

When are the physiological reactions unhealthy?

Helene Garde

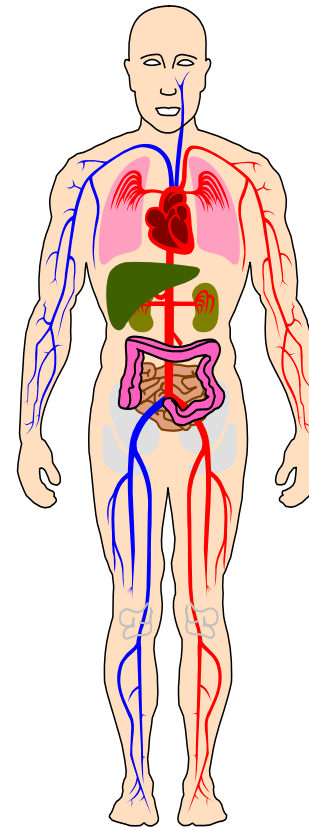
National Research Centre for the Working Environment





Model

Exposure



Effect

Biological response





Models for health risk

- Cognitive activation theory
- Homeostatis/Allostasis
- Lack of restitution
- Shift of rhythms
- Stress-disequilibrium theory
(Not included)



CATS

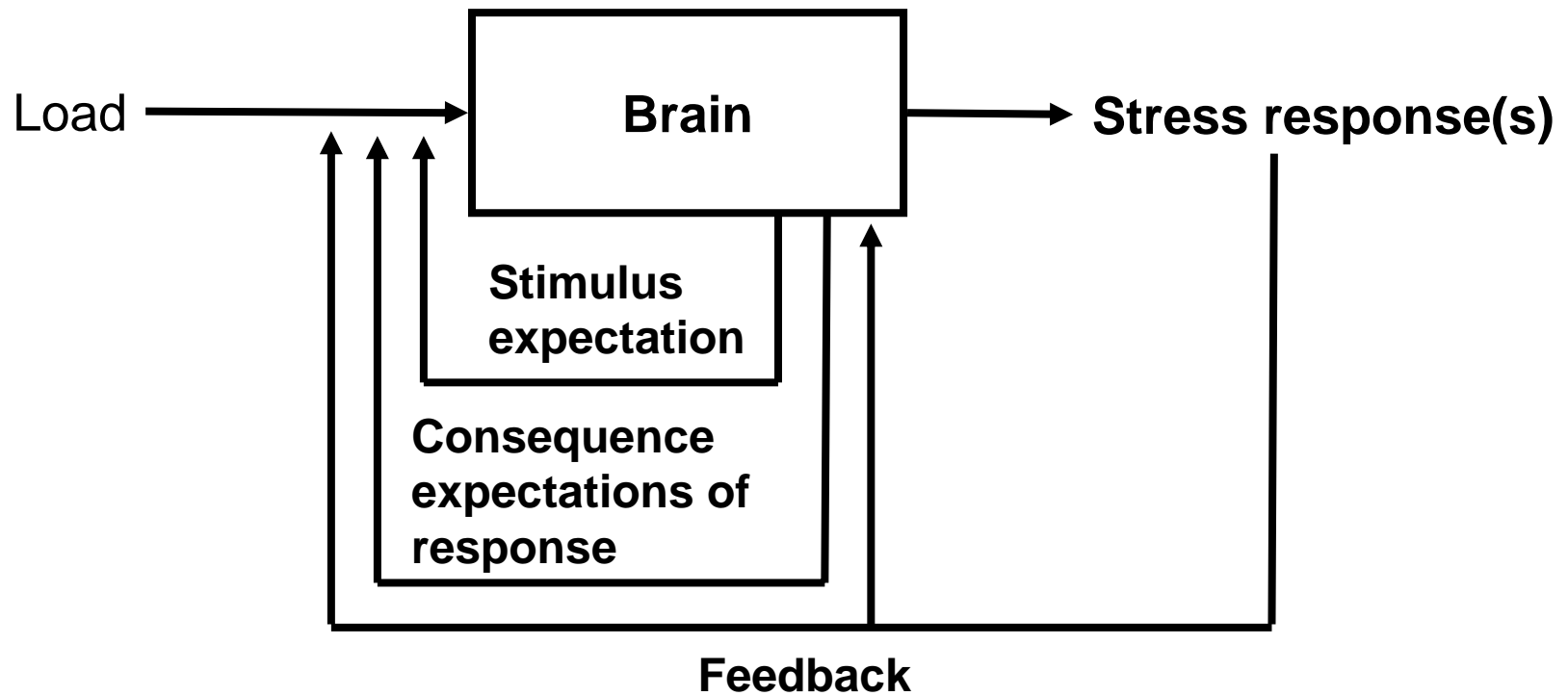
The stress response:

- A general alarm in a homeostatic system, producing general and unspecific neurophysiological activation from one level of arousal to more arousal.
- Occurs if something is missing, if there is a threat, or if there is a discrepancy between what should be and what is.
- Essential and necessary physiological response, may lead to illness if sustained.
- Depends on acquired expectations of the outcomes of stimuli and available responses.

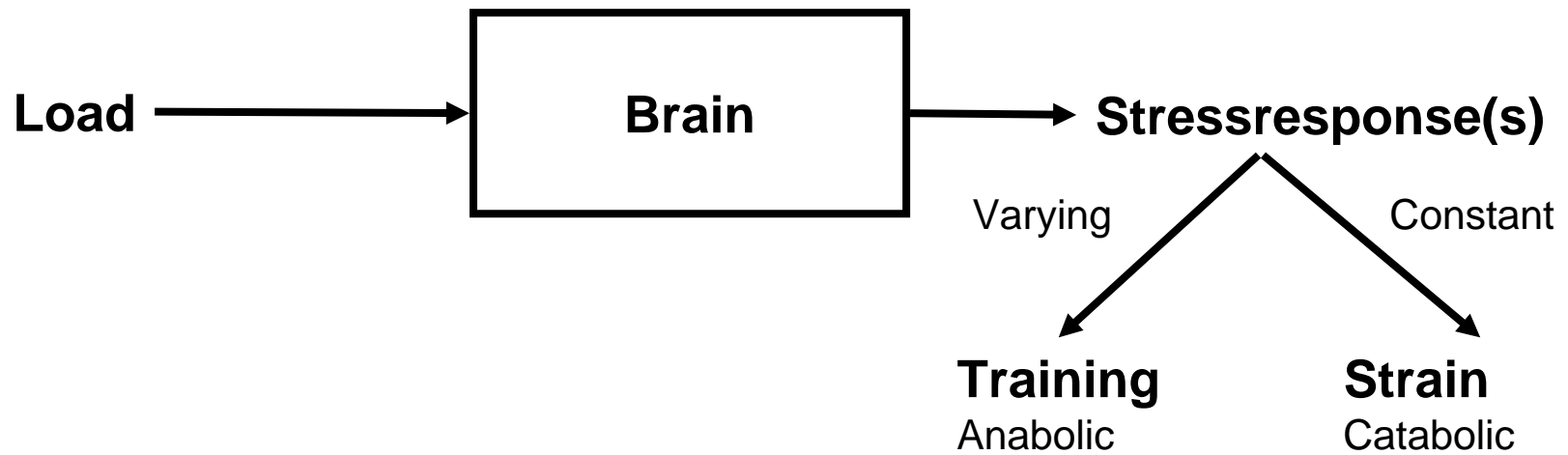
Ursin & Eriksson, Psychoneuroendocrinology, 2004



CATS



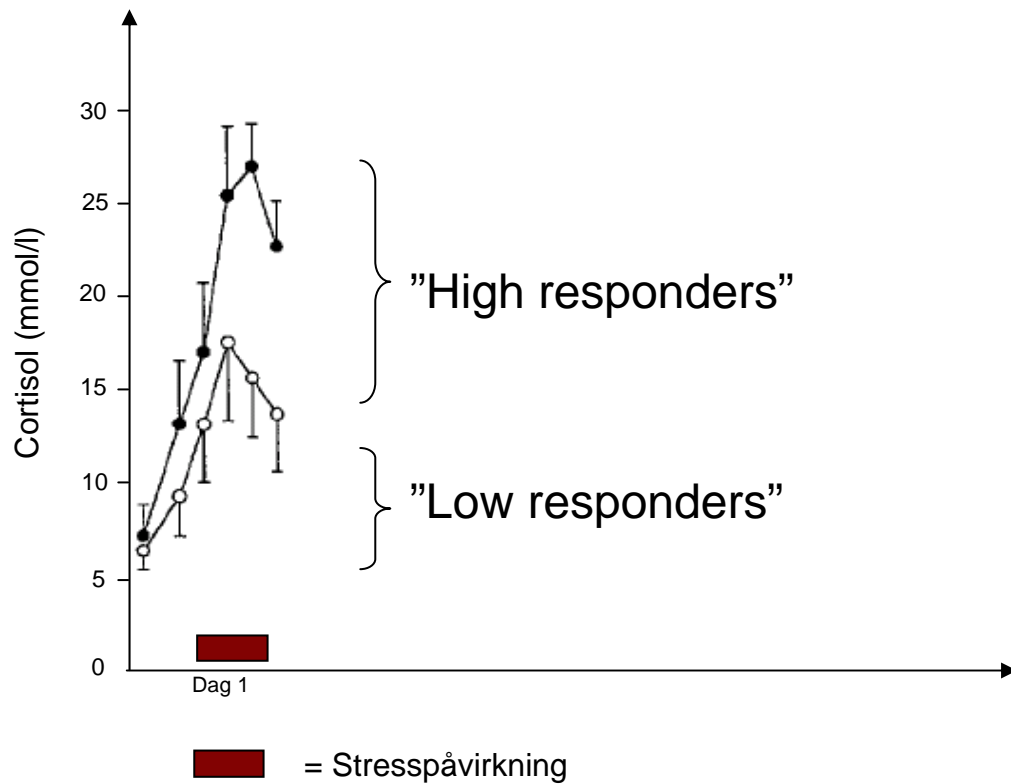
CATS





Self-esteem og internal locus-of-control

Stressreaction (cortisol) in response to Trier Social Stress test



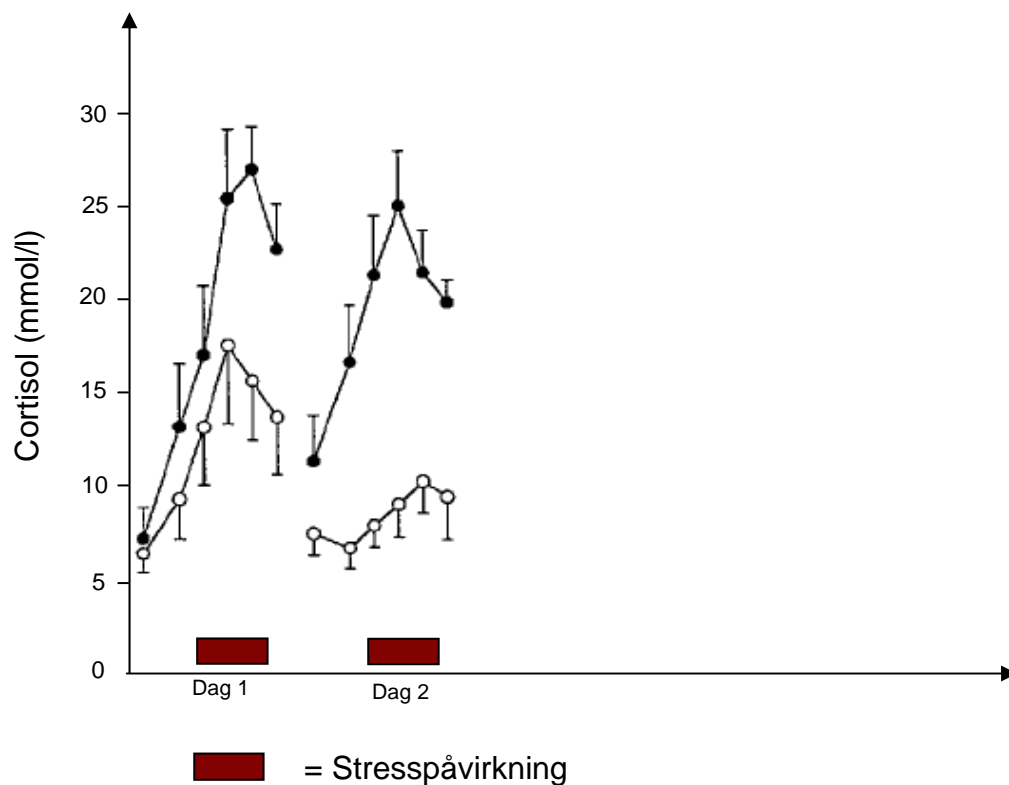
Kirschbaum et al., Psychosom Med 1995; 57: 468-474.





