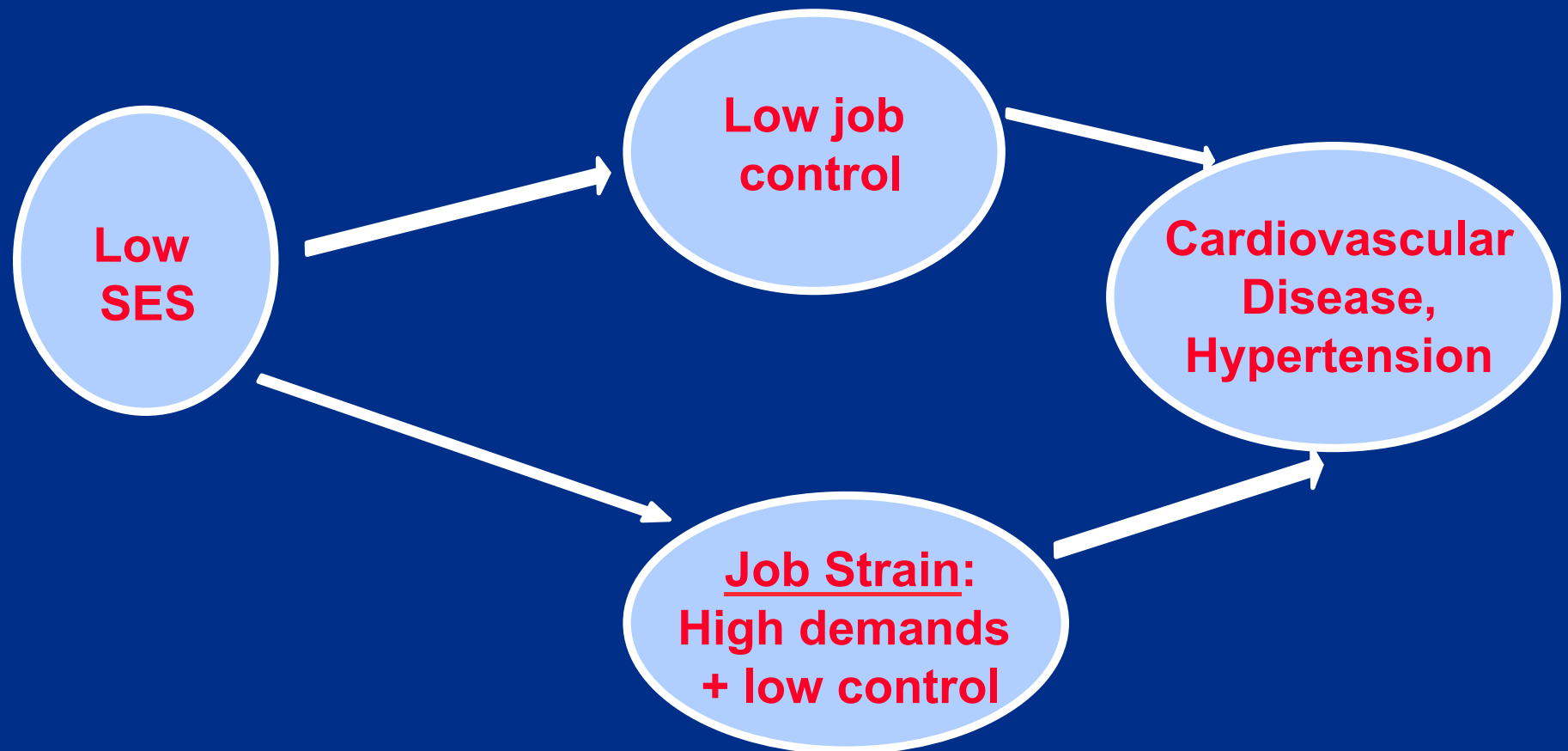
Induction

- 1) Very weak associations of systolic BP w/ distant past exposure
- 2) Substantial associations with past 0-5 yr. exposure
-- but only if employed 25+ yrs
- 3) For men with low SES, and 25+ years on the job:
-- substantial associations with past 5-20 yr. exposure windows
After adjustment for other time windows:
-- substantial associations with 0-5 yr window (home SBP), and
6-10 & 16-20 yr windows (work SBP)
High correlation between exposures in adjacent time windows

Recovery

- 1) Some effect of past exposure but reduced after adjust for other time windows (collinearity between time windows?)

Low SES, CVD and hypertension: Potential workplace pathways



Job Strain, CVD and CVD risk factors: Main Effects

- Low Job Decision Latitude
 - some positive associations in 35 of 46 studies
- High Job Demands
 - some positive associations in 14 of 40 studies
 - inverse associations in 5 recent studies!
(positive in HANES x-sectional; inverse in HANES follow-up)
- Low Social Support
 - positive in 5 of 13 studies

Job Strain, CVD and CVD risk factors: Effect Modification

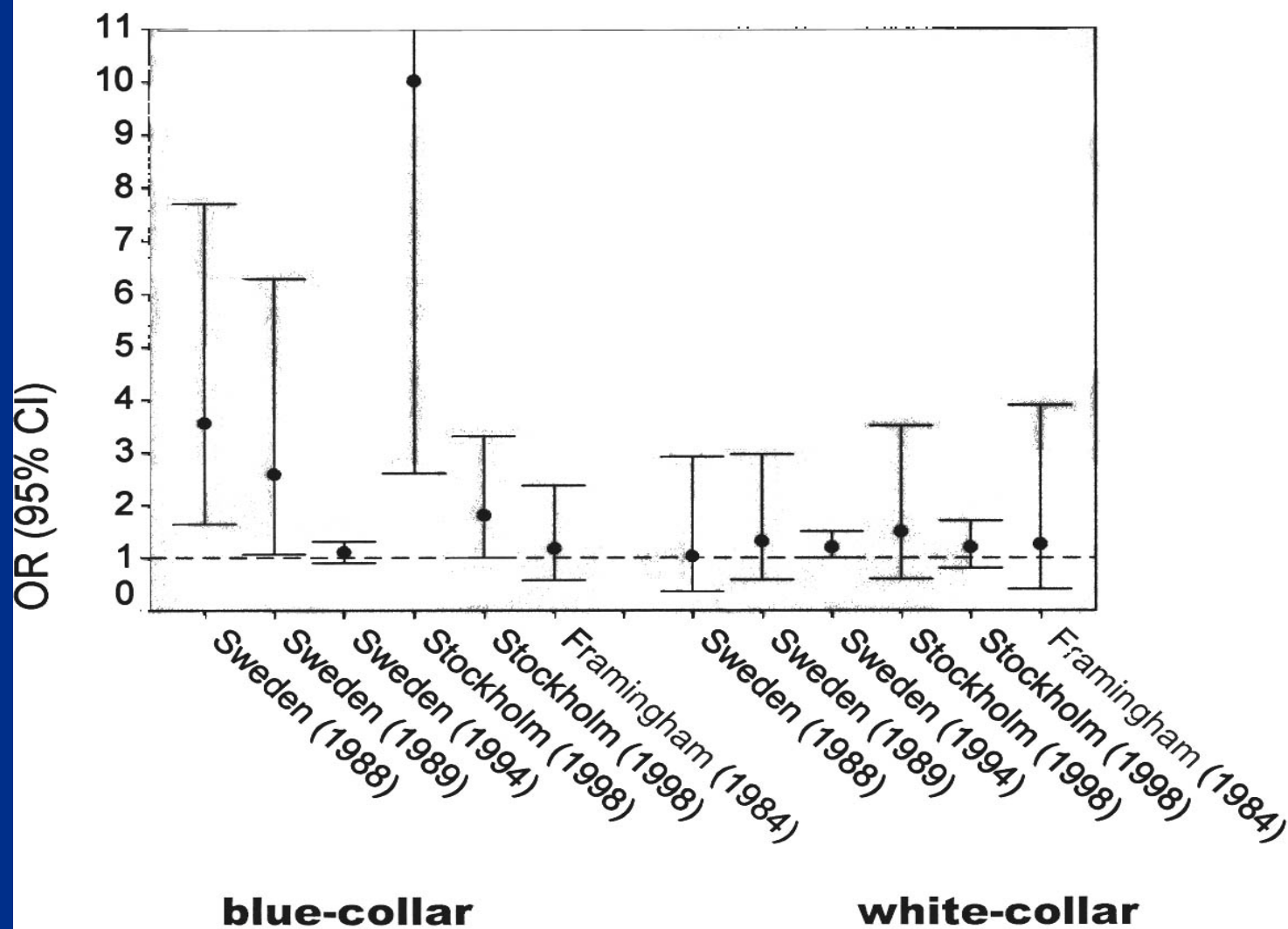
Stronger effects if:

- Older Age
 - in 4 of 5 studies
- Lower Socioeconomic Status (e.g., blue-collar workers)
 - in 8 of 14 studies (but, 3 stronger for white collar)
- Low Social Support
 - positive in 5 of 6 studies

Similar effects for men and women:

- in 20 studies, similar effect sizes
- stronger for men in 9, while stronger for women in 9

Job strain-CVD associations by SES -- men



Job strain and AMBP: A meta-analysis

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Center for Social Epidemiology, Los Angeles California, USA*

30th International Congress of Occupational Health, Cancun Mexico
A1327, March 19th, 2012

Background

- 27 years of studies of work stress and blood pressure or hypertension.
- Consistently null associations between work stress exposures and casual office BP
- No quantitative meta-analysis conducted because of variation in exposures and blood pressure outcomes.

Objectives of current review

- Conduct a quantitative meta-analysis of published studies to assess magnitude & global significance of association by:
 - Focusing on ONE work exposure: job strain (high workload demands + low decision latitude)
 - Focusing on ONE BP outcome (ambulatory blood pressure)
 - Examine the role of potential moderators (e.g., gender, population-based vs. single occupation studies, self-report of exposure vs. imputation etc.)
 - Systematically assess quality of studies

Inclusion/Exclusion Criteria

Online search of PubMed and CSA Psycinfo databases with dates ranging from 1984 to May, 2011.

- i. Exposure to job strain assessed for 2 major dimensions: workload demands + any of the following: decision latitude, skill discretion, decision authority or decision control.
- ii. Dependent variable: ABP (working, 24 hour, leisure time/ evening, sleep), hypertension status (if measured by ABP).
- iii. Case-control, cross-sectional or cohort design
- iv. Empirical/not laboratory study
- v. Complete study published in English as full-length article in peer-reviewed journal.
- vi. Excluded: Casual/office blood pressure studies

Results of Search Strategy

articles found by search
(n=201)

Full text articles retrieved
meeting inclusion criteria
and assessed for validity
and bias criteria (n=37)

Studies considered for
inclusion in meta-analysis
(n = 28 studies)

