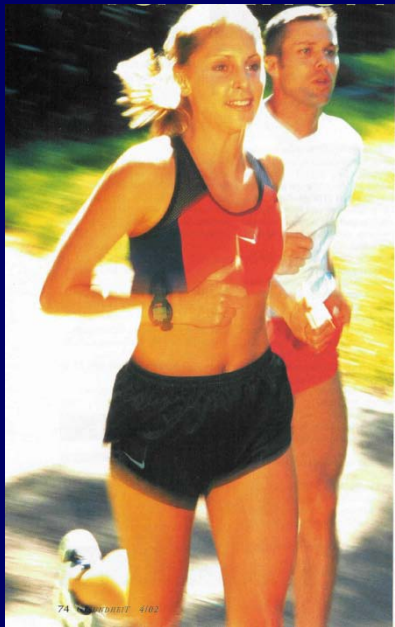
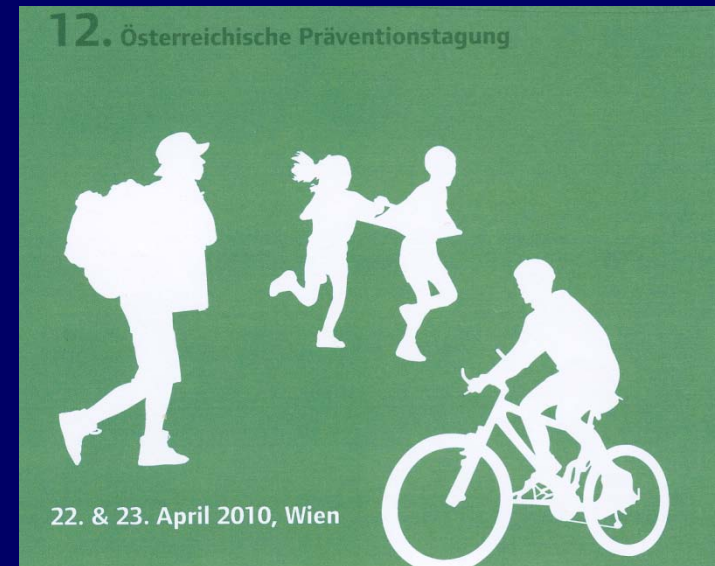


# Bewegung wirkt!

Physiologische Auswirkungen auf die Gesundheit

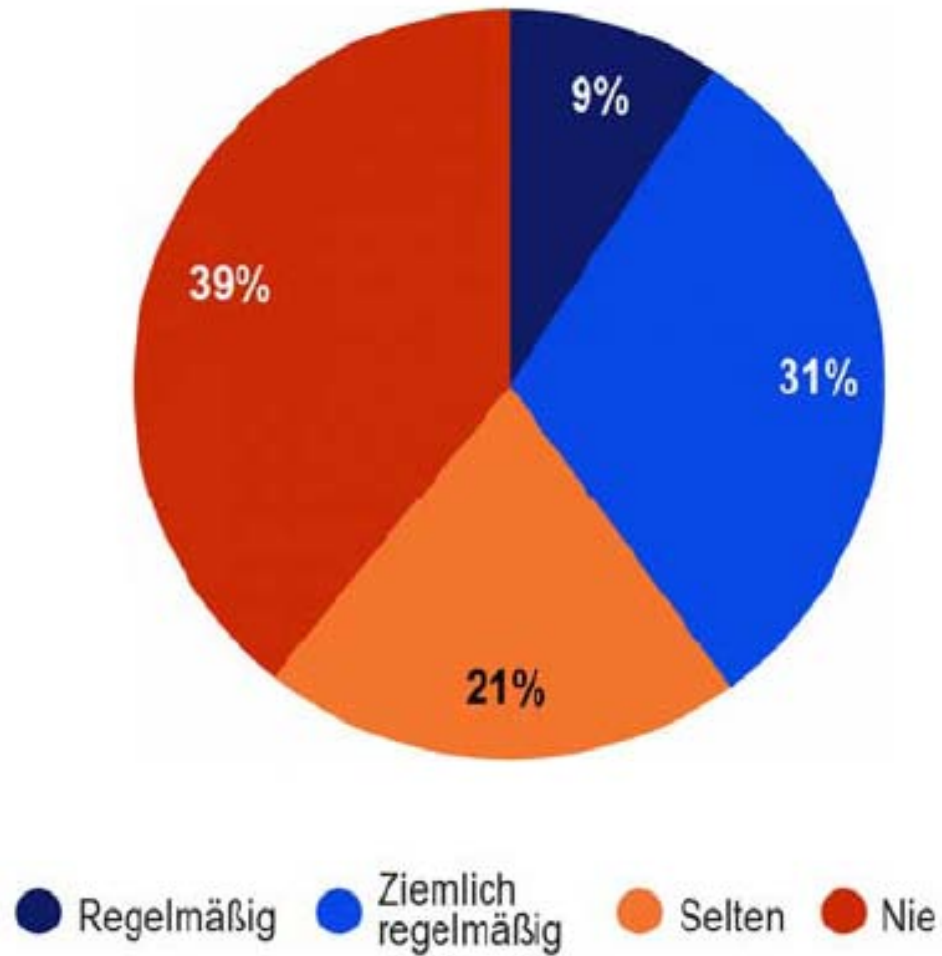


**Univ.-Prof. Dr. med.  
Norbert BACHL**

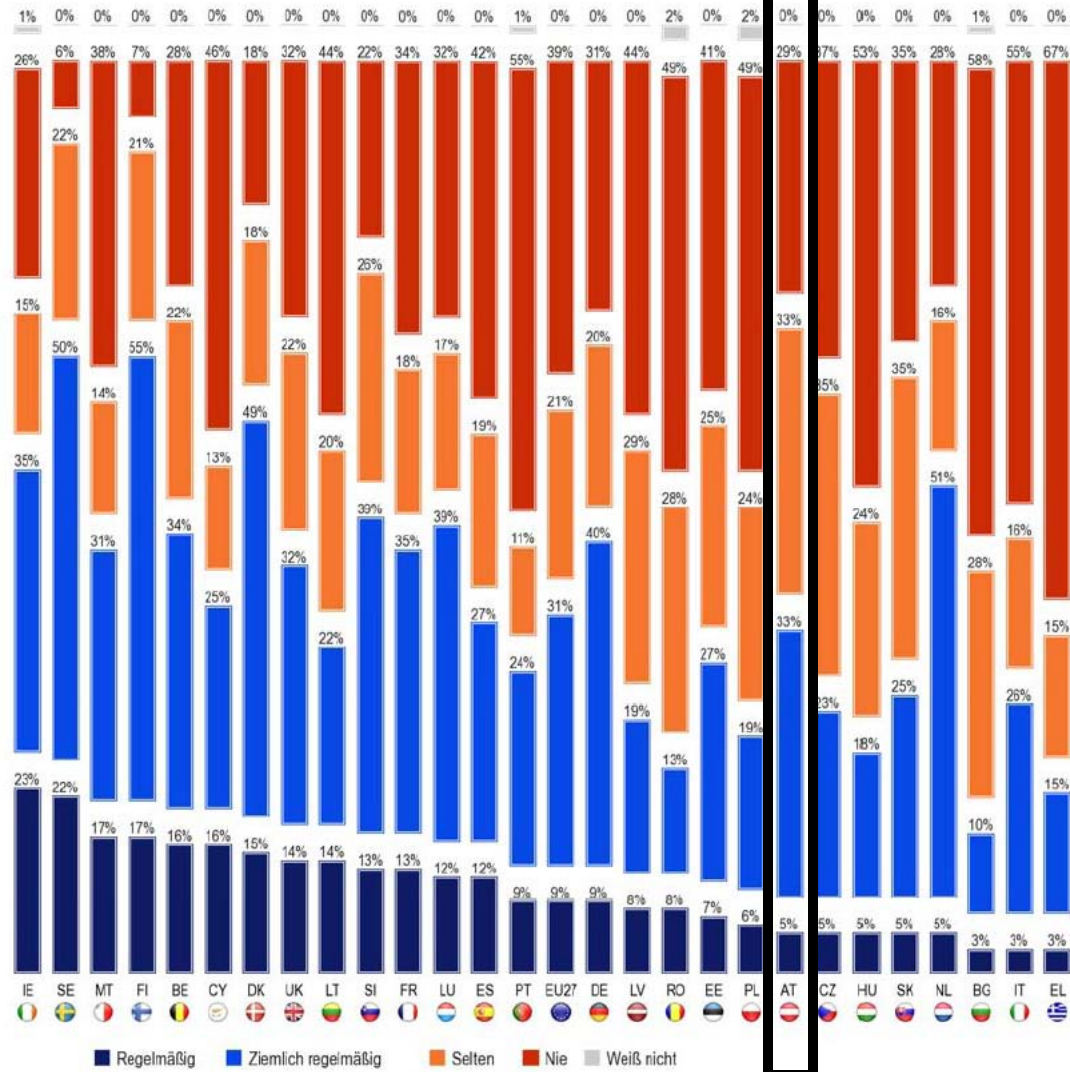


**ZENTRUM FÜR SPORTWISSENSCHAFT und UNIVERSITÄTSSPORT  
der Universität Wien  
Abteilung Sport- und Leistungsphysiologie**