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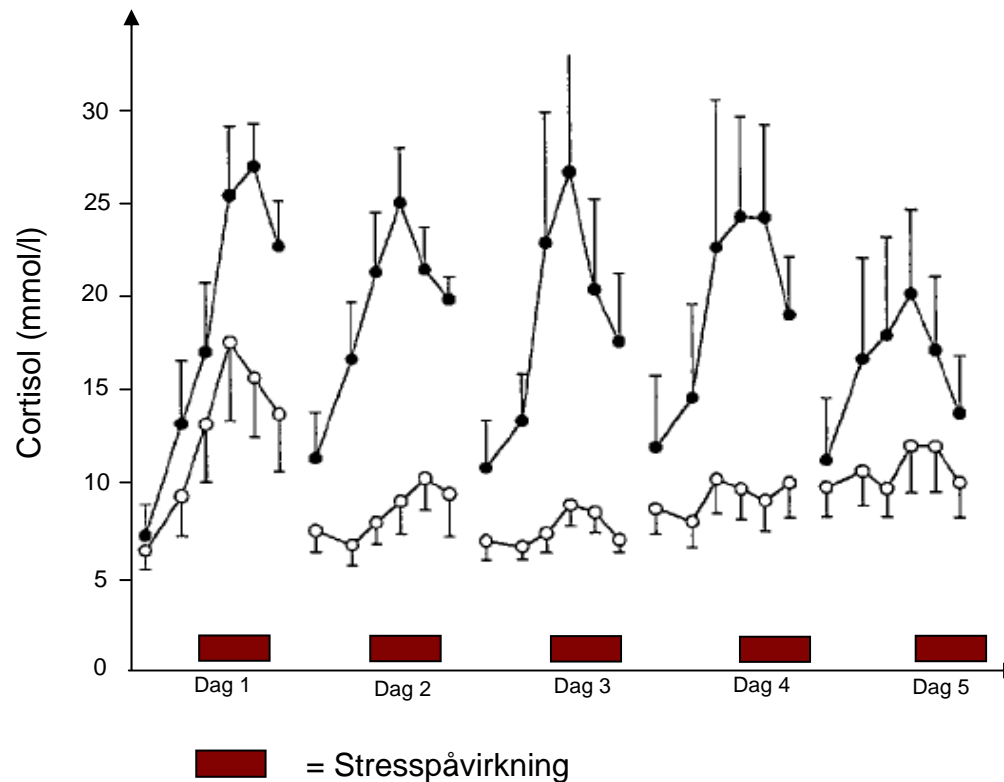
Kirschbaum et al., Psychosom
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Homeostatis

- The relative stability, despite environmental fluctuations, of those tissue parameters that are critical to cell survival, e.g.
 - nutrient availability,
 - oxygen availability,
 - temperature,
 - pH, and
 - ion concentrations.

Cannon



Homeostatic processes or allostasis

The ability
to achieve
stability
through
change.

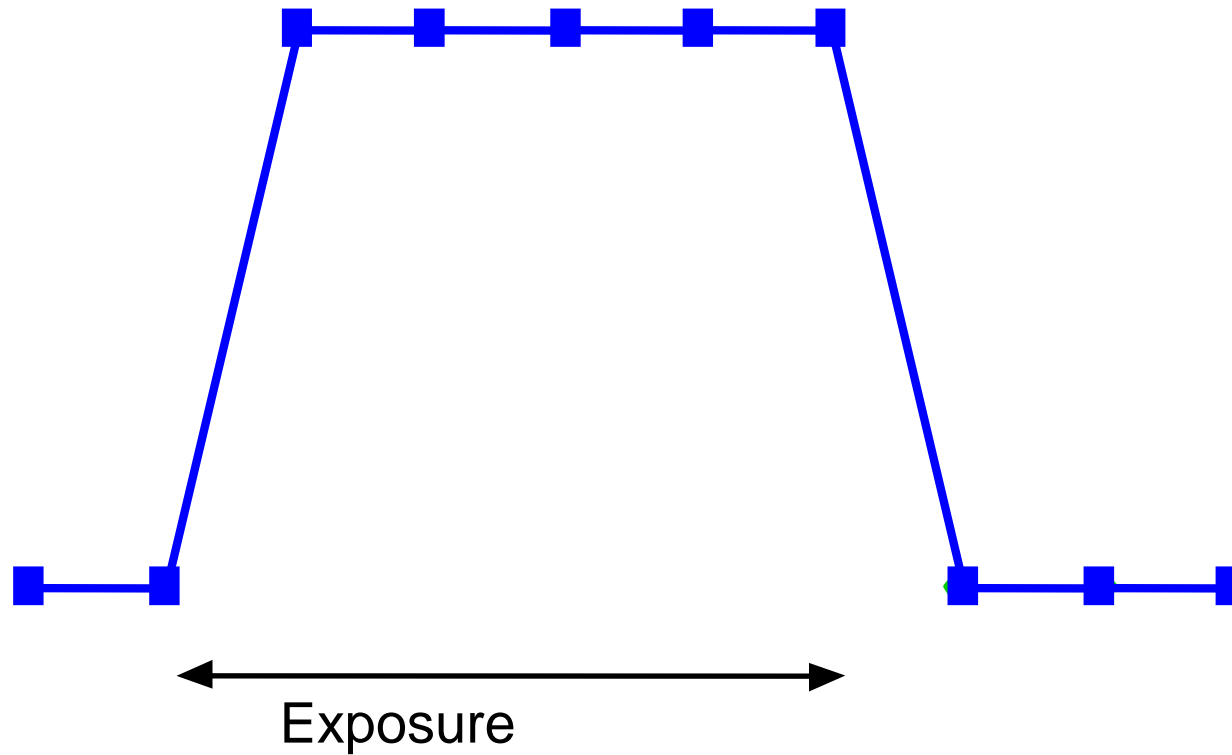


McEwen New England Journal of Medicine (1998)





Healthy response





Allostatic (or homeostatic) load

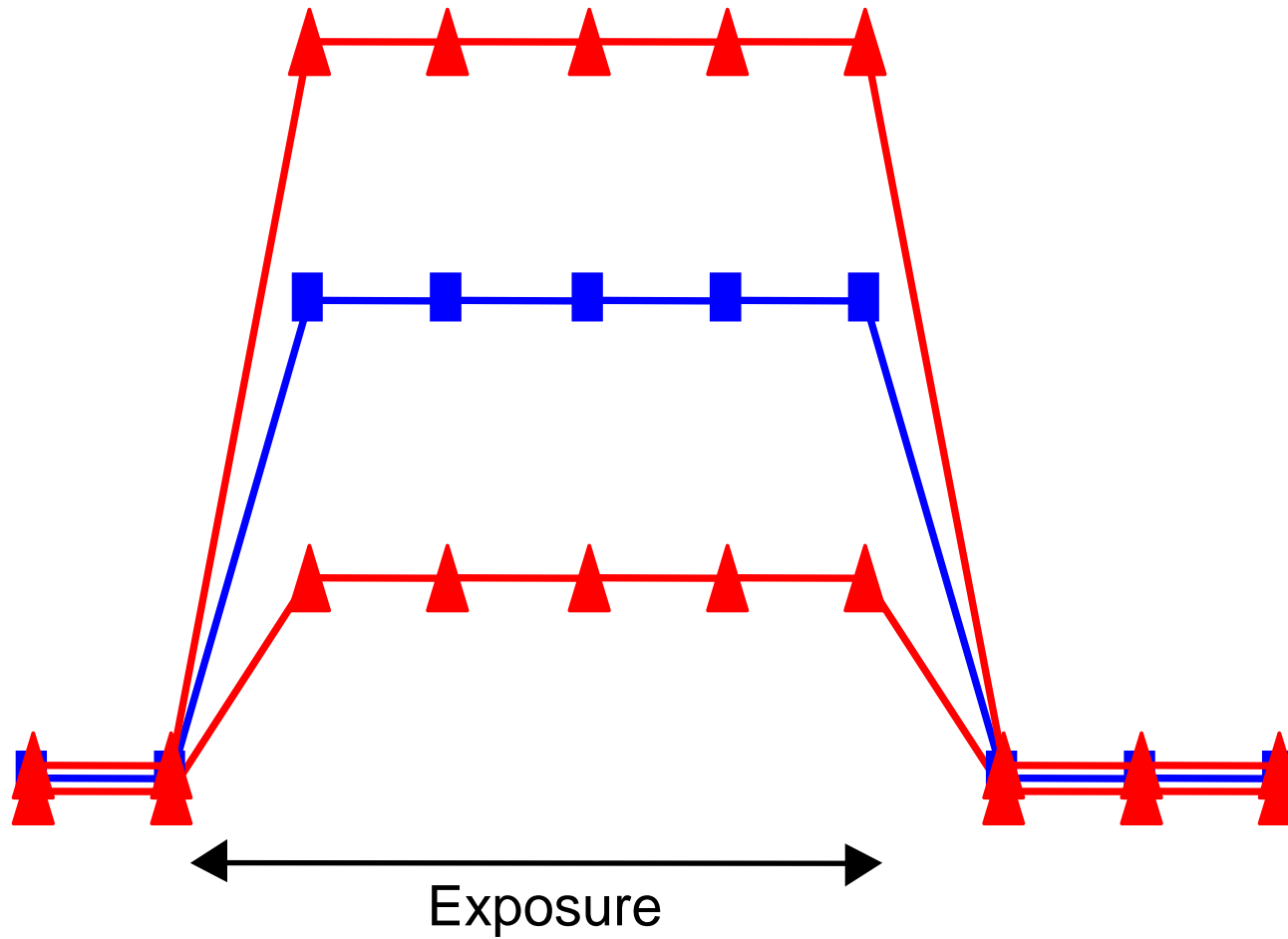
The wear and tear that result from chronic overactivity or underactivity of allostatic systems

McEwen New England Journal of Medicine (1998)





Size of response





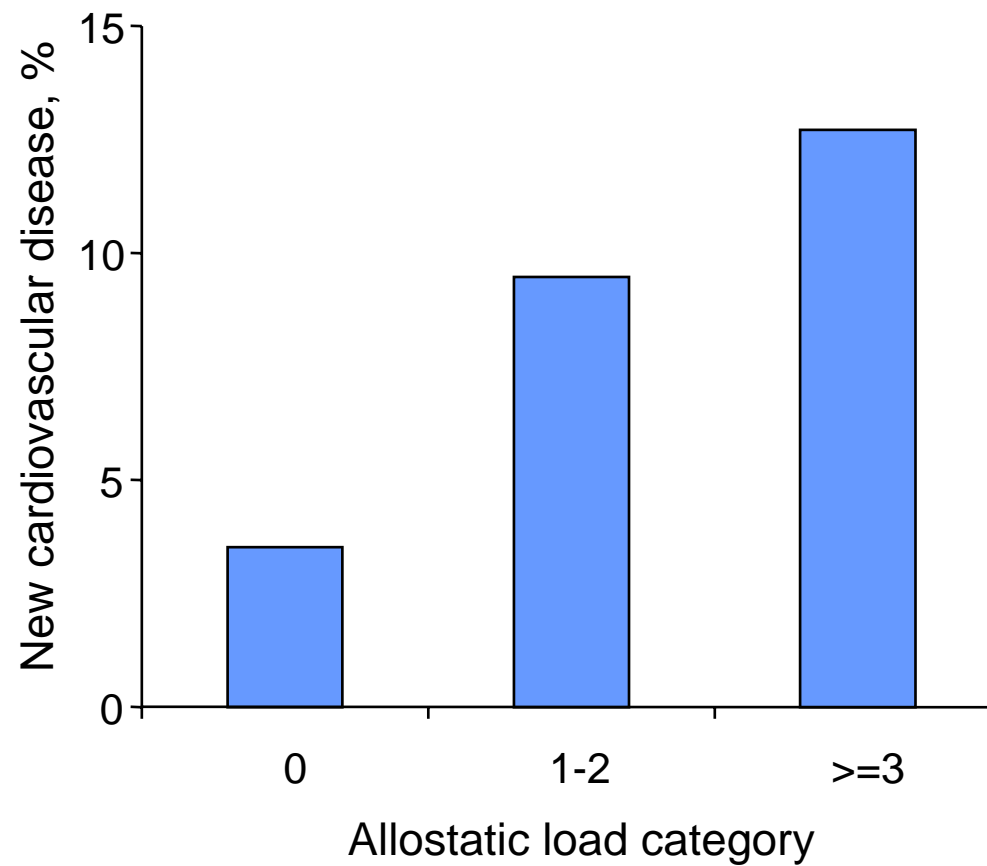
Successful aging

- Systolic blood pressure (>148 mm Hg)
- Diastolic blood pressure (>83 mm Hg)
- Waist-hip ratio (>0.94)
- Total cholesterol-HDL ratio (>5.9)
- Total HbA_{1c} ($>7.1\%$)
- Urinary cortisol (>25.7 mg/g creatinine)
- Urinary norepinephrine (>48 mg/g creatinine)
- Urinary epinephrine (>5 mg/g creatinine)
- HDL cholesterol (< 1.45 mmol/L)
- DHEA-S (<2.5 μ mol/L)

T.E. Seeman et al. (1997)



