

Psychosocial biomarkers in studies of ageing

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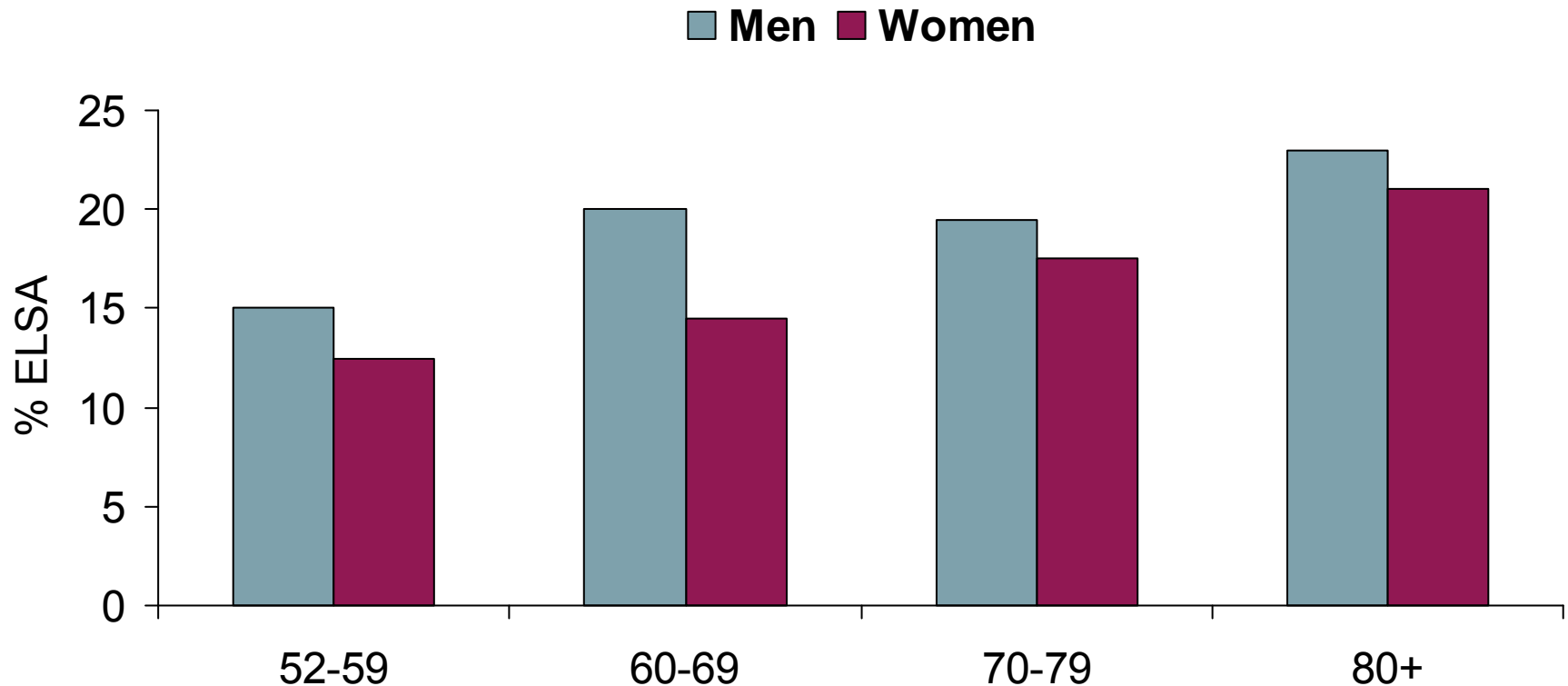
What are biomarkers:

- Body shape: weight, height, waist, BMI
- Physiology: blood pressure, lung function
- Blood analytes: cholesterol, glucose, C-reactive protein, interleukin (IL)-6, fibrinogen
- Physical function: grip strength, walking speed, chair rises
- Saliva, cheek cells: cortisol, DNA
- Hearing and vision tests

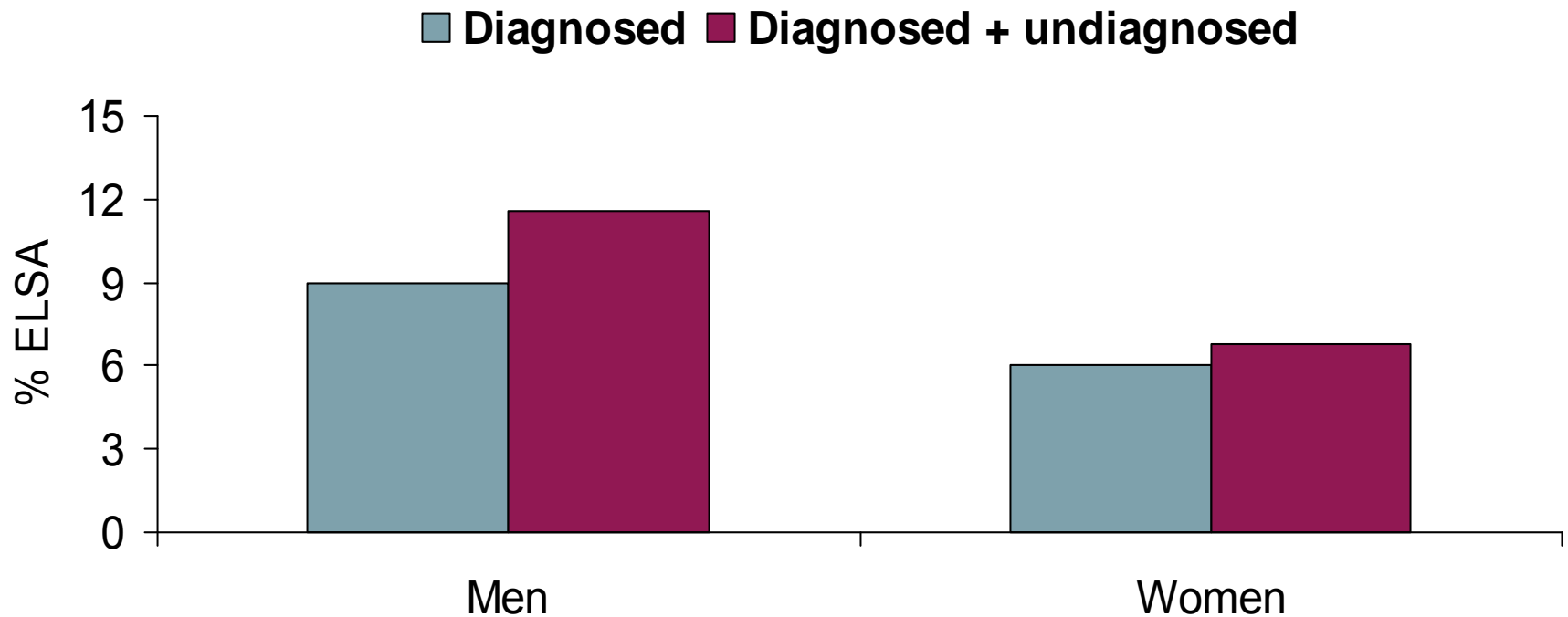
Purpose of biomarkers

- Measures of clinical (or preclinical) conditions
 - blood pressure, fasting glucose, lung function measures, body mass

Undiagnosed high blood pressure



Diagnosed and undiagnosed diabetes



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 - Waist circumference, inflammatory markers, fibrinogen, grip strength
- Non-specific indices of adaptation and resistance to future illness
 - Cortisol, IGF-1, DHEA sulfate, vitamin D

Psychosocial biomarker research

Measurement of physiological processes that reflect psychological, social and economic experience