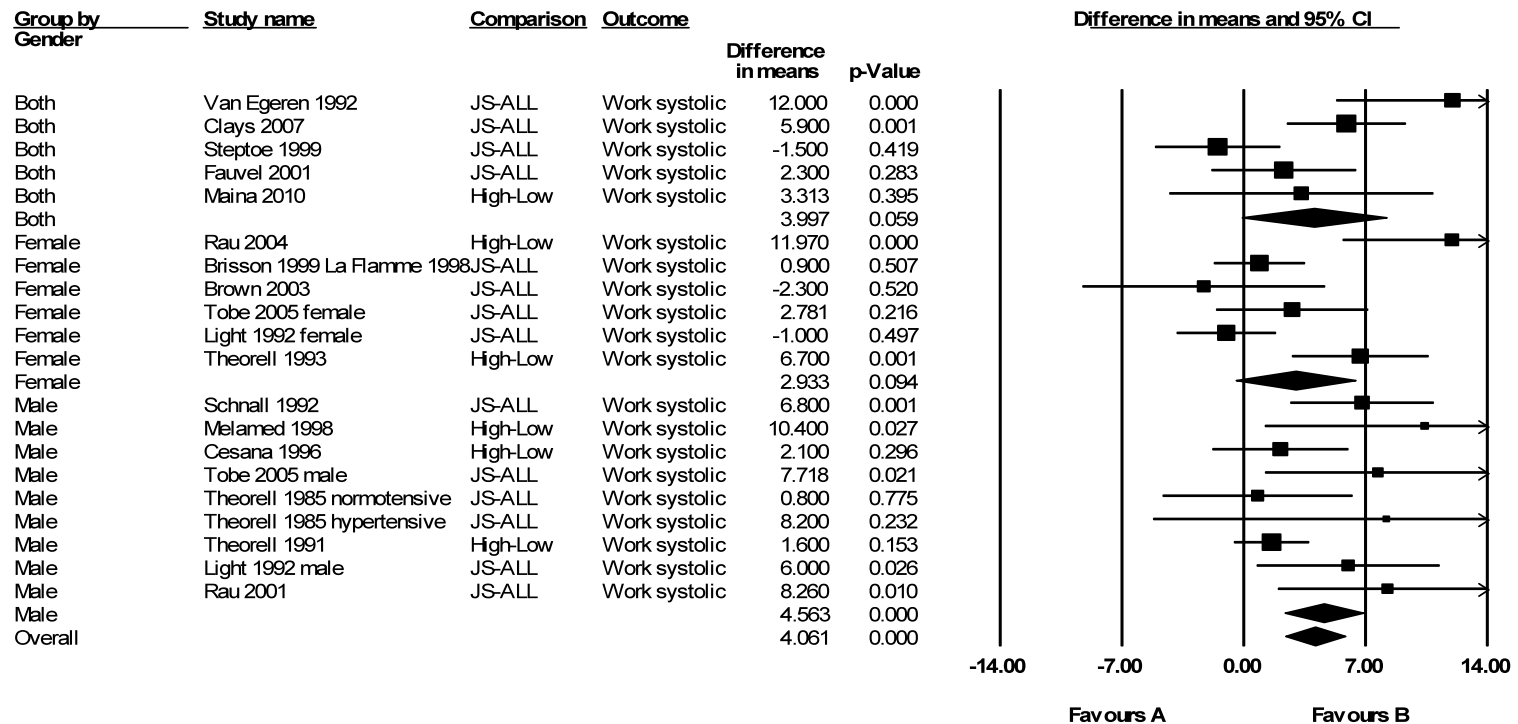
Articles excluded based
on inclusion/exclusion
criteria after review of
abstract and title or Full
Text (n = 164)

Articles reporting
duplicative results from
the same study
population -> collapsed
together (n=9)

Inclusion in quantitative meta-analysis

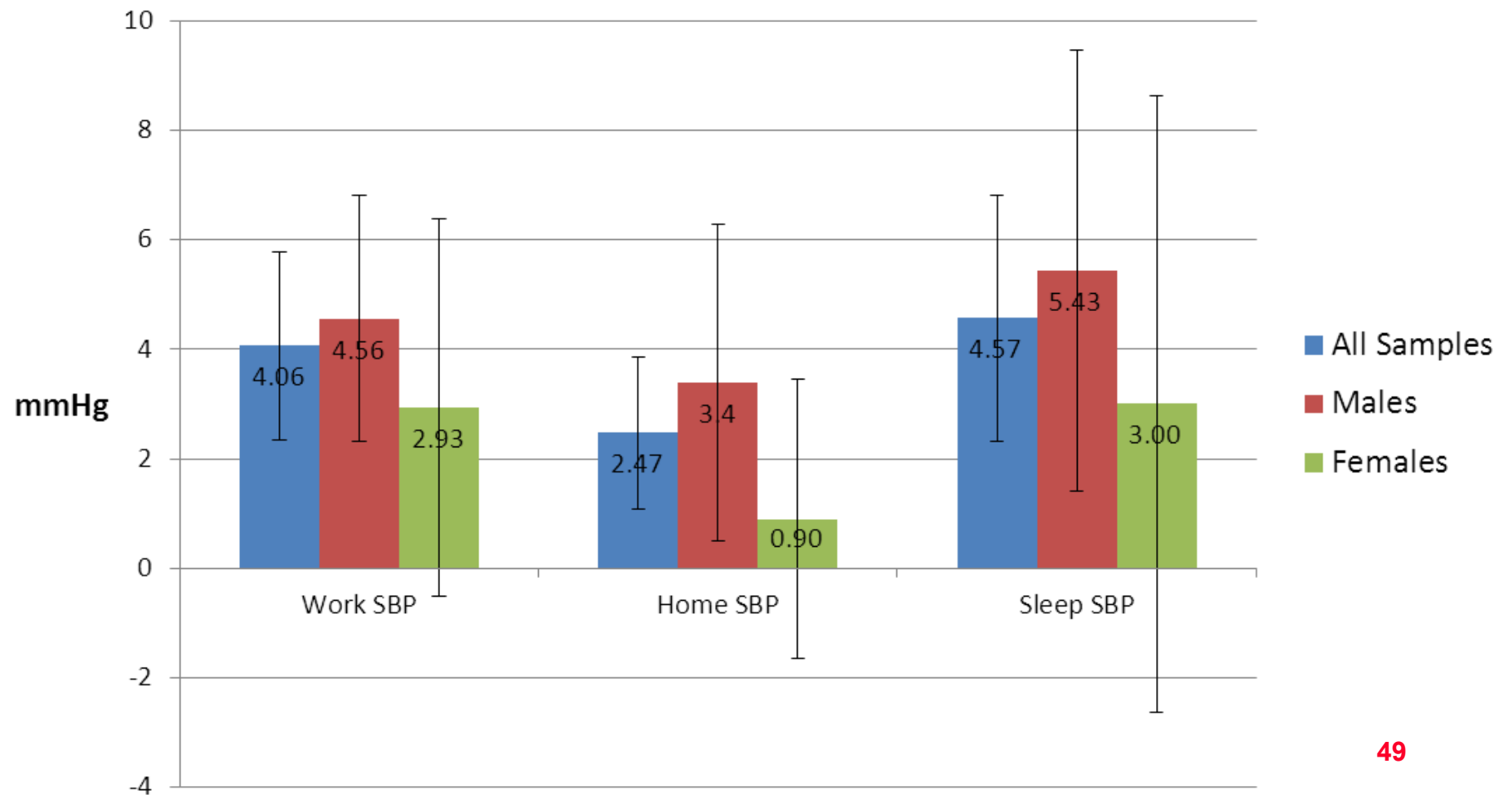
- **28 studies considered**
- **Excluded (9):**
 - 4 due to unavailable data (all x-sectional)
 - 3 longitudinal ABP change studies – variable time periods
 - 3 cumulative exposure studies (Schnall et al 1998 also longitudinal)
- **Included: 19 (22 samples) cross-sectional studies with single exposure to job strain**

Meta Analysis



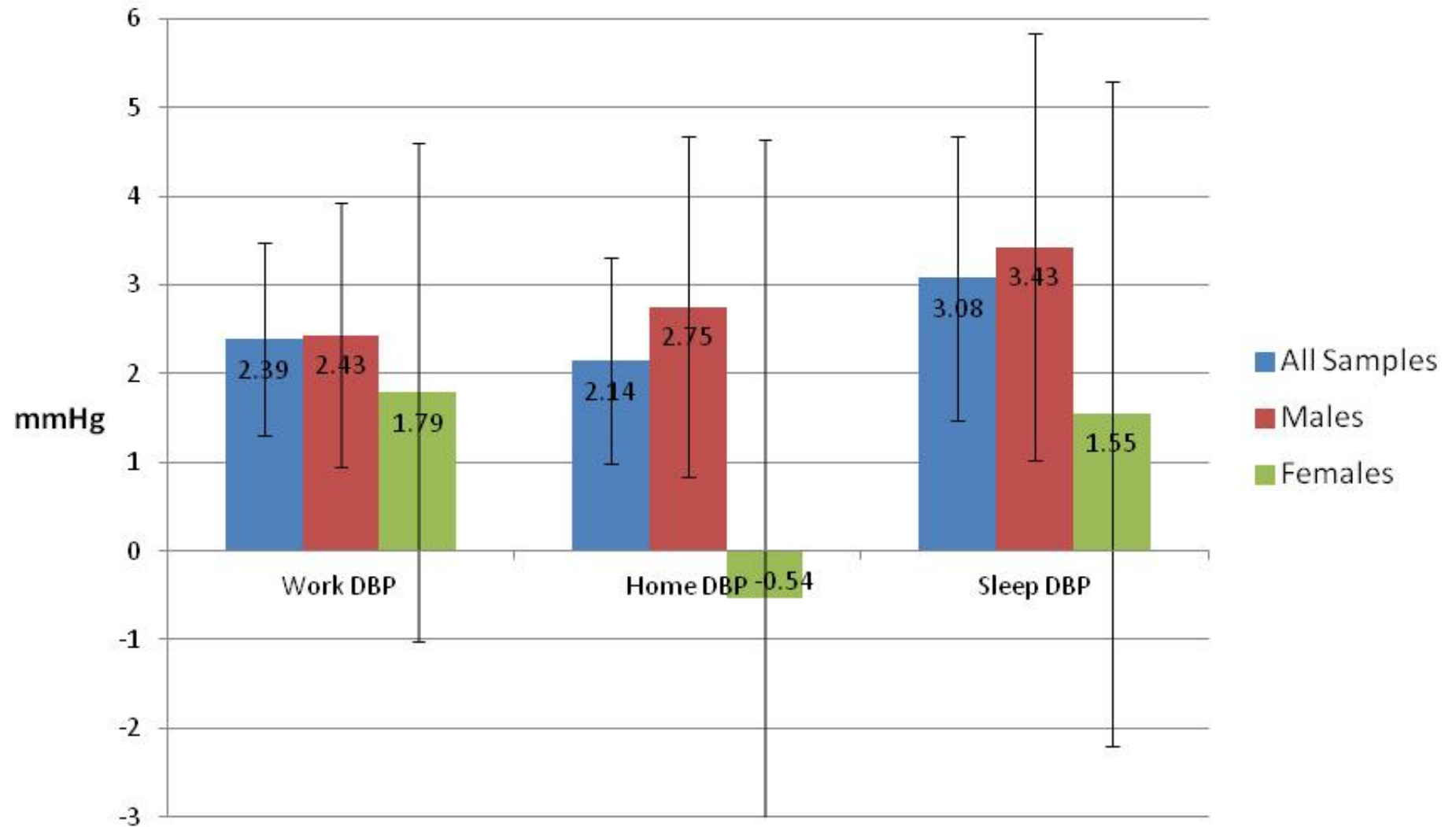
Meta Analysis

Job strain & systolic ambulatory blood pressure (20 samples from 17 studies, mm Hg, 95% CI)



Job strain & diastolic ambulatory blood pressure

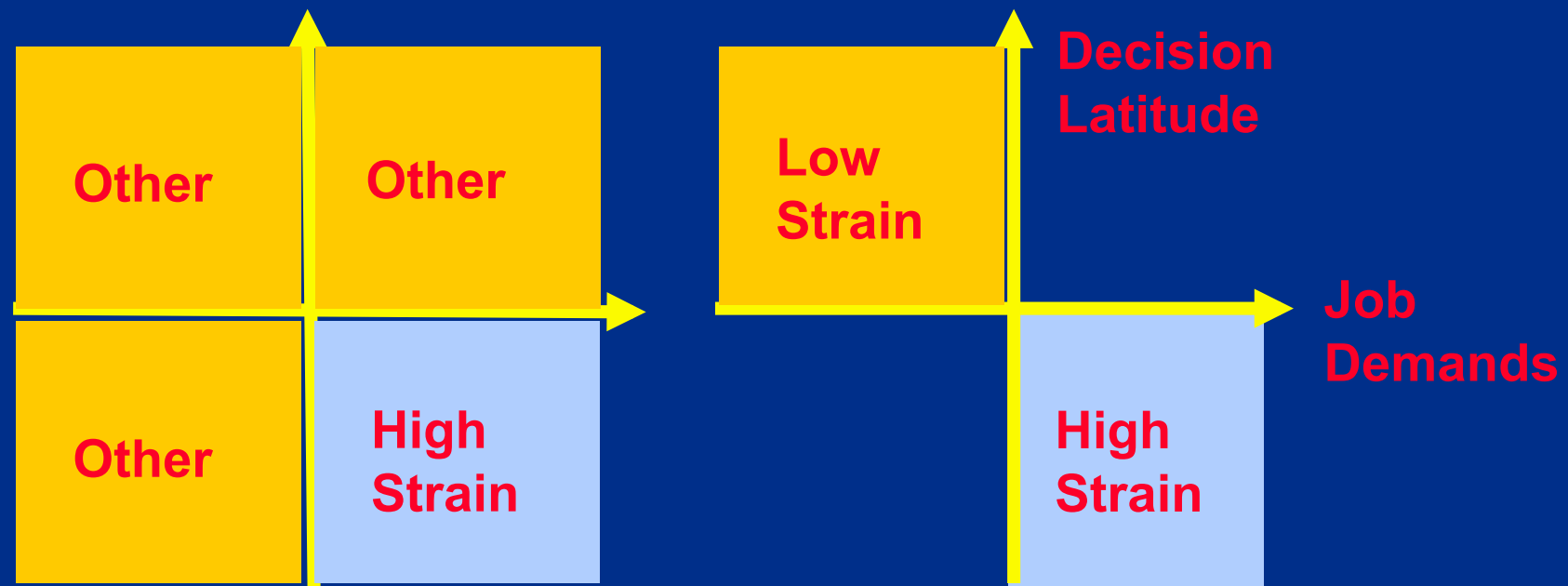
(20 samples from 17 studies, mm Hg, 95% CI)