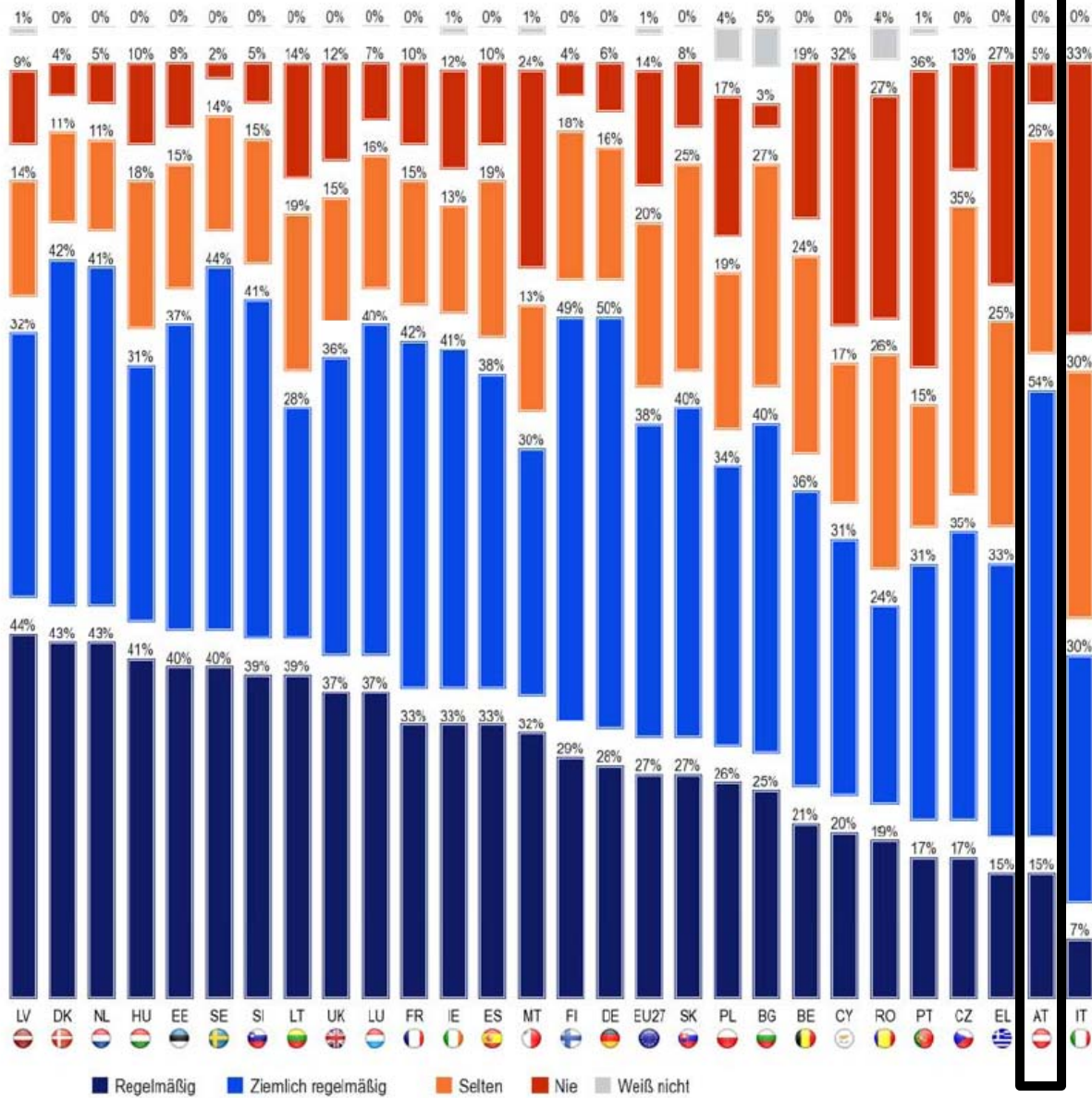
QF1. Wie oft treiben Sie Sport oder trainieren Sie?



QF1. Wie oft treiben Sie Sport oder trainieren Sie?



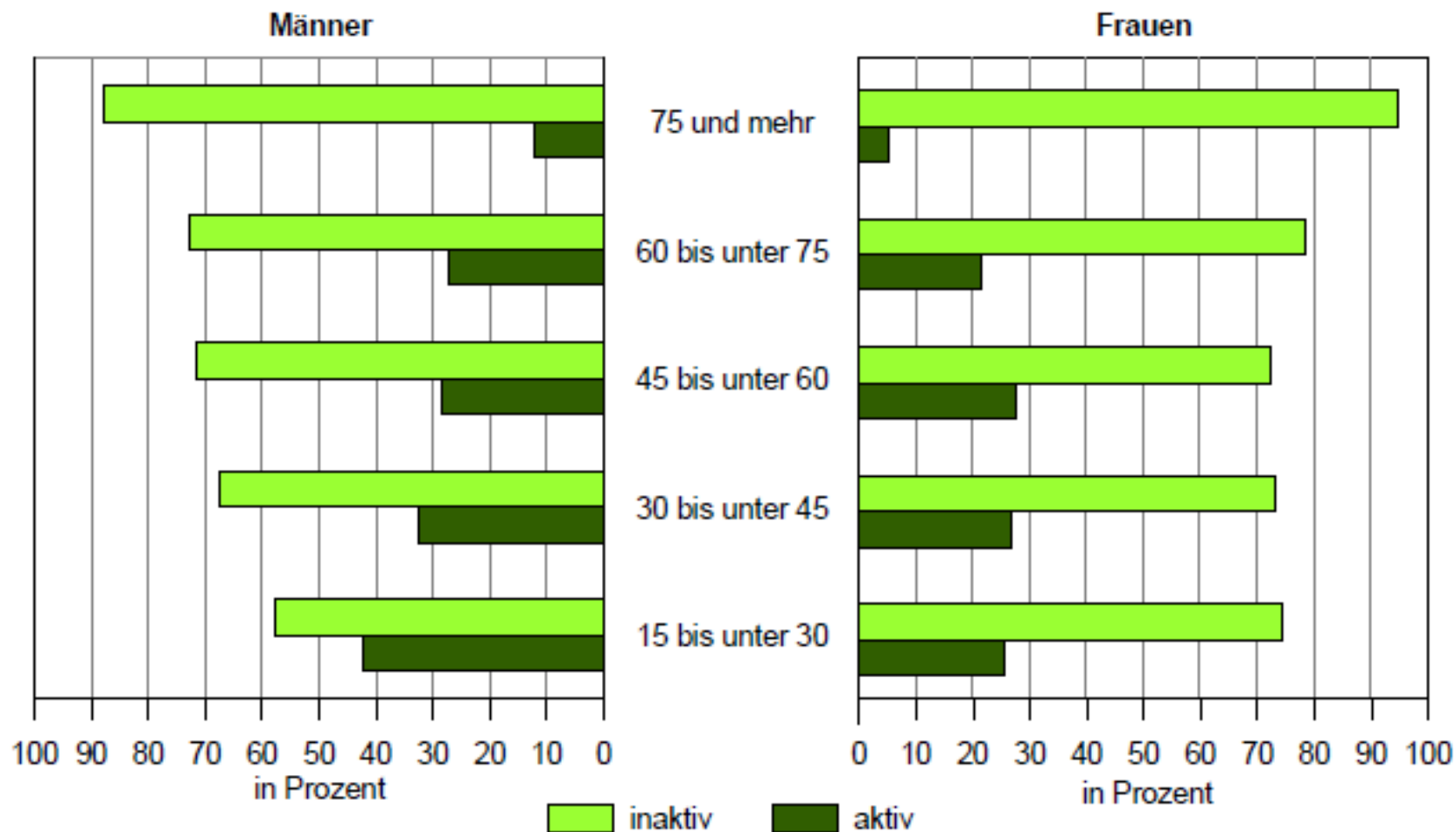
QF2. Wie oft betätigen Sie sich körperlich im Freien? Dazu zählt z.B. Fahrradfahren, Spaziergehen, Tanzen, Gartenarbeit,...