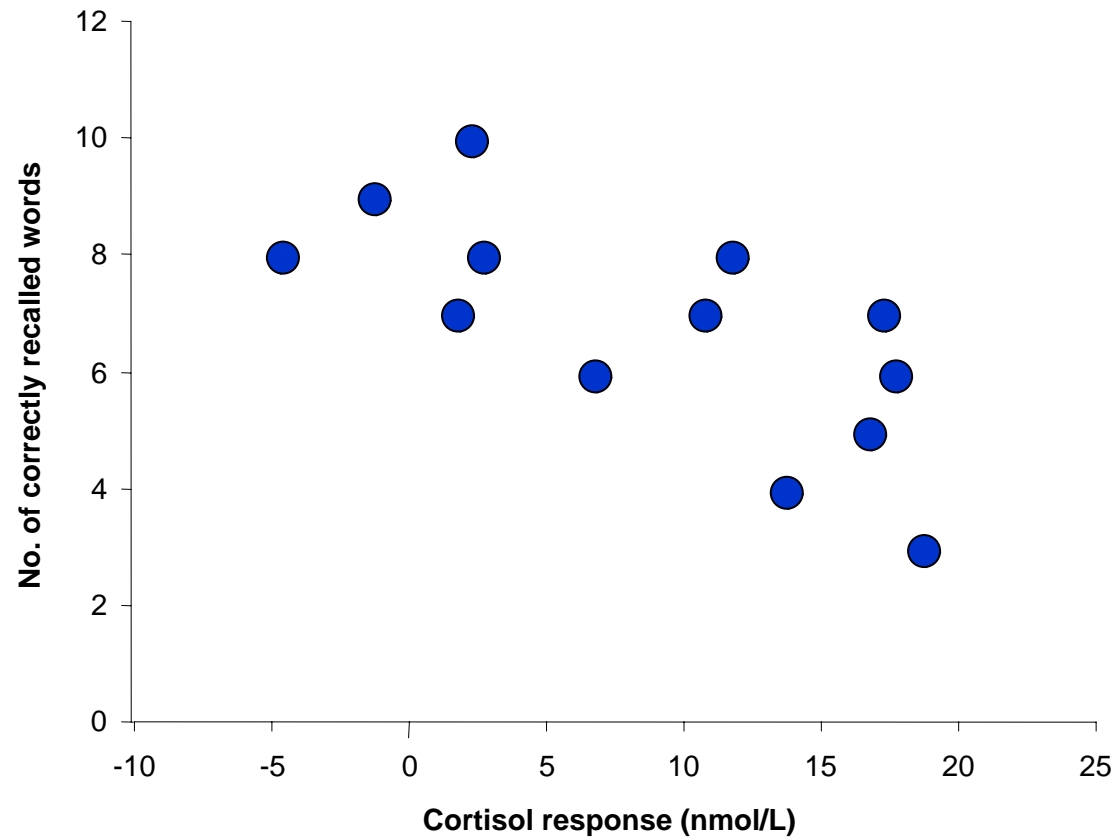
Successful aging



T.E. Seeman et al. (1997)