Job Strain Exposure Contrasts

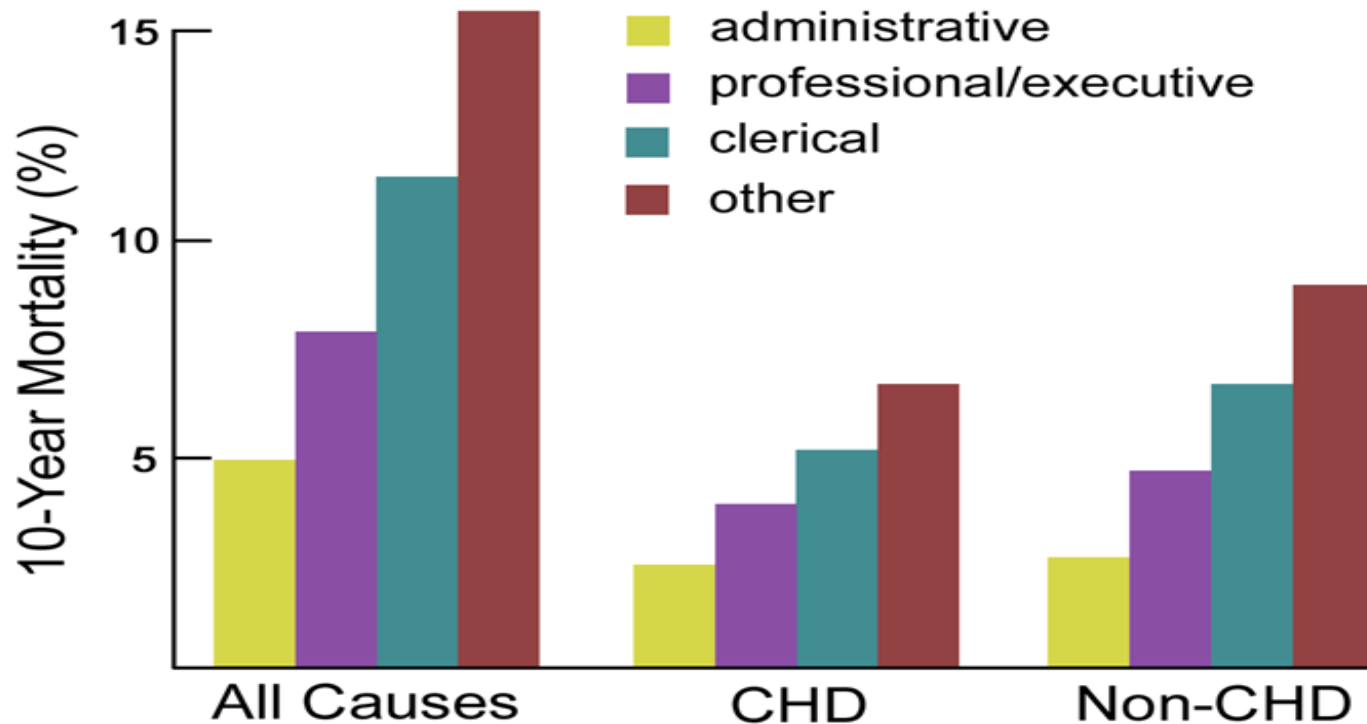
Work SBP/DBP (mm Hg):

2.4/1.9 ($p < .001$, $n = 14$ samples) 4.1/4.6 ($p < .001$, $n = 6$ samples)



The social class “gradient” in disease

Age-adjusted percent of men dying in 10 years from all causes, from coronary heart disease, and from non-coronary heart diseases.

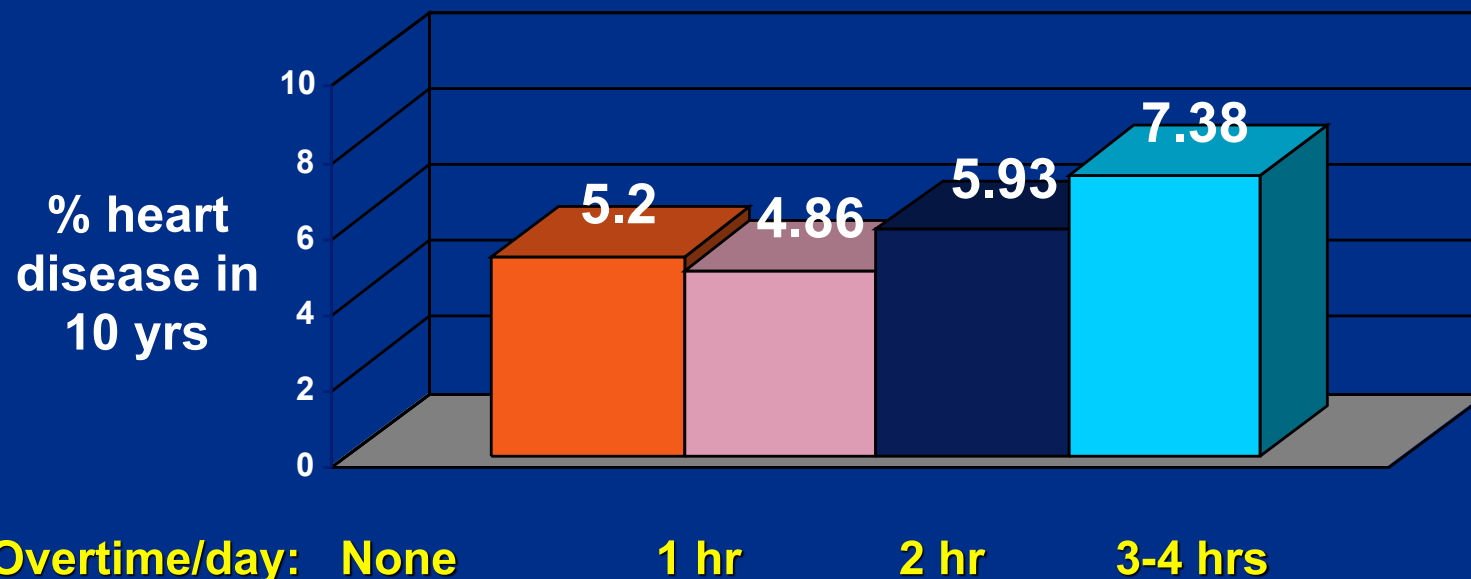


Subjects were British civil servants

Marmot et al

Long work hours increase heart disease risk

(6,014 British govt workers, men & women, age 39-61, followed 11 yrs, 369 cases)



Similar pattern if control for age, gender, marital status, job status, diabetes, blood pressure, cholesterol, smoking, alcohol use, fruit and vegetable consumption, exercise, body mass index, sleeping hours

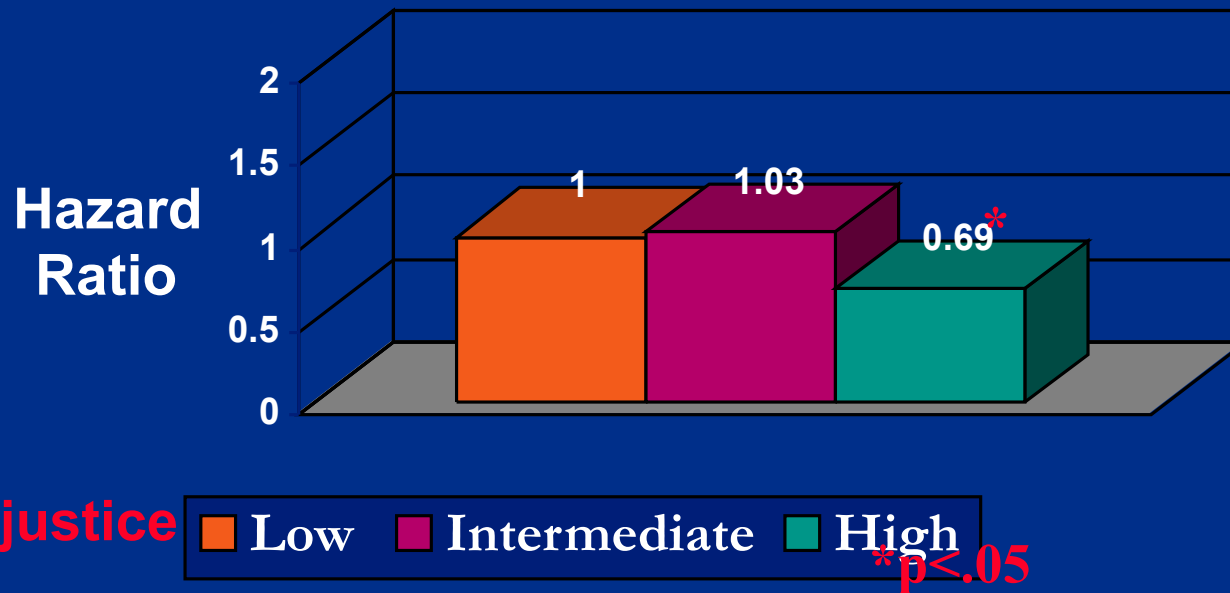
Virtanen M, Ferrie JE, Singh-Manoux A, Shipley MJ, Vahtera J, Marmot MG, Kivimaki M. Overtime work and incident coronary heart disease: the Whitehall II prospective cohort study. European Heart Journal 2010 doi:10.1093/eurheartj/ehq124.

Organizational justice

- ❑ Relational justice (Whitehall II Study, $\alpha=.72$)
 - Do you ever get criticized unfairly (reverse scored)?
 - Do you get consistent information from line management (your superior)?
 - Do you get sufficient information from line management (your superior)?
 - How often is your superior willing to listen to your problems?
 - Do you ever get praised for your work?

Relational justice (fair treatment by supervisors) decreases risk of heart disease

(Whitehall II study, 6,442 men, age 35-55, 8.7 yr follow-up)