- **Life stress exposure**

Work stress, financial strain, caregiving, neighbourhood factors, family conflict, life events

- **Social participation factors**

Social networks, social support, social isolation

- **Psychological factors**

Depression, anxiety, hostility, optimism, loneliness, positive well-being

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- Mediation of psychosocial influences on disease risk
- Markers of optimal functioning and well-being
- Corroboration of self-report differences:
 - Individual
 - Population

Psychosocial biomarker research

Measurement of physiological processes that reflect psychological, social and economic experience

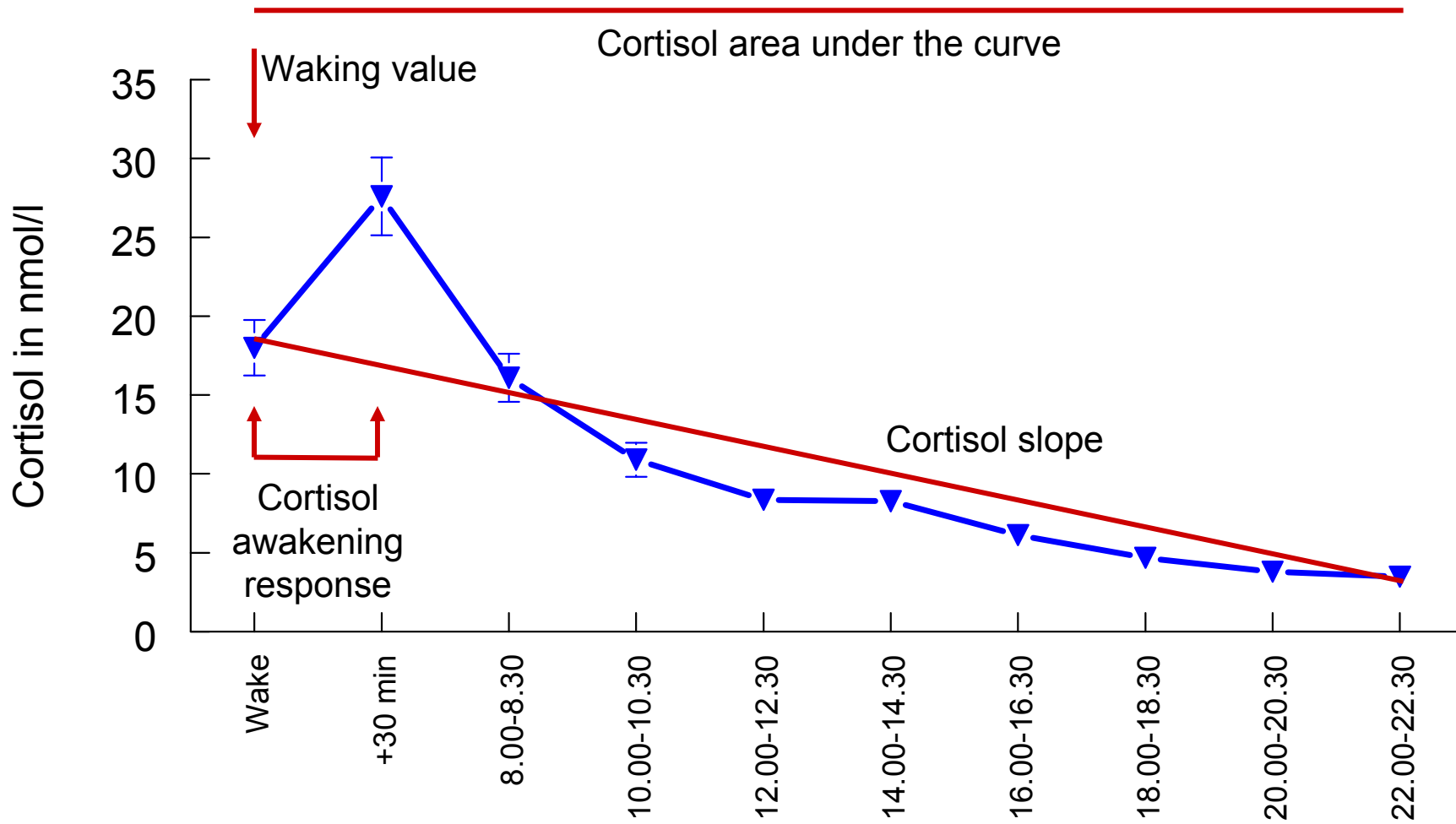
➤ Cortisol

Some effects of high cortisol

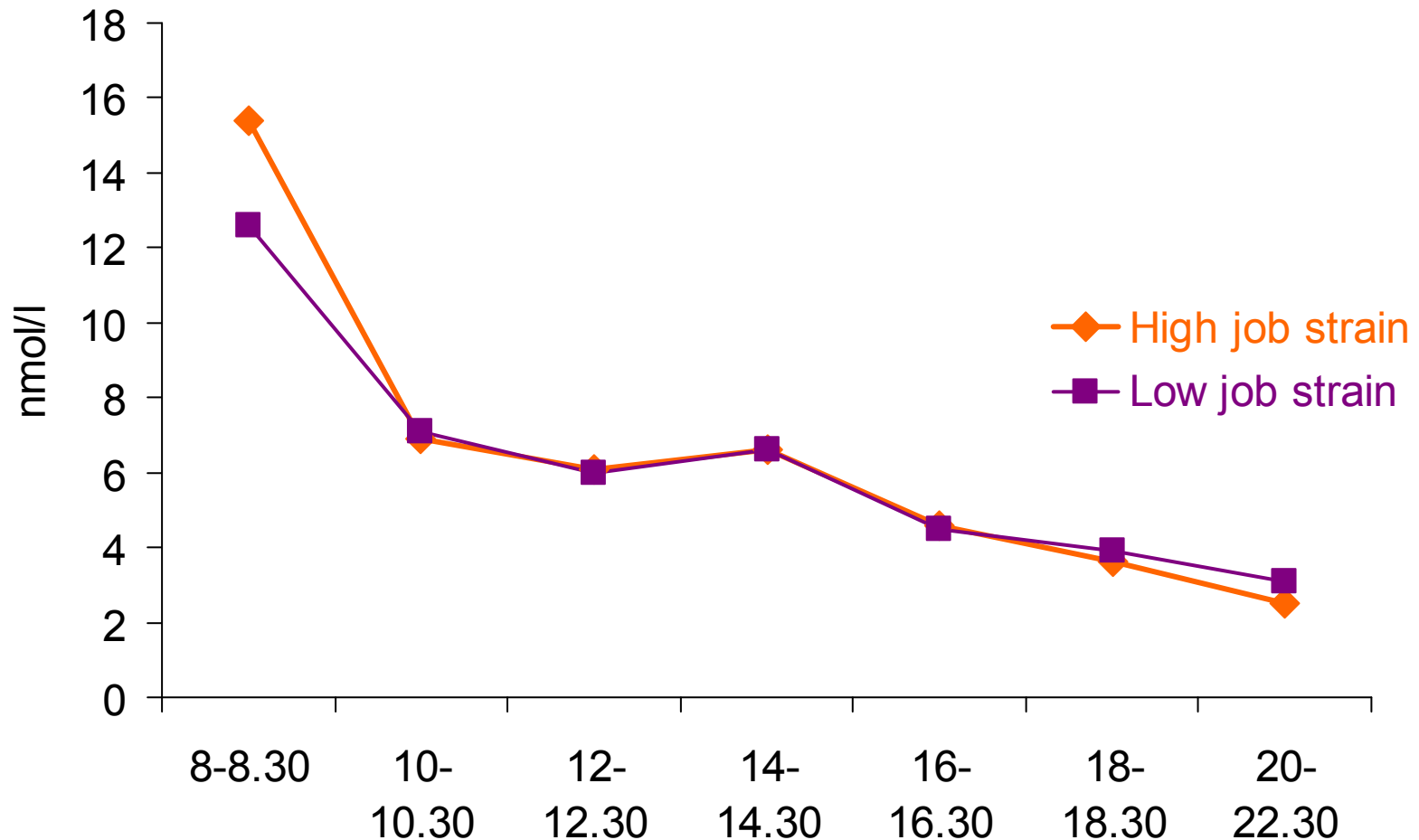
Potentially damaging effects

- Increased lipid (LDL-cholesterol) in the blood
- Suppression of immune function
- Decalcification of bone
- Deposition of abdominal fat
- Damage to the hippocampus
- Muscle wasting
- Impaired reproductive function

