

# Coping Strategies for Musculo-skeletal Pain at the worksite

Theoretical models for stress and coping  
Empirical Research / Experiences  
Training lessons

Hilde Grønningsæter Dr.scient  
Associate professor

Buskerud and Vestfold University and College  
November 2015

## Lesson 1 (25.11.15)

- The aim of this module
- Questions to be answered
- Theoretical foundations:
  - Stress and coping
  - Stress Management Training

## Lesson 2 (24.11.15)

- Practical exercises – SMT
  - Breathing
  - Relaxation
  - Imaging



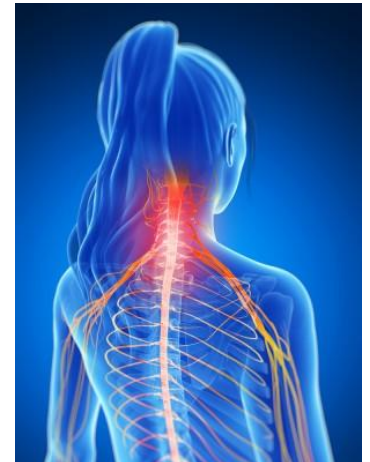
# The aim of the module

- To understand the relationship between job stress and health problems (i.e neckpain)
- To understand and apply the most frequent used coping strategies to prevent-, reduce or change perception of muscle-pain (health problems)
- To learn how to implement stress-management-training (SMT)

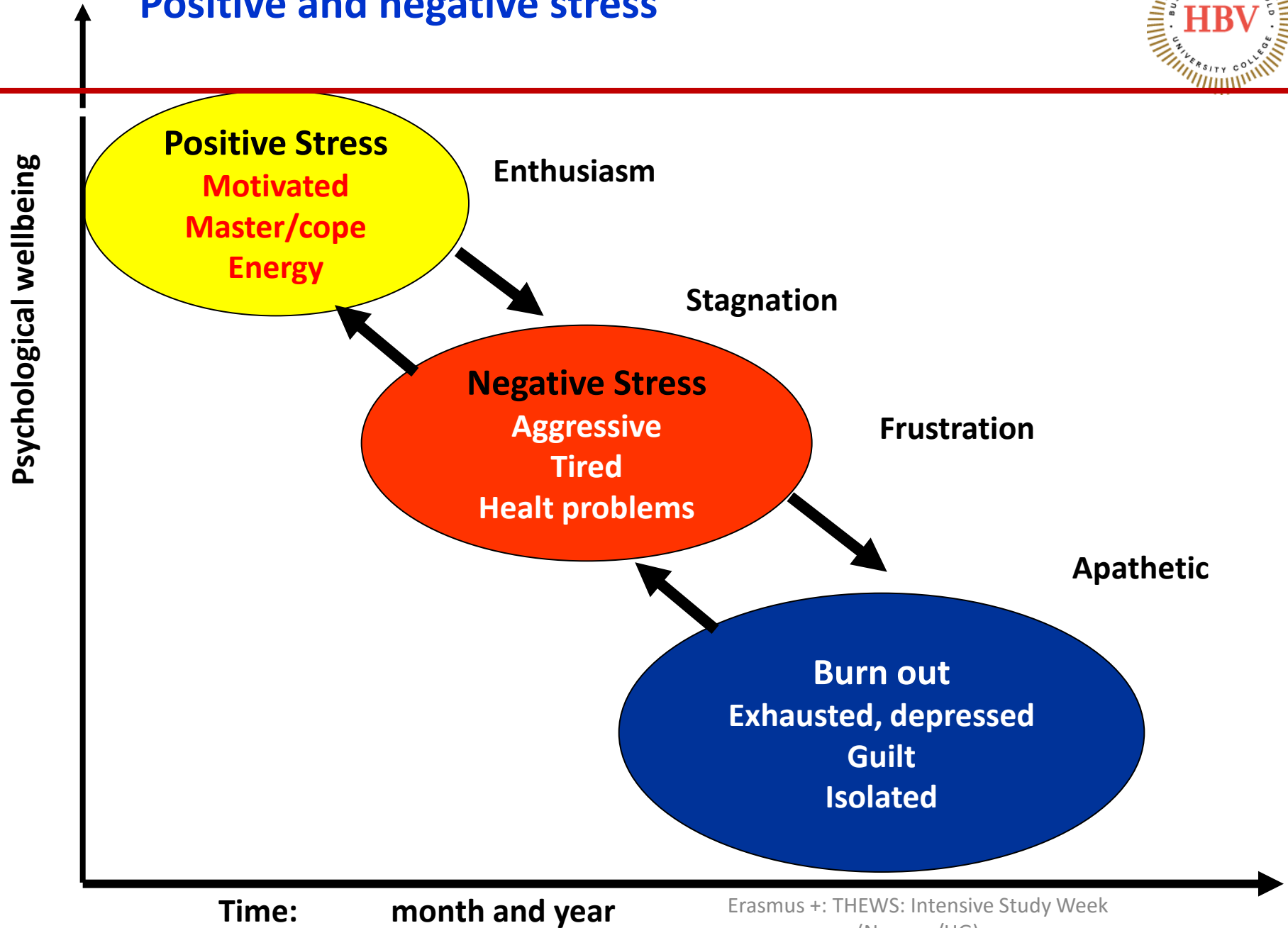


# Questions to be answered

- What is stress? Discuss the most frequent used theories og models
- What is coping? Discuss the definitions and the practical meaning of the terms
- What is Stress management? Discuss the models, the exercises used and explain the biological and psychological basis
- What is Deep Breathing? Why and how does it work?
- What is Relaxation? Why and how does it work?
- What is imagery? Why and how does it work ?



# Positive and negative stress



# History 1: «The fight – flight response» a psychobiological theory

---

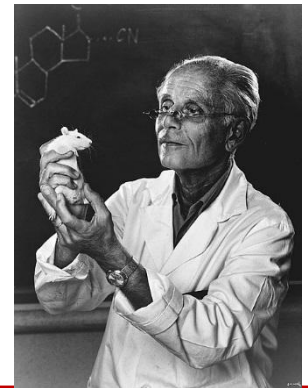
- **Walter Cannon (1871 - 1941):** among the first in modern time who did research on stress stimuli / stressors. Studied biology, psychology, philosophy and medicine.
- He described **"The fight-or flight" response** ("The wisdom of the body" 1932)
- His theory states that animals react to threats with a **general discharge** of the **sympathetic nervous system**. His first interest was emotions and stress / the digestive system and arousal in animals.
- **The adrenal medulla** produces a hormonal cascade that results in the secretion of **catecholamines**, especially **norepinephrine (noradrenalin)** and **epinephrine (adrenalin)**
- He introduced a new theory about the **homeostasis**
- **"Stress" def:** a force that disturb the inner homeostatic condition



## History 2: «The general adaption syndrome» a psychobiological theory

**Hans Selye (1907-1982):** Austrian / Hungarian, studied medicine in Prague, worked in Canada

- The father of “stress”
- **Physiological /biological stress** is an organism's response to a **stressor** such as an environmental condition or a **stimulus**
- **Stress** is a body's method of reacting to a **challenge**
- **“Stress” def** is the **physical, mental and emotional** human **response** to a particular **stimulus**, otherwise called a “stressor” (Selye 1936)
- Selye proved reactions that were essential for health/survival and disease
- i.e long-term consequences of stress



# History: The general adaption syndrome

---

**GAS = The general adaption syndrome** (**The stress of Life** (Selye, H. (1956; 1976)

**1. Alarm stage:** labels the stressor as a threat or danger to balance

- Activates its fight or flight response system, and releases the “stress” hormones such as adrenaline, noradrenaline *and cortisol* (see Cannon).
- A shock stage – and an anti-shock stage

**2. Resistance stage:** general activation in the pituitary cortex, releasing cortisol at all kinds of stress

**3. Exhaustion stage:** the gate towards burnout or stress overload, which can lead to health problems if not resolved immediately



# History 3: The transactional theory. A Cognitive theory

---

**Richard Lazarus (1922 – 2002):** American professor in cognitive psychology.

- Lazarus, R. (1966): The Interaction between the Individual and the Environment is sustained Processes that goes both ways (transactional)
- Richard S Lazarus (1970): «Stress and Coping»
- Lazarus, R & Folkman, S (1984): «*Stress, appraisal, Coping*»
- Lazarus, RS & Folkman, S (2006): «Transactional theory and research on emotions and coping”

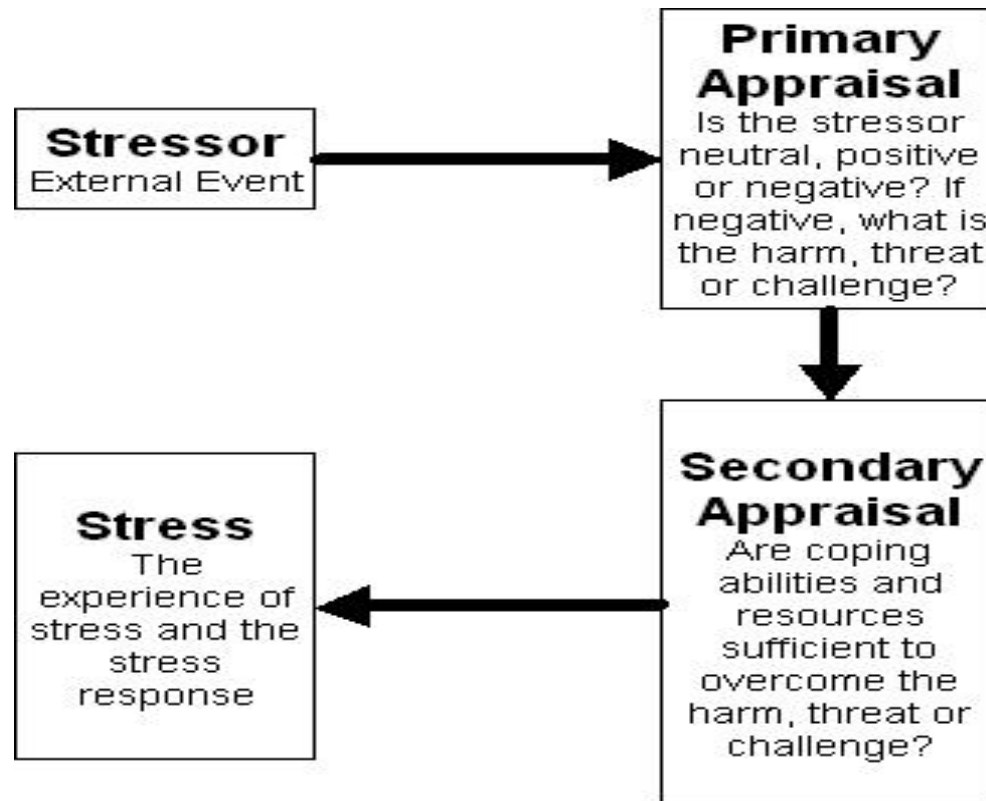


# History 3: The transactional theory. A Cognitive theory

---

- Lazarus, R & Folkman, S (1984): «Stress, appraisal, Coping»
  - **Reactions to stress** (stress) is determined by the individual's perception and assessment of the situation
  - **Primary appraisal:** «is this a threat, a harm/loss or a positive situation»?  
↓
  - **Secondary appraisal** ⇒ Do I have the resources required to minimize, tolerate or eradicate the stressor and the stress it produces?