Cortisol and memory

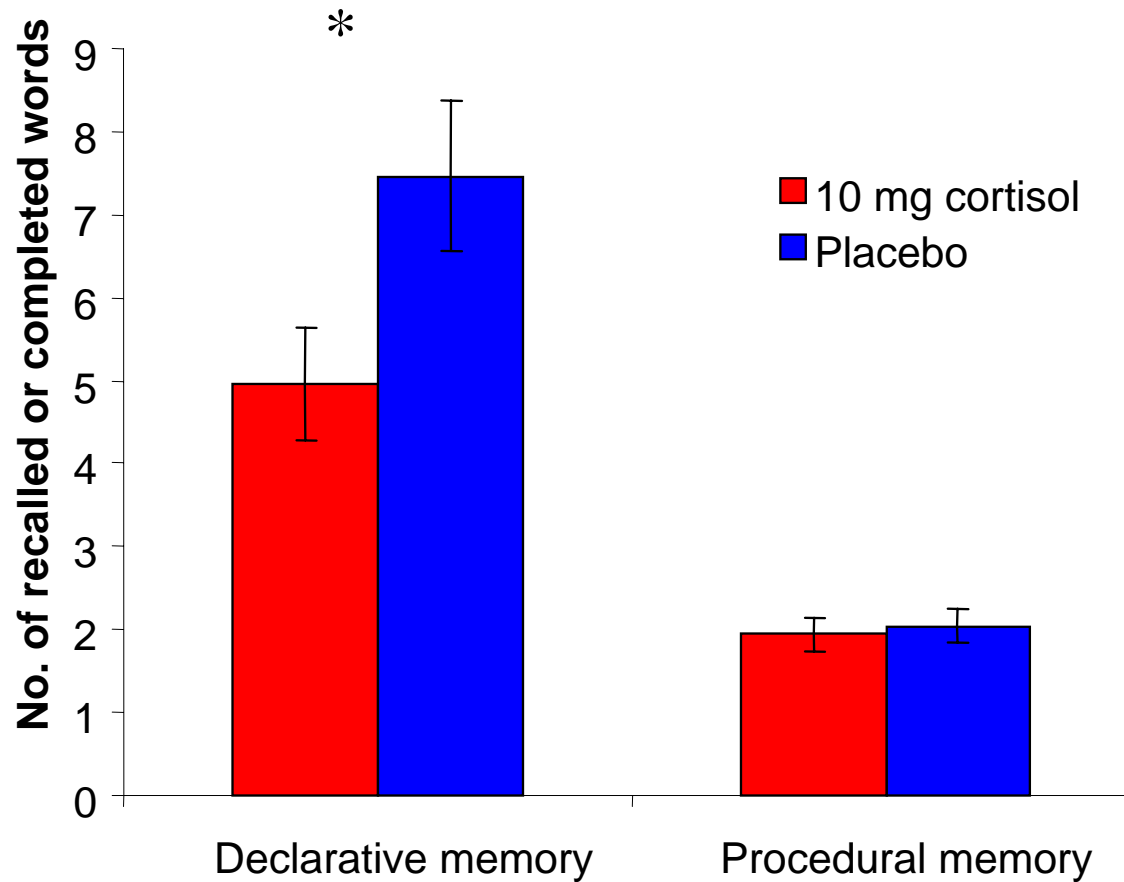


Kirschbaum et al. Life Sci. 1996





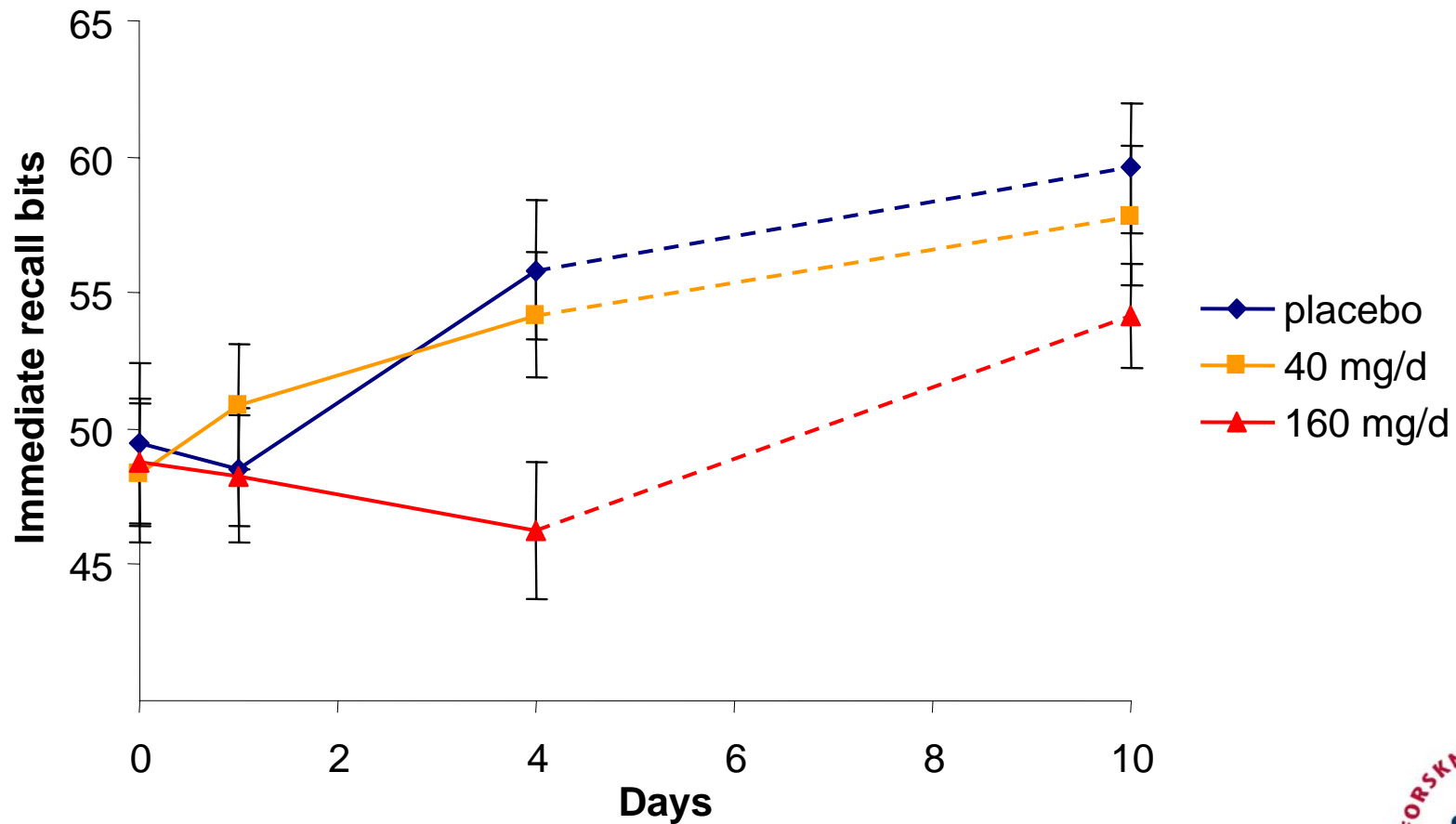
Cortisol and memory



Kirschbaum et al. Life Sci. 1996



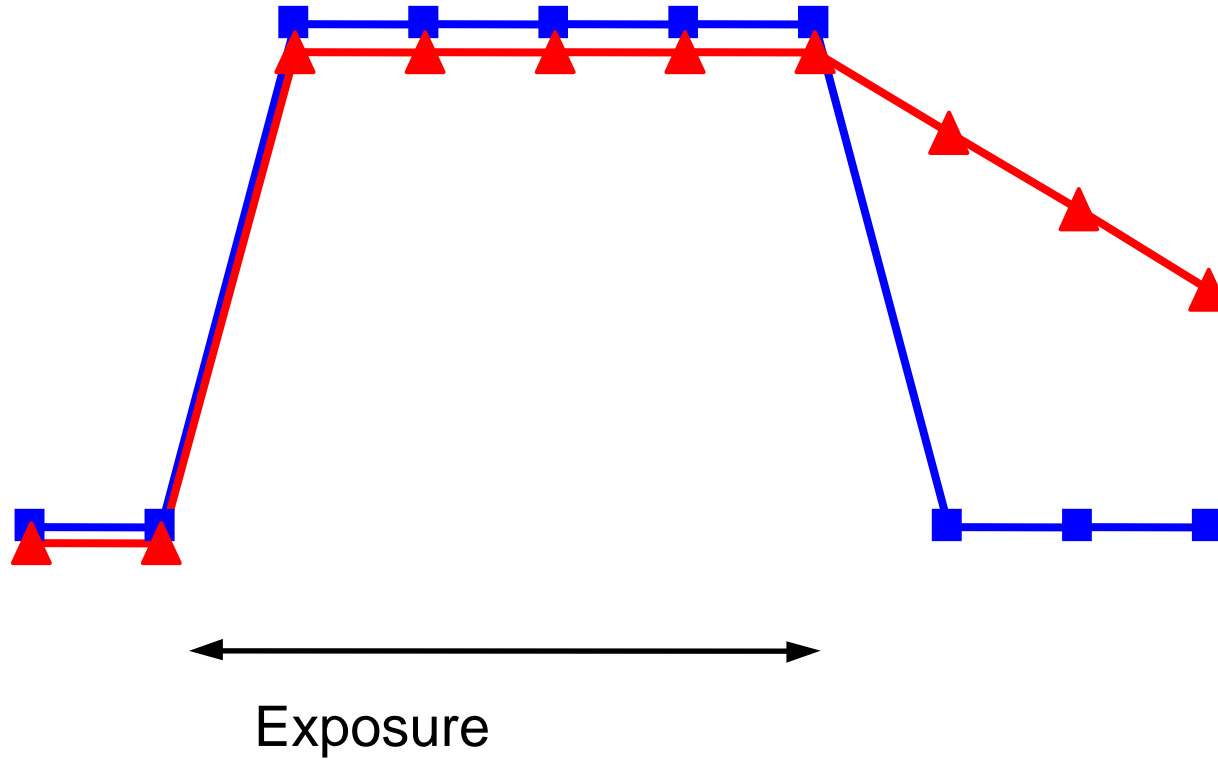
Cortisol and memory



Newcomer et al. Arch.Gen.Psychiatry 1999

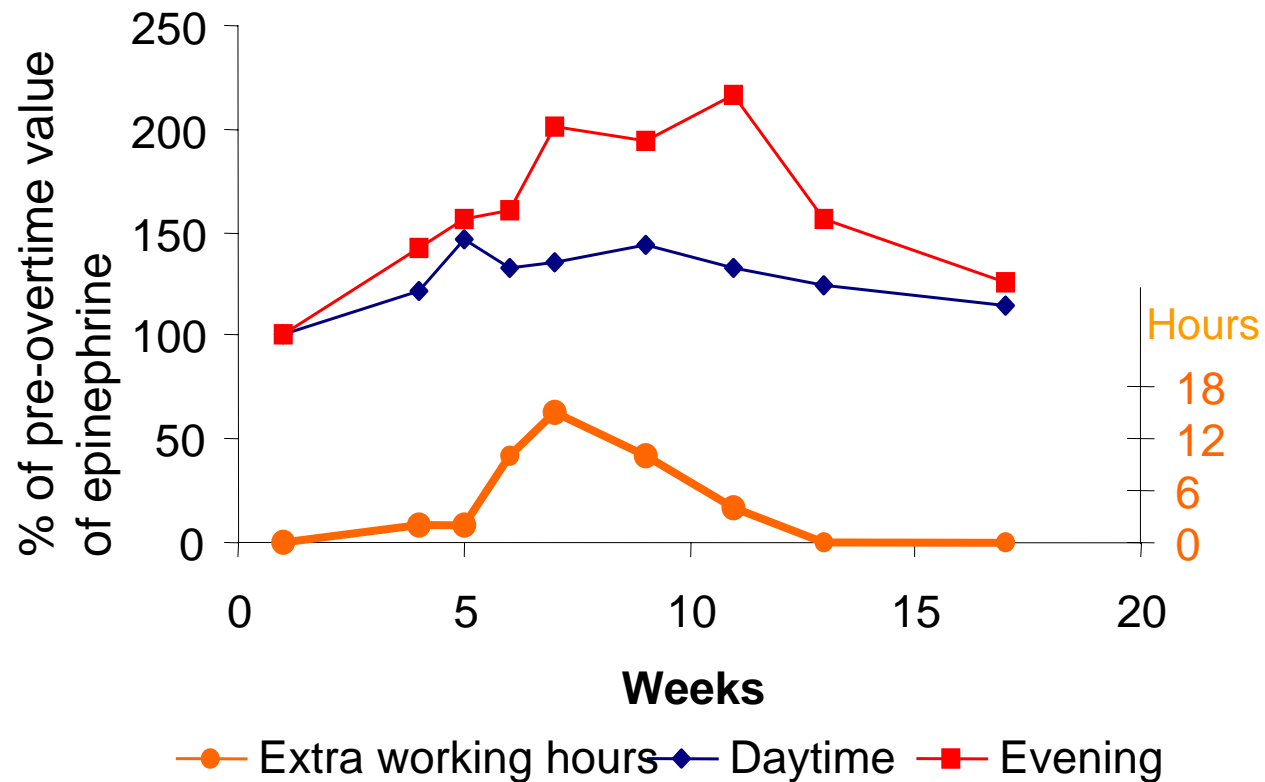


Rate of recovery





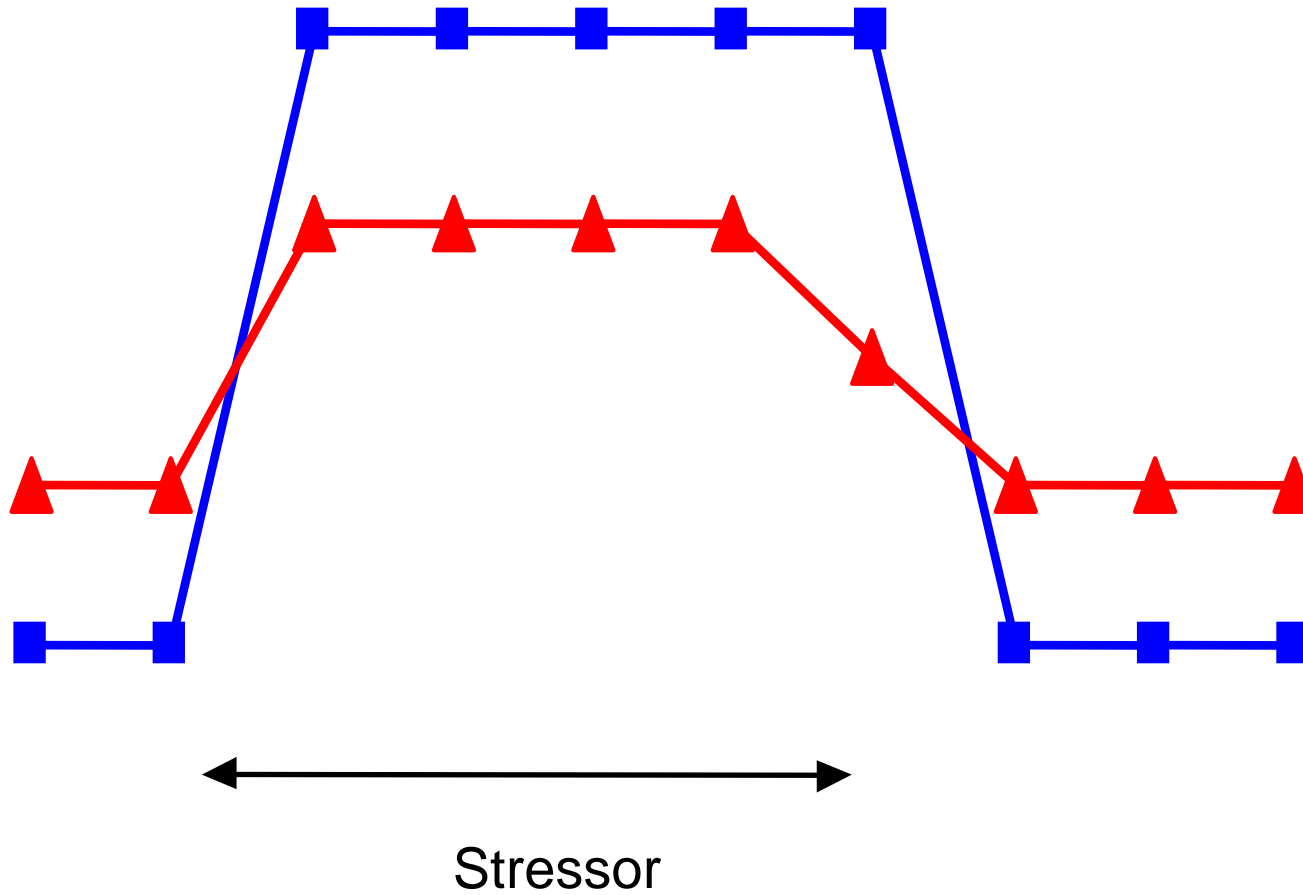
Unwinding after work overload



Frankenhaeser and Johansson. *Int.Rev.Appl.Psychol.* (1986)