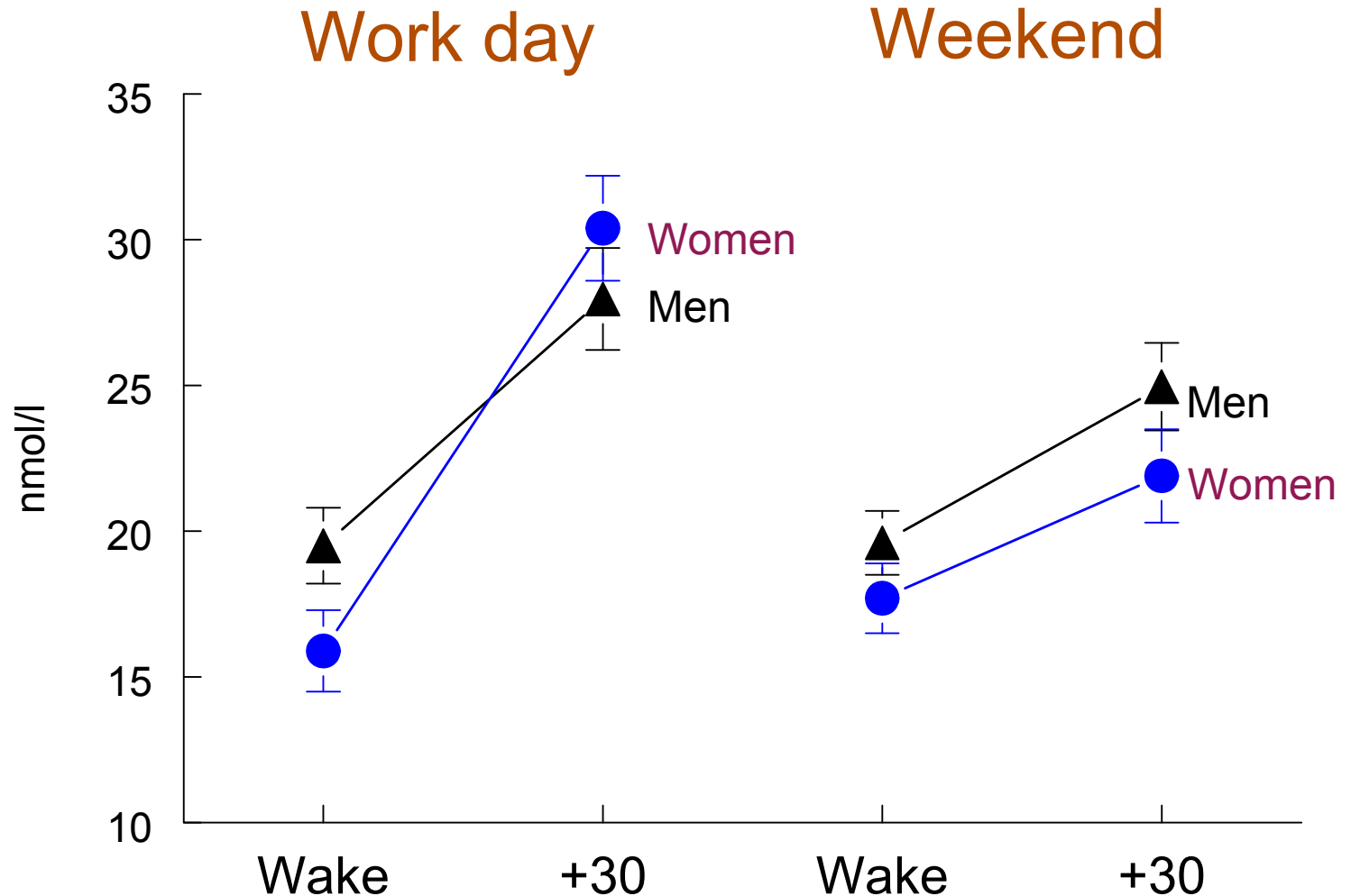
Cortisol profile over the day



Cortisol and job strain



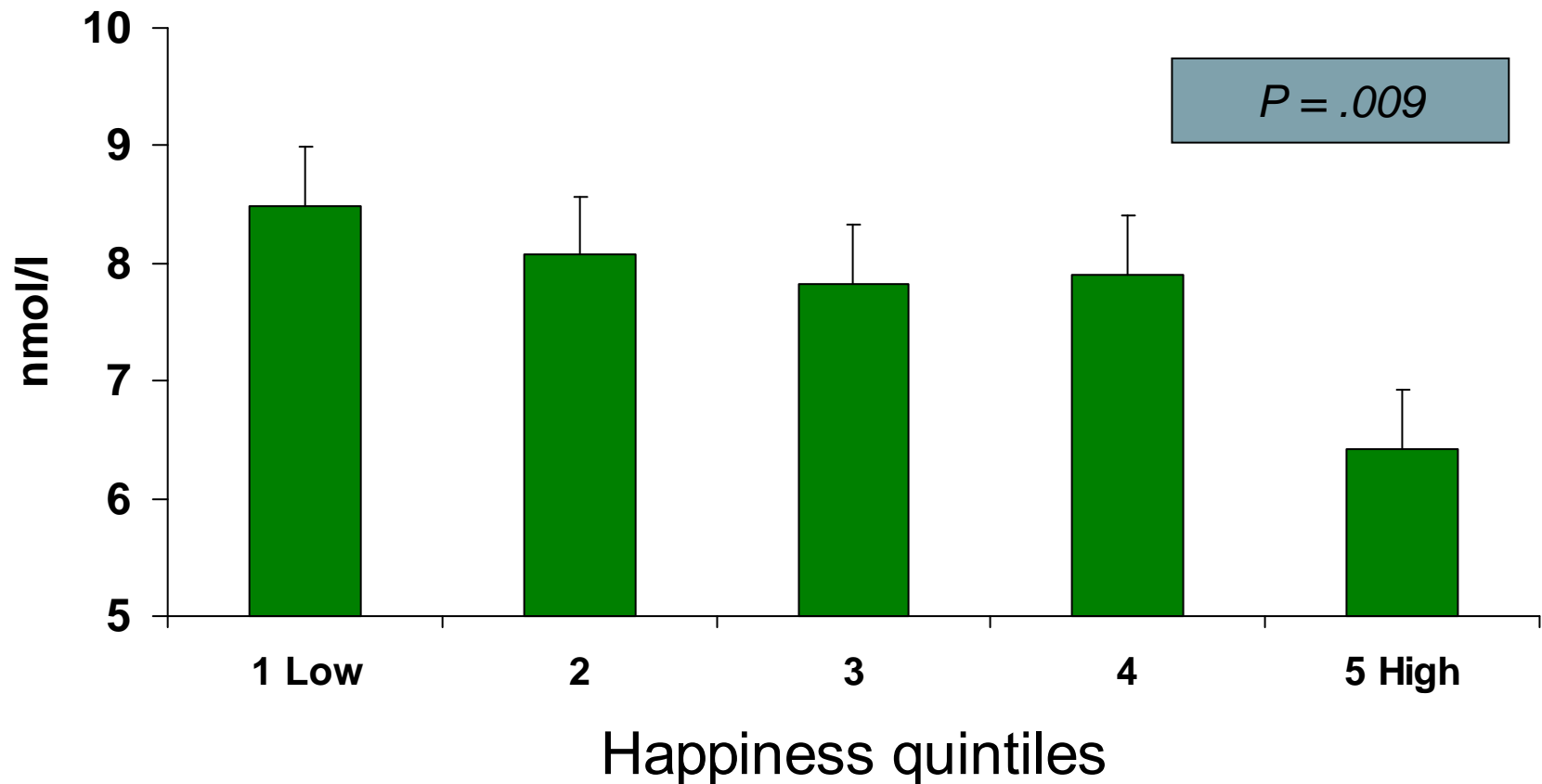
Cortisol waking response



Cortisol awakening response – meta analysis

Factor	Correlation	95% C.I.	N studies	<i>P</i>
Job stress	0.061	0.012 – 0.110	22	0.045
General life stress	0.065	0.007 – 0.123	35	0.029
Depression	-0.026	-0.084 – 0.033	17	0.13
Anxiety	0.040	-0.032 – 0.112	22	0.27
Fatigue	-0.148	-0.255 - -0.037	6	0.009

Salivary cortisol and positive affect



8 samples (08:00 – 22:30)

Adjusted for gender, age, occupational grade, smoking, bmi, and GHQ

Cortisol and coping study