## History 3: The transactional theory. A Cognitive theory

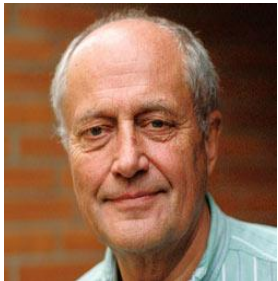


# History 4: The *cognitiv activation* theory of stress (CATS)

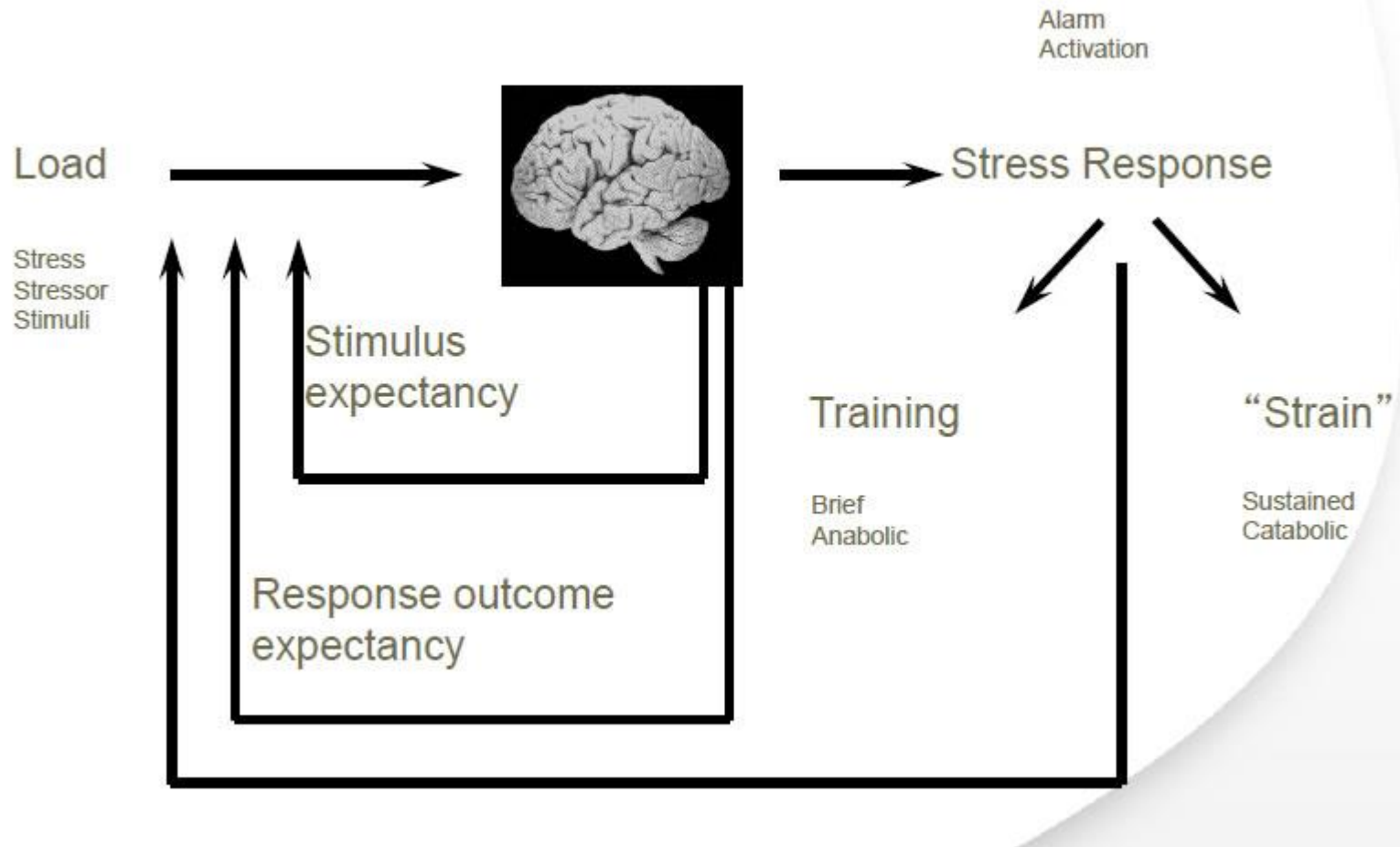
**Holger Ursin (f-1934)** Norwegian PhD MD, brain researcher, professor emeritus in psychology UiB

- Ursin, Baade og Levine (1978) «Psychobiology of Stress»
- Levine og Ursin (1991) "What is Stress?"
- Ursin and Eriksen (2004): «The cognitive activation theory of stress»
- **The stress response** is a **general alarm** in a homeostatic system, producing general and **unspecific neurophysiological activation** from one level of arousal to more arousal
- The unpleasantness of the alarm is **no health threat**
- **If sustained**, the response (stress) may lead to **illness** and **disease** through established pathophysiological processes ("**allostatic load**")

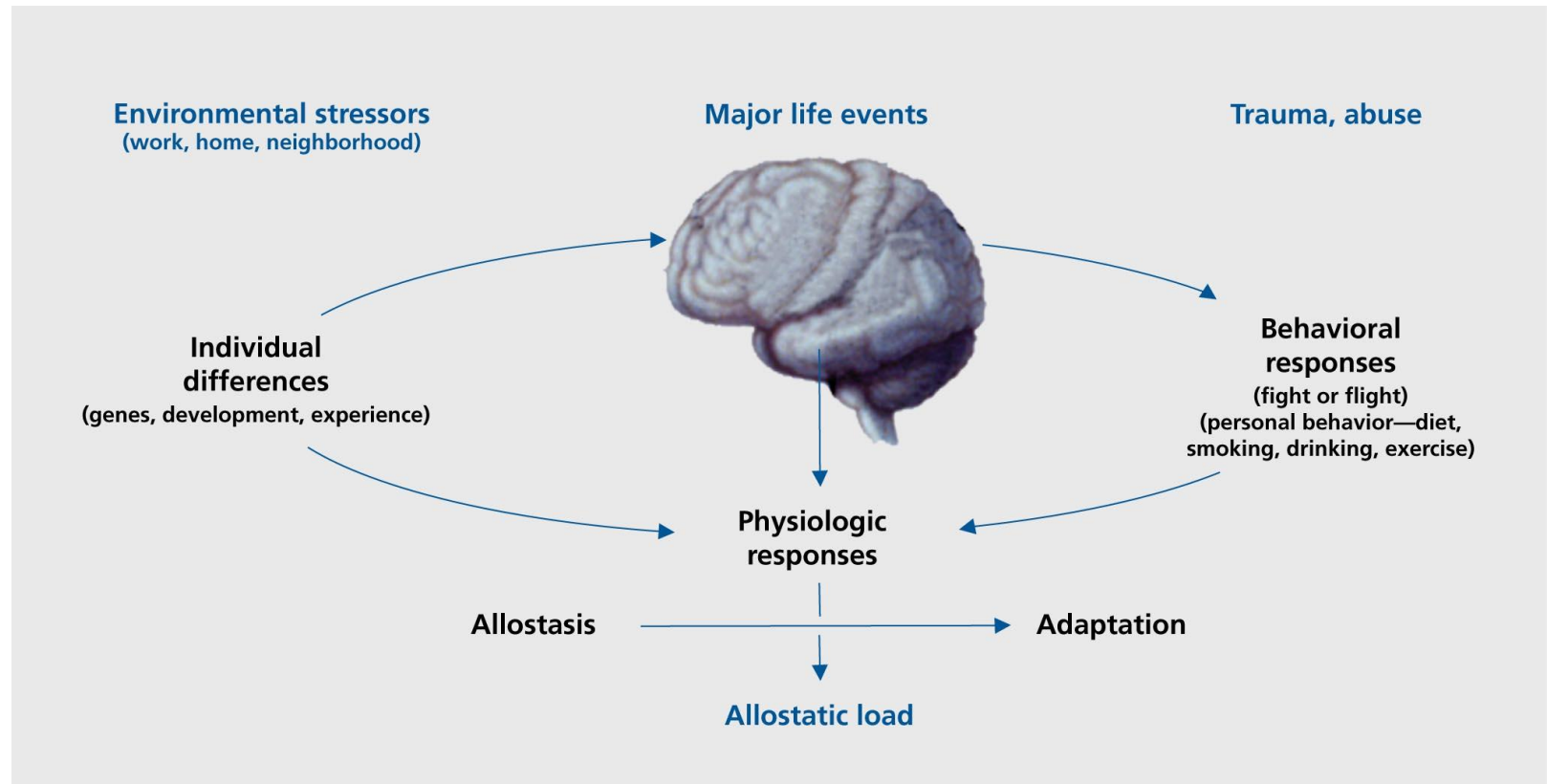
Ursin, H & Eriksen HR (2004) Psychoneuroendocrinology 29 (2004) 567–592



## 4: CATS Cognitive activation theory (Ursin & Eriksen 2004)



## 4: Allostatic load



### Allostatic load: established pathophysiological processes

(Allostasis, McEwen (22) by permission from the New England Journal of Medicine).

# History 5: Stress and salutogenesis.

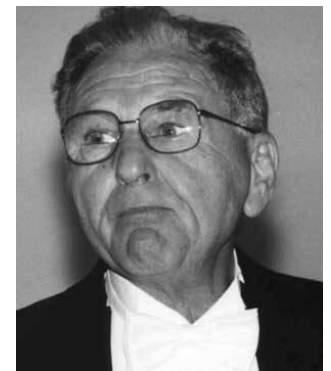
A «health sociological» model in a *health promotion* perspective



**Aaron Antonovsky (1923 – 1994).** American/Israeli. Medical sociologist.

Professor at Ben Gurion University, Israel.

- [Antonovsky \(1979\)](#): «Health, stress and coping»
- [Antonovsky \(1987\)](#): Unraveling the Mystery of Health: How people Manage Stress And Stay Well
- [Antonovsky \(1996\)](#) The Sense of coherence. An historical and future perspective. Isr J. Med. Sci.