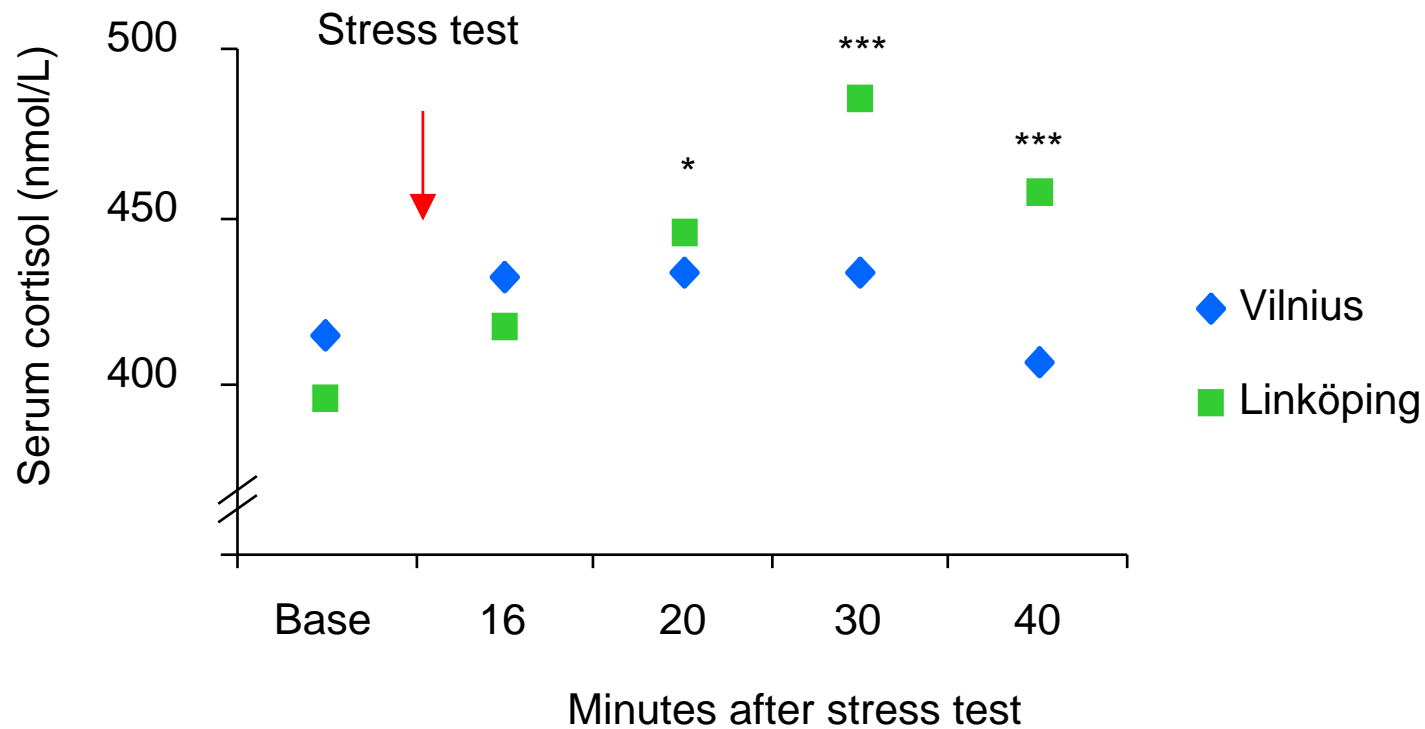


Reduced reactivity





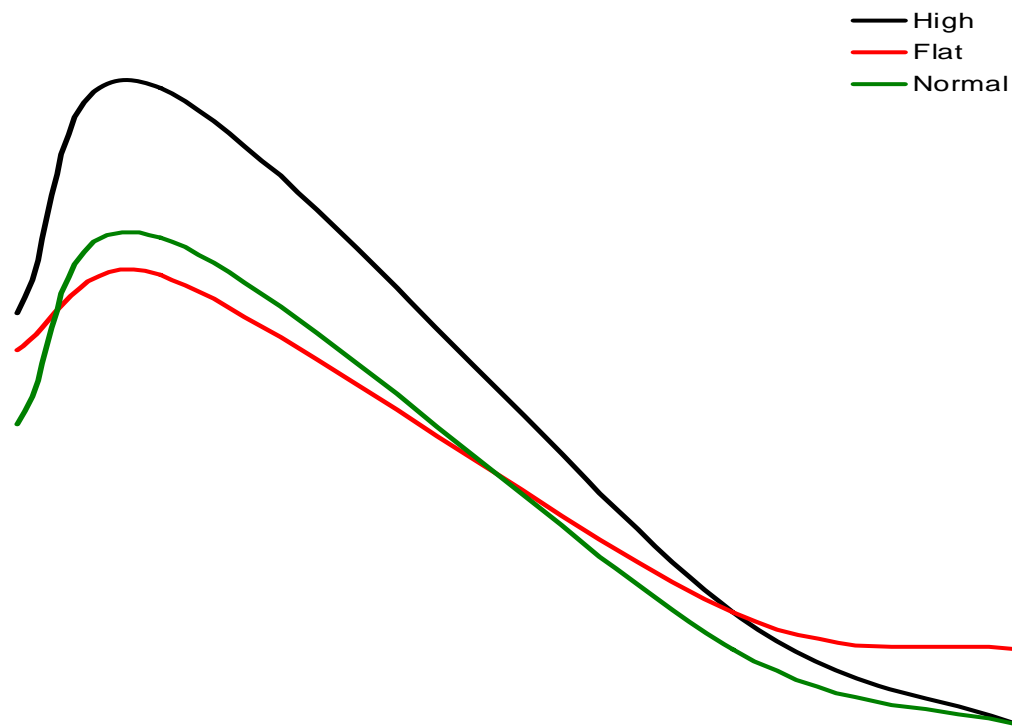
Serum cortisol after stress test



M. Kristensson et al. (1998)



Lack of variability

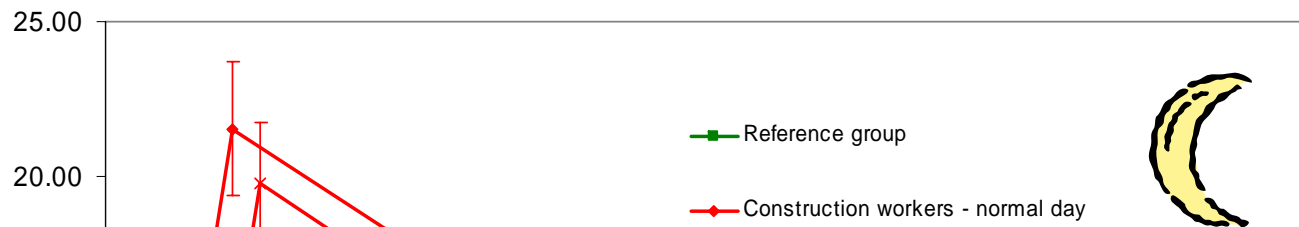




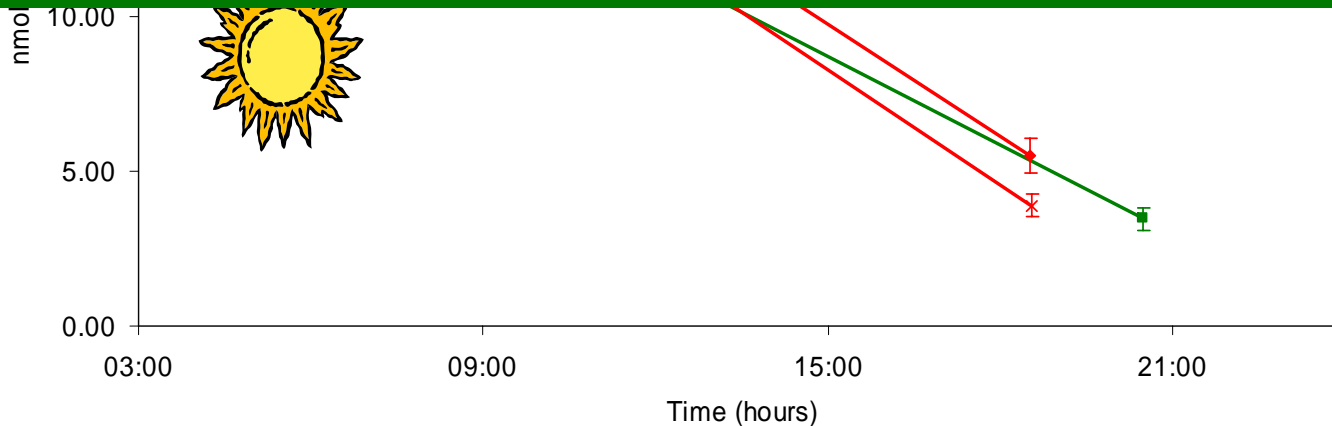
Construction workers



Cortisol in saliva during a working day



Significantly higher concentration of saliva cortisol observed in construction workers compared to reference group. No difference was observed between construction workers having long and normal days



Hansen, 2006

Relative variability in salivary cortisol

	Construction workers		Reference group	P-value
	Long days	Normal days		
CV (%) *		76	99	0.004
CI (%) #		[65-92]	[91-108]	
CV (%) *	82	72	99	0.043
CI (%) #	[64-112]	[57-95]	[91-108]	