- 740 men and women from the Whitehall II epidemiological cohort (age 60.9 ± 5.5 years)
- Salivary cortisol sampled 6 times over the day
- Psychological coping inventory identifies three broad strategies:
 - Problem engagement
 - Seeking social support
 - Avoidant coping

Cortisol and coping study

- Lower cortisol associated with:
 - Greater problem engagement
($\beta = -0.135$, $p = 0.003$)
 - More support seeking ($\beta = -0.093$, $p = 0.034$)

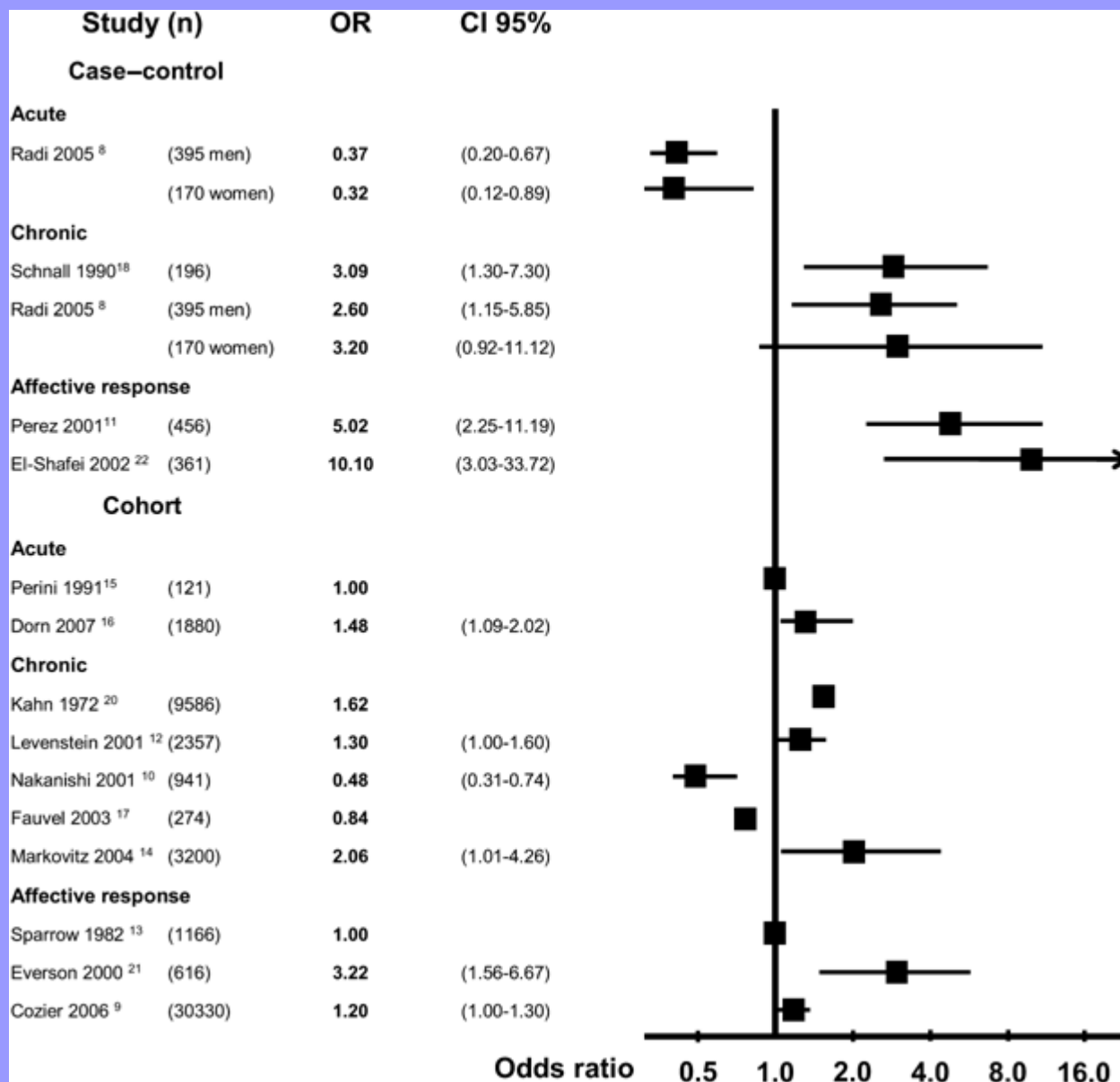
Independently of age, gender, SES, smoking, depression, and self-rated health

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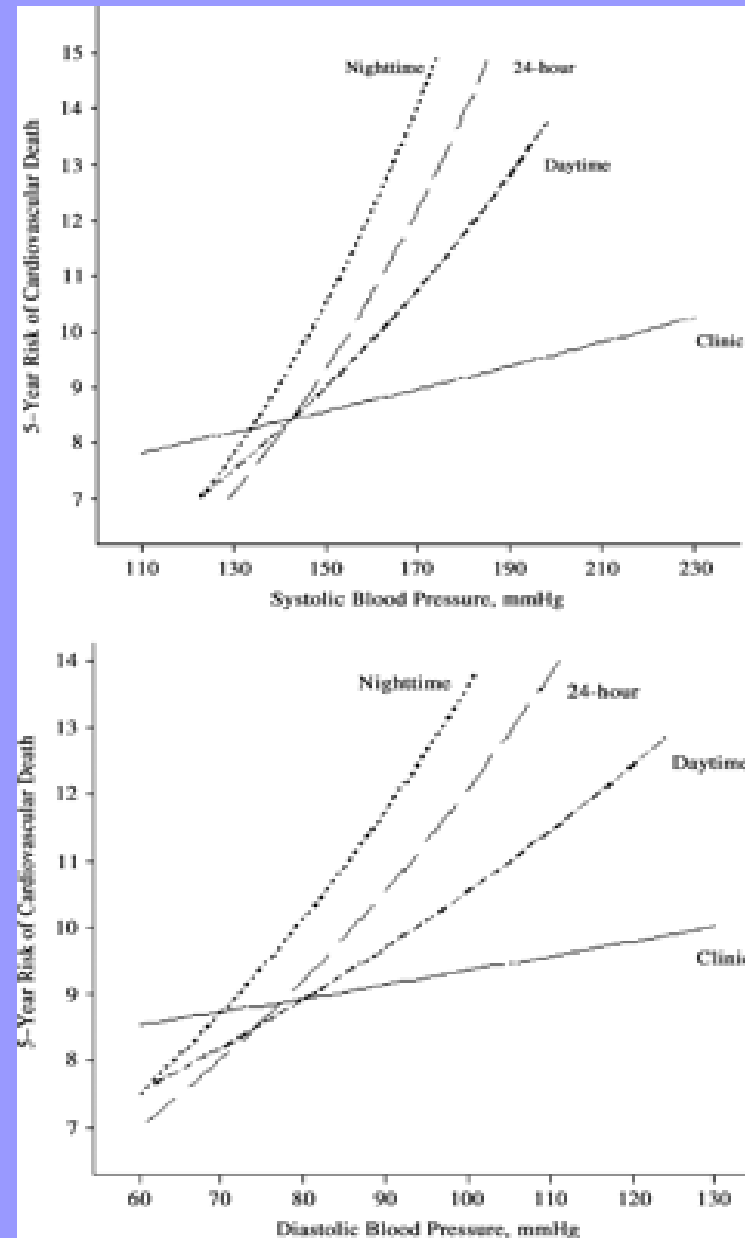
- Cortisol
- Blood pressure