SPECIAL EUROBAROMETER „SPORT AND PHYSICAL ACTIVITY“

European Commission, 2010

# Körperliche Aktivität in der Freizeit nach Altersgruppen und Geschlecht

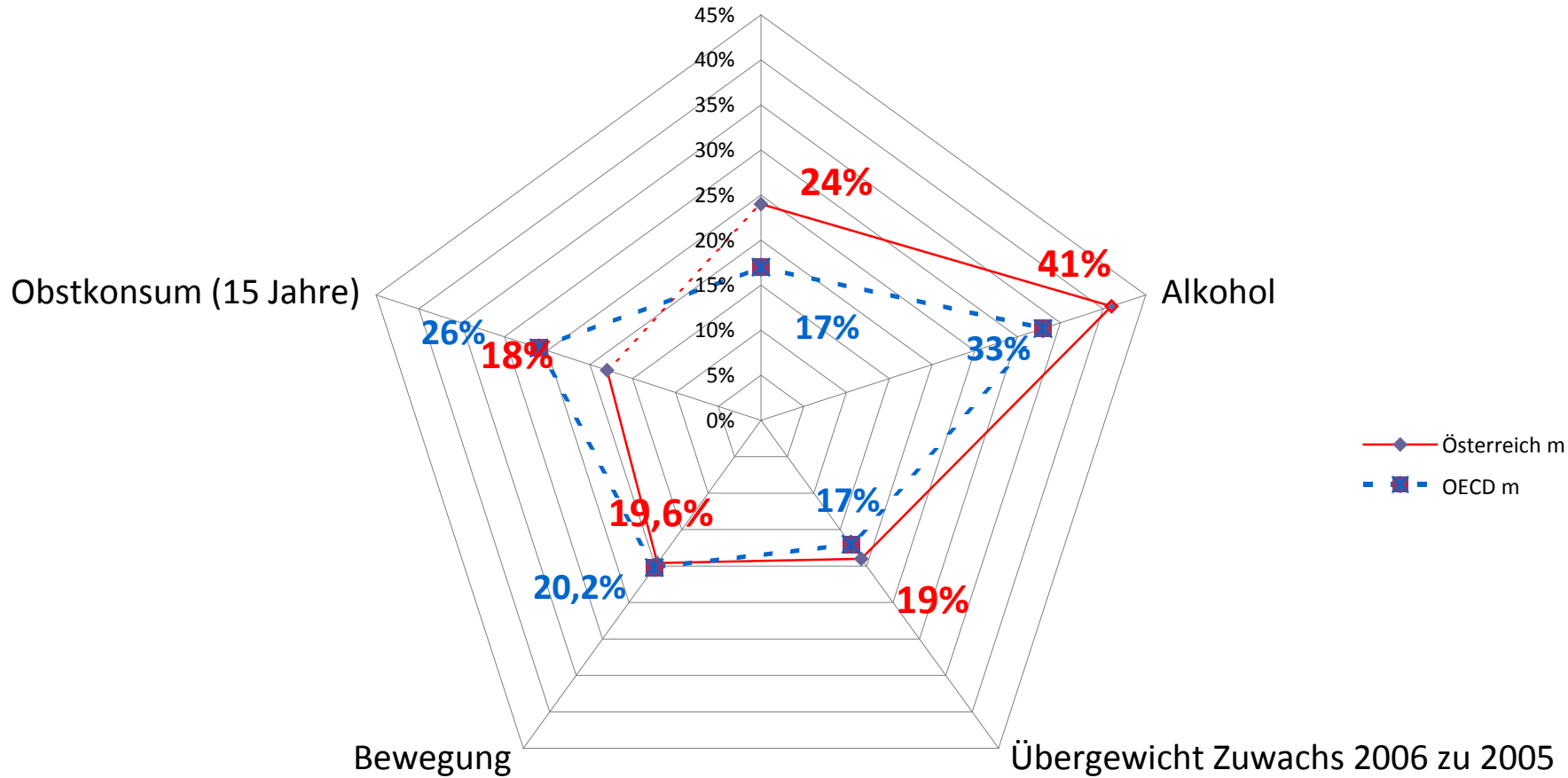


Q: STATISTIK AUSTRIA, Gesundheitsbefragung 2006/07.

# Gesundheitsrisiken 15 J män. OECD(2009)

in % alle män. Jugendlichen

Rauchen



„Nichtmedizinische“ Determinanten der Gesundheit

## Körperliche Inaktivität –

## Risikofaktoren, Zivilisationserkrankungen

Degenerative Herz-Kreislauf-Erkrankungen

Hypertonie

Periphere Gefäßerkrankungen

Schlaganfall

---

Diabetes Typ II

Fettstoffwechselstörungen

Adipositas

Gallenblasenerkrankungen

---

Colon Karzinom

Mamma Karzinom

---

Osteoporose

Unspezifische Rückenschmerzen

Muskelschwäche

Gebrechlichkeit

Allgemein funktionelle Beeinträchtigung

---

Einschränkung kognitiver Funktionen

Depression

---

Frühzeitige Mortalität

Therefore, given these facts, F.W. Booth et al, 2002 coined the phrase:

## *Sedentary Death Syndrome (SeDS)*

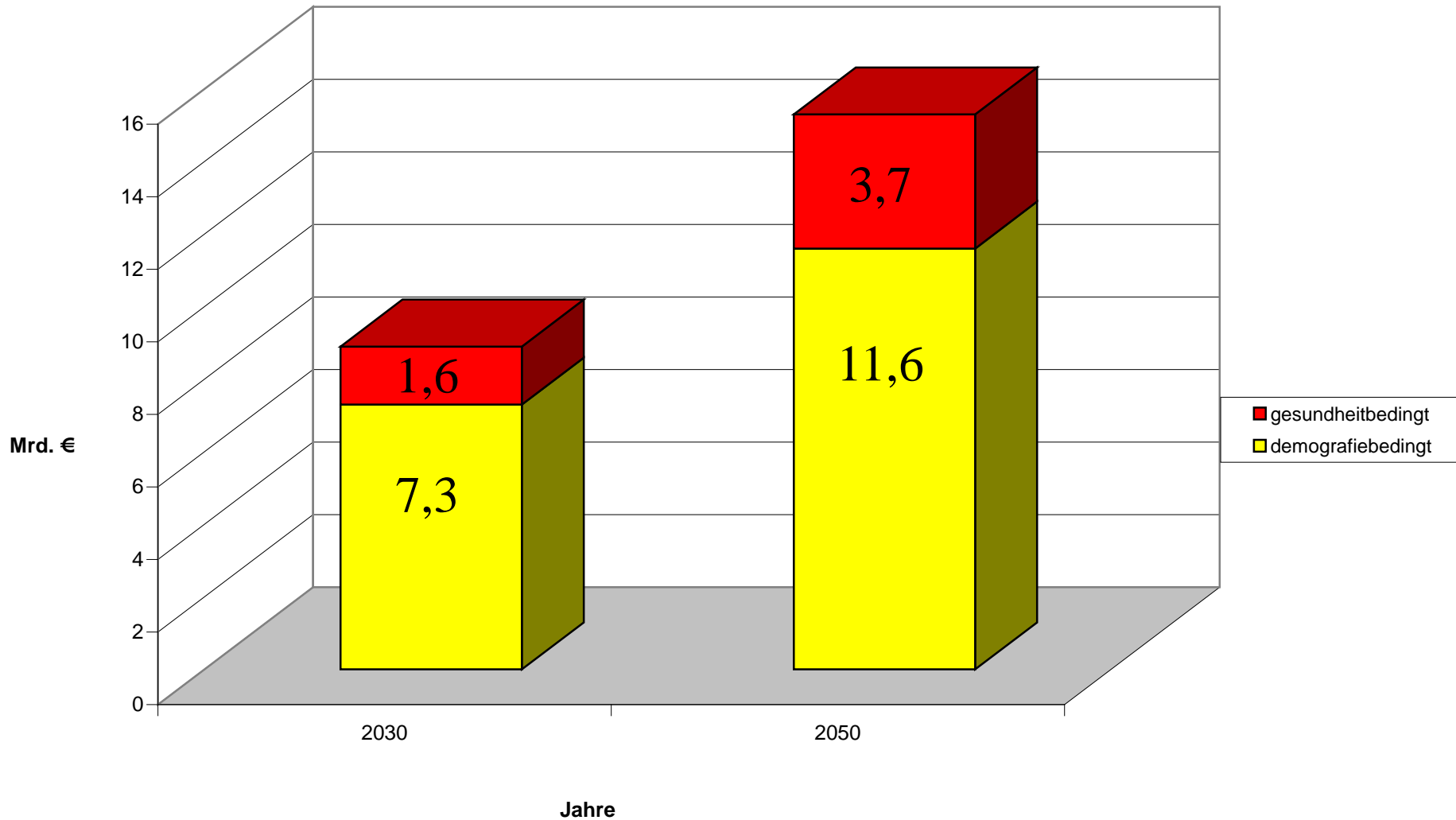
*to categorize the emerging entity of sedentary lifestyle-mediated disorders that ultimately result in increased mortality.*

F.W. Booth, 2002

„Österreich wird ein einziges Krankenhaus und Pflegeheim!“



## Zuwachs Krankheitskosten 2030 und 2050 gegenüber 2007



Nach Beske, f.: Morbiditätsprognose 2050, 2009

W. Chini, 2010

**Bessere Prävention macht Volkswirtschaft gesünder!**

# THE „MAGIC 4“ OF LIFESTYLE MEDICINE

- **Regular Physical Activity**
- **Nutrition**
- **Non Smoking**
- **Normal Body Weight**



Gesundheitswirkungen durch regelmäßige körperliche Aktivität bei Erwachsenen, gereiht nach der Stärke der Beweislage (U.S. Department of Health and Human Services, 2008, S. 9).