* Coefficient of variance

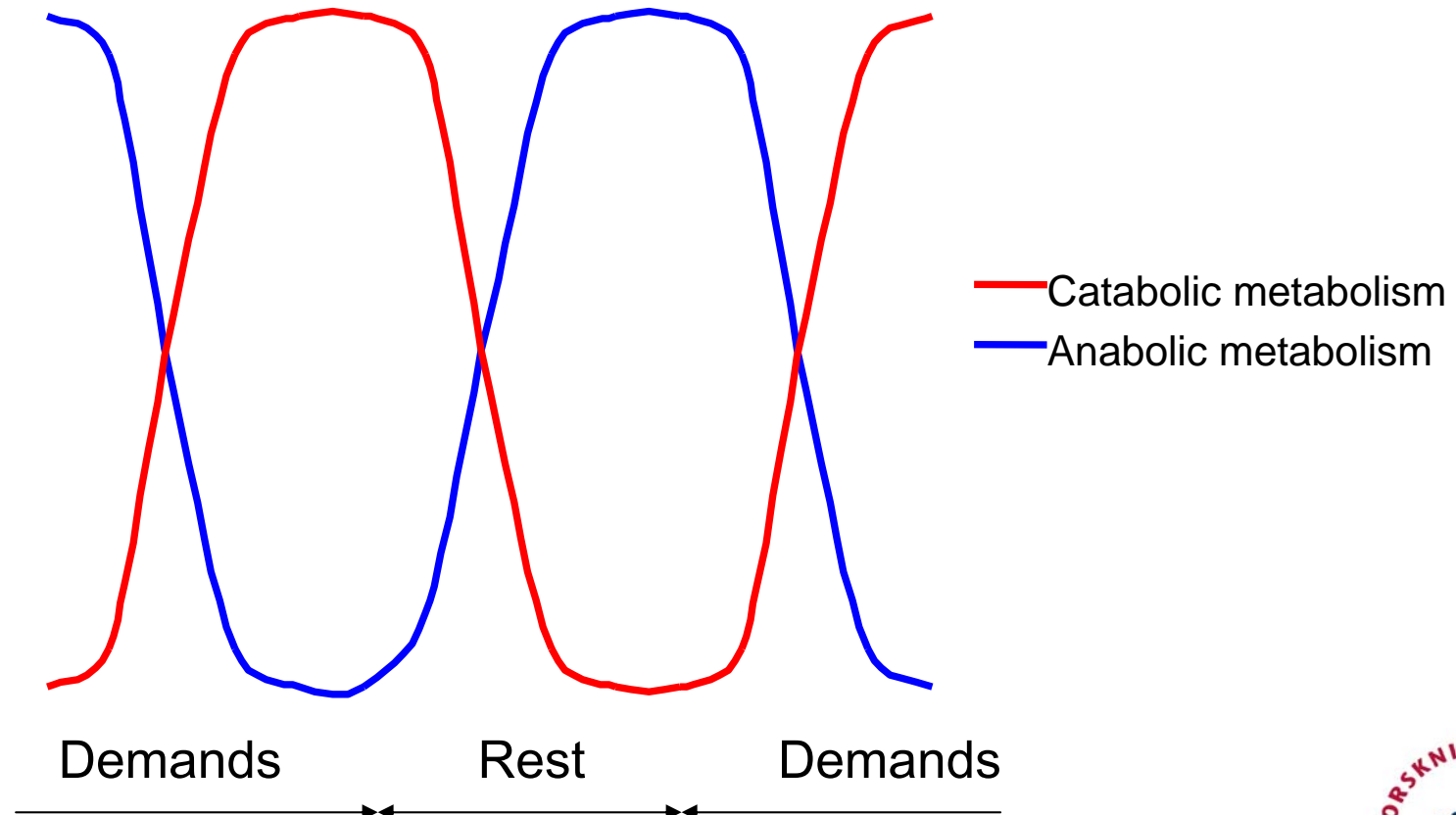
95% Confidence interval

Hansen, 2006



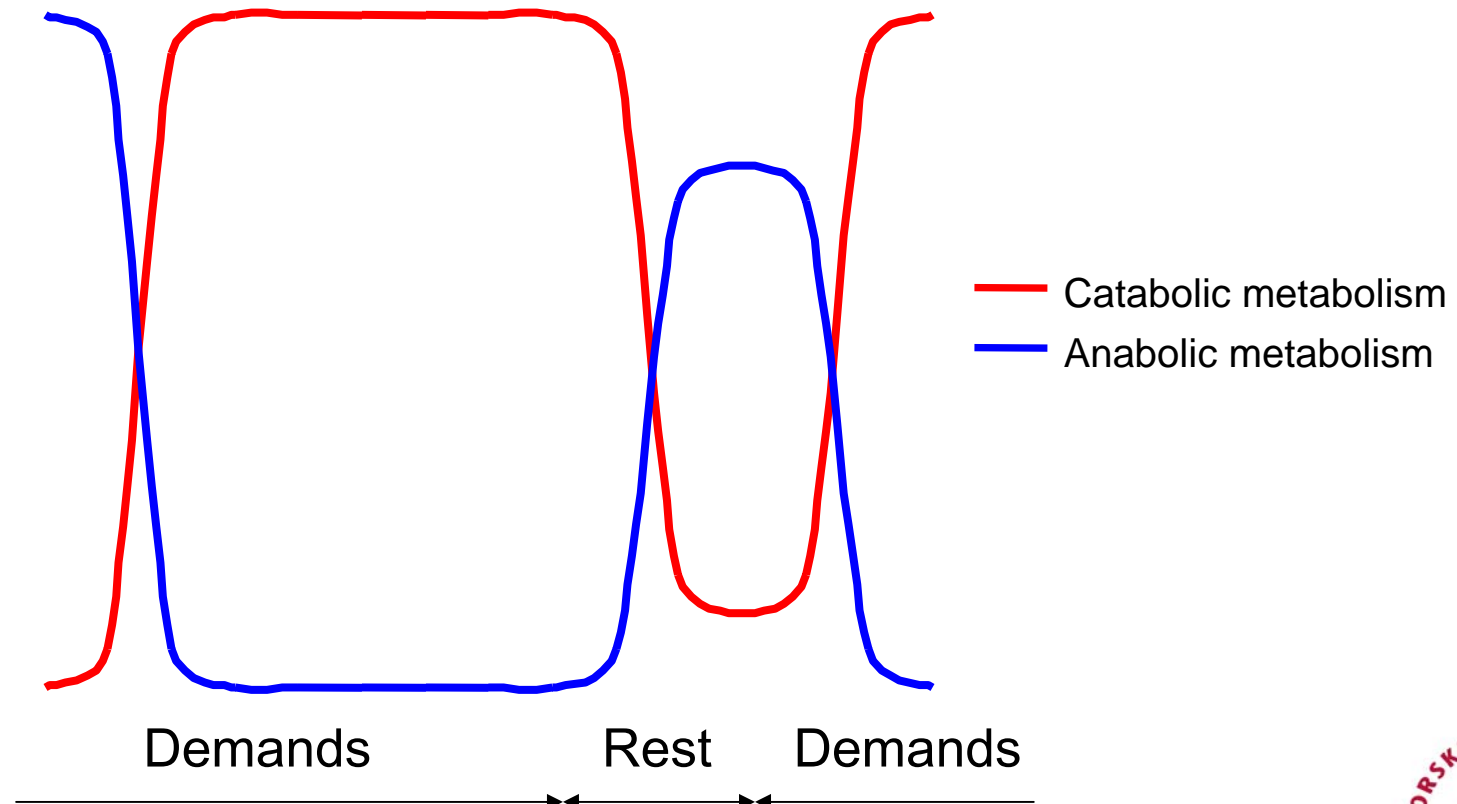


Restitution

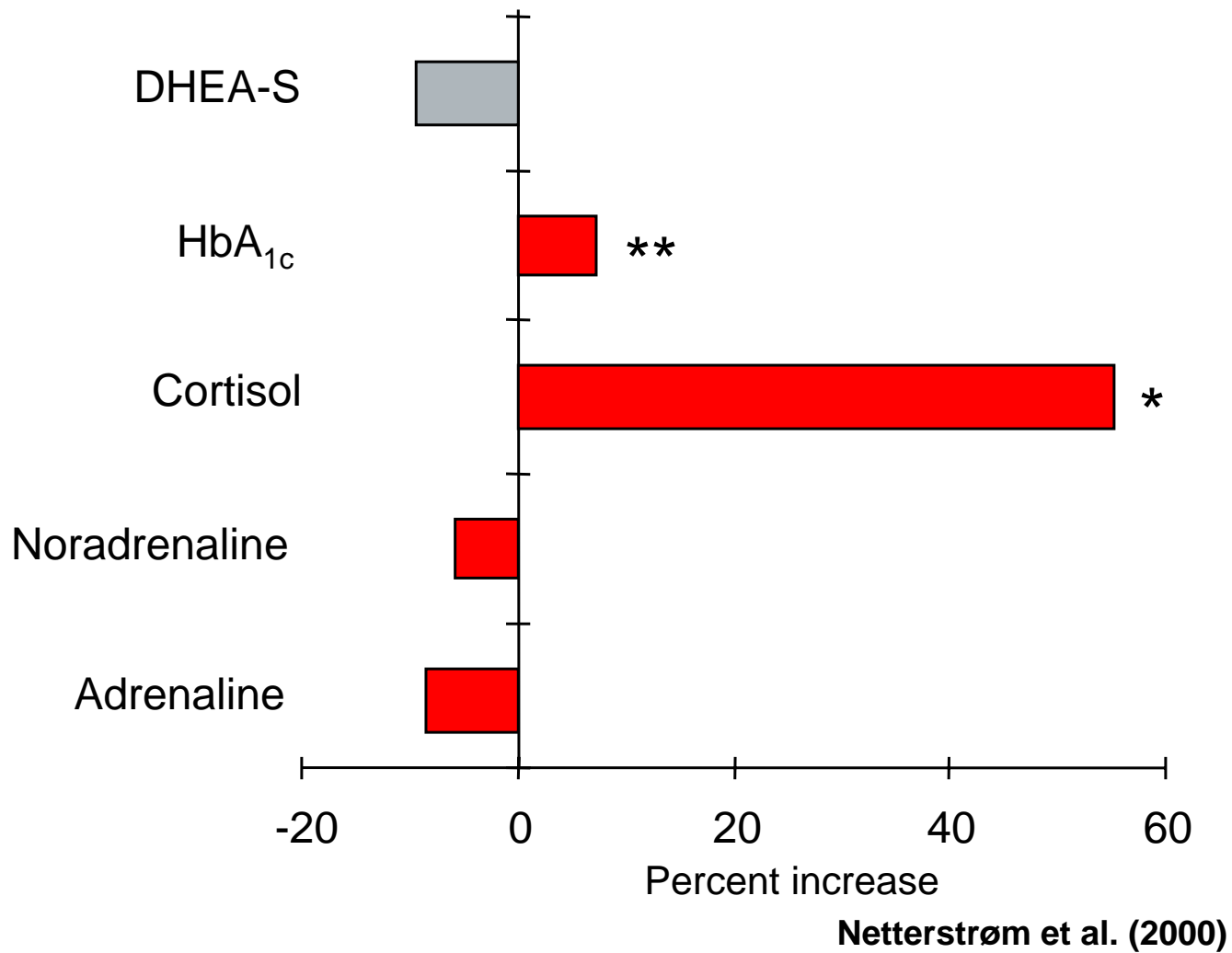




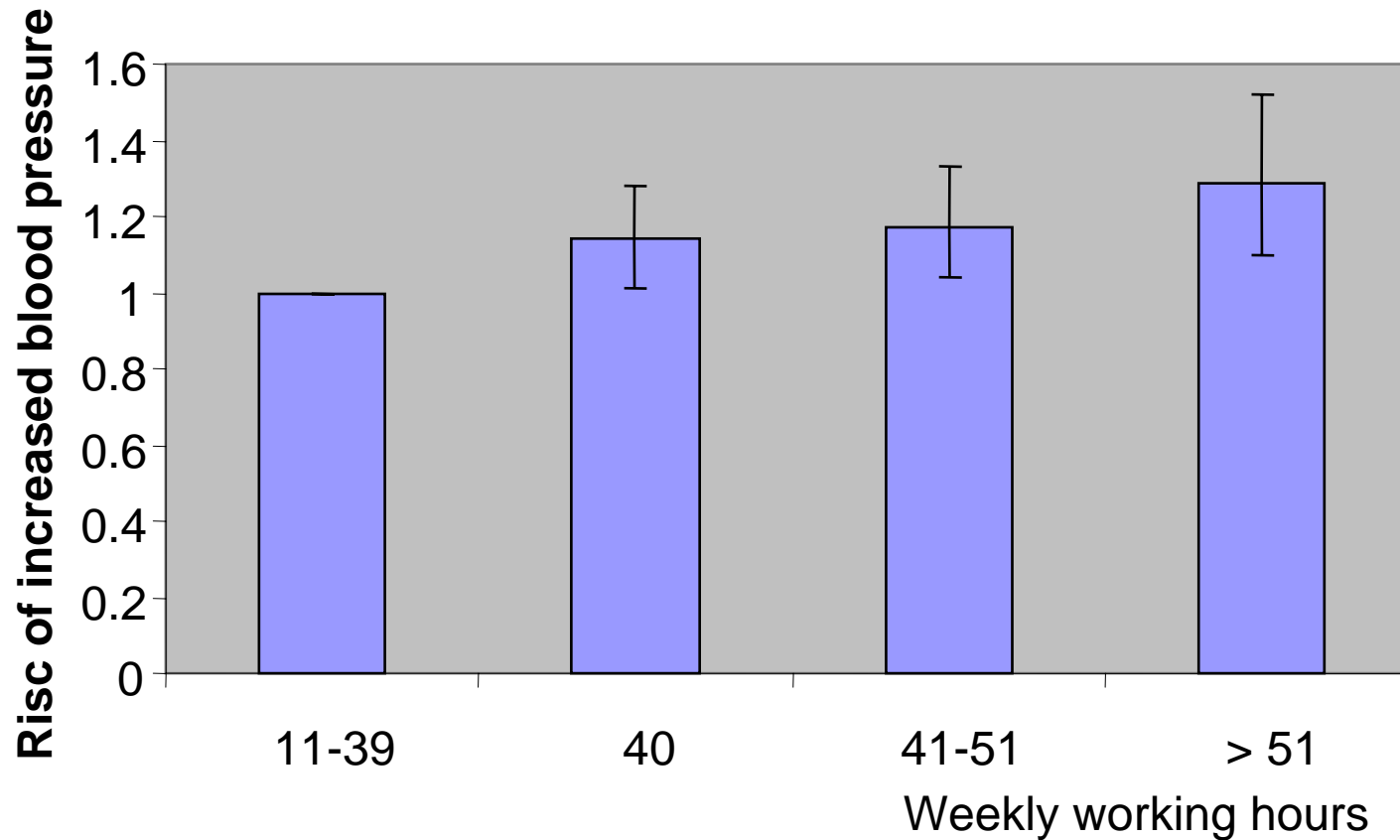
Restitution



Outsourcing



Working hours and blood pressure



Contolled for diabetes, tobacco, physical activty, SES, gender, age
(n=24.205, 18-64 år)

Yang et al. 2006

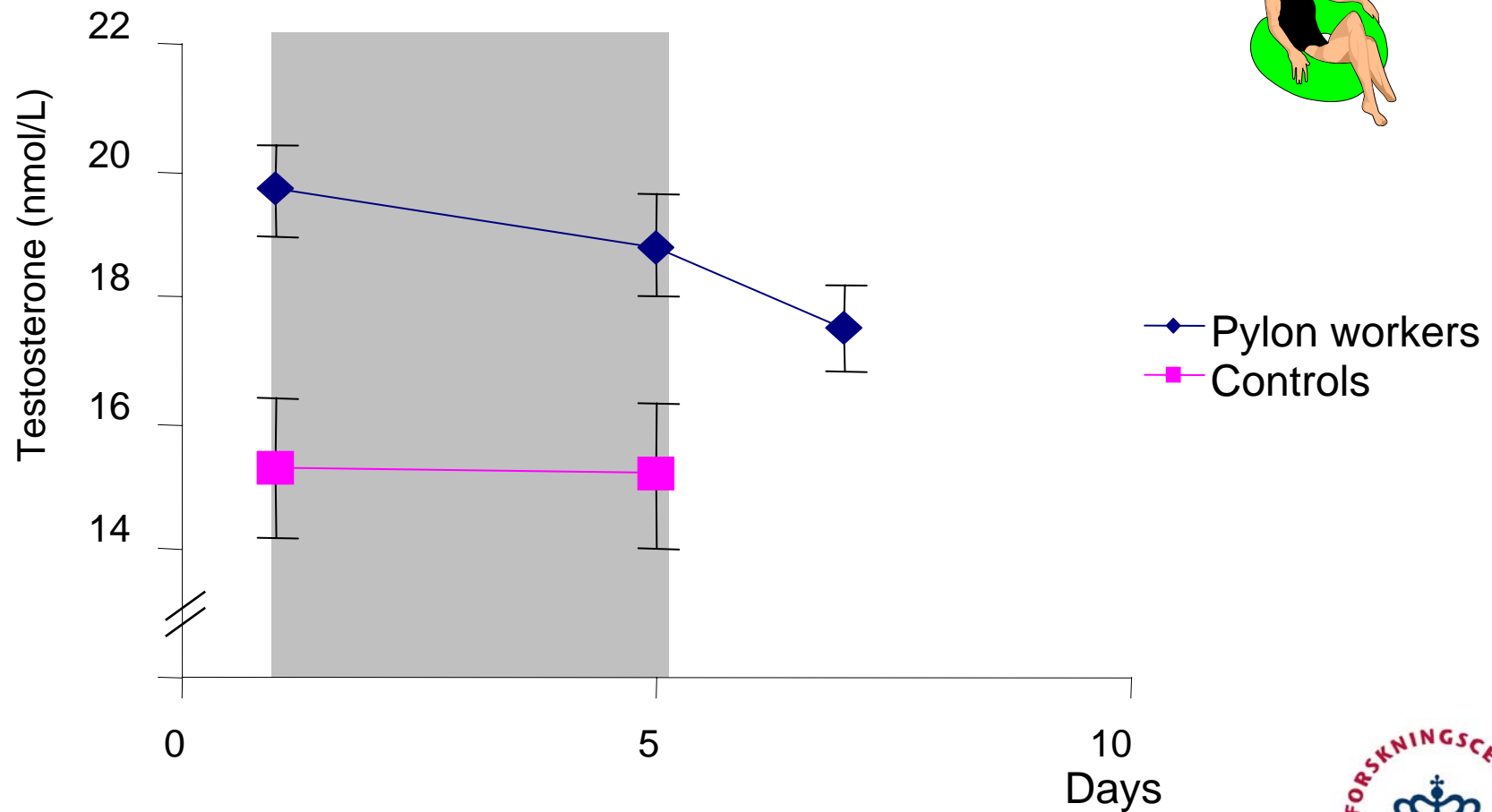
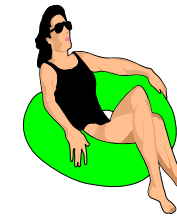