# History 5: Stress and salutogenesis.



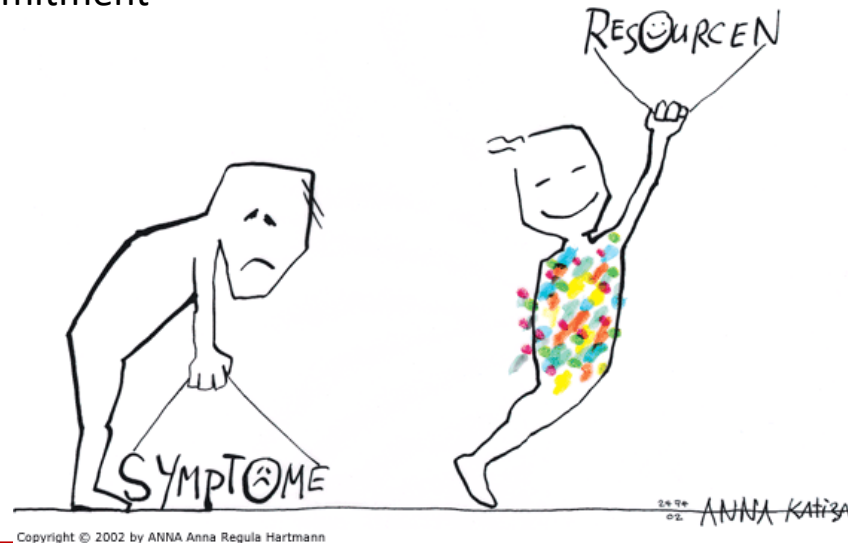
A «health sociological» model in a health promotion perspective

- **The salutogenic** approach searched for the **origins of health** rather than the causes of disease.
- Explained why some people become ill under stress and others stay healthy
- Introduced the concept of **Sense of coherence (SOC)** (Antonovsky 1979)
- **The SOC is defined as:** “The extent to which one has a pervasive, enduring though dynamic, **feeling of confidence** that one’s environment is **predictable** and that things will **work out as well** as can reasonably be expected.”



## 5. The theory of sense of coherence SOC

- SOC has three components:
  - **Comprehensibility** is the extent to which events are perceived as **making logical sense**, that they are **ordered, consistent, and structured**
  - **Manageability** is the extent to which a person **feels they can cope**
  - **Meaningfulness** is how much one feels that **life makes sense**, and challenges are worthy of commitment



# Summary: what is stress?

# Summary: what is stress?

Most researchers agree that a definition of the concept of stress may contain three factors;

1. Stress as an external factor = **STIMULI**

**i. Stimuli: stressor**

2. Stress as the reaction you experience after external or internal influence  
= **RESPONS**

**ii. Respons: stressreaction, activation, arousal**

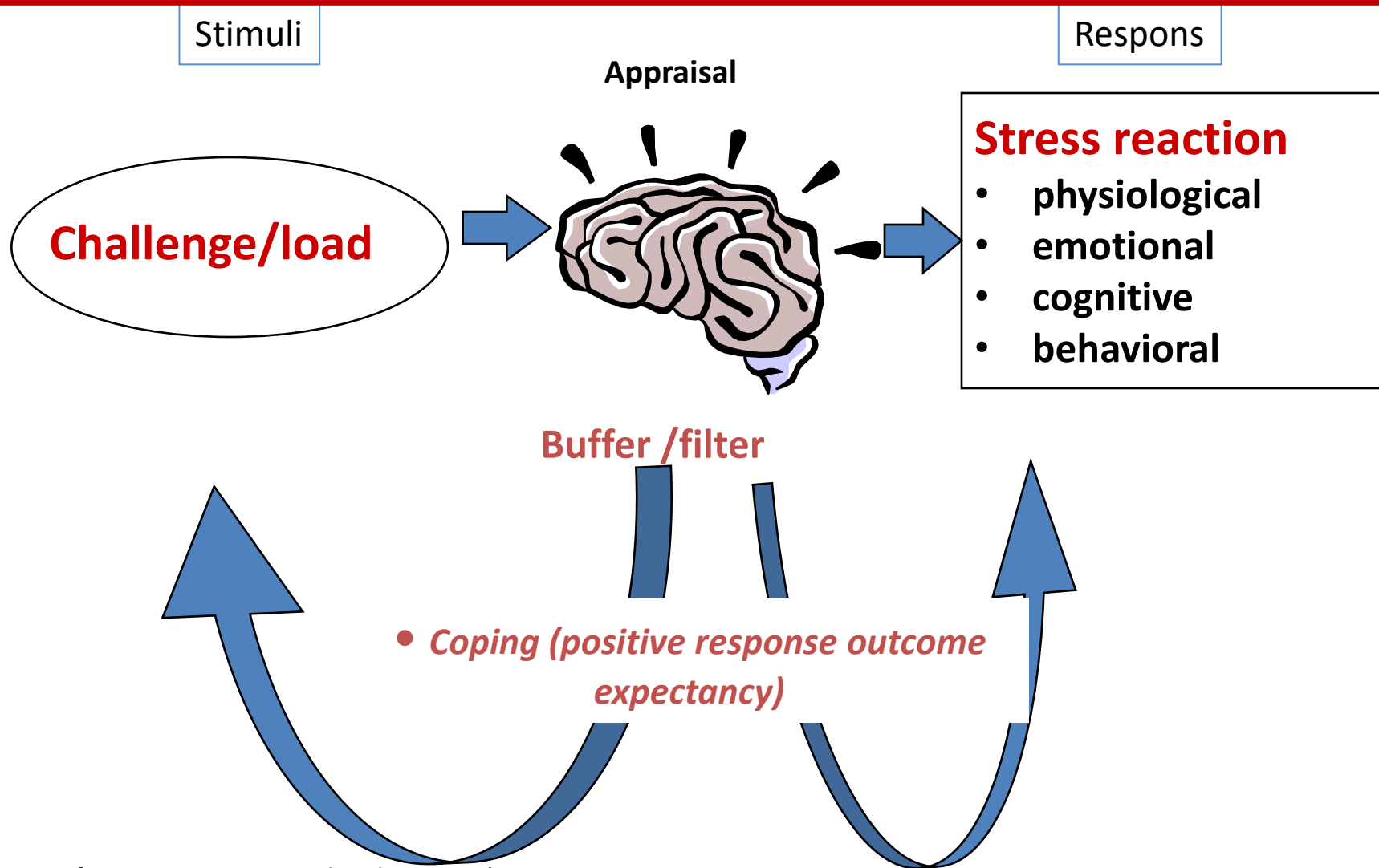
3. Stress as interaction or process: stimuli – respons, influenced by cognitive appraisal

**iii. Appraisal, expectations, coping resources**

References: Selye, H: «The stress of Life» (1976)

# Stress and Health

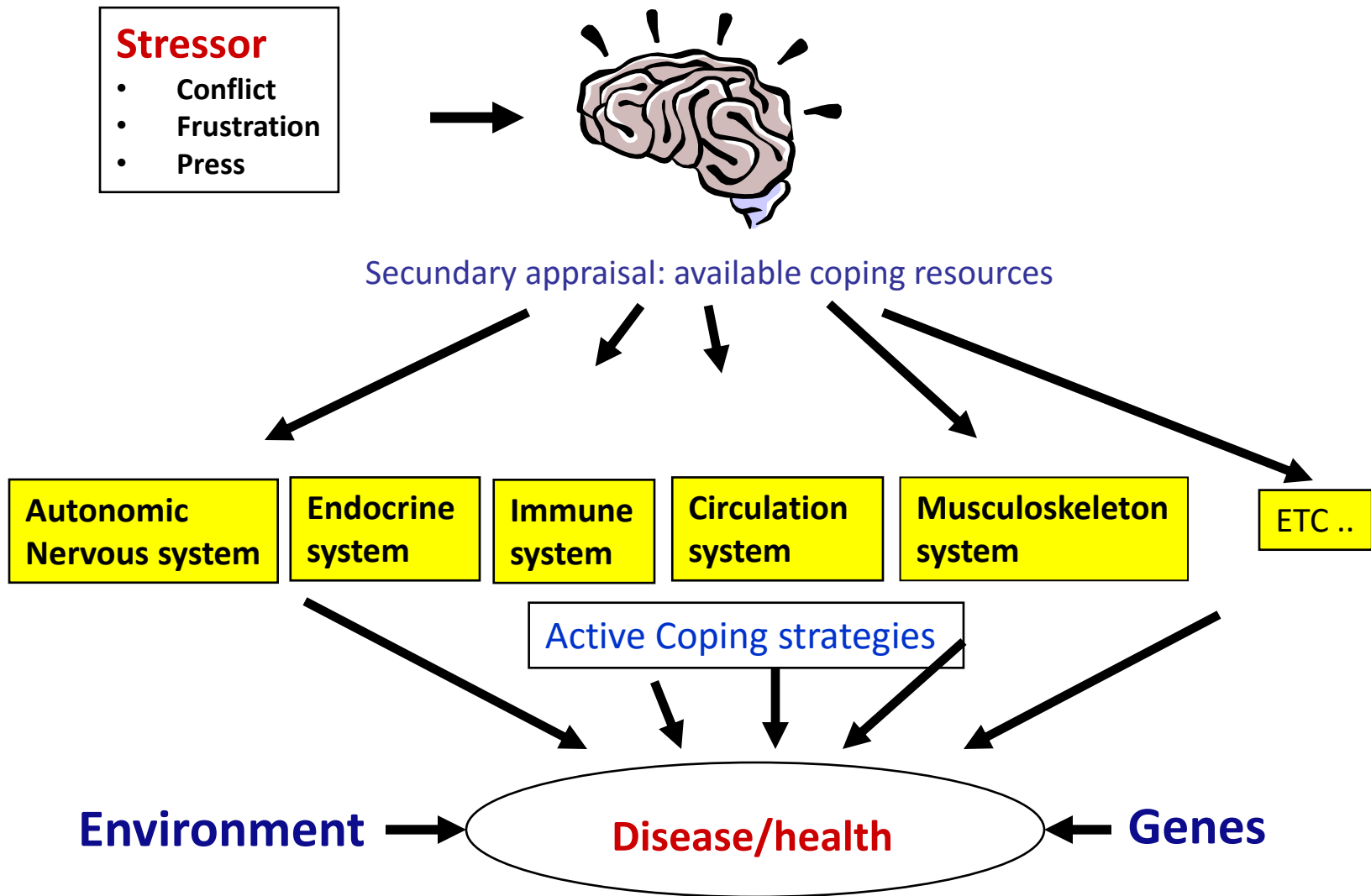
# What is stress?