### **Wirkungen**

- Vermindertes Risiko für den vorzeitigen Tod aller Ursachen
- Vermindertes Risiko für ischämische Herzkrankheiten
- Vermindertes Risiko für Schlaganfall
- Vermindertes Risiko für Bluthochdruck
- Vermindertes Risiko für das Metabolische Syndrom
- Günstige Beeinflussung der Blutfette
- Vermindertes Risiko für Diabetes mellitus Typ 2
- Prävention der Körpergewichtszunahme
- Gewichtsreduktion, besonders bei gleichzeitiger Kalorienreduktion
- Verbesserte kardiovaskuläre und muskuläre Fitness
- Vermindertes Risiko für Stürze
- Vermindertes Risiko für Darmkrebs
- Vermindertes Risiko für Brustkrebs
- Reduktion von Depression
- Verbesserte kognitive Funktion (bei älteren Personen)
- Verbesserung der „Aktivitäten des täglichen Lebens“ (bei älteren Personen)
- Reduktion von Abdominalfett (Bauchfett)
- Vermindertes Risiko für Hüftfrakturen
- Vermindertes Risiko für Lungenkrebs
- Vermindertes Risiko für Gebärmutterkrebs
- Gewichtserhaltung nach Körpergewichtsreduktion
- Erhöhte Knochendichte
- Verbesserte Schlafqualität

# ***Study on drivers of Londons double decker buses*** *Morris et al.*



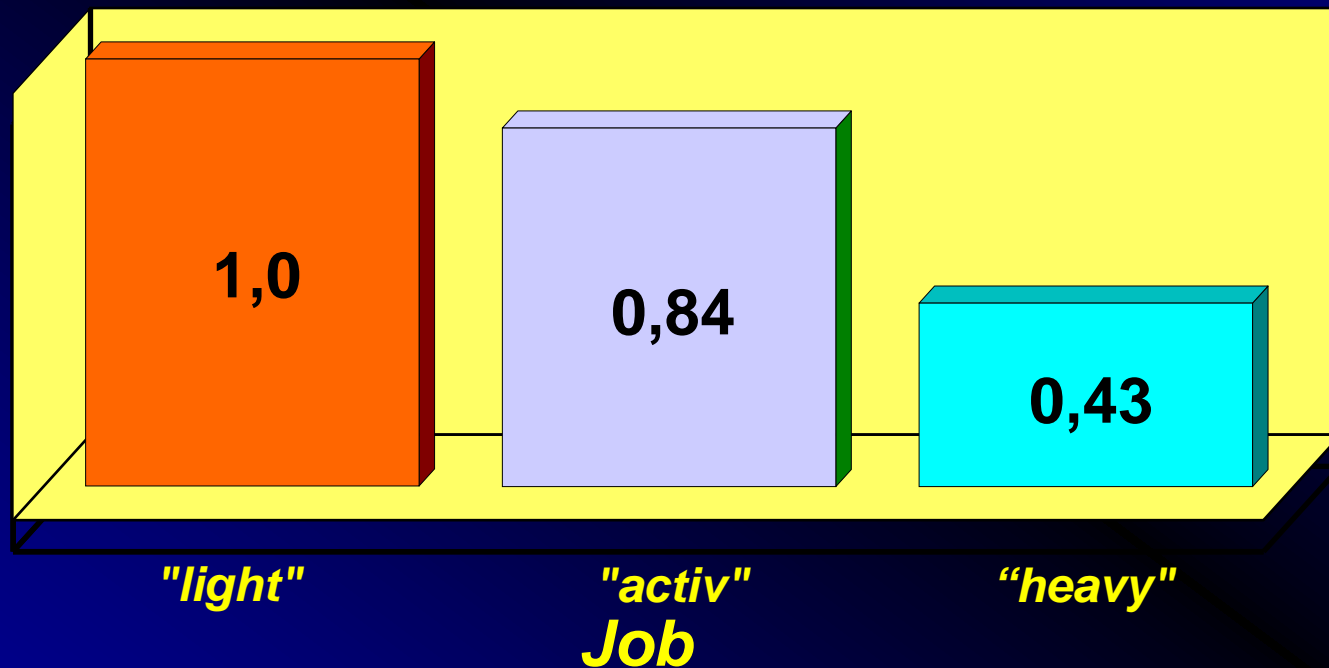
**Jeremy Morris**  
University of London, UK



Post-mortem Study on 206 Institutes of Pathology in GB  
Morris et al.

Relative Mortality risk of CHD in relation to group „light“

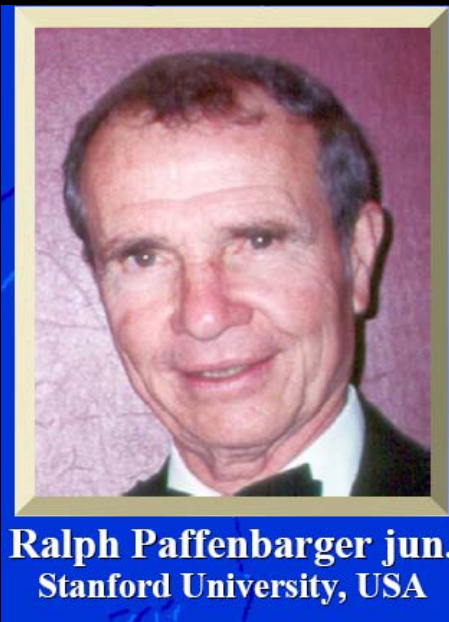
Data of all groups: A+B+C (n = 5000)



nach Morris et al. : Brit. Med. J., (2) 1485-1496, 1958

## „The Harvard Study“ (1993)

*Paffenbarger et al. :N.Engl.J.Med.(328,*



**16936 Harvard-graduates**

**Duration:** since 1962-1964 till today (current study till 1977)

**Activity Score:** Questionnaire: walking („city blocks“), stair climbing („flight of stairs“),

**Sports activity:** type of Sport, Volume, Intensity (5, 7.5, 10 kcal/min)

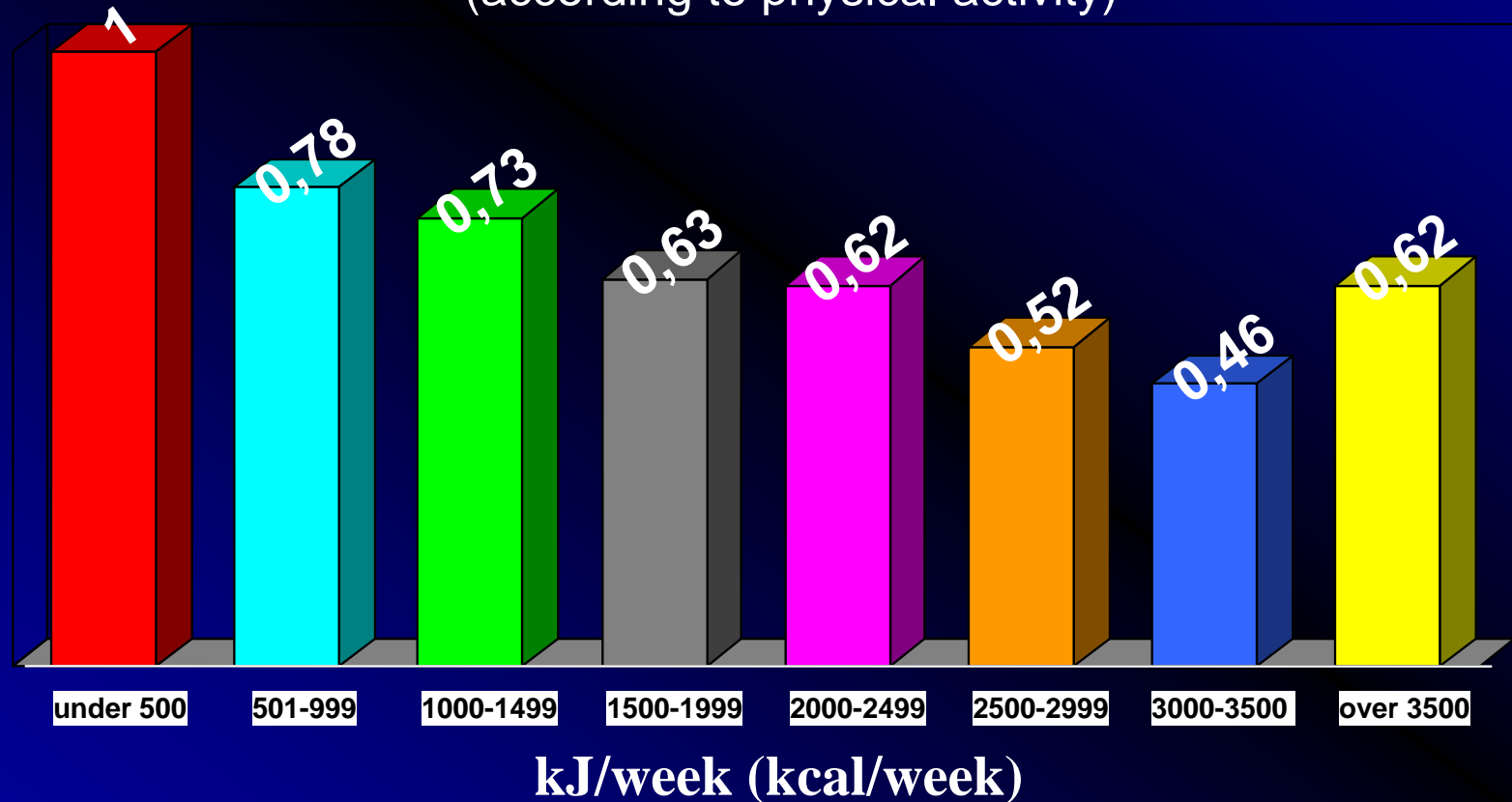
# „The Harvard Study“ (1993)