Stress and Hypertension



Sparrenberger et al
2009
J Hum Hypertension

Ambulatory and clinical BP

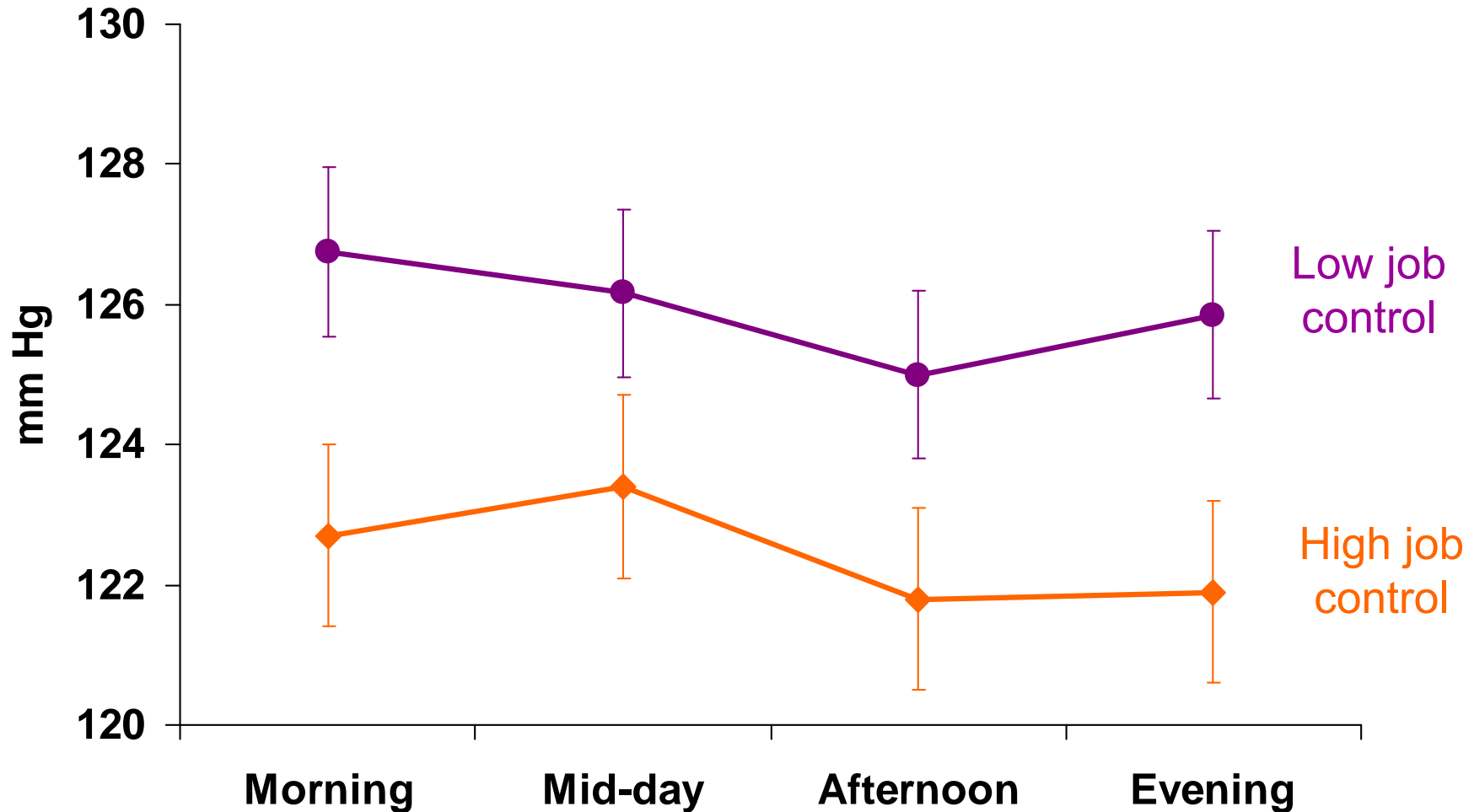


5 year risk of death in relation
To ambulatory and clinic BP in
1114 older patients (65+ years)
From Burr et al, 2008