(Early version of CATS: Grønningsæter PhD. thesis 1992)

# Stress reactions - the physiological pathways to health or disease

Interprete severity (Primary appraisal: irrelevant, harm or threat)

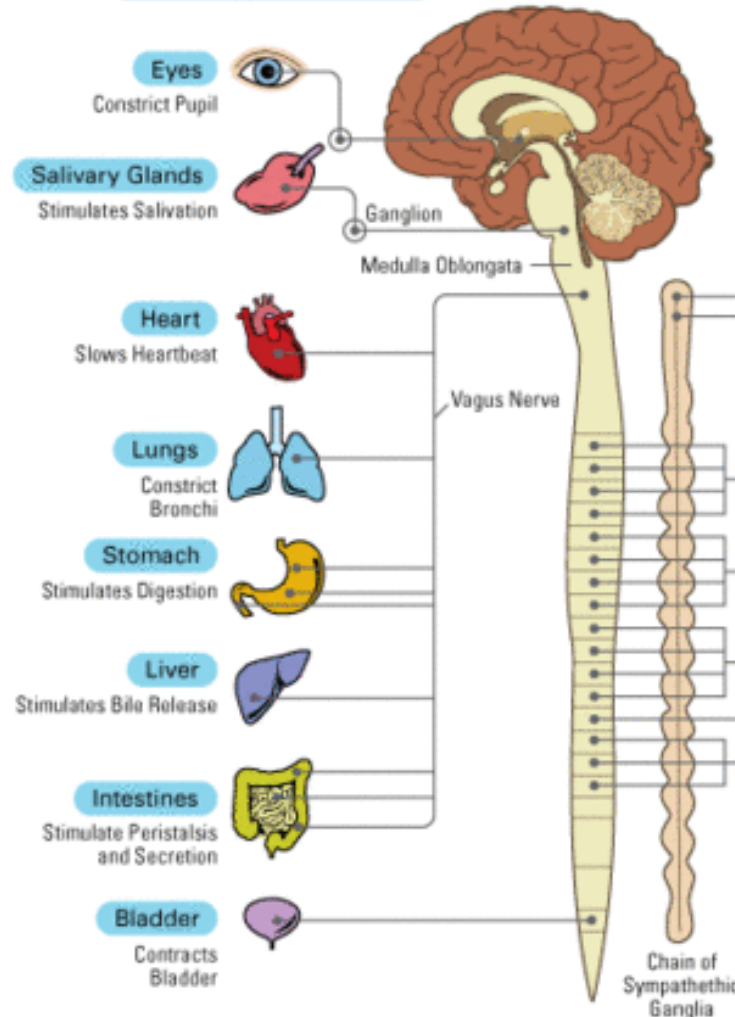


# Stress and the autonomic nervous system

Stress activates the sympathetic nervous system.

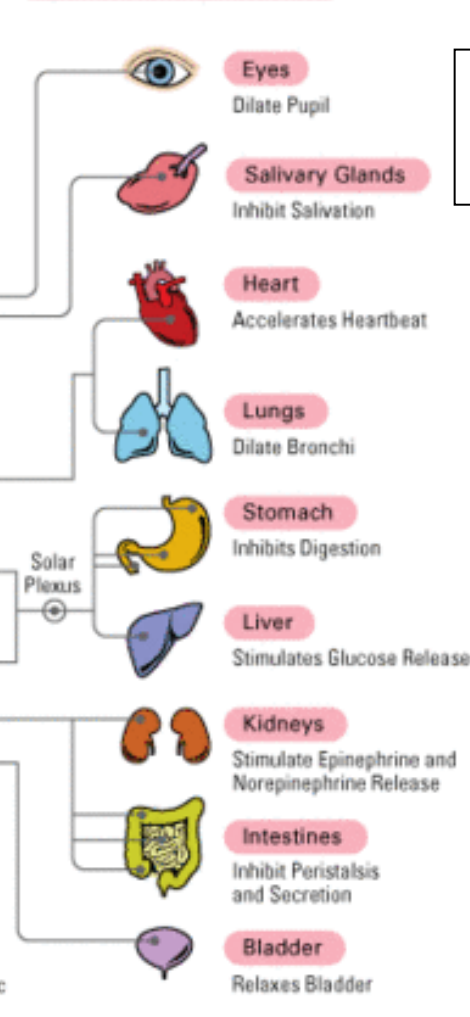
## Schema Explaining How Parasympathetic and Sympathetic Nervous Systems Regulate Functioning Organs

### Parasympathetic



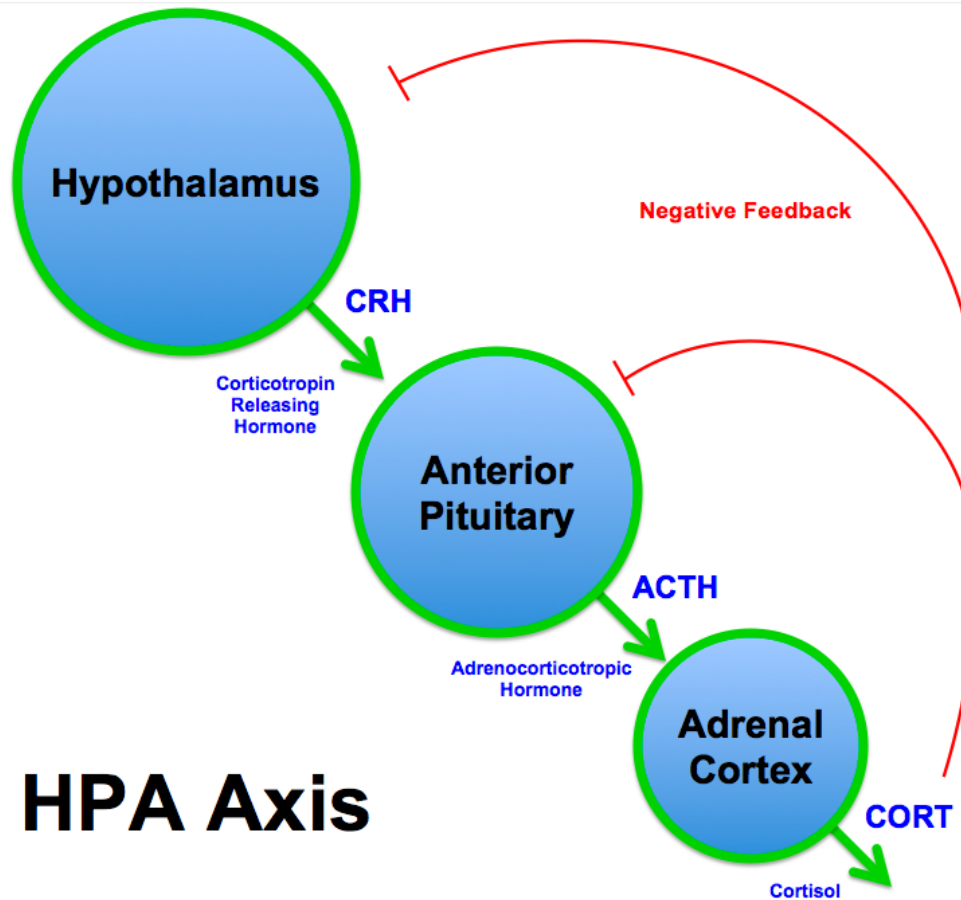
Relaxation activates the «rest or digest» system

### Sympathetic



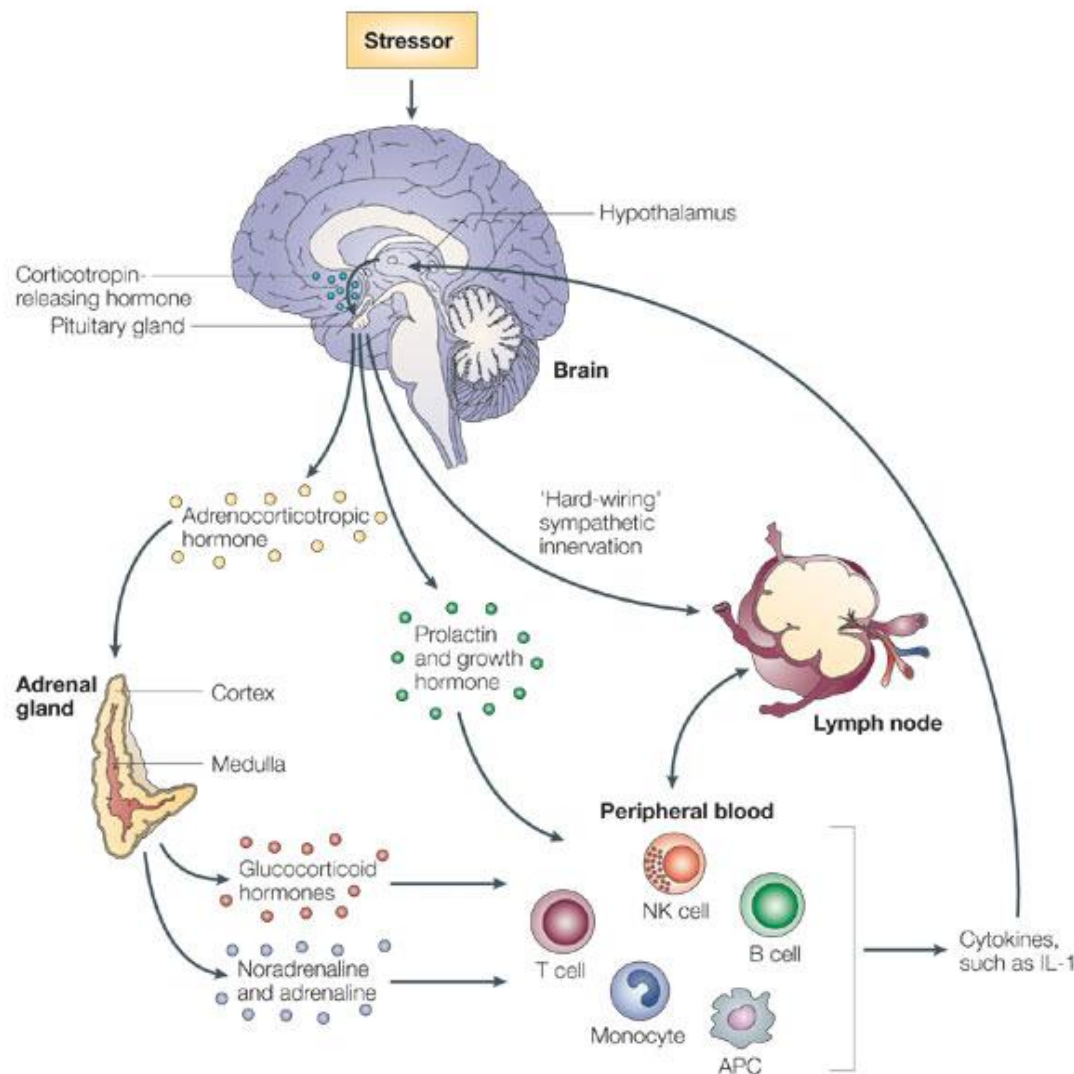
Stress activates The «fight or flight» system»