Paffenbarger et al. :N.Engl.J.Med.(Vol314,No.10), 605-613, 1993

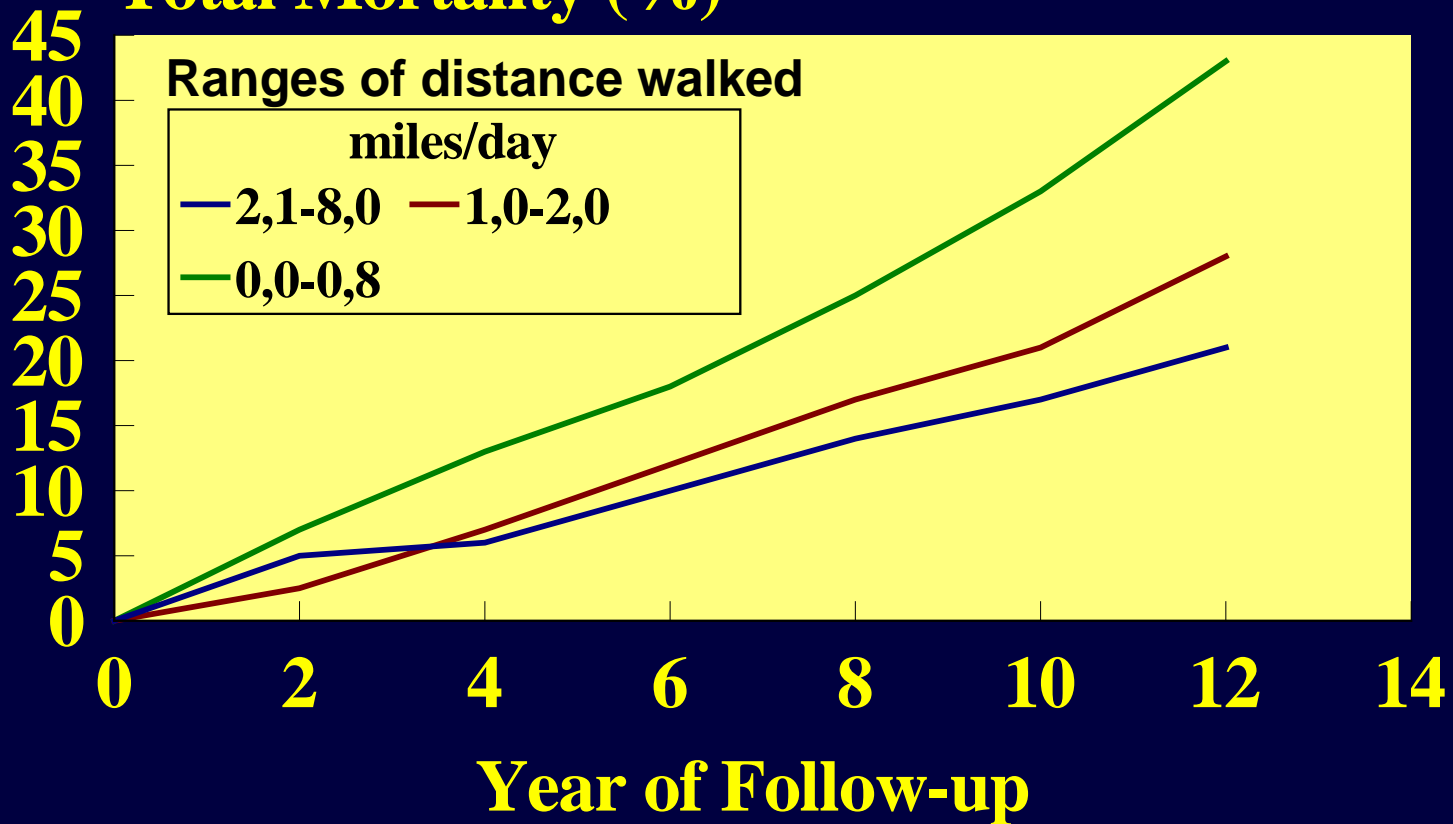
Period: 1962-1977

"Relative risk of all cause mortality"

(according to physical activity)



## Total Mortality (%)



Cumulative Mortality According to Year of Follow-up and Distance Walked per Day. To Convert distances to kilometers, multiply by 1.609. AA.Hakim et al, The New England Journal of Medicine, 1998



Positive effect of training on:	Strong evidence A	Moderate evidence B	Limited evidence C	No evidence D
Pathogenesis				
Symptoms specific to the diagnosis				
Physical fitness or strength				
Quality of life				

*Fig. 7. Coronary heart disease.*

Positive effect of training on:

Strong evidence  
Moderate evidence  
Limited evidence  
No evidence

A B C D

Pathogenesis  
Symptoms specific to the diagnosis  
Physical fitness or strength  
Quality of life

Pathogenesis				
Symptoms specific to the diagnosis				
Physical fitness or strength				
Quality of life				

Fig. 2. Diabetes type 2.

A

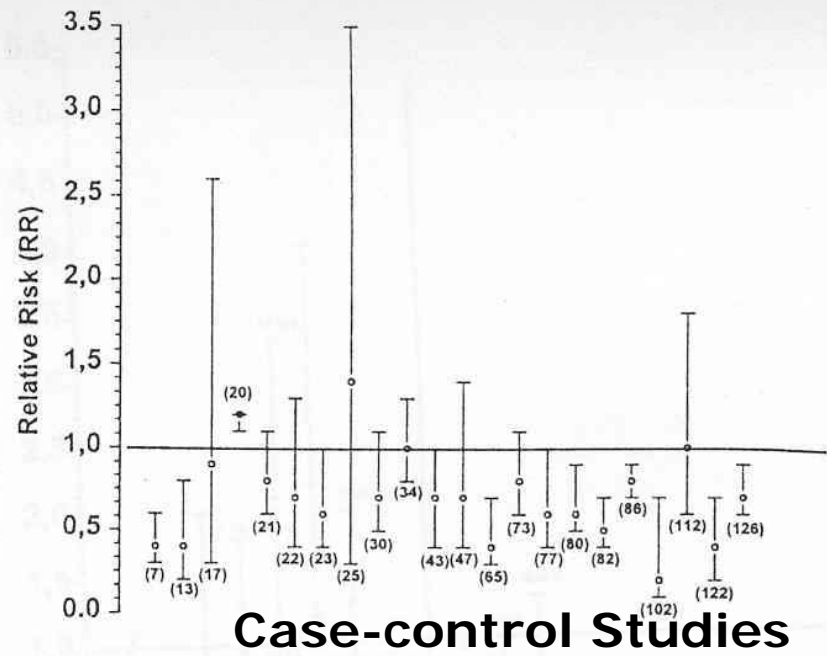
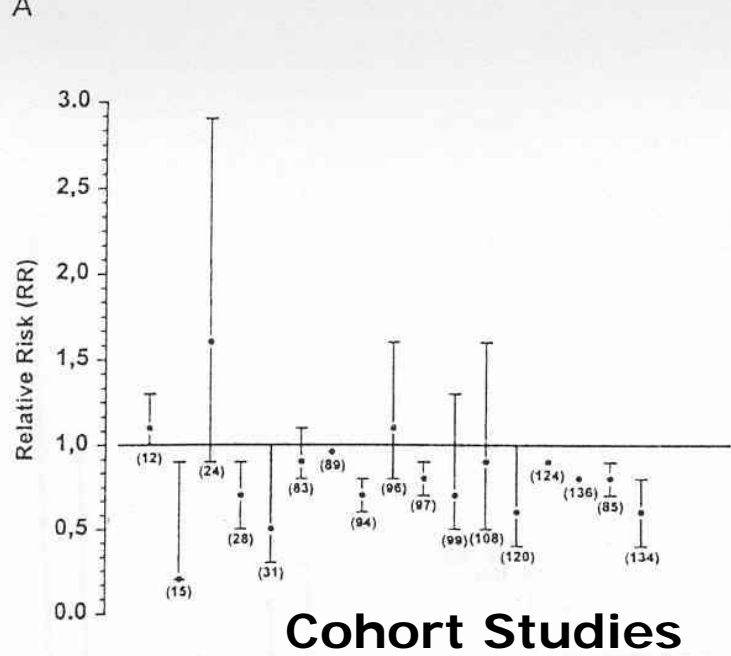


FIGURE 3—(A) Relative risk of breast cancer with 95% confidence intervals among persons with high versus low physical activity (LPA and OPA) in cohort (●) and case-control studies (○) (see references).