Job stress and blood pressure

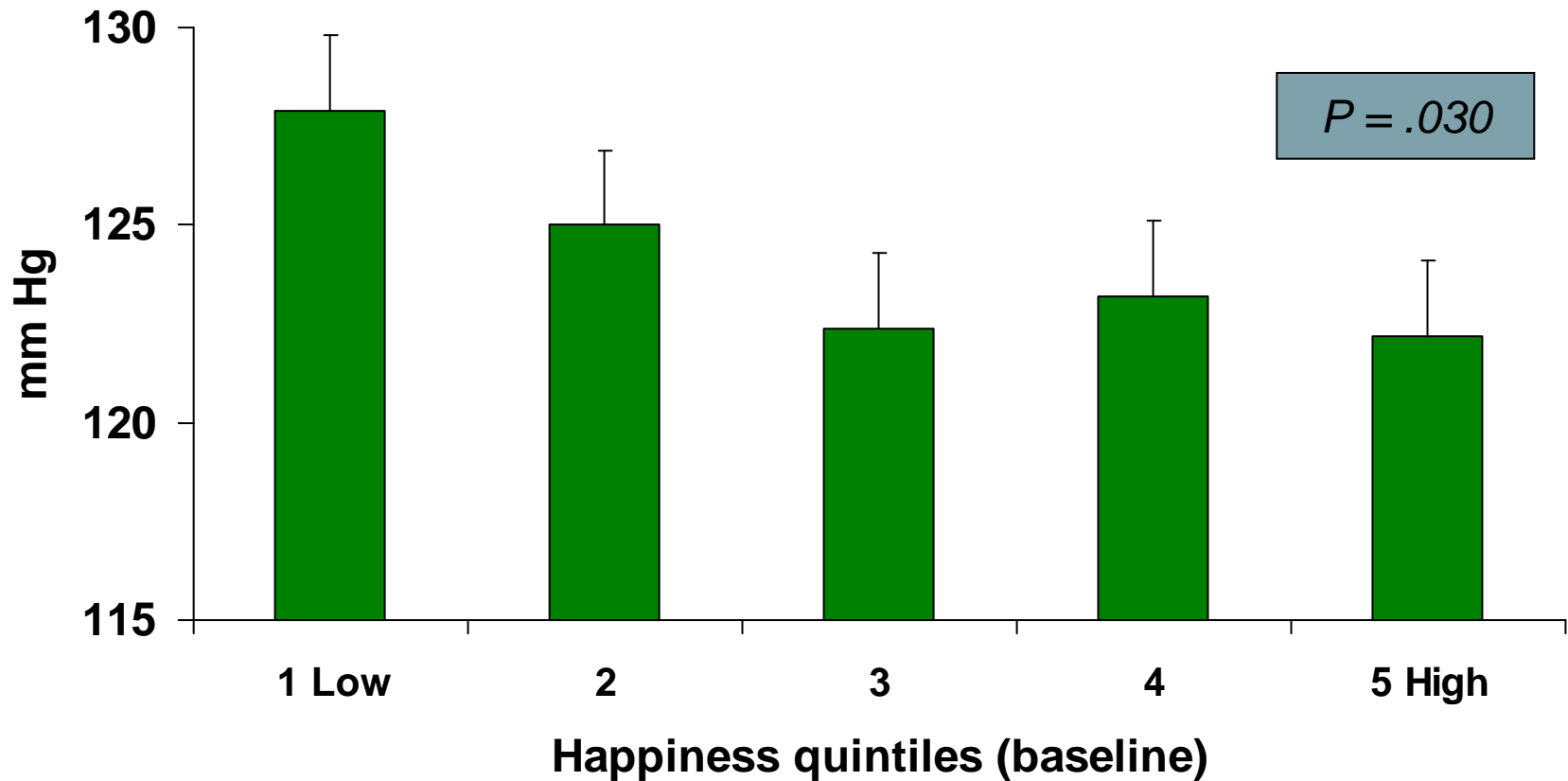
	Positive Associations	Null effects
Clinical/ casual BP	Cesana, 96; Kawakami, 98; Pieper, 89	Albright 92; Alterman, 94; Carrere, 91; Emdad, 97; Tarumi, 93; Greenlund, 95; Netterstrom, 91; Kivimäki, 07
Ambulatory BP	Cesana, 96; Harenstom, 88; Light, 92; Schnall, 94; Theorell, 91; van Egeren, 92; Steptoe 04	Knox 85; Steptoe 99

Ambulatory systolic pressure: working day



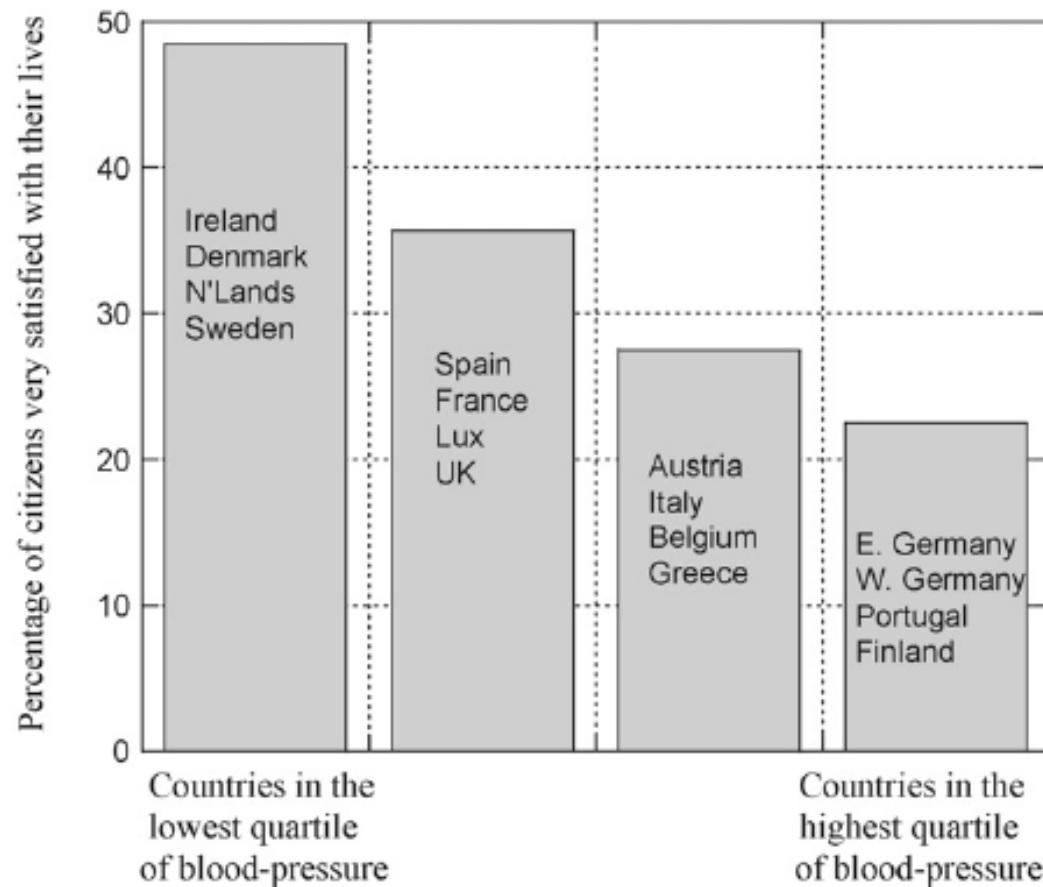
Adjusted for gender, age, occupational grade, smoking, bmi, and physical activity

Systolic BP and happiness – 3 year



Adjusted for gender, age, occupational grade, work at follow-up, smoking, bmi, GHQ. N = 160

The Inverse Correlation Between Hypertension and Life Satisfaction: 16 European nations Aggregated into Quartiles