# Stress and the hypothalamic, pituitary adrenal axis





# Stress and a link to disease: the hypothalamic, pituitary adrenal axis and the immune reactions

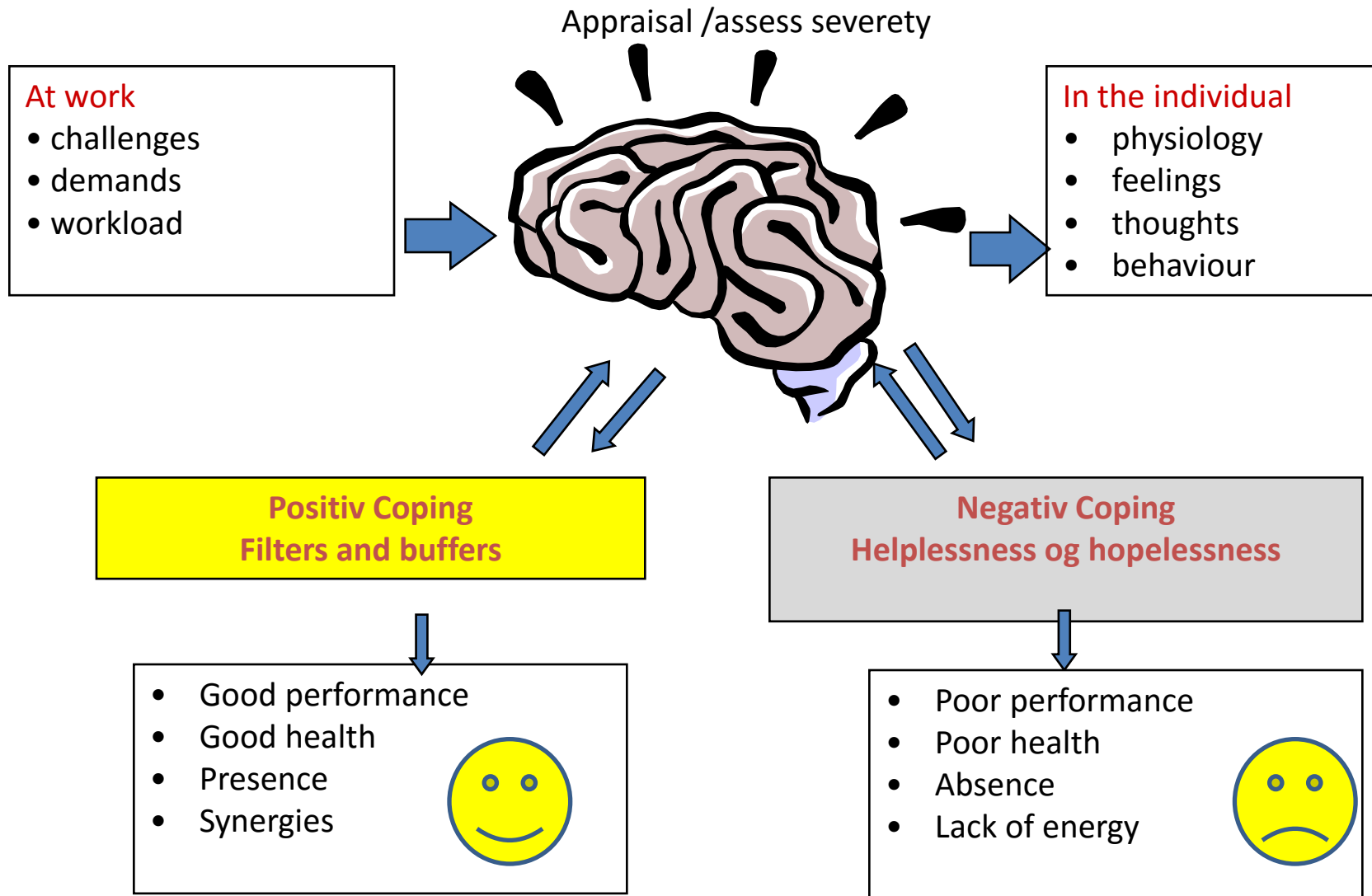


Glaser & Kiecolt-Glaser 2005, Nature Reviews Immunology 5, 243-251 (March 2005)

Nature Reviews | Immunology

Erasmus +: THEWS: Intensive Study Week  
(Norway/HG)

# Stress and coping



# What is coping?



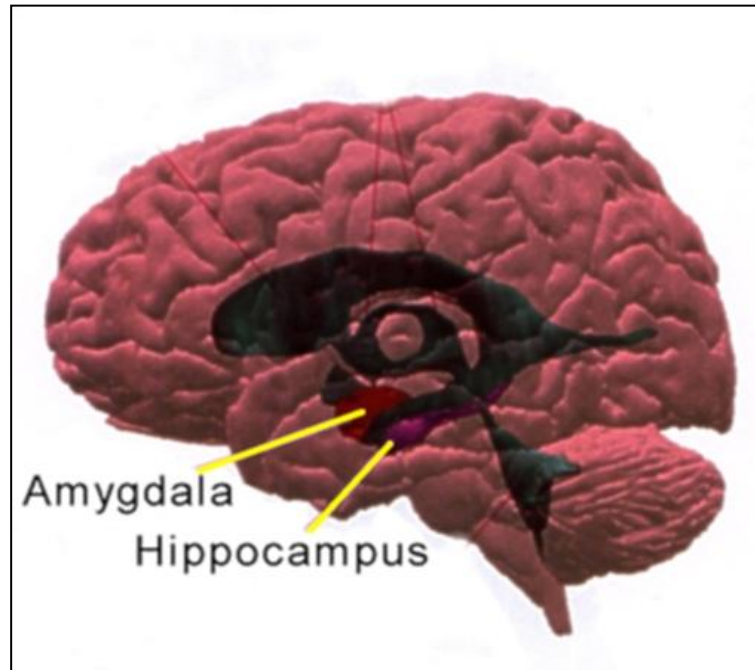
# What is coping? (in cognitive terms by Lazarus and Folkman 1984)



- **Coping** is conscious effort to solve personal and interpersonal problems, and seeking to master, minimize or tolerate stress or conflict.
- **The effectiveness of the coping efforts** depend on the type of stress and/or conflict, the particular individual, and the circumstances.
- **Coping mechanisms** are commonly termed coping strategies or coping skills.
- **The term coping** generally refers to adaptive or constructive coping strategies, i.e. the strategies reduce stress levels (jfr positive response outcome expectancy (Ursin&Eriksen2004)).
- **Maladaptive coping strategies**, i.e. negative coping: stress levels increase (smoking, alcohol, drugs)(jfr Helplessness and hopelessness (Ursin&Eriksen 2004)).
- Subconscious or non conscious strategies are often referred to as **psychological defense mechanisms**. (Stimuli expectations (Ursin&Eriksen2004))

# The limbic system – essential in the stress-coping process

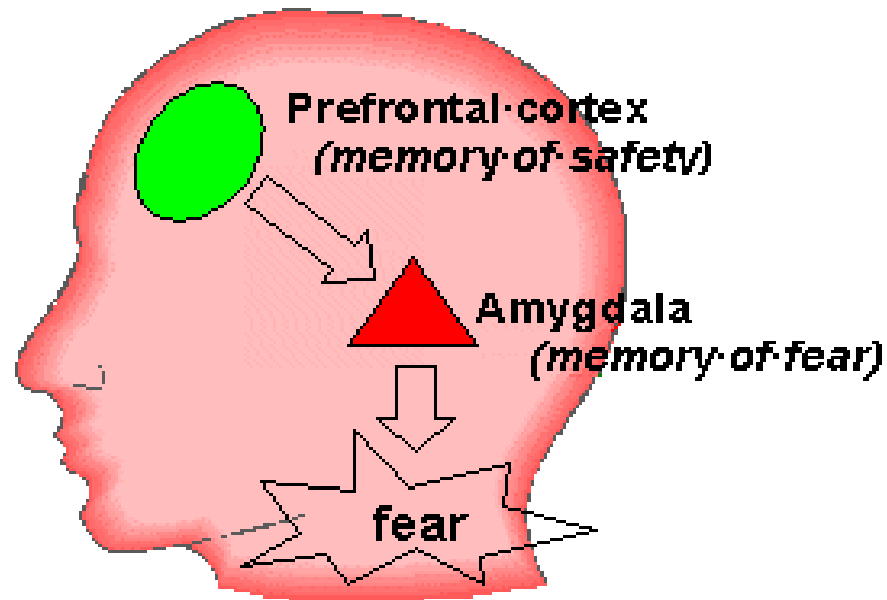
---



The **limbic system** (“the emotional brain”) deals with three key functions: emotions, memories and **arousal** (or stimulation).

## Positive intentions reduce stress

---



- By insecurity and uncertainty **the amygdala** will automatically activate adverse reactions (**anxiety / stress**).
- Positive intentions, positive outcome expectancies, self-efficacy reduce activation in amygdala
- Positive thoughts and strategies must be learned and re-learned

# Coping is described in many ways:

## I Internal resources – cognitive, personal factors:

**Positive outcome expectancy, self-efficacy, will-power, resilience, faith....**

- I can change the situation *if I want so*
- I am conscious of my situation and can act appropriately

## II Coping patterns (as measured by Schreurs et al 1993)

- Action oriented (problem solving)
- Passive avoidance
- Emotion focused

## III Coping strategies or mechanisms (Seaward 1994:138)

- All possible efforts/ techniques to reduce negative effects of stress / anxiety
  - Action oriented (i.e time management)
  - Intrapsychic (acceptance)



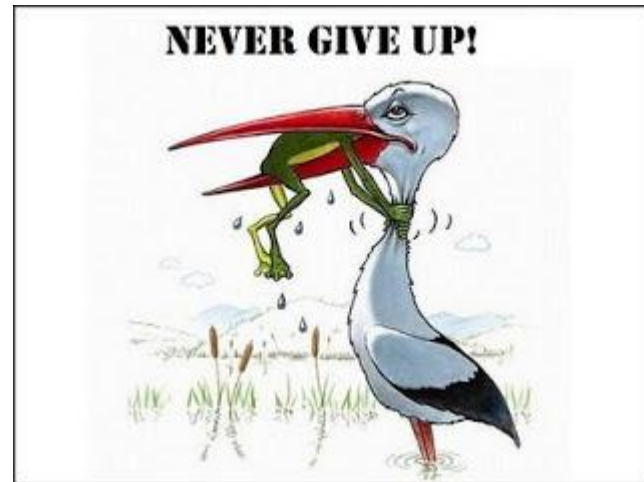
(See also «The coping model» by Lazarus in Seaward 1994:139)

*Du kan ikke styre bølgene, bare surfebrettet...*

# Emotion focused coping

This involves attempts to reduce negative emotional reactions to stress

- Embarrassment
- Fear
- Anxiety
- Depression
- Tension
- Frustration



This may be the only realistic option in situations where one has no control



# Problem focused coping

- **Focus causes of stress:**
  - Think practical and/or pragmatic
  - Take control. Make concrete changes related to the sources of stress
    - “Plan your work and work your plan”: Shift work, move.....
  - Seek social support; information, help, knowledge
  - Make a situational analysis of pros and cons

Problem focused coping does not work when the stress factor is beyond reach, i.e in chronic disease , by grief....