I.Thune et al, 2001

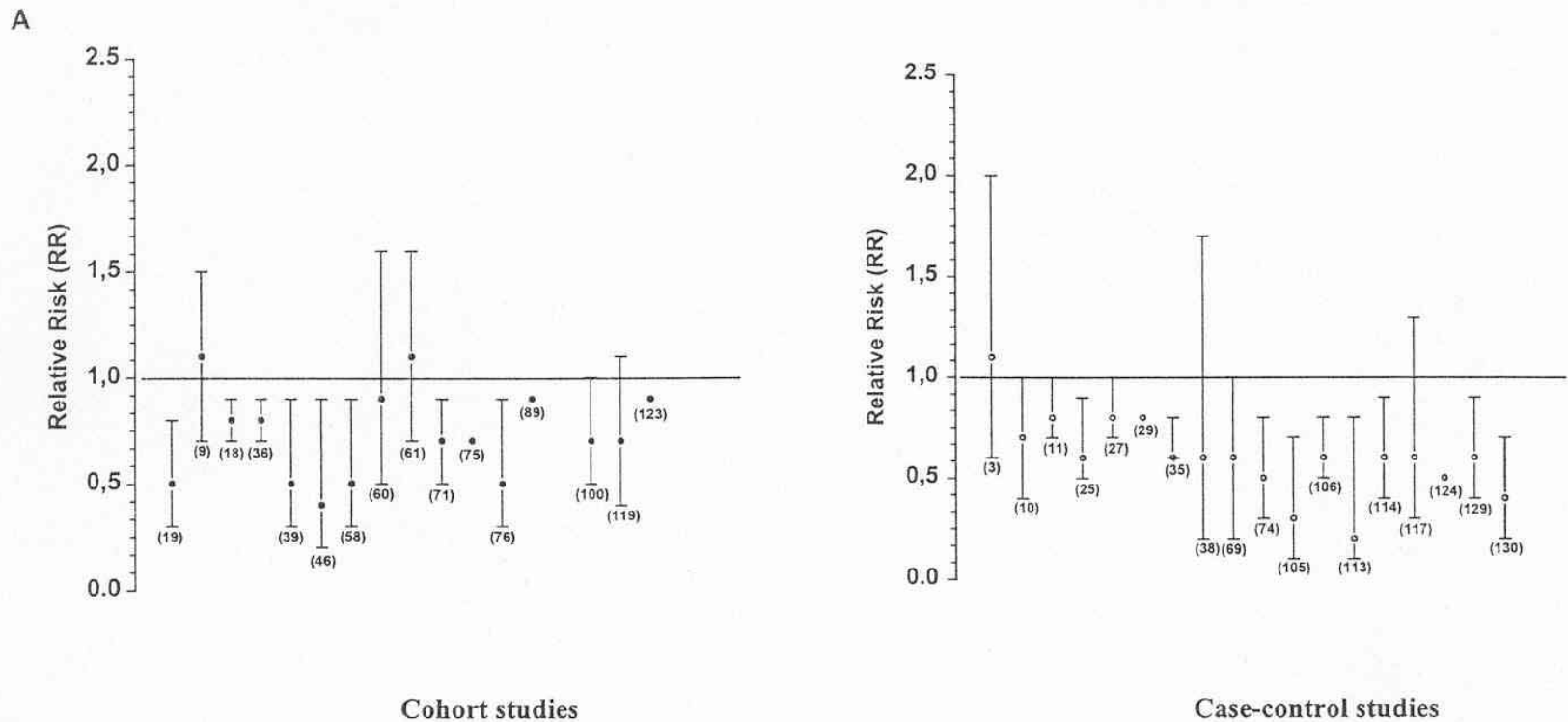
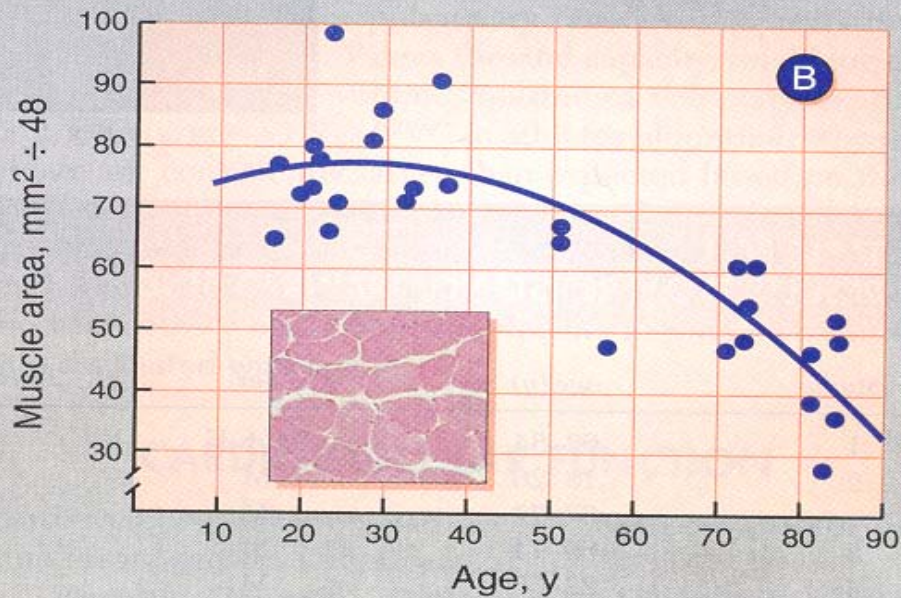
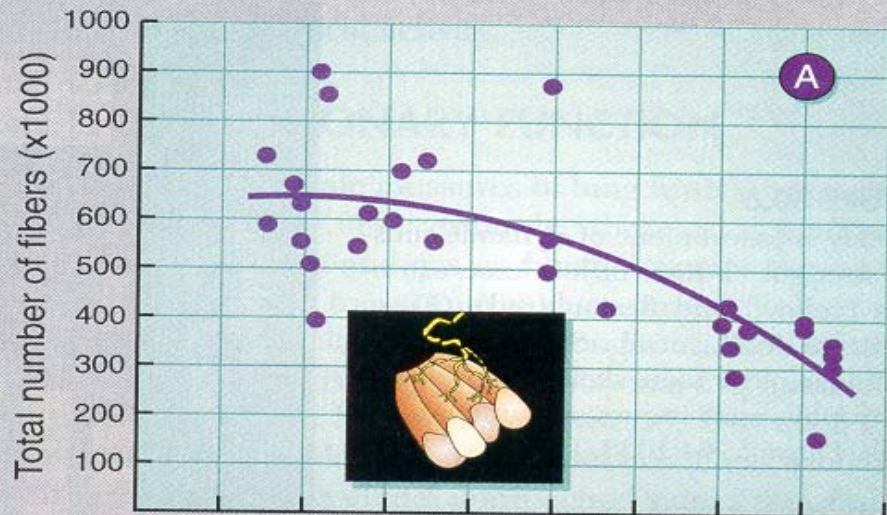
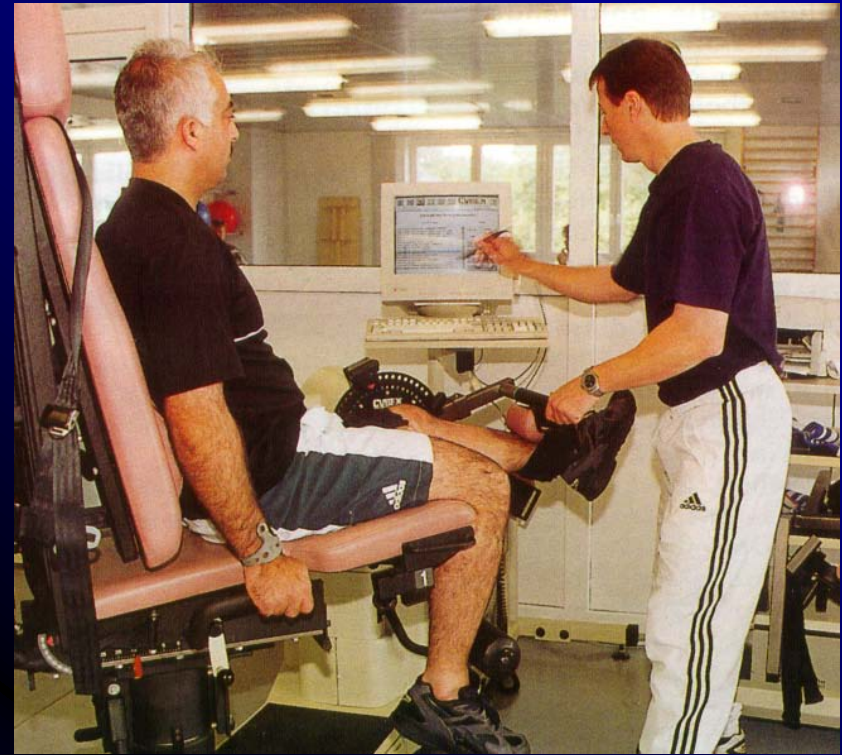
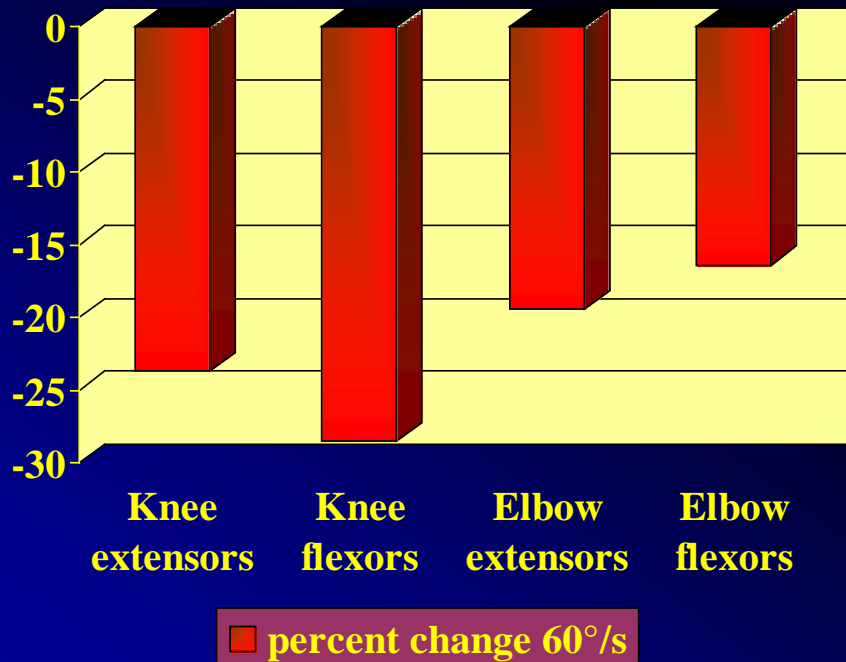