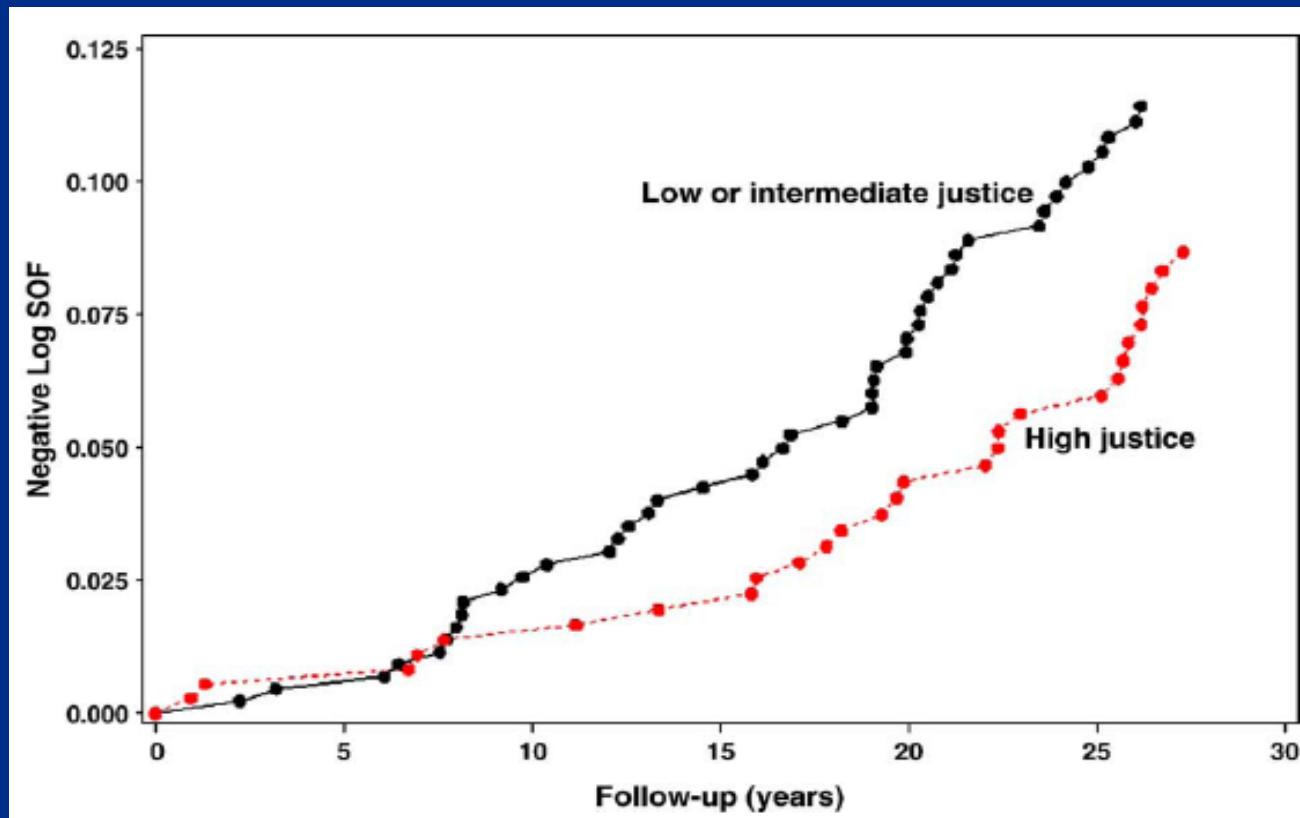


Controlling for age, occupational status, BMI, cholesterol, smoking, hypertension, alcohol, physical activity, job strain, effort-reward imbalance

Kivimaki M, Ferrie J, Brunner E, Head J, Shipley M, Vahtera J, et al. Justice at work and reduced risk of coronary heart disease among employees: the Whitehall II Study. Archives of Internal Medicine. 2005;165:2245-51.

Relational justice and coronary heart disease

Finnish factory workers, 540 men, 264 women, 25.6 yr follow-up
“My supervisor treats me fairly”



Elovainio M, Leino-Arjas P, Vahtera J, Kivimäki M. Justice at work and cardiovascular mortality: a prospective cohort study. *Journal of Psychosomatic Research* 2006;61:271-274.

Shorter sleeping hours

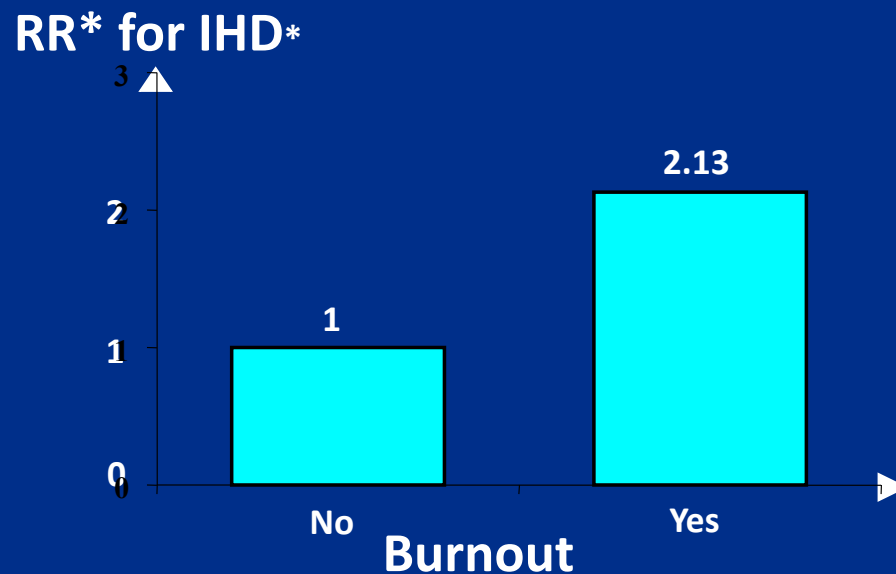
- **An important pathway to illness:**
 - Lack of sleep → higher blood pressure, heart rate
 - 4-6 (vs. 7-8) hrs/day of sleep → increased risk of heart disease

*Van der Hulst et al. Scand J Work Environ Health 2003;29(3):171-88.
Harma M. Scand J Work Environ Health 2003;29(3):167-9.*

Burnout predicts ischaemic heart disease

A 4.2 years' follow-up study of 3,877 Dutch male employees from Rotterdam

"Have you ever been burned out?" No = 74%, Yes=26%

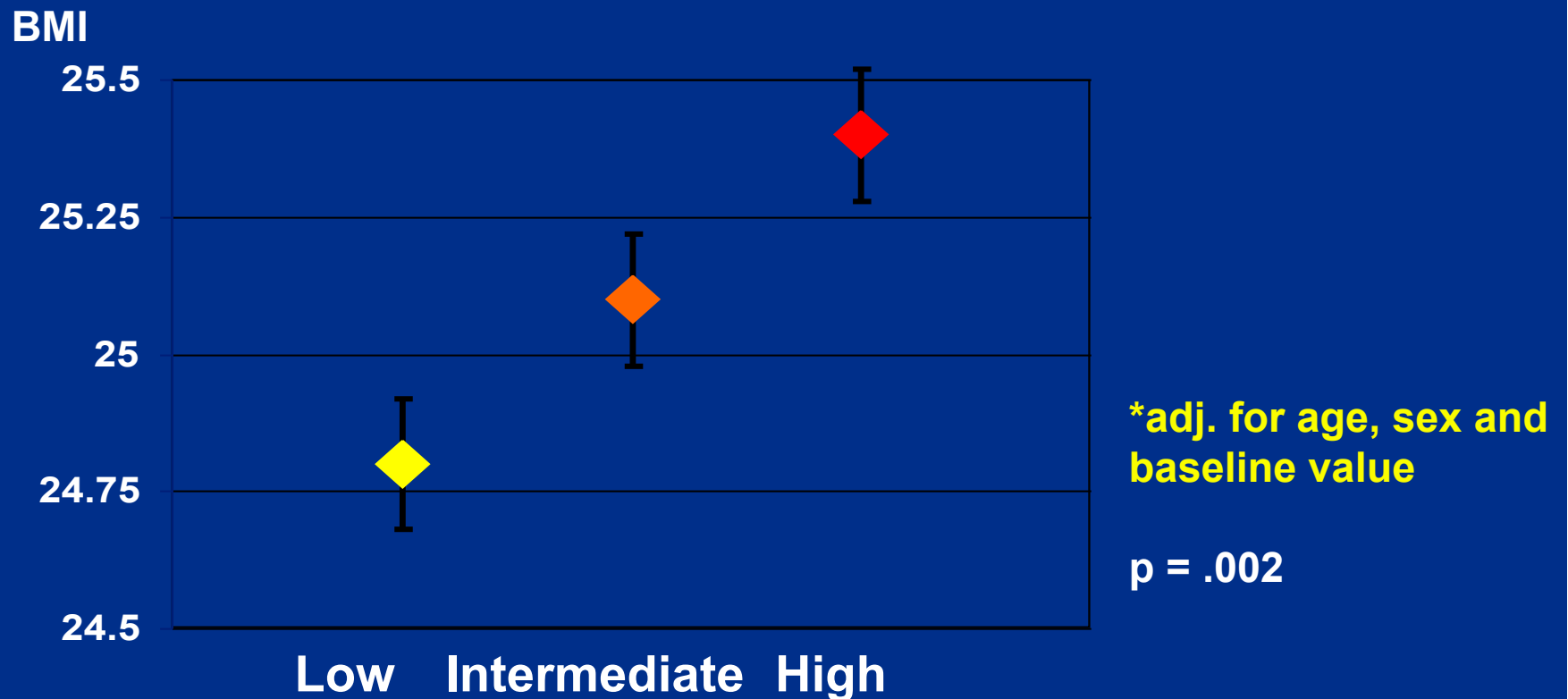


* Controlled for age, BP, smoking, cholesterol. 59 cases.

Appels & Schouten. Behav Med 1991;Summer:53-59

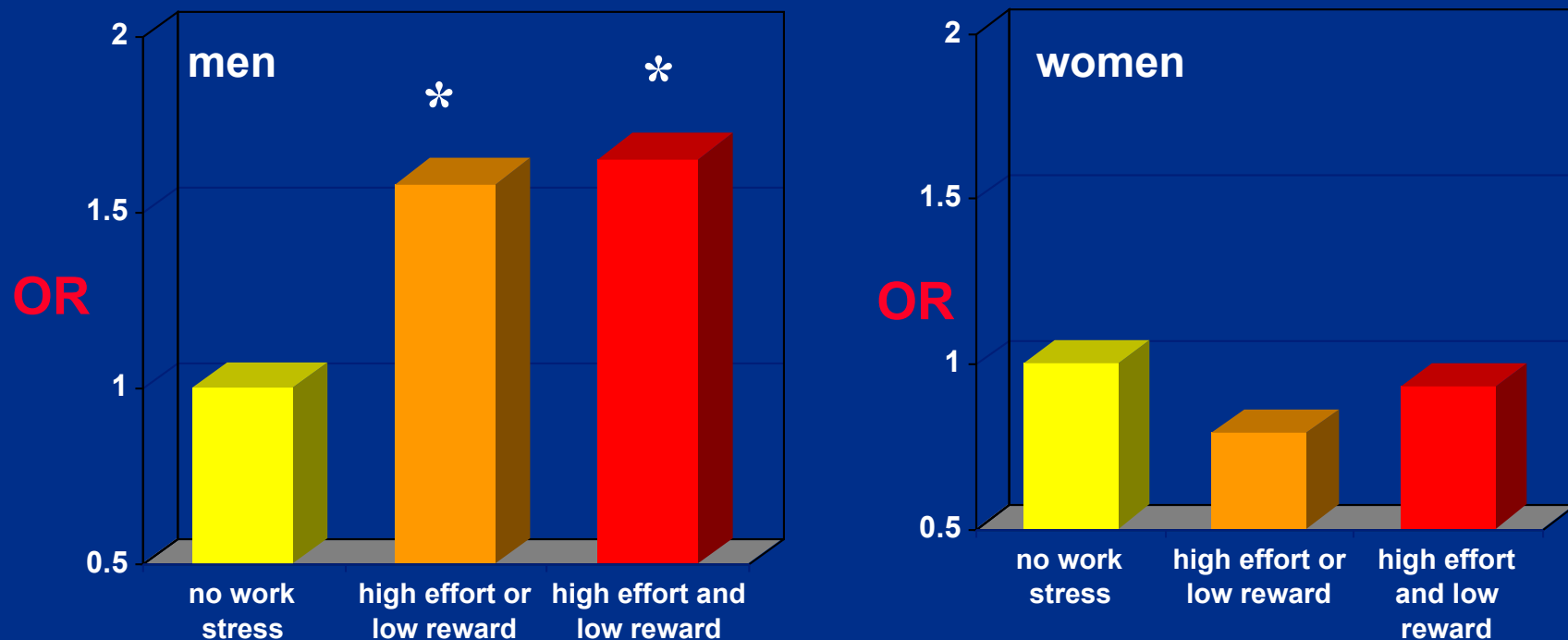
Effort-reward imbalance predicts increase in body mass index at 10-yr follow-up*

(N=902 male and female industrial workers, Finland)



Effort-reward imbalance increases risk of incident type 2 diabetes in men

(British Whitehall II-Study; N=8067, mean follow-up: 12.5 yrs)