# Sense of coherence and musclepain

# Sense of Coherence and muscle pain



- Stress is known to alter the pain threshold
- SOC is a factor in pain perception and symptom reporting
- A low SOC predicts musculoskeletal symptoms (neck, shoulder, and low-back) in later life
- SOC is a predictor of response to pain management programs for chronic pain sufferers
- SOC predicts the outcome of low-back surgery, possibly through increasing ability to cope with pain
- In arthritis patients, lower SOC is linked to pain levels, as well as greater difficulty in performing daily activities and general health
- Extended research over the past fifteen years

(Reference: Collingwood, J: Ppsychsentral.com)

(Google Scholar: 39 700 treff)

# **Psychobiological explanations of musculoskeletal disorders**

# Psychobiological explanations of musculoskeletal disorders

New theories have been proposed to explain the development of musculoskeletal disorder symptoms in psychologically stressful jobs with a moderate or low physical load

(Hägg, 1991; Schleifer & Ley, 1994; Johansson et al., 2003; Knardahl, 2002).

## 1. "The Cinderella Hypothesis"

(referring to Cinderella, who was first to rise and last to go to bed):

- The motor units in i.e the trapezius muscle are recruited in a fixed order
- Small, low-threshold motor units are recruited at low levels of contraction, before larger ones
- These are activated until complete relaxation of the muscle
- Long-lasting activation of these units may cause degenerative processes, damage and pain (Wærsted, 1997)



# Psychobiological explanations of musculoskeletal disorders

---

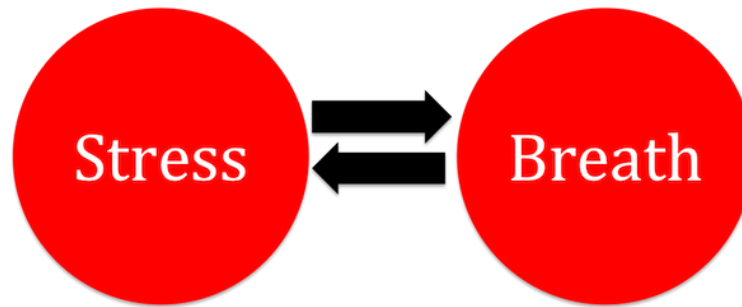
## 2. Cognitive factors and mental stress may induce muscle tension.

- Ongoing psychological stress may keep low-threshold motor units active more or less continuously (Wærsted 1996, Lundberg, Forsman et al., 2002)
- This means that **the same muscle fibers** may also be **active during breaks** at work and after work, unless the individual is able to relax **mentally**



## 3. Stress and breathing

- Stress-induced **hyperventilation** decreases peak CO<sub>2</sub> levels
- Increases the blood **pH level** (beyond 7.45 = alkalosis).
- This contributes to **elevated muscular tension** and a **suppression of parasympathetic activity** (Schleifer & Ley, 1994)



## 5. Vicious circles

- **Vicious circles** may start in muscle spindles during stress and repetitive work
- May contribute to **elevated muscle stiffness** and dysfunctional coordination, including **co-contractions**
- High concentration of **inflammatory substances** and increased **pain sensitivity**
- The pathological processes may **spread from one muscle to another via nerve signals** (Johansson et al. 2003)





# Psychobiological explanations of MSD (musculoskeletal disorders)

## 6. Lack of clear signals

- In light physical work (i.e computer work) - no adequate signals of fatigue
- In contrast to heavy physical work, the worker can continue to work for hours or days without knowing that certain motor units are exhausted



Hentet fra <http://www.macses.ucsf.edu/research/allostatic/muscle.php#tension>

# Psychobiological explanations of MSD (musculoskeletal disorders)

## Conclusion:

The most important factors in preventing MSD in the modern society:

- **Rest, recovery and restitution** (Lundberg for The Allostatic Work Load 2008)



Hentet fra <http://www.macses.ucsf.edu/research/allostatic/muscle.php#tension>

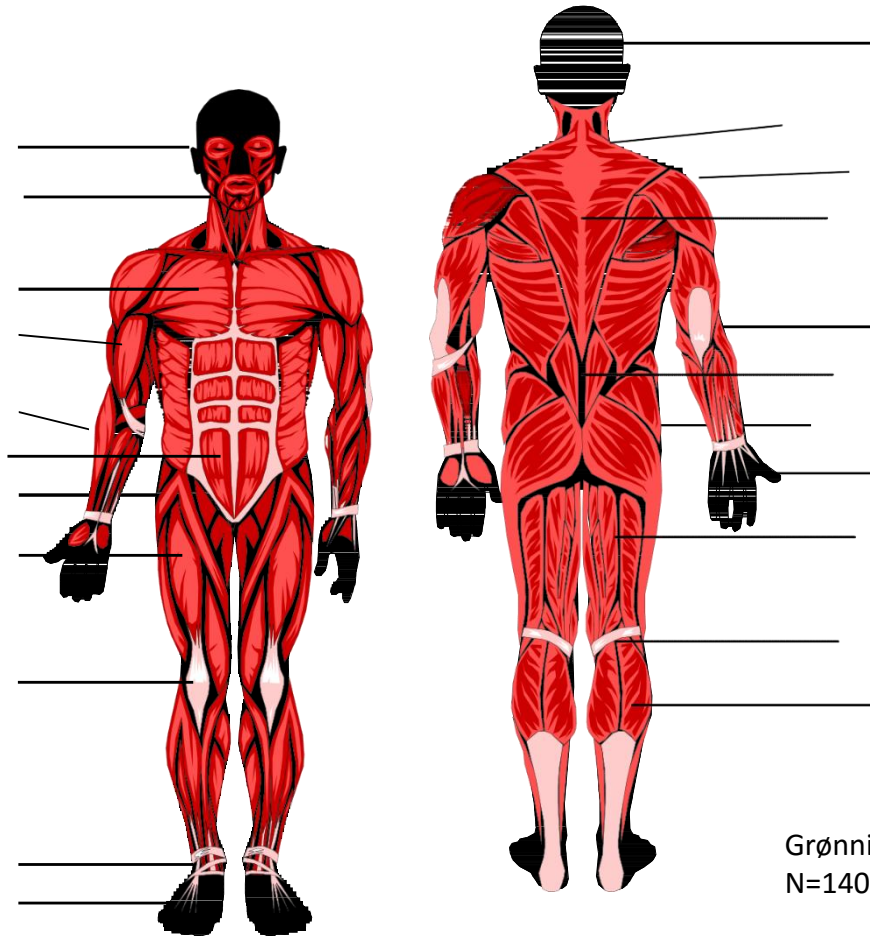
# Incidence: Reported health complaints in Bank employees

Øyne: 15,5  
Kjeve: 5,4%

Bryst: 6,1%  
Overarm: 15,5

Underarm: 9,5%  
Mave: 10,8  
Hofte: 14,2  
Lår foran:  
6,1%

Kne: 19,6



Head: 23,0%  
Neck/shoulder: 45,9%  
Shoulder: 24,3%

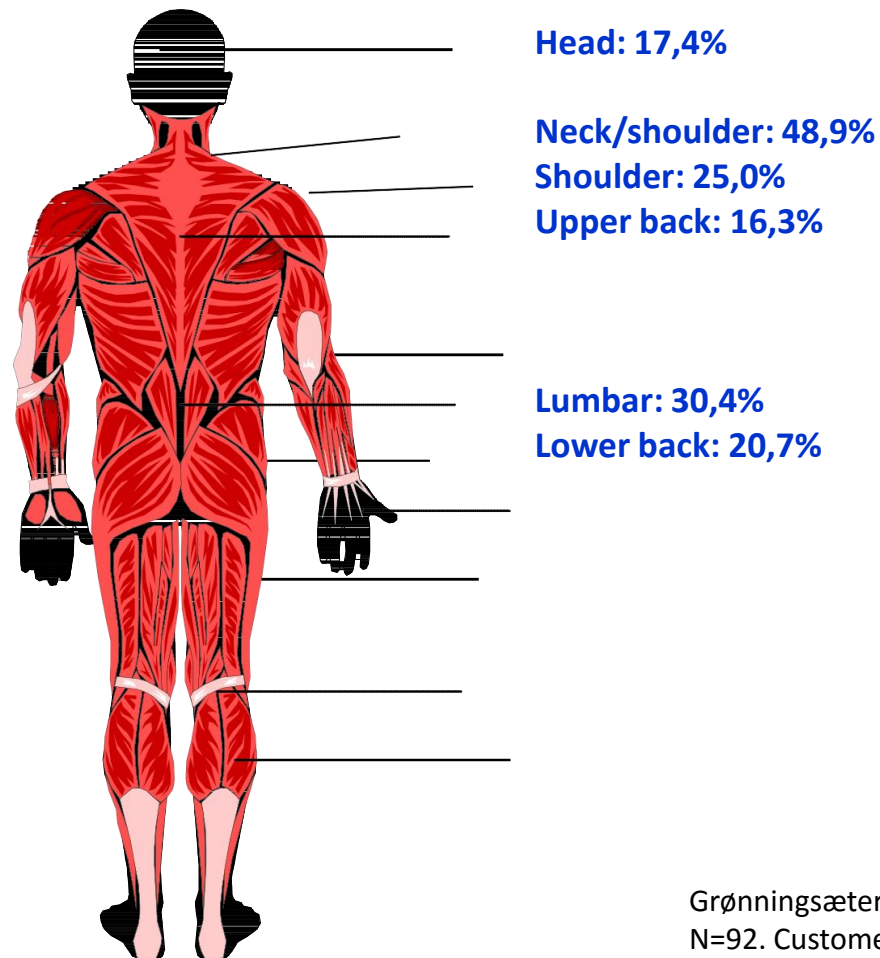
Upper back: 14,9%

Lumbar: 26,4%  
Low back: 12,8%

Grønningsæter H.(1999):Health profile test  
N=140. Bankemployees.