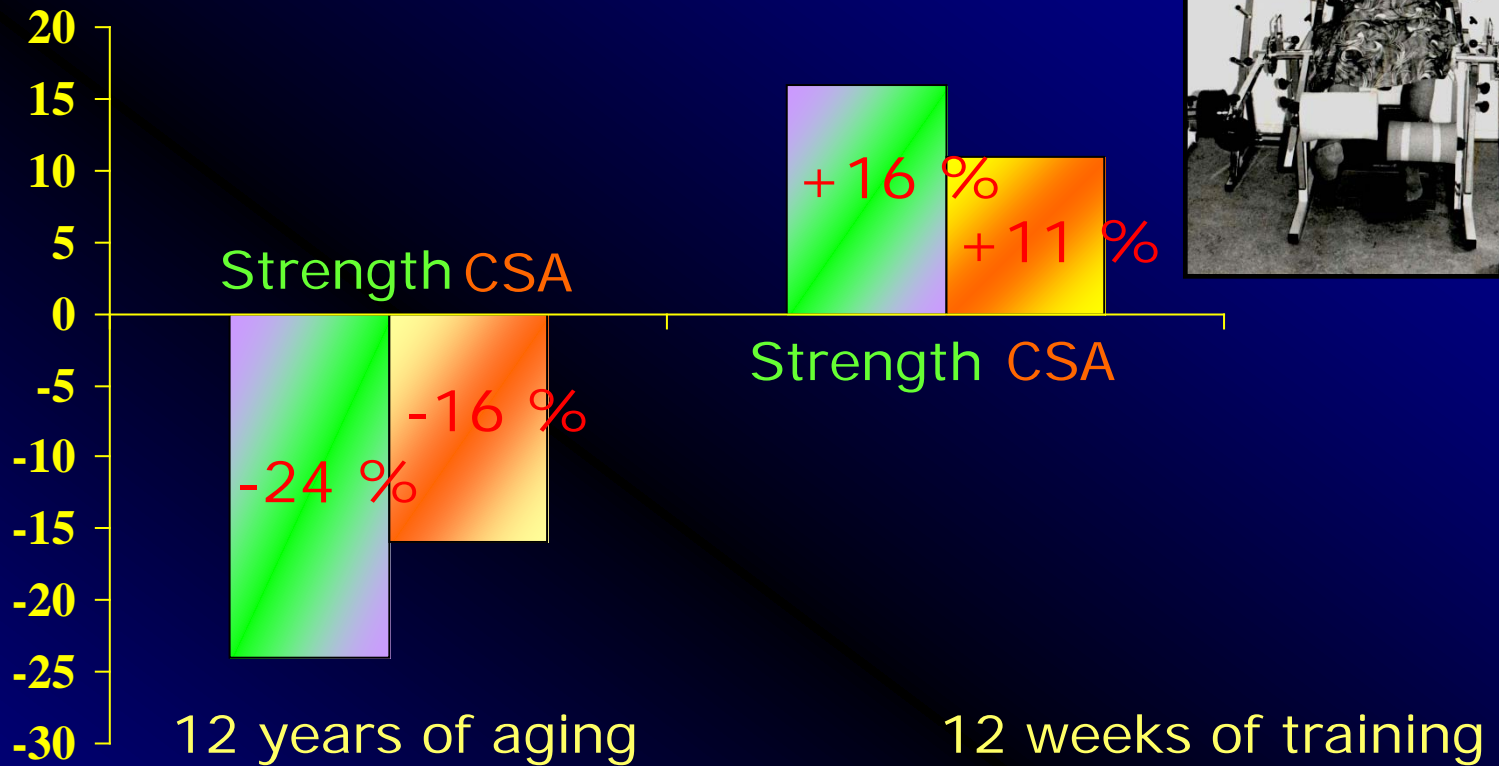
FIGURE 2—(A) Relative risk of colon cancer with 95% confidence intervals among persons with high versus low physical activity (LPA and OPA) in cohort (●) and case-control studies (○) (see references)

I. Thune et al, 2001



Longitudinal changes in isokinetic muscle strength in older men (initial mean age  $65.4 \pm 4.2$  y) after 12 y

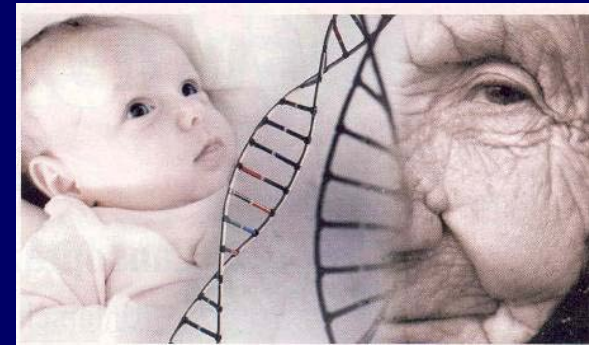




Isokinetic device 60°/sec. Knee-Extension - W.Frontera, 2002

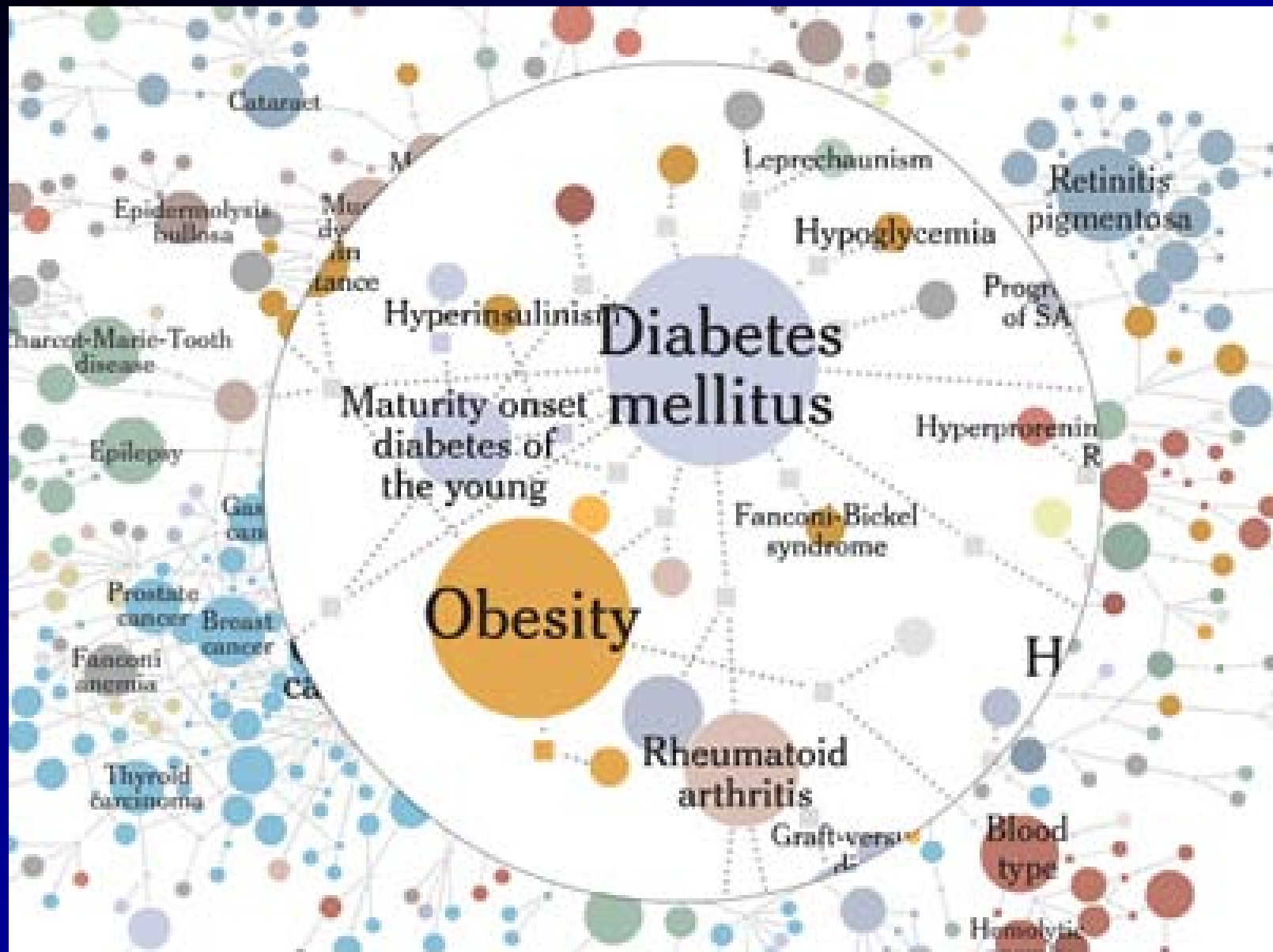
# Vision: Diseasome

- Phenotype (disease) = mix of totally different entities
- Health outcome = diseasome instead of disease
- Epigenomic effects = environmental factors can modify and trigger health outcomes by changing the genome
- „There is no black and white! Not everything is just bad and not everything is just good! Best case-worst case-scenario, individual susceptibilities
- All health outcomes are due to permanent genome-environmental interactions! For the first time in history we may be able to analyse the genome-environmental interplay!