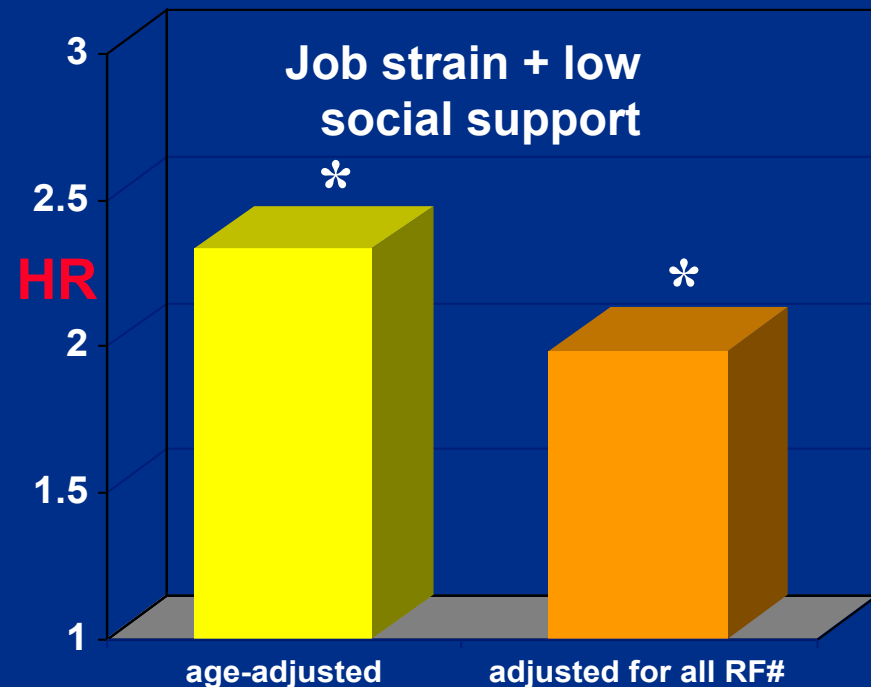
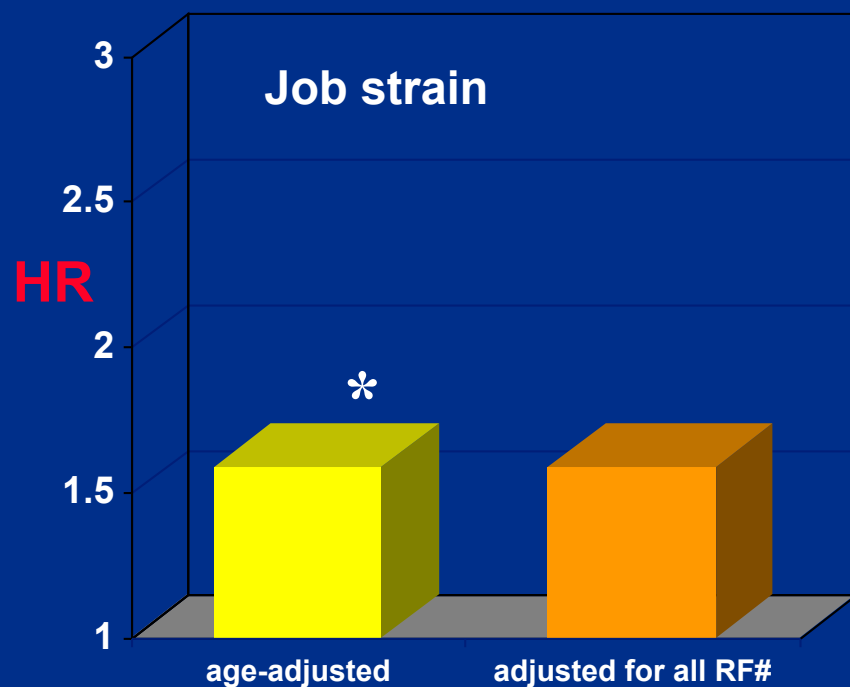


ORs adjusted for age, employment grade, ethnic group, length of follow up, ECG abnormalities, family history of diabetes, BMI, height, SBP, exercise, smoking, life events

Kumari A, et al. Arch Intern Med 2004;164:1873-80.

Work stress increases risk of incident type 2 diabetes in women

(British civil servants; N=1729 women, mean follow-up: 11.6 yrs)



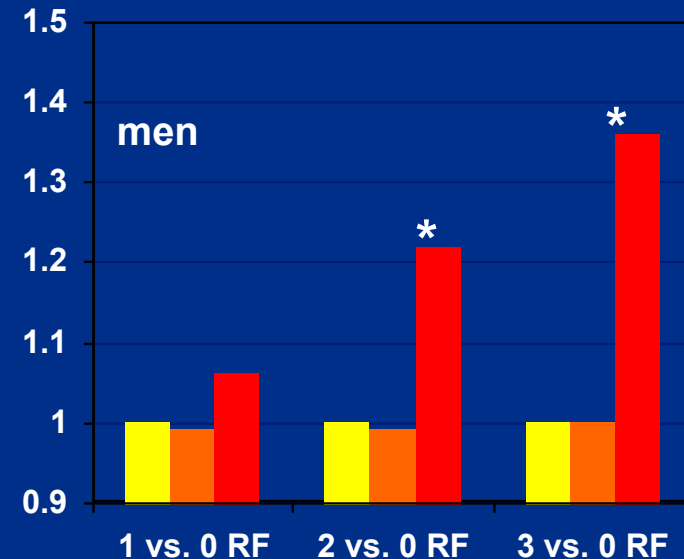
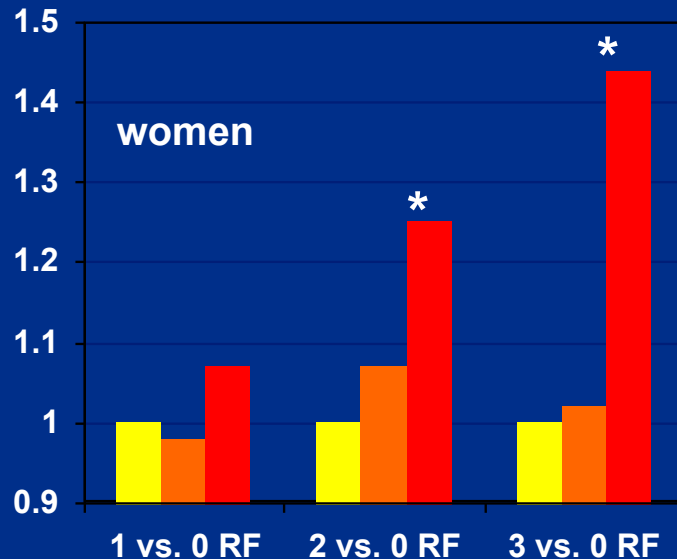
Hazard Ratios adjusted for diet, physical activity, alcohol, smoking, employment grade, life events, BMI, systolic BP, triglycerides, HDL cholesterol, CRP

Heraclides A, et al. Diabetes Care 2009;32:2230-5.

Effort-reward imbalance associated with co-manifestation of behavioural CHD risk factors

(N=28,844 women and 7,233 men, public service, Finland)

Risk factors (RF): BMI ≥ 25 , smoking, heavy alcohol use, physical inactivity; Odds ratios, adj. for age, SES, marital status



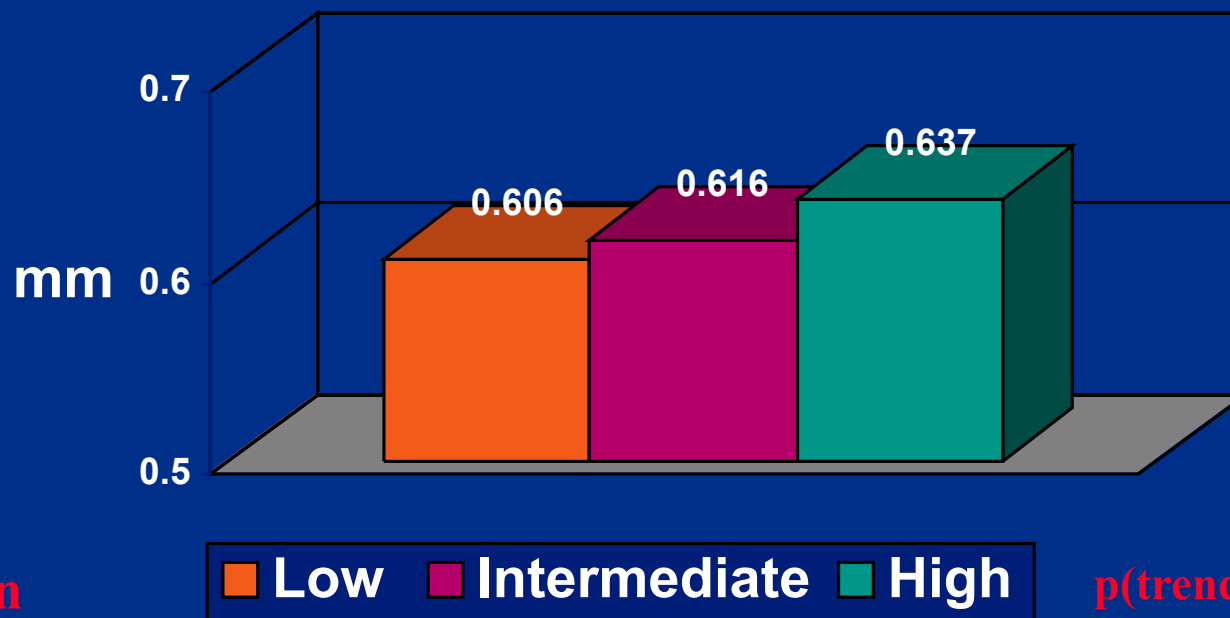
Effort-reward imbalance

no

medium

high

Job strain associated with carotid artery intima-media thickness, controlling for pre-employment risk factors (Finnish men, age 33-39)

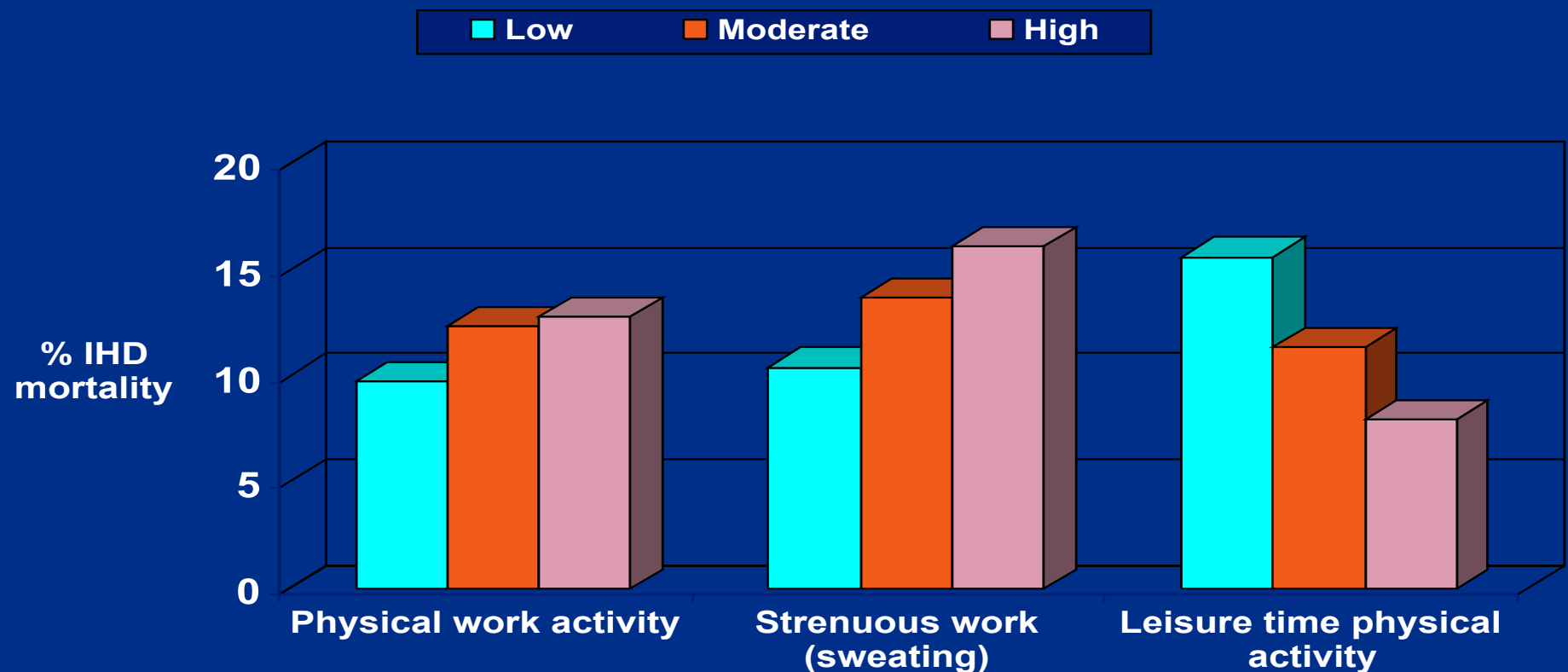


Controlling for age & risk factors assessed at age 12-18: BMI, HDL & LDL cholesterol, triglycerides, systolic BP, smoking, family history of CHD, *parents occupational position*

Kivimäki M, Hintsanen M, Keltikangas-Järvinen L, Elovainio M, Pulkki-Råback L, Vahtera J, Viikari JSA, Raitakari OT. Early risk factors, job strain, and atherosclerosis among men in their 30s: The Cardiovascular Risk in Young Finns Study. *American Journal of Public Health* 2007;97:450–452.