**Average reduced productivity reported due to health complaints is 9,1%**

# Incidence: Reported health complaints in Costumer Service Workers



Grønningsæter H.(1999): Health profile test  
N=92. Customer Service Airlines

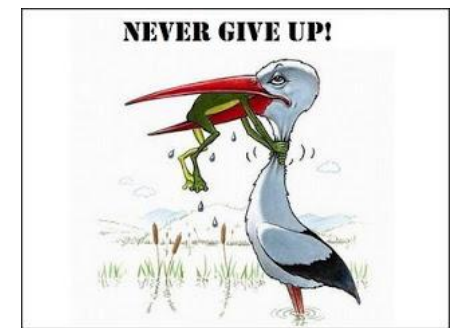
**Average reduced productivity reported due to health complaints is 10.1%**

# Stress management training

- **Stress management** encompasses techniques intended to equip a person with **effective coping mechanisms** for dealing with psychological stress.
- Any technique developed to help someone **cope with or lessen** the physical and emotional effects of everyday life pressure (Lazarus & Folkman 1984).



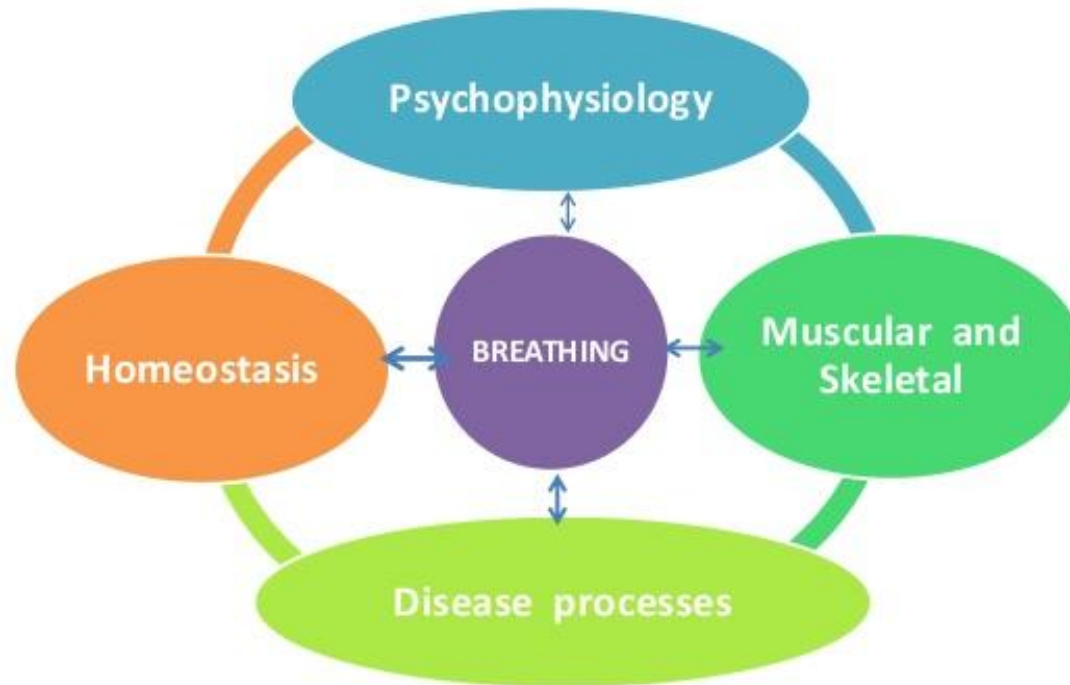
- **Relaxation techniques (examples)**
  - Breathing
  - Mental imagery
  - Autogenic Training
  - Progressive Muscular Relaxation
  - Biofeedback
  - Physical exercise and nutrition
  - Meditation
  - Yoga
- **Coping strategies (examples)**
  - Cognitive Restructuring
  - Behavior Modification
  - Communication skills
  - Time management
  - Humor therapy
  - Art Therapy
  - Creative Problem solving





# Stress and Breathing

Breathing responds to many conditions.  
Breathing functionality depends on context.



Rosalba Courtney 2013

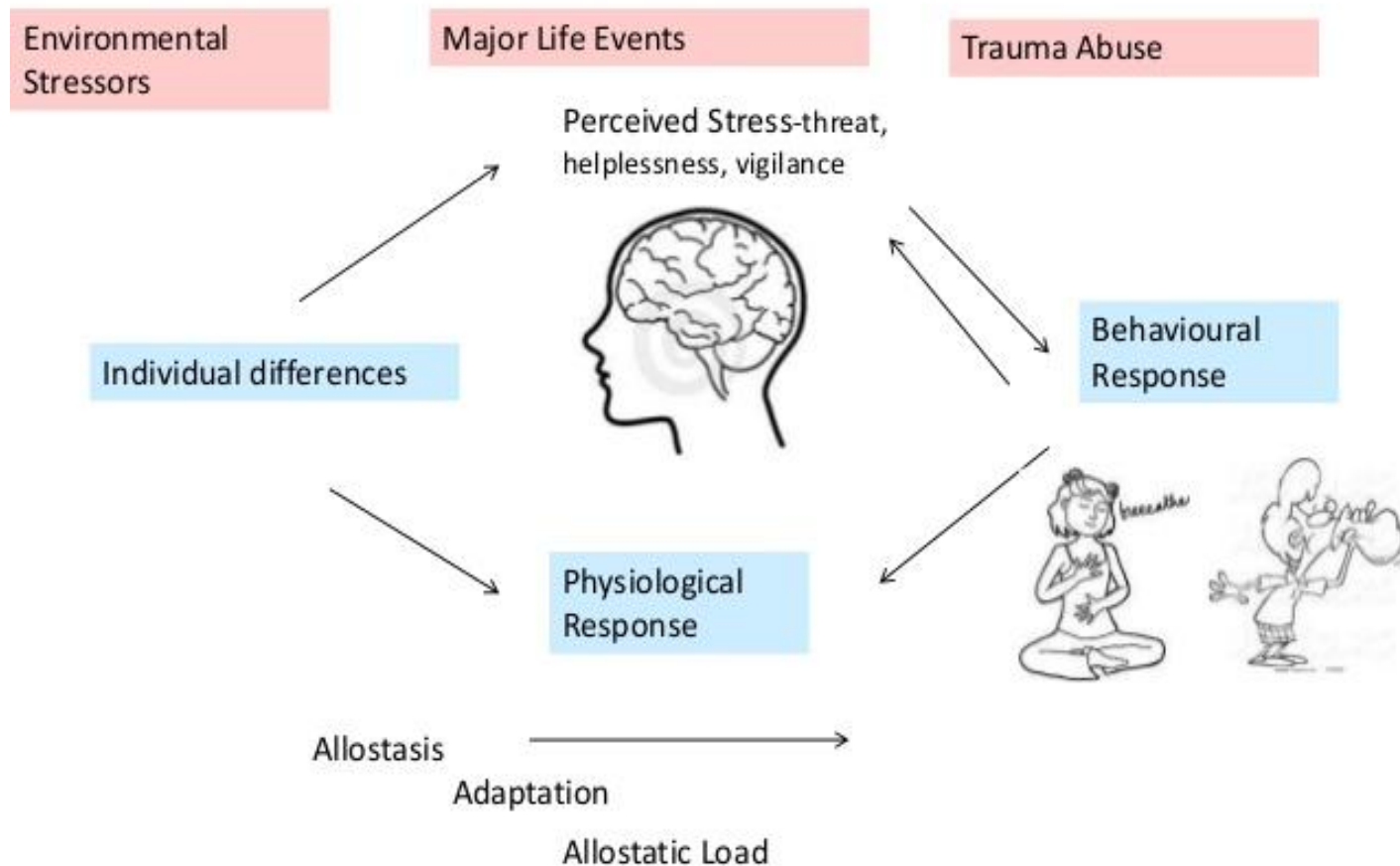
10

Hentet 24.09.2015 <http://www.slideshare.net/drbarry/dysfunctional-breathing-context-causes-and-contributingspreecast-may-2013>



# Stress and Breathing

**Stress and Excess Allostatic Load is an important source of dysfunctional breathing.**



Rosaida Courtney 2015

Modified from McKewen 1998

- **Diaphragmatic Breathing** is controlled deep breathing (belly breathing).
- We normally breathe **14 – 16 times/min** under resting conditions.
- **During heavy exercise**, the ventilation rate can increase to **60 times/min** (Seaward (1999:260 – 266).