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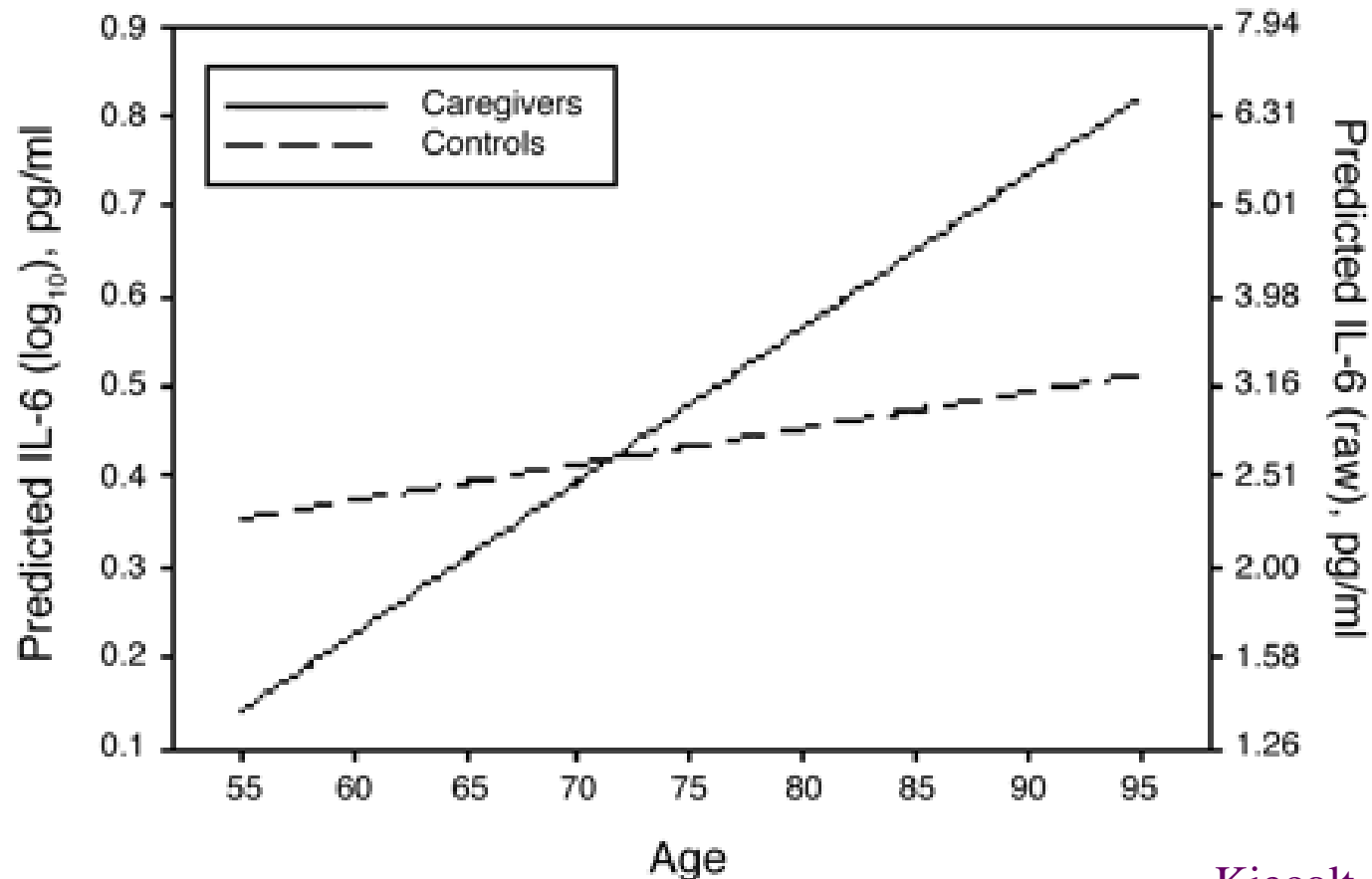
- Cortisol
- Blood pressure
- Inflammatory markers (C-reactive protein, fibrinogen, IL-6)

Interleukin 6

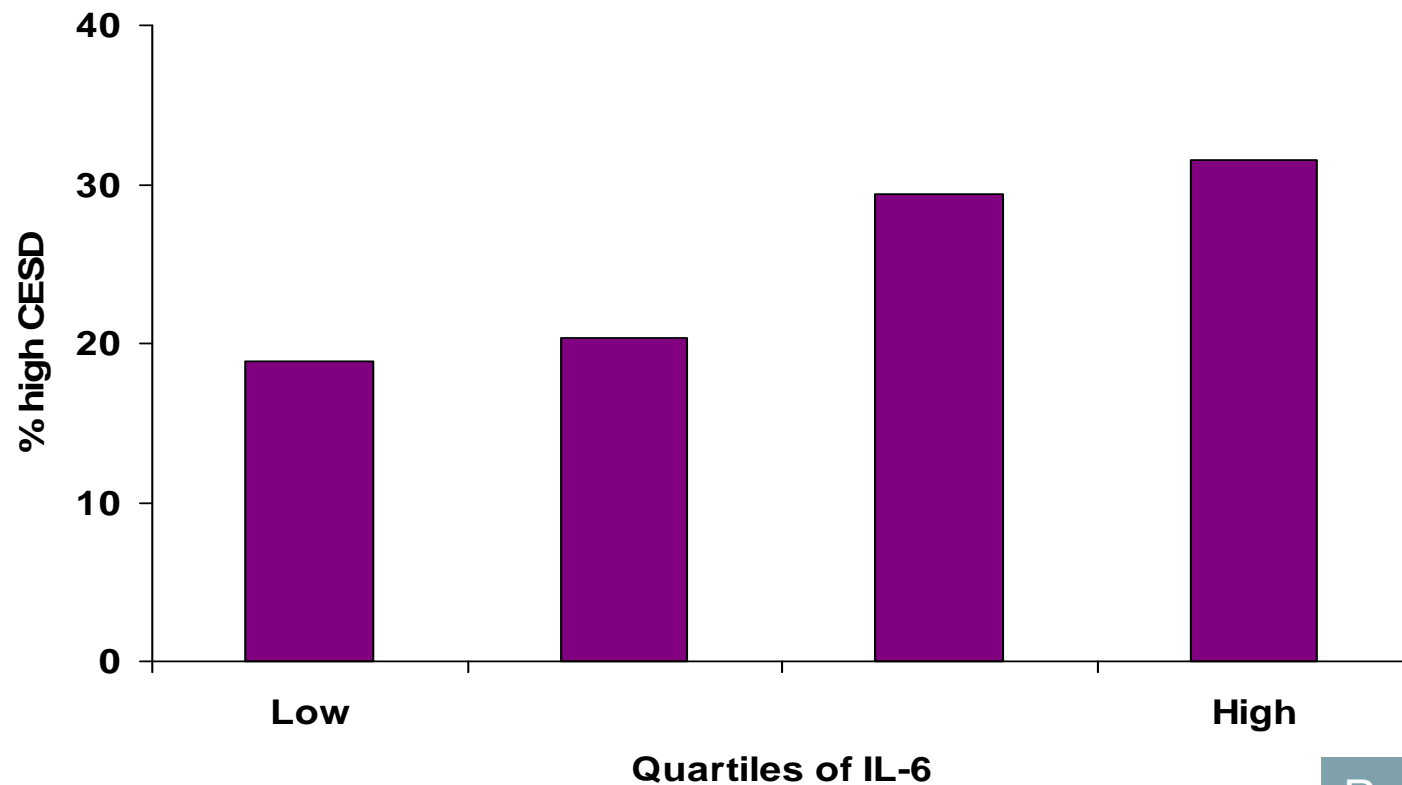
An 'endocrine' cytokine associated with

- Coronary heart disease
 - Type 2 diabetes, insulin resistance
 - Depression
 - Disability
-
- Sensitive to acute and chronic psychosocial factors

Caregiver stress and plasma interleukin-6



IL-6 and depressed mood



3024 men & women aged 70-79
Adjusted for gender, age, body mass, chronic illness
smoking, alcohol, medication