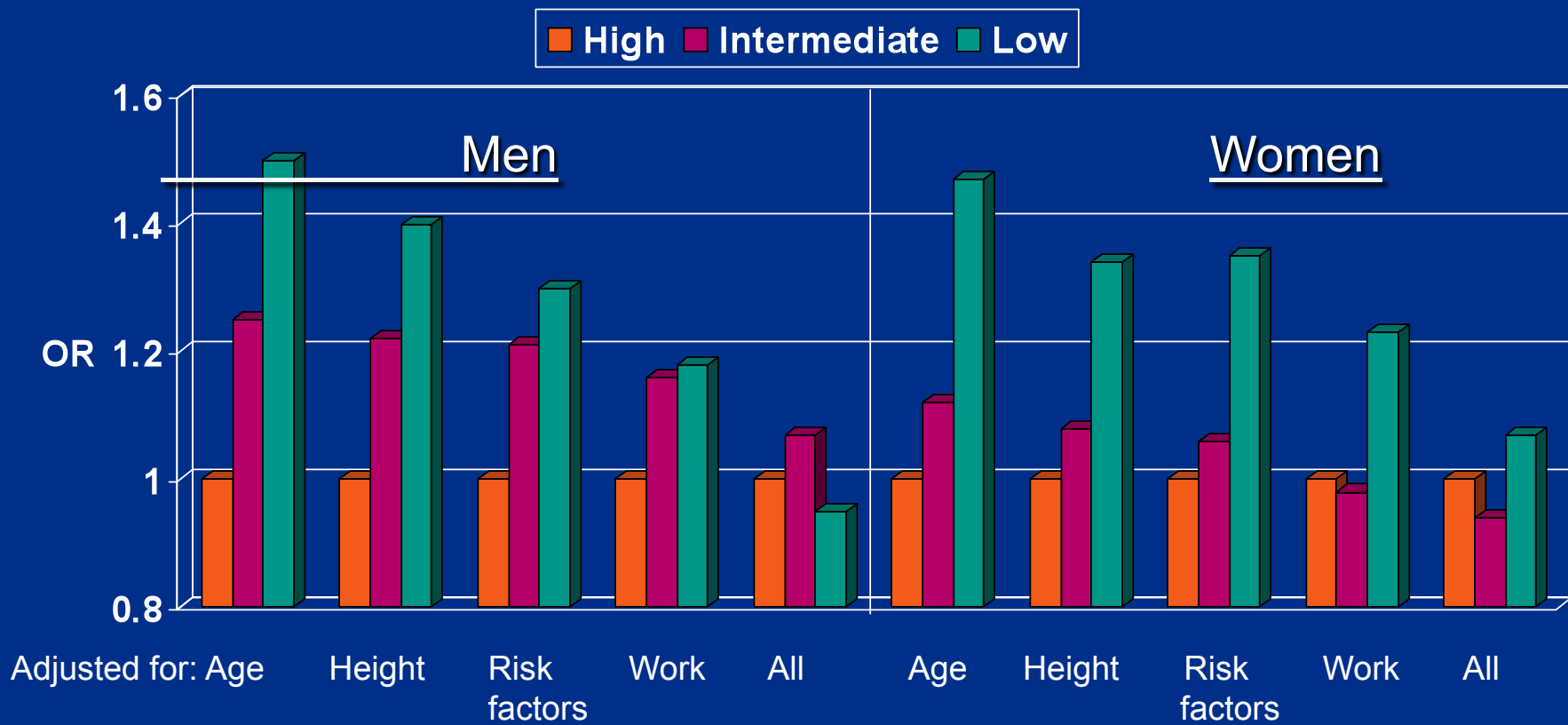
Physical work activity increases, leisure-time physical activity decreases IHD mortality

(5249 employed Copenhagen men age 40-59, 30 yr f/u, 1971-2001)



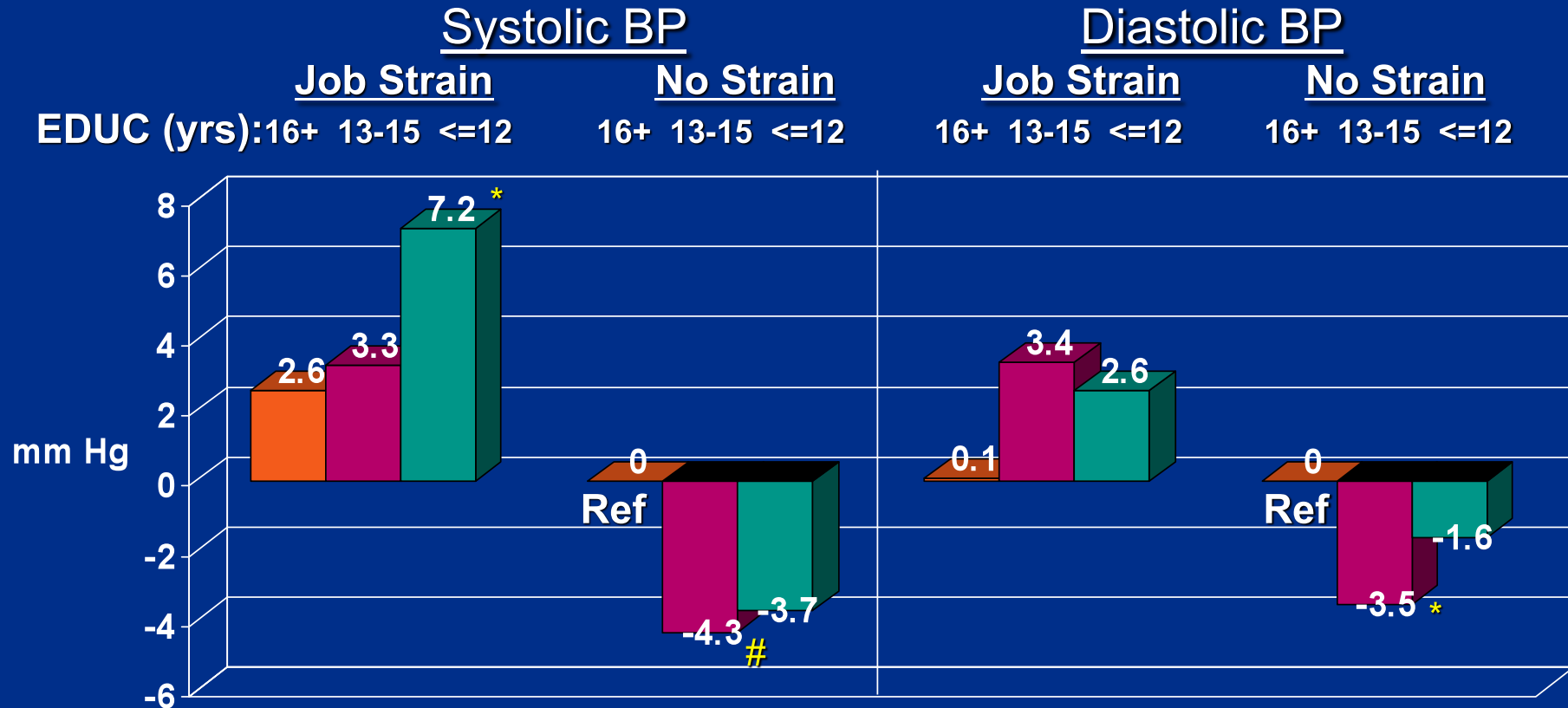
Holterman A, et al. *Scandinavian Journal of Work, Environment and Health*. 2009;35(6):466-474.

Odds ratios for new CHD in Whitehall II by employment grade



Marmot et al. Lancet 1997;350:235-239.

Job Strain and Work Ambulatory BP by Education (n=283 men, Time 1)



INTERACTION TERM: $p=.08$

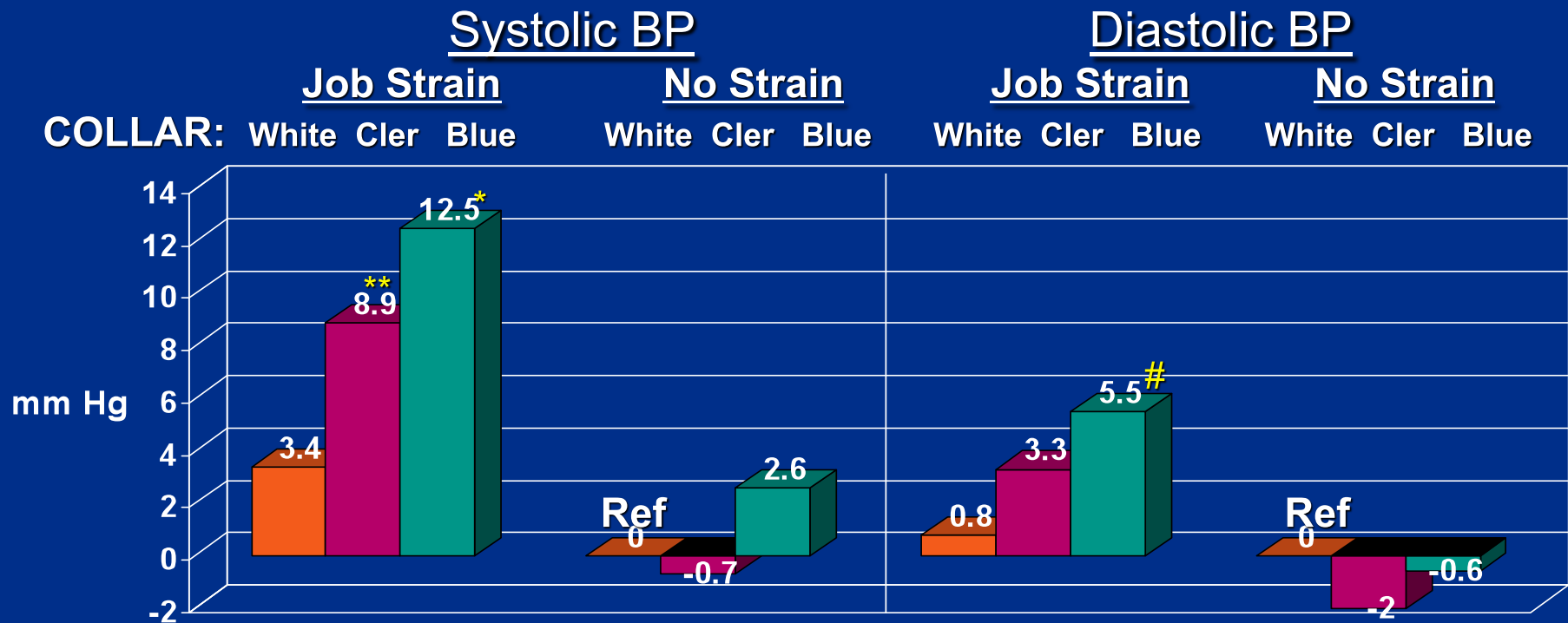
$p=.15$

controlling for age, body mass index, race, smoking, alcohol use and work site

$p<.10$, * $p<.05$, ** $p<.01$, *** $p<.001$ (vs Ref group)

Job Strain and Work Ambulatory BP by Occupational Status

(n=283 men, Time 1)



INTERACTION TERM: $p=.23$

$p=.10$

controlling for age, body mass index, race, smoking, alcohol use and work site

$p<.10$, * $p<.05$, ** $p<.01$, *** $p<.001$ (vs Ref group)

Why job strain-low SES interaction?