### 3. Steps to initiate Diaphragmatic Breathing:

1. Assume a comfortable position
2. Concentration
3. Visualization



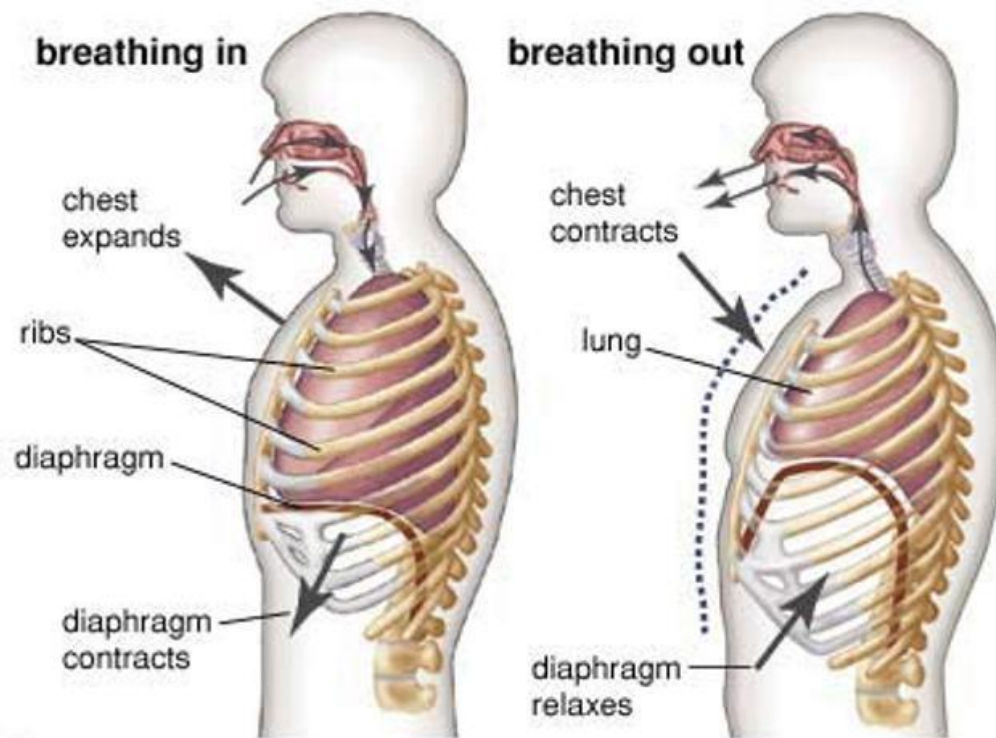
# Lesson 1

---



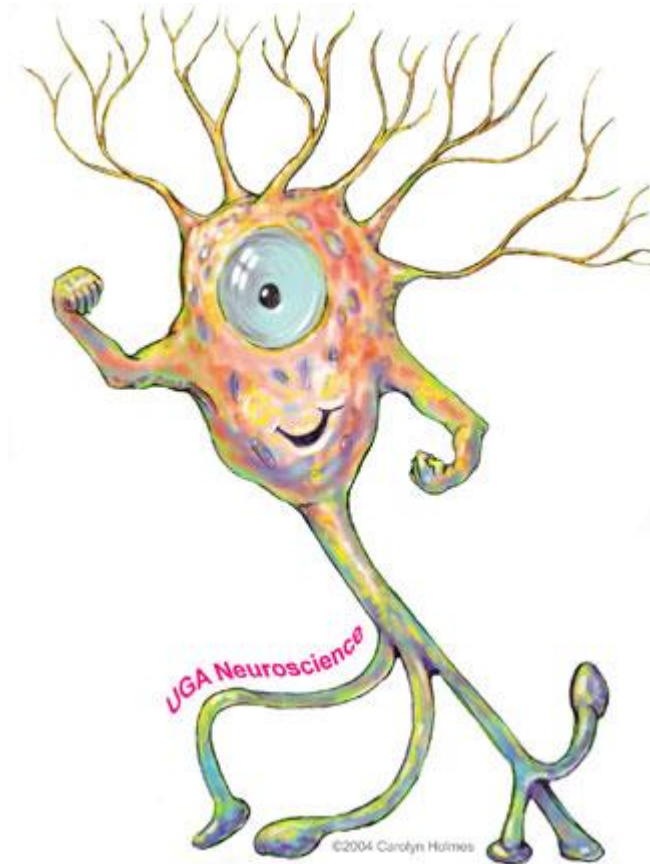
Close your eyes breathing as *slowly* as possible  
Notice what is happening to you

# The breathing movements



# The role of breathing for your entire body

---



**Our breath is connected to our  
autonomic nervous system**

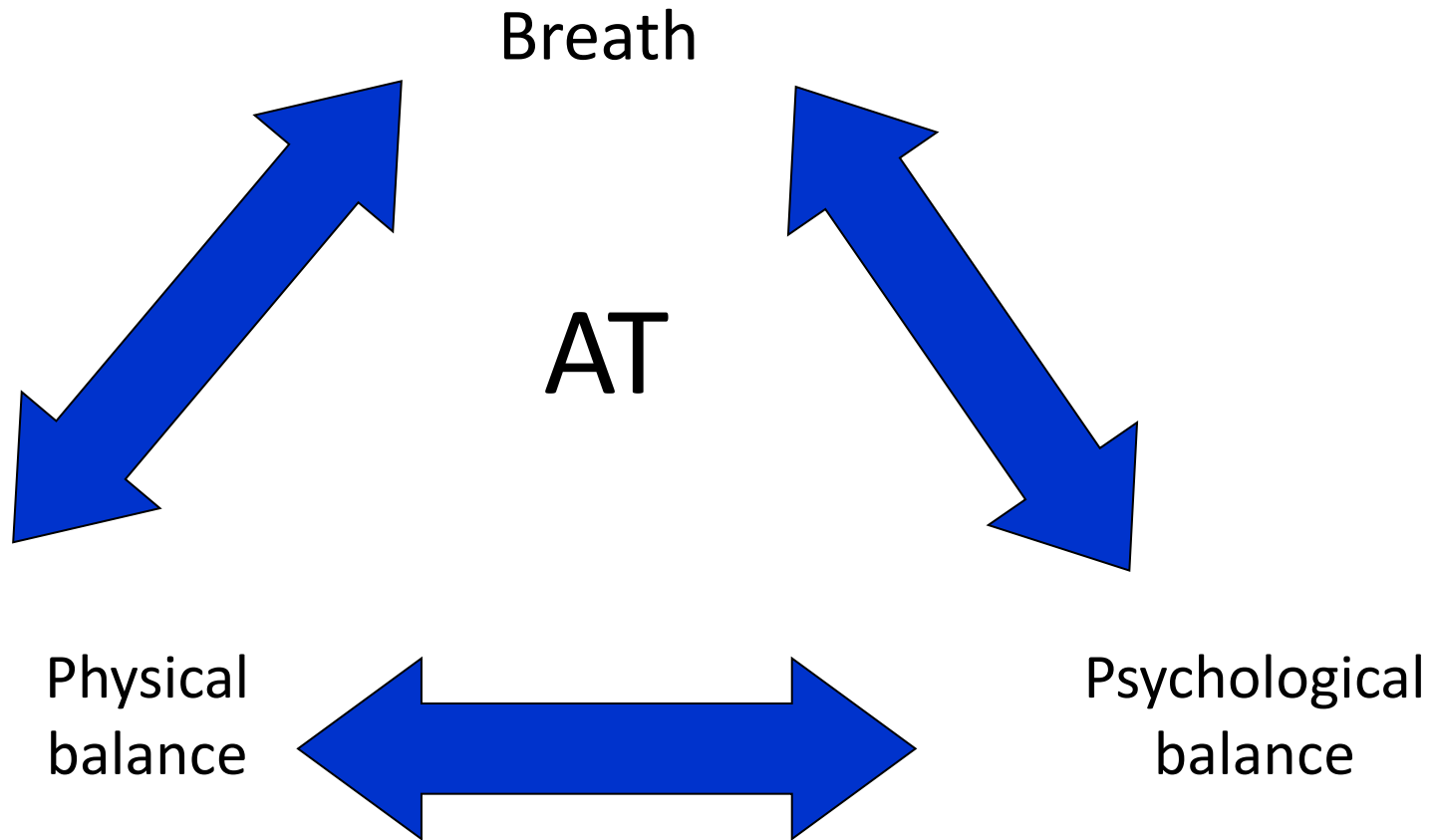
## Lesson 2

---



Close your eyes and **observe** your breathing.  
**Attention** is on your **nose**. **Notice** how you breath **in and out**

# Awareness training (AT)

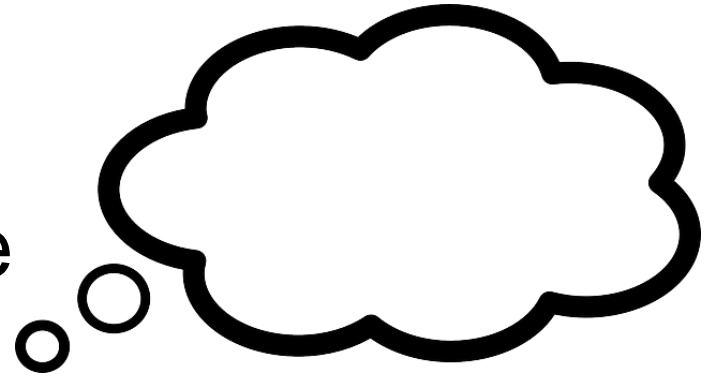




# How

- You can't stop thinking
- You can't control your mind
- Let the thoughts come – and go

- **Stop**
- **Observe**
- **Aksept**
- **Let go**



## SOAL



## Lesson 3

---



Close your eyes and direct your attention to your breathing center in the stomach  
(breathing anchor).  
Notice how your stomach move.

# Mental Imagery – many forms

- Describes **the ability of the uncounscious mind** to generate images:
  - Calming and healing effect (day-dreaming)
- **Visualization** is **one aspect** of mental imagery
  - A consciuos direction of self-generated images
- **Guided mental imagery** is a variation: the images are suggested by another person
- Used for **thousands of years** to access the power of the mind **to heal**
  - the body, mind and soal



Seaward (1994:303)

# Mental Imagery – in sport



Introduced to **Sports** in the 1970s

– Timothy Gallwey- «**The Inner Game of Tennis**» (1974)

- «**The inner game**» is based upon certain principles:
  - An individual uses non-judgmental observations of critical variables
  - Important to be accurate about the observations
  - If the observations are accurate, the person's body will adjust and correct automatically to achieve best performance (Gallwei 2000)
- Developed a comprehensive method of **coaching**
- Later applied to many situations, areas and purposes (business, sport, health, therapy)



# Mental Imagery as a Relaxation technique

- **The skill of Mental imagery** involves the creation of:
  - Images, scenes or impressions by engaging the body's physical senses of
  - **sight, sound, smell, feel and taste** for an overall pleasureable desired effect
- Under **stress** the images we build are normally **negative**
- **Worst-case scenarios** often create more stress, more tension and more negative behaviours
- By training - **positive imagery may change** this process



# Mental Imagery as a Relaxation technique



- **Mental imagery can be divided into three types:**
  1. **Peaceful natural scenes** or images that place you in a natural environment
  2. **Behavioral changes;** images that allow one **to see** and **feel** oneself performing
    1. A different, more health-conscious behavior
    2. Any behavior leading to obtain a goal or a wanted situation
  3. **Internal body images;**
    1. Trips inside the body to observe damaged, diseased or dysfunctional tissue being healed or repaired

# Mental Imagery as a Relaxation technique

## Color therapy, light therapy are loosely associated with imagery

- Colors of light have **specific vibrations** (frequencies) that may interfere the healing
- **Red** is said to generate feelings of arousal (gives you energy)
- **Blue** is believed to have a calming quality (relaxing energy)

(Seaward (1994))

- Mental **imagery research** related to somatic diseases, including neck-pain will be discussed during the ISP week.



- Stress theories, including biological -, psychological -and cognitive aspects have been discussed in relation to health and disease
- Psychological stress may induce muscle pain, including neck pain
- Coping is the most important factor in reducing negative stress reactions and experiences
- Understanding the psychobiology of stress and coping is not only desirable but also necessary to master one's own stress and help others
- Breathing, relaxation and mental imagery have been shown to be effective in reducing psychological stress and muscle pain