Penninx et al,
Biol Psychiat
2005

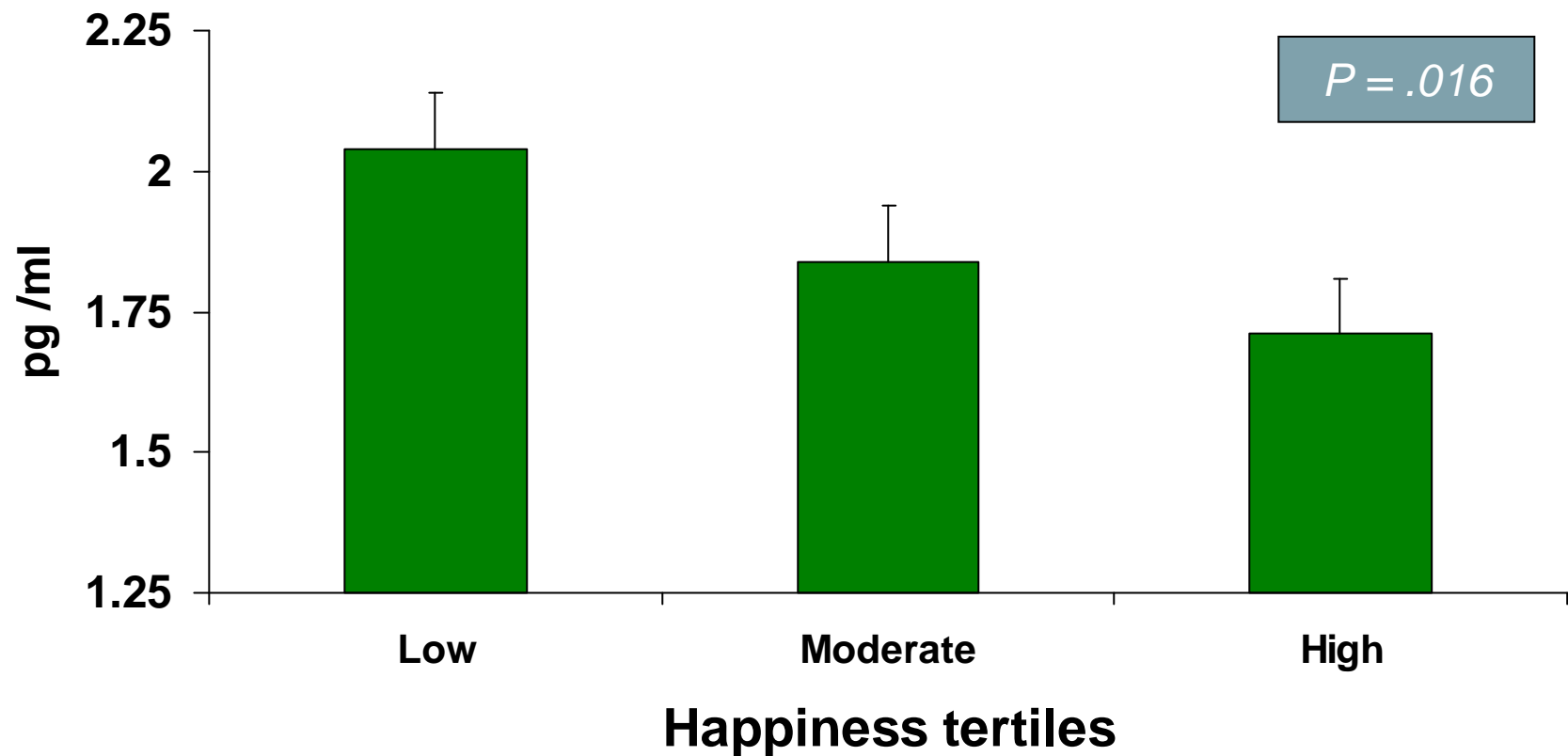
IL-6 and cognitive impairment

4 year follow-up of 2632 men and women aged 70-79 years

Cognitive impairment, adjusting for baseline cognitive score, age, education, race, depression, alcohol, stroke and statins

- High inflammation RR: 1.66 (1.19 – 2.18)
- Low inflammation RR: 1.08 (0.89 – 1.30)

IL-6 and happiness



Adjusted for age, income, ethnicity, BMI, smoking, waist/hip ratio, employment, CES-D

Steptoe et al, 2008
Am J Epidemiol

Psychosocial biomarker research

Measurement of physiological processes that reflect psychological, social and economic experience

- Cortisol
- Blood pressure
- Inflammatory markers (C-reactive protein, fibrinogen, IL-6)
- Heart rate variability

Heart rate variability

Neural regulation of homeostasis

Sympathetic
nervous
system

accelerates

Parasympathetic
nervous
system

slows



Heart rate

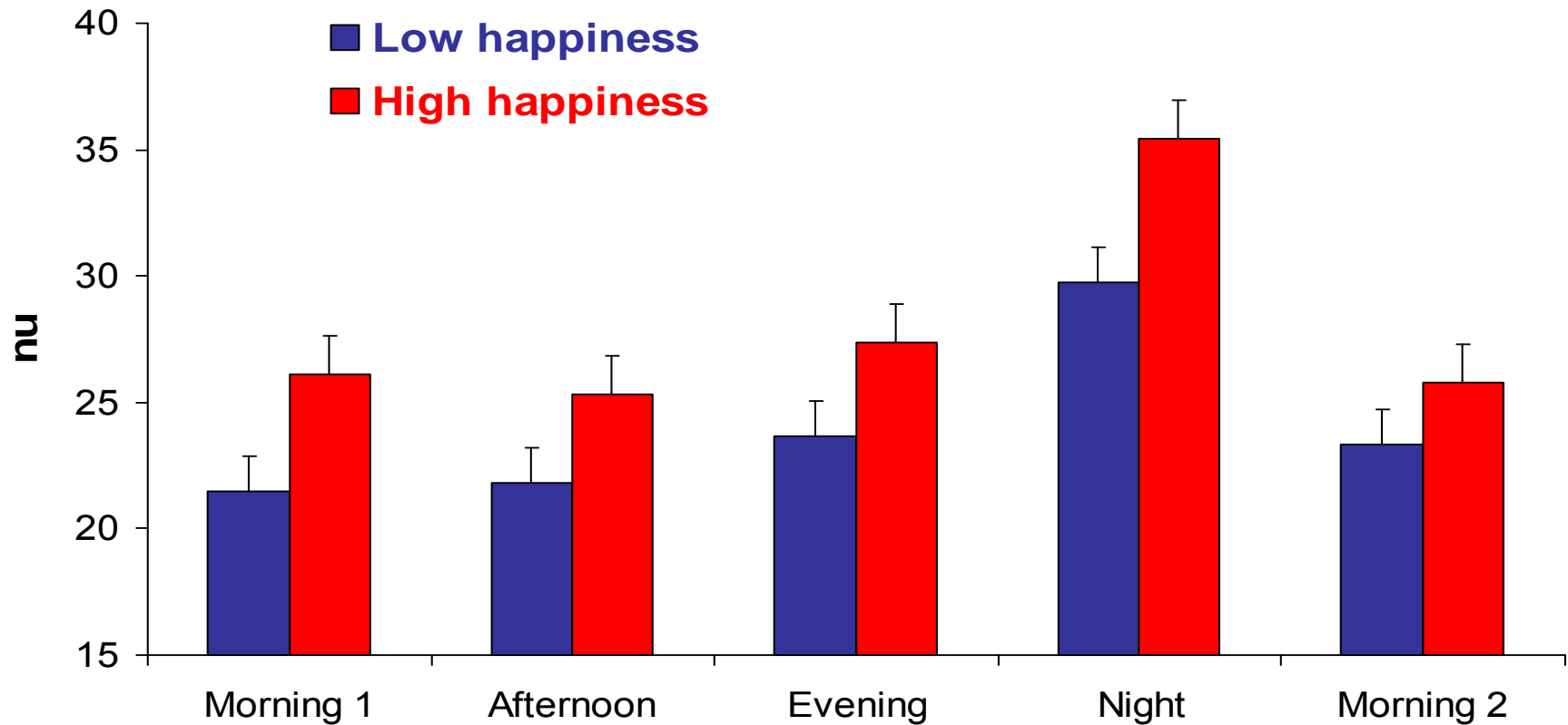
Low heart rate variability

- Higher risk of death or recurrent events in patients with coronary heart disease (Atrami study, 1998)
- Incident CHD in apparently healthy cohorts (Liao, 1997)
- Future hypertension (Schroeder, 2003)
- Post-stroke mortality (Makikillio, 2004)

Low heart rate variability

- Poorer cognitive executive function (Hansen et al 2003)
- Less effective impulse control in children (Allen et al 2000)
- Reduced sleep efficiency (Hall et al 2004)
- Social isolation (Horsten 1999)
- Work stress (Vrijkotte 2000; Hemingway 2005)
- Depression (Rottenberg 2007)

Positive affect and HF-HRV



Adjusted for age, gender and β -blockers
Bhattacharyya et al, 2008; Psychosom Med

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