- Unhealthy behaviors? smoking, lack of physical exertion, BMI (for CAD but not BP)
- Physical and psychosocial working conditions
- Low income/benefits
 - 76% of low-income employees: no paid sick days (vs. 42% U.S. avg)
- Physical non-work exposures
 - air pollution (PM_{2.5})
- Sedentary behavior
 - poor public recreation facilities; unsafe to exercise outdoors
- Unhealthy diet
 - healthy food highly priced or unavailable
- Life stressors
 - unemployment; crime; deteriorating urban physical environment

Lovell V, *No Time to be Sick*. Institute for Women's Policy Research, May 2004.

Isaacs SL, Schroder SA. Class – The ignored determinant of the nation's health. *NEJM* 2004;351(11):1137-1142.

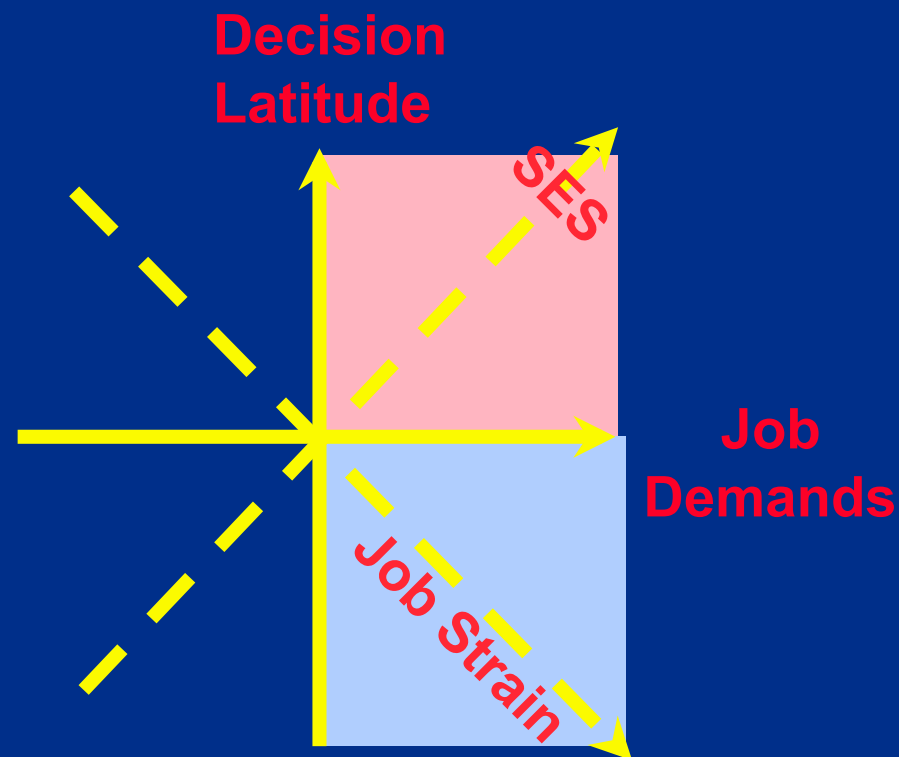
Landsbergis P, Schnall P, Pickering T, Warren K, Schwartz J. Lower socioeconomic status among men in relation to the association between job strain and blood pressure. *Scandinavian Journal of Work, Environment and Health* 2003;29(3): 206-215.

Job Strain, CVD and CVD risk factors: Methodological Issues

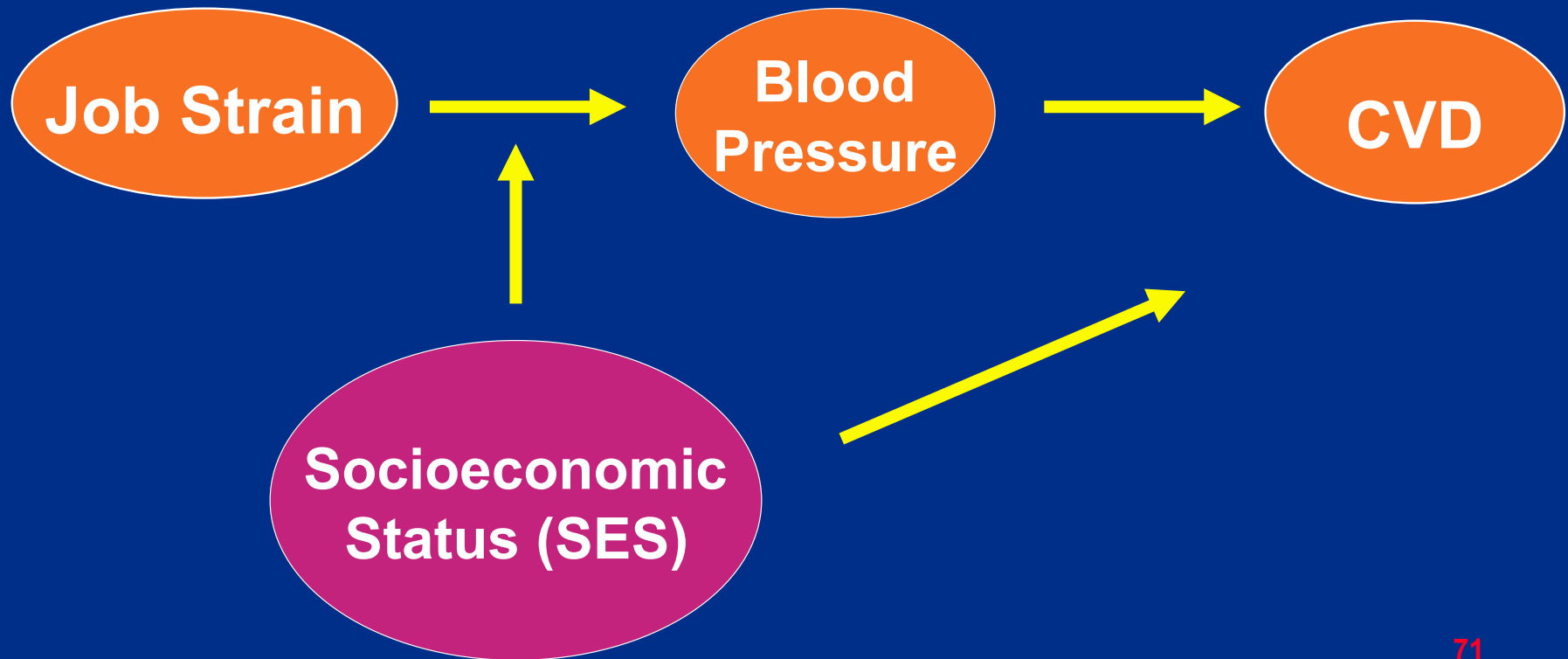
- Imputation studies
 - Positive in 8 of 12 CVD studies
 - Positive in 2 of 10 risk factor studies (+ 2 mixed)
- Use of varied measures of Job decision latitude:
 - Low “supervision clarity” (Framingham heart study)
 - Low income (Finnish Kuopio heart study)
- Job demands:
 - Physical demands (Finnish factory study)
 - Low autonomy & support, responsibility, insecurity, deadlines, mental stress (Kuopio heart study)

Job Strain

Definition: The combination of HIGH Job Demands and LOW Decision Latitude (decision authority + skill use)



Does this occur because of effect modification of the job strain-blood pressure relationship?



Correlation between job characteristics and SES measures (283 men, time 1)

	<u>Latitude</u>	<u>Demands</u>		
Education	.37	.32		
Occupational status	.36	.36		
Personal income	.45	.31		
Family income	.39	.28		
	<u>Occupational status</u>	<u>Personal Income</u>	<u>Family Income</u>	
Education	.57	.50	.51	
Occupational status		.53	.58	
Personal income			.84	

Job strain and SES: variables

	<u>Time 1 (n=283)</u>		<u>Time 1-2 (n=195)</u>
	<u>Mean</u>	<u>Range</u>	<u>r</u>
Job decision latitude	35.8	17-48	.64
Psychological workload demands	31.8	14-48	.64
Age (yrs)	44.3	30-60	--
Education (yrs)	14.3	6-18	--
Occupational status	72.0	15-95	.92
Personal income (\$)	46,085	15-100,000+	.84
Family income (\$)	54,390	15-100,000+	.82

	<u>%</u>	
Job strain	22%	.29
(high job demands + low job decision latitude)		

Work Site BP³ Study

Typical job titles (283 men, time 1)

WHITE-COLLAR (46%)

Vice President, Director, Manager, Personnel specialist,
Budget officer, Senior systems analyst

CLERICAL, TECHNICAL, ADMINISTRATIVE (33%)

Electronic publishing technician, Billing clerk, Data
entry clerk, Staff assistant, Personnel supervisor,
Claims examiner, Computer programmer

BLUE-COLLAR (21%)

Auto mechanic, Electrician, Elevator operator,
Machinist, Welder

Association between SES and job strain (high job demands + low job decision latitude) (283 men, time 1)

	<u>Job strain</u>	<u>No strain</u>	<u>p</u>
Education (yrs)	14.4	14.3	ns
Occupational status	74.2	71.4	ns
Personal income (\$)	44,304	46,577	ns
Family income (\$)	52,828	54,820	ns

	<u>Job strain</u>	<u>Latitude</u>	<u>Demands</u>
White-collar	24%	38.3	34.5
Clerical, technical	22%	33.7	29.6
Blue-collar	15%	33.8	29.1
	(ns)	(<.001)	(<.001)

Why synergy between job strain and SES? Possible explanations:

**Interaction of 2 powerful main effects (as with SRF)
Measurement of job demands**

- **Too non-specific for white-collar workers?**

Job strain model not as applicable to white-collar work

- **White-collar demands = challenging, mentally active work (protective effect of “active” work in some CHD studies)**
- **Blue-collar demands = for fast-paced performance**
- **Able to exercise control in other areas of life?**

Study strengths and limitations

Strengths

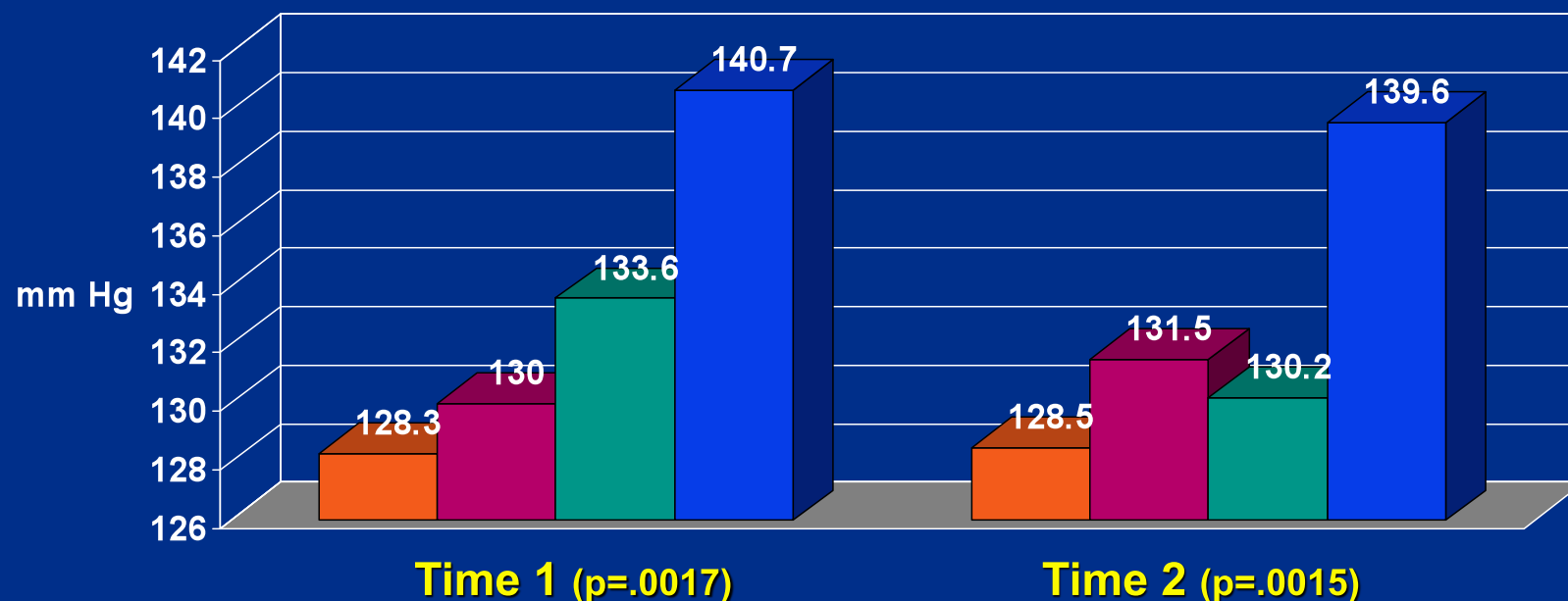
- New technology improves validity of BP measurement
- Widely-used valid exposure measure (JCQ)
- Variance in exposure
- Good measurement and control of confounders
- Assessment of changes in exposure
 - Fair reliability and validity of work history questionnaire
 - Decent power for analyses of recent work history