Øresundsbron



Building the bridge between Sweden and Denmark

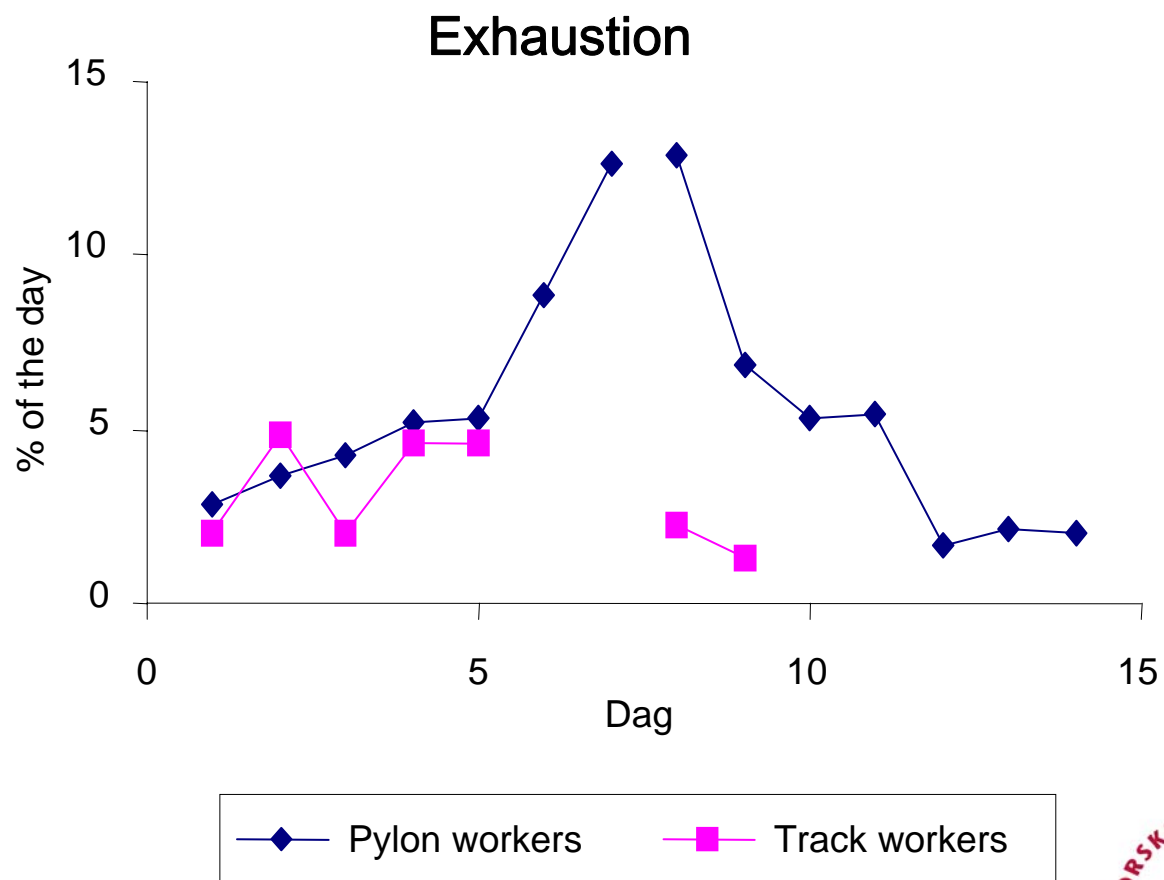


Ørbæk et al. 2000





Øresundsbron

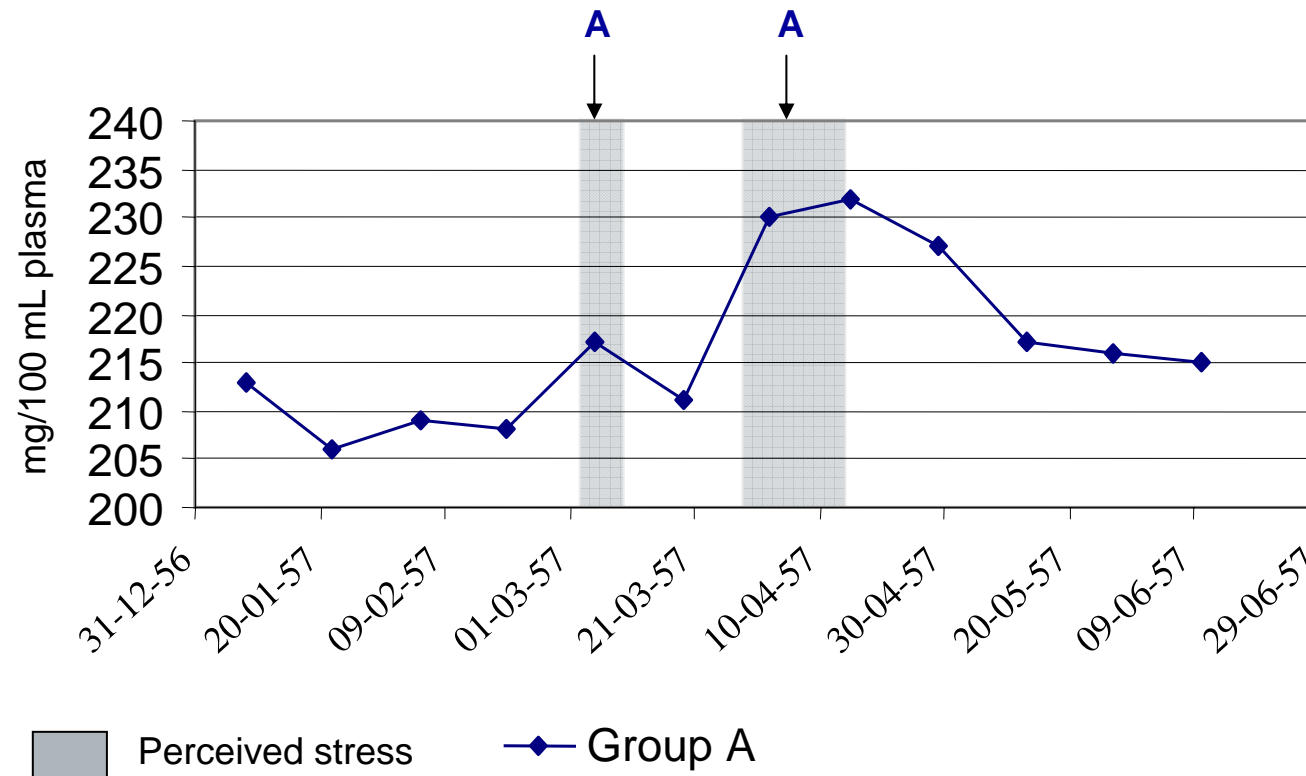


Ørbæk et al. 2000





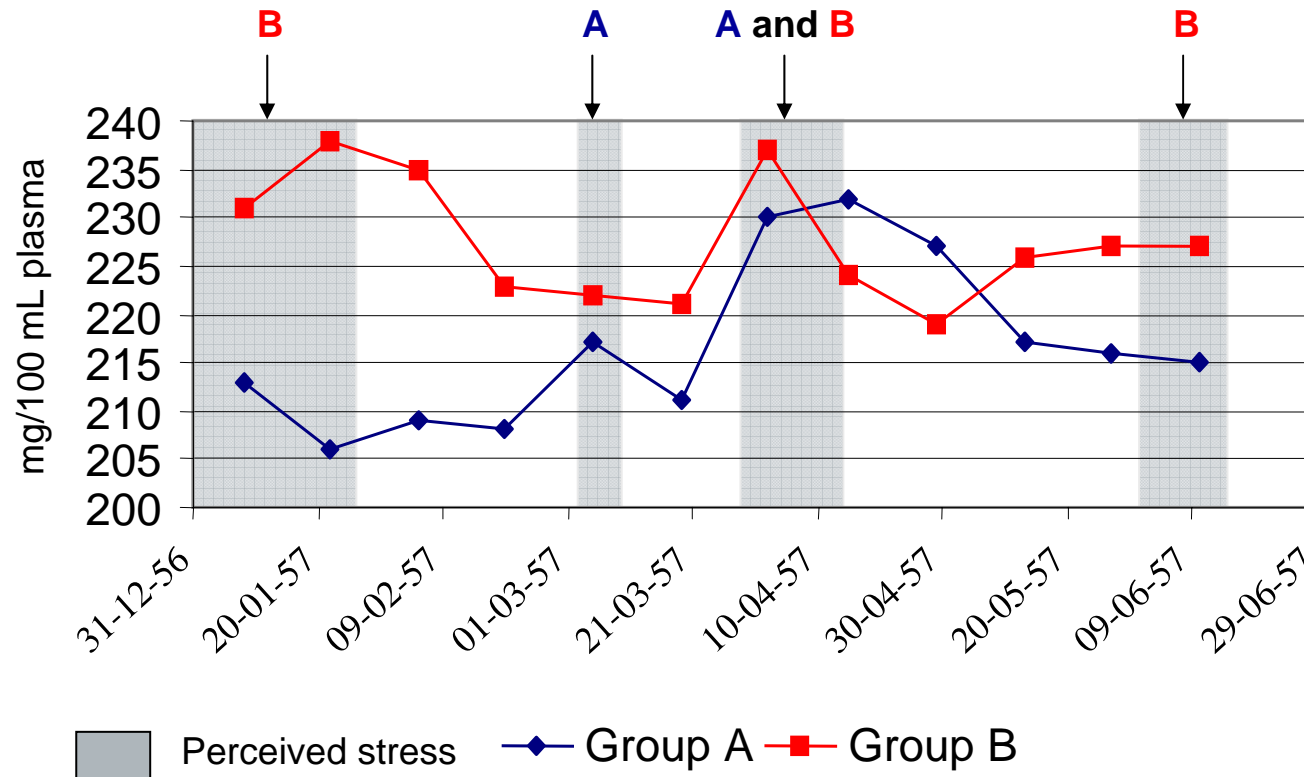
Total serum kolesterol



Friedman et al. 1958



Total serum kolesterol

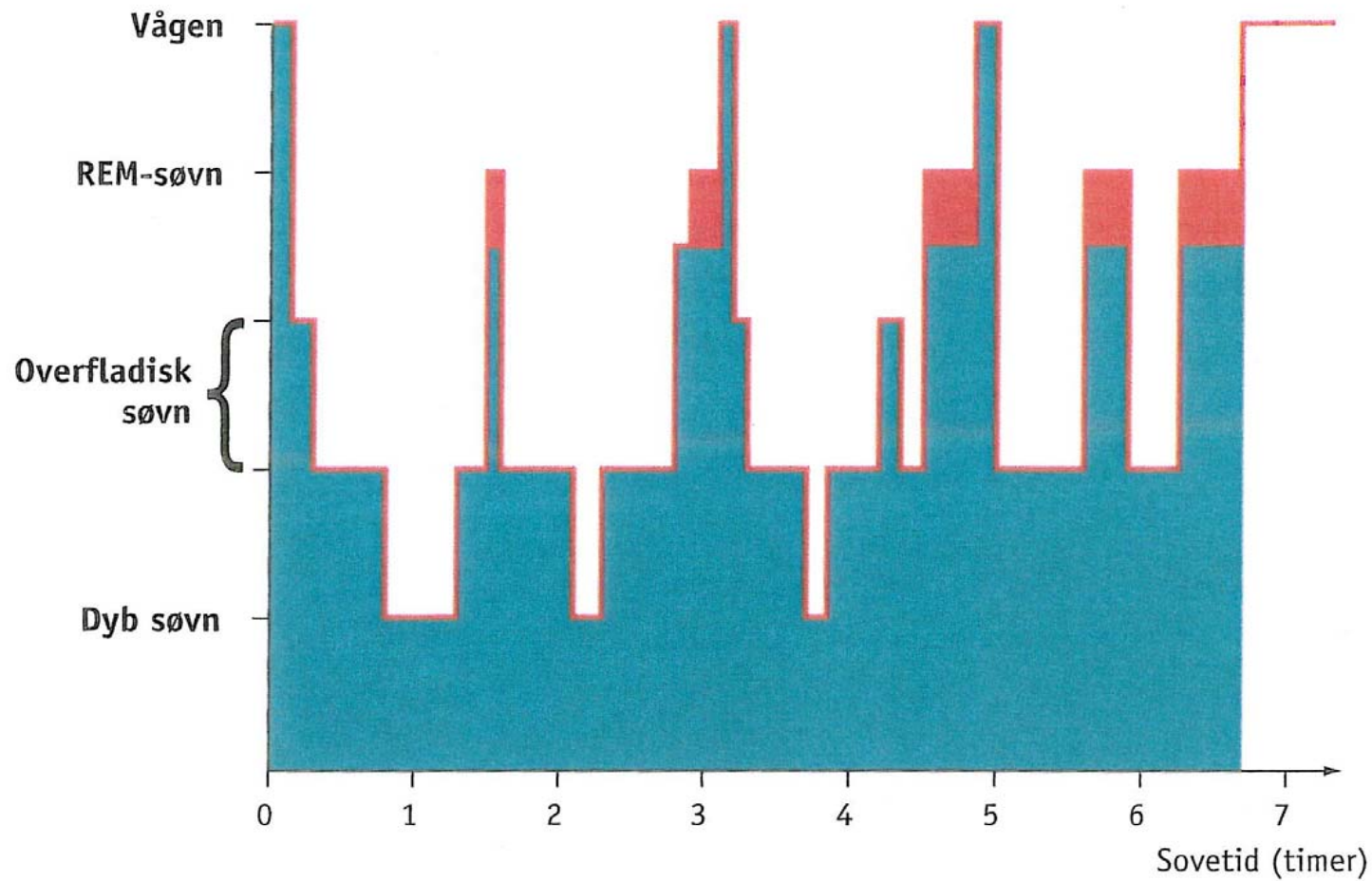


Friedman et al. 1958





Typical sleep



Gerlach: Søvn, 2003





Hormones respond to sleep

Sleep → hormones:

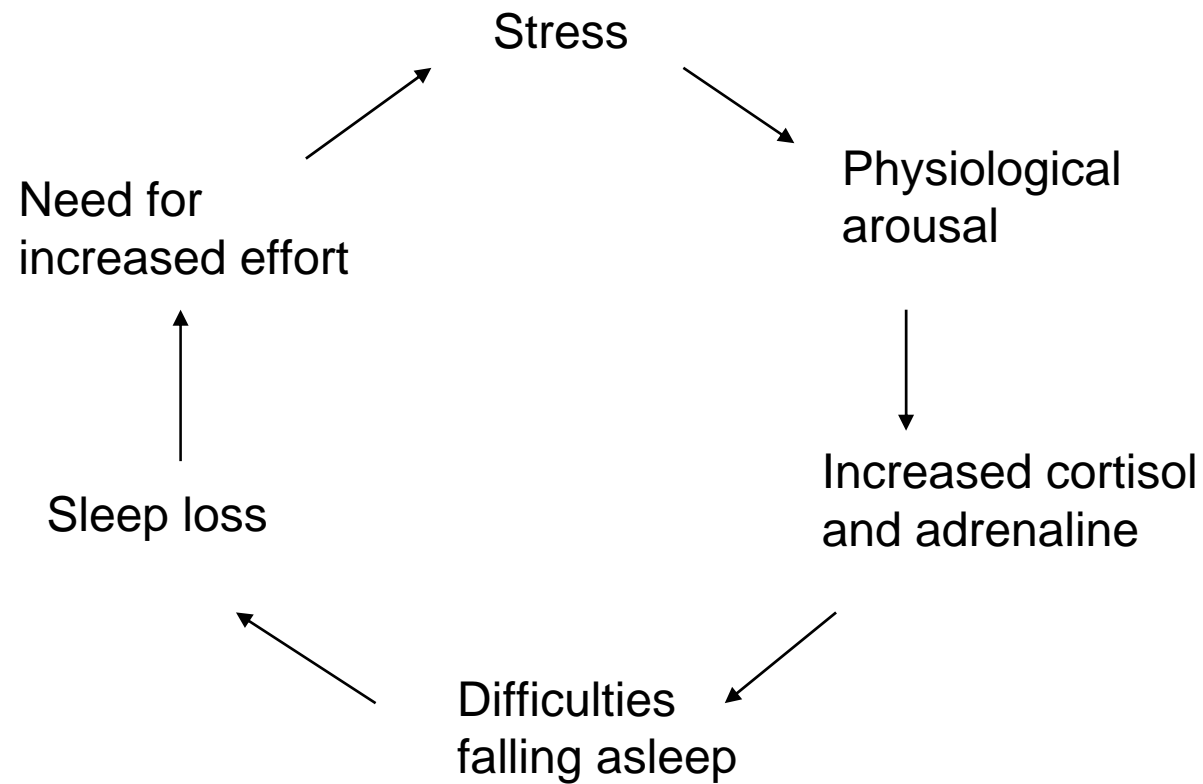
- Growth hormone, prolactin and testosterone ↑
- Thyroid hormone and adrenaline ↓
- Cortisol ↑ during terminal sleep

Hormones → sleep:

- CRH reduces sleep quality
- Melatonin stimulates sleep



Stress and sleep





Sleep problems -> illness

• Increased risk of heart disease

- Review of 10 studies
- High quality studies found increased risk of coronary events after adjusting for age and other risk factors
- The combined risk was 1.7 (range 1.5-3.9)

• Increased risk of diabetes

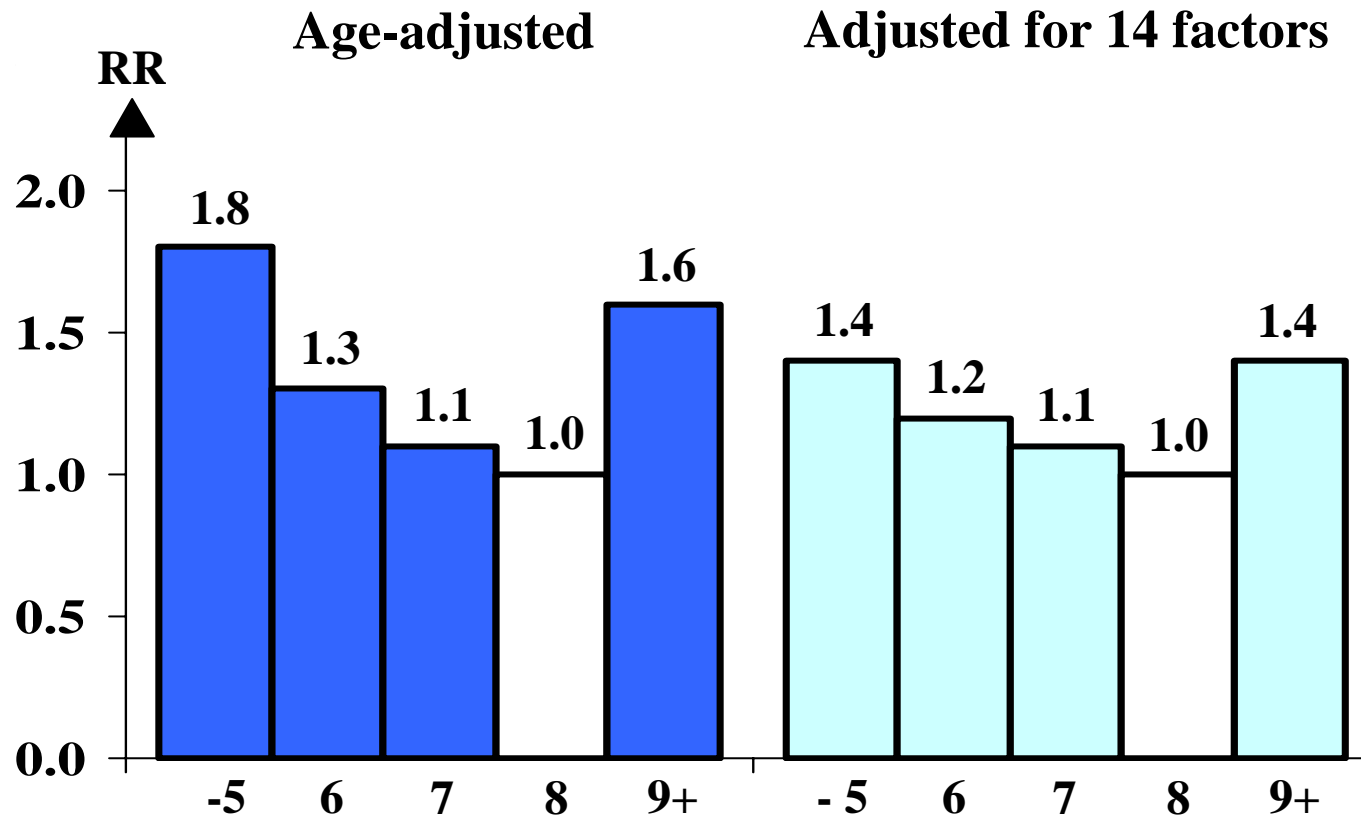
- 6599 non-diabetic men at baseline, aged 44.5 ± 4.0 years
- 281 (4.3%) developed diabetes during follow-up (14.8 years)
- Men with difficulties falling asleep or regular use of hypnotics had increased risk of 1.52 [95% CI: 1.05-2.20]

Schwartz S et al., J Psychosom Res, 1999
Nilsson PM et al., Diabetes Care, 2004



Sleep and heart disease

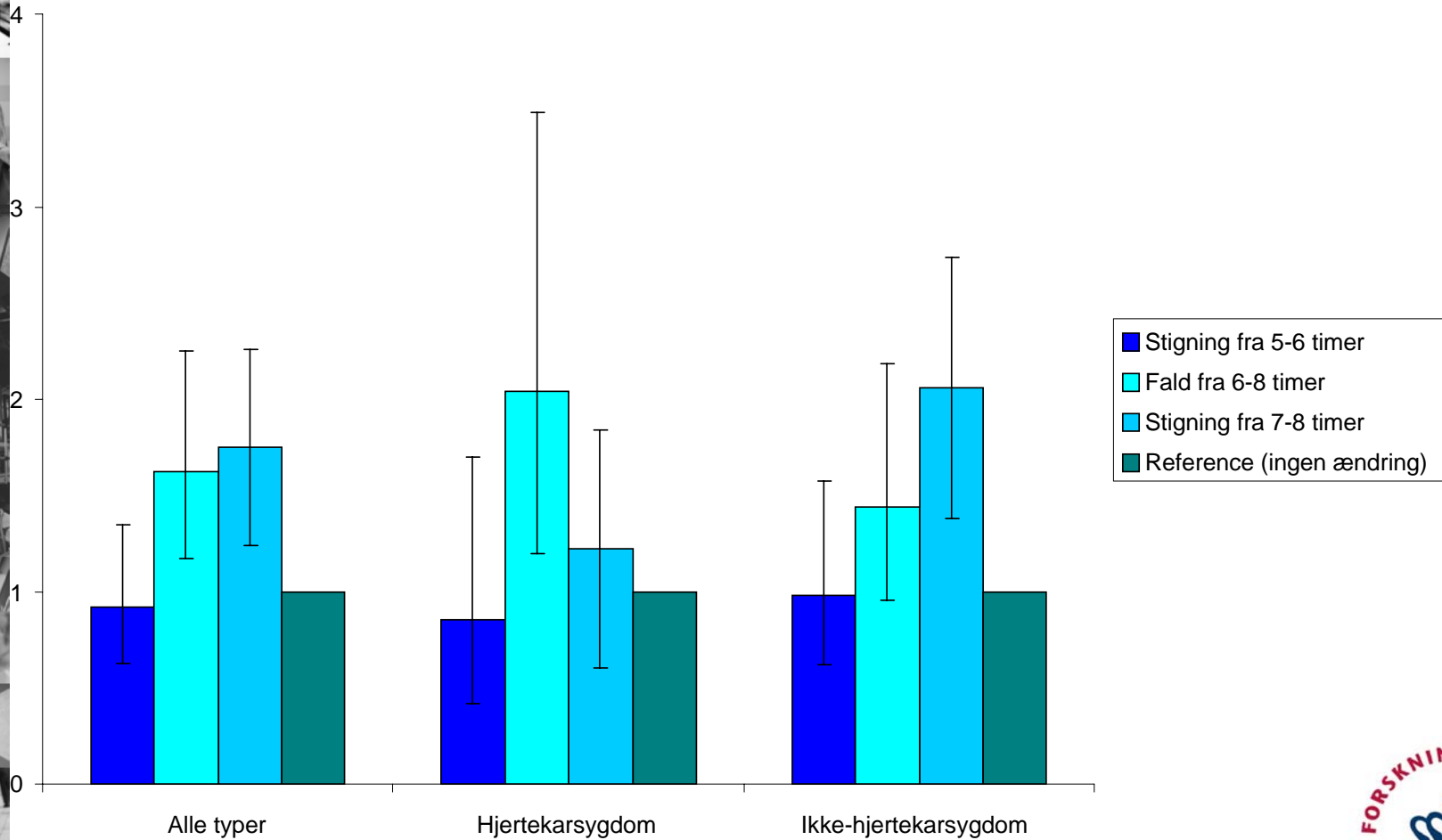
A study of 71,617 American nurses followed for 10 years



Ayas et al. Arch Intern Med 2003;163:205-9. The Nurses' Health Study



Ændring i søvn og død



Ferrie JE et al. Sleep (2007) 31:12:1659





Psychosocial work and sleep

Increases sleep problems:

- High demands
- Low control
- Keep thinking of work
- Expect difficult workday
- Unsolved conflicts
- Unsolved problems

Decreases sleep problems:

- Social support

Kalimo et al., Stress Med, 2000

Åkerstedt et al., J Psychosom Res 53(1), 2002

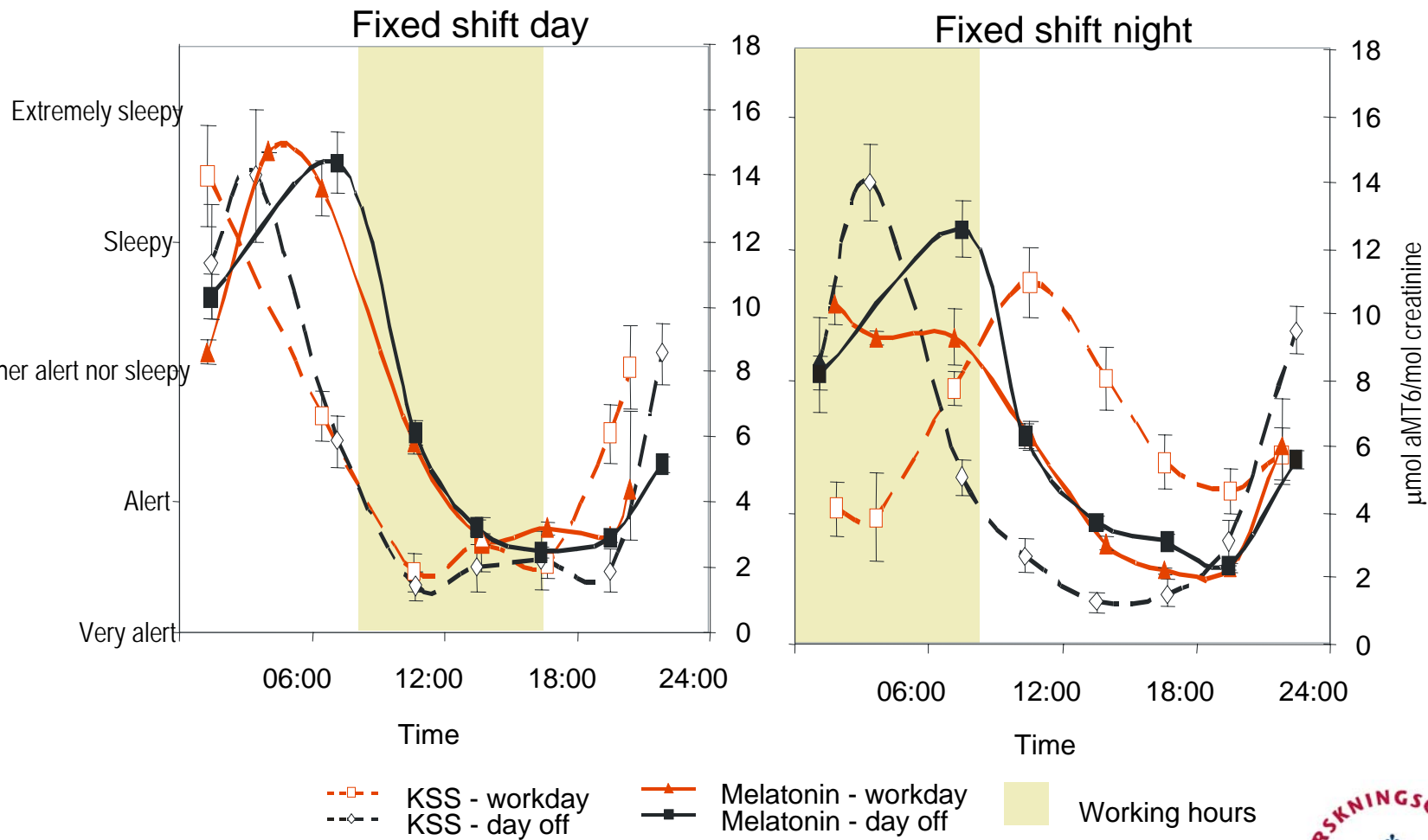
Åkerstedt et al., J Psychosom Res 53(3), 2002

Kecklund et al., Biol Psychol, 2004





Shift of rhythms



Hansen et al., 2006
Garde et al., unpublished data



Models for health risk

- Cognitive activation theory
- Allostatic load
- Lack of restitution
- Shift of rhythms
- Stress-disequilibrium theory
(Not included)