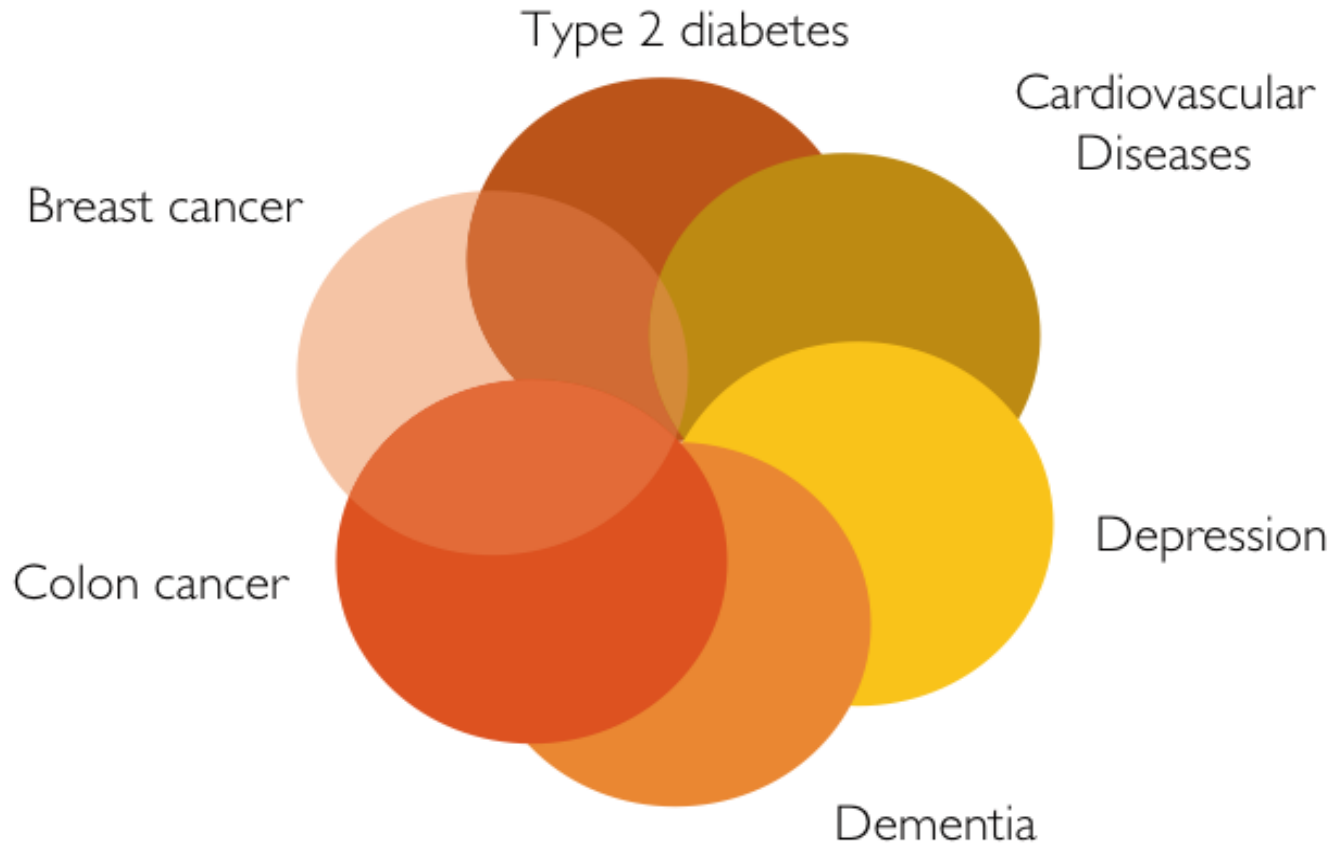


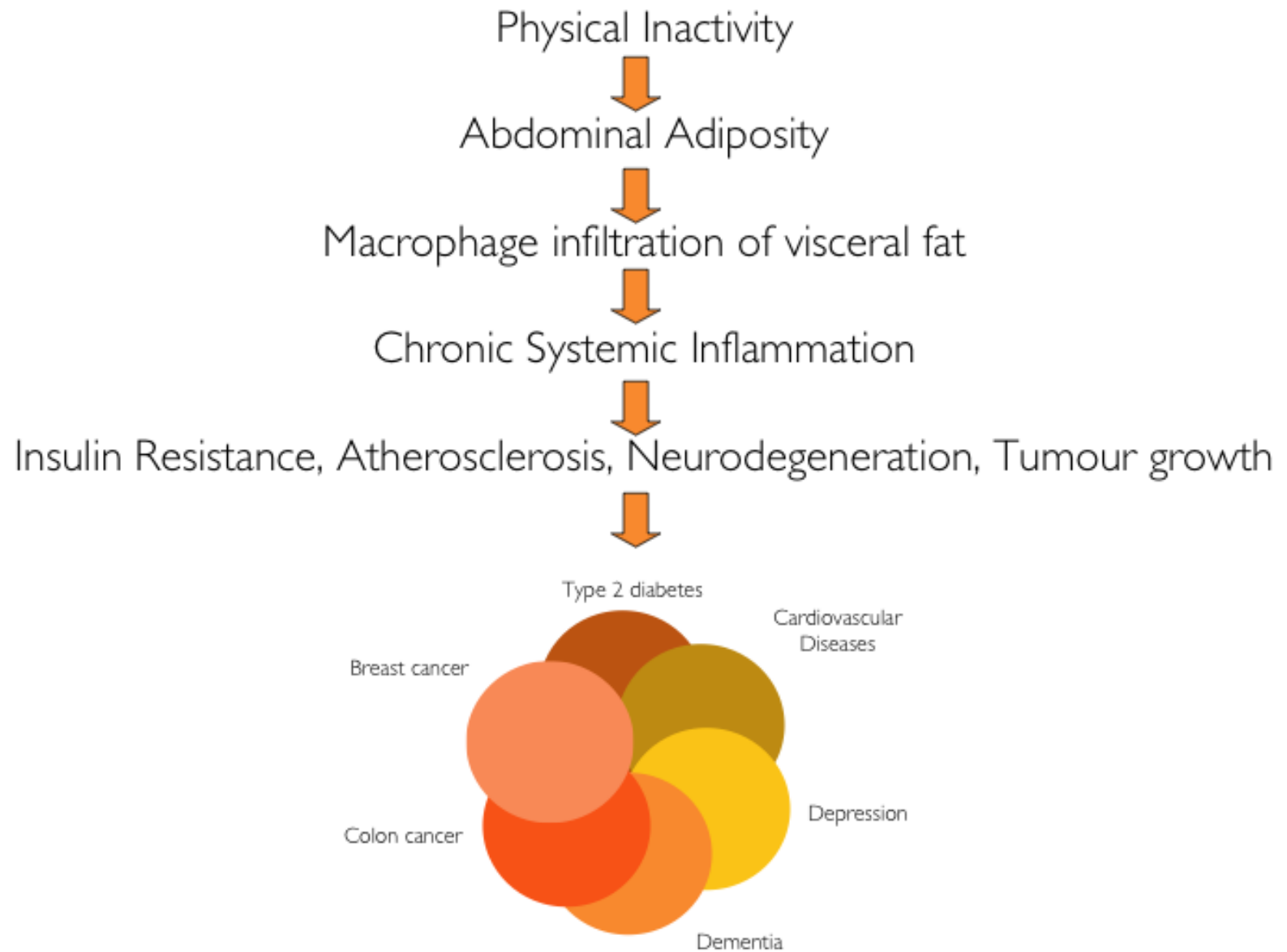


# Diseasome - Mapping the Human diseasome



# Diseasome of Physical Inactivity

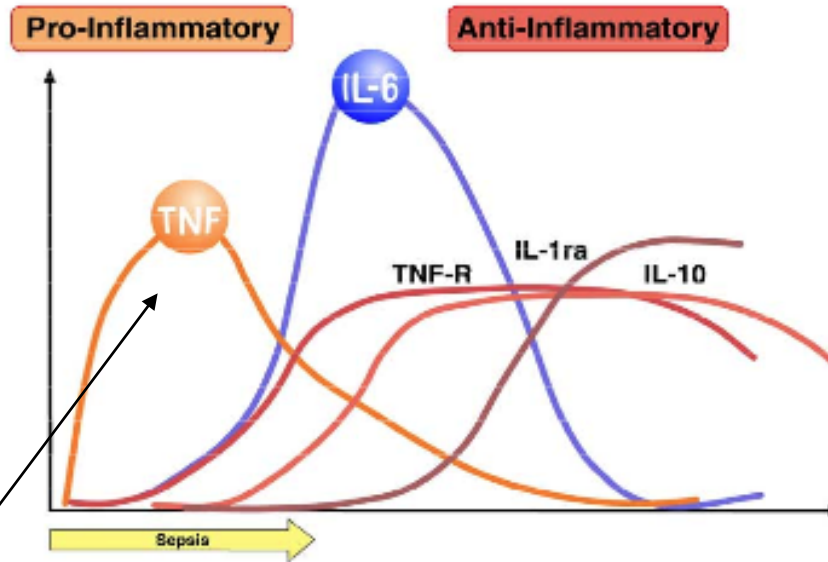




# The link between inflammation, insulin resistance and atherosclerosis