Limitations

- Potential participation bias
- Initial Cross-sectional analysis
- Limited N, power -- for interaction, analyses of distal work history
- Limits to validity of work history questionnaire
- Excludes highest exposure groups, severe hypertensives

Job Strain change and Work Systolic Ambulatory BP (n=195 men, Time 1 and 2)

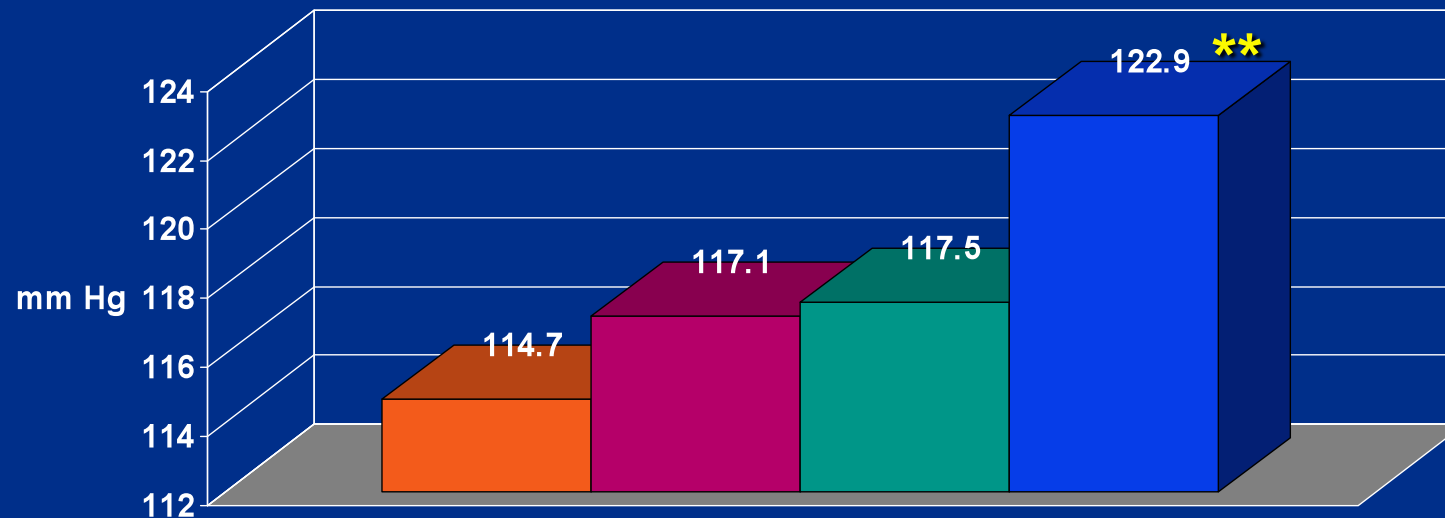
Strain-T1:	no	no	yes	yes		no	no	yes	yes
Strain-T2:	no	yes	no	yes		no	yes	no	yes



controlling for age, education, body mass index, race, smoking, alcohol use, work site

Job Strain change and Time 2 work systolic AmBP (n=71 Quebec white-collar women with a University degree)

Strain-T1:	no	no	yes	yes
Strain-T2 (+14 mon.):	no	yes	no	yes

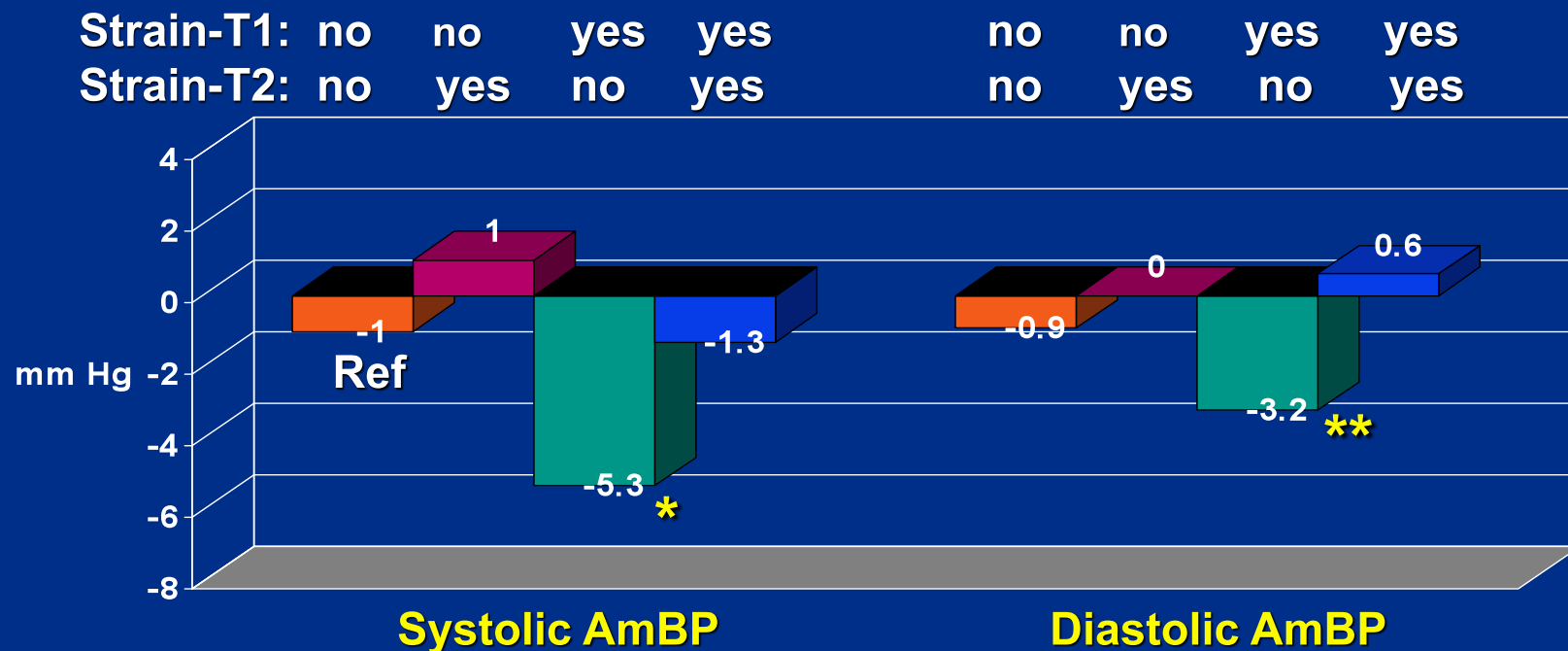


controlling for age, smoking, OC use

(Laflamme N et al. *Scand J Work, Environ Health* 1998;24(5):334-343.)

**p<.01 vs. ref.

Job Strain change and 3-yr Work Ambulatory BP change (n=195 men, Time 1-2)



controlling for age, race, body mass index, smoking, alcohol use, work site

p<.05, **p<.01, (vs Ref group)

Studies of Job Strain and Ambulatory Blood Pressure (updated 6/2006)

	<u>Significant positive associations</u>	<u>Mixed positive and null associations</u>	<u>Total # of studies</u>
Ambulatory BP	9	16	25
men	4	6	10
women	3	4	7
both	2	6	8

Belkić K, Landsbergis P, Schnall P, Baker D, Theorell T, Siegrist J, Peter R, Karasek R. Psychosocial factors: Review of the empirical data among men. *Occupational Medicine: State of the Art Reviews* 2000;15(1):24-46.

Brisson C. Women, work, and CVD. *Occupational Medicine: State of the Art Reviews* 2000;15(1):49-57.

Belstress Study 2007

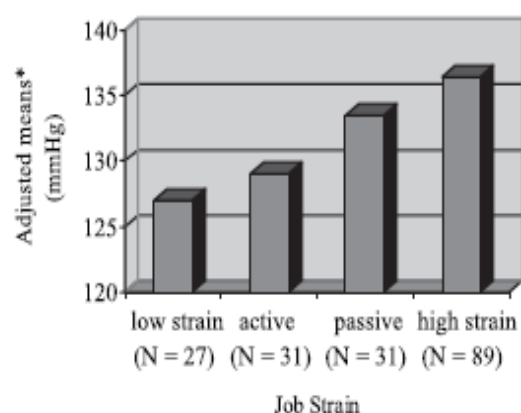


Fig. 1. Adjusted association between quadrant groups of job strain and mean systolic blood pressure at work (mm Hg). *Adjusted for gender, age, body mass index, smoking, high physical demands of the job, high stress outside work, mean level of physical activity prior to blood pressure measurements, and occupation.

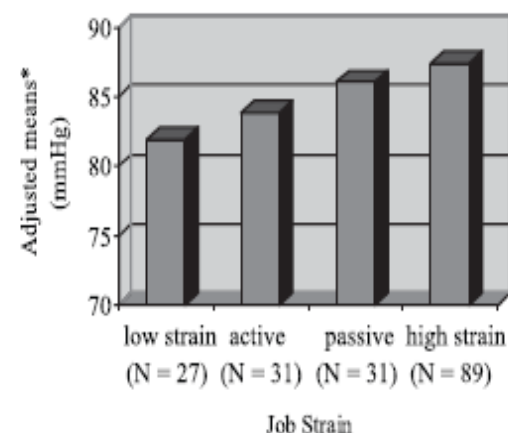


Fig. 2. Adjusted association between quadrant groups of job strain and mean diastolic blood pressure at work (mm Hg). *Adjusted for gender, age, body mass index, smoking, high physical demands of the job, high stress outside work, mean level of physical activity prior to blood pressure measurements, and occupation.

Clays et al. High Job Strain and Ambulatory Blood Pressure in Middle-Aged Men and Women From the Belgian Job Stress Study. JOEM 49(4) April 2007

Work hours and Hypertension

Yang et al JOEM 48(4) April 2006

TABLE 4. Multivariate Logistic Regression of Self-Reported Hypertension

Characteristics	OR	95% CI	p
Age group, y			
18 to 35	1.00		
36 to 50	2.53	2.18 to 2.94	<0.0001
51 to 64	5.71	4.93 to 6.62	<0.0001
Gender			
Female	1.00		
Male	1.24	1.11 to 1.39	<0.0001
Race/ethnicity			
Non-Hispanic white	1.00		
Non-Hispanic black	1.65	1.34 to 2.03	<0.0001
Hispanic	0.85	0.73 to 0.98	0.03
Non-Hispanic Asian	0.89	0.77 to 1.02	0.10
Education			
Less than high school	1.00		
High school	0.95	0.78 to 1.16	0.58
Some college	1.03	0.84 to 1.25	0.79
College and higher	0.81	0.67 to 0.98	0.03
Household Income			
0% to 99% federal poverty level	1.00		
100% to 199% federal poverty level	0.81	0.63 to 1.04	0.10
200% to 299% federal poverty level	0.84	0.62 to 1.14	0.27
≥300% federal poverty level	0.77	0.60 to 0.98	0.04
Tobacco consumption status			
Never smokers	1.00		
Past smokers	1.26	1.13 to 1.41	<0.0001
Current smokers	1.16	1.01 to 1.32	0.03
Self-reported diabetes	2.66	2.23 to 3.19	<0.0001
Sedentary lifestyle	1.10	0.99 to 1.21	0.066
Occupation			
Professional	1.00		
Manager	1.11	0.96 to 1.27	0.15
Clerical worker	1.23	1.00 to 1.51	0.05
Sales worker	1.00	0.85 to 1.18	0.97
Service worker	1.06	0.88 to 1.27	0.54
Skilled worker	1.05	0.87 to 1.20	0.58
Semiskilled worker	0.97	0.78 to 1.20	0.75
Unskilled worker	1.50	1.00 to 2.25	0.05
Work hours per week			
11 to 39	1.00		
40	1.14	1.01 to 1.28	0.04
41 to 50	1.17	1.04 to 1.33	0.01
≥51	1.29	1.10 to 1.52	0.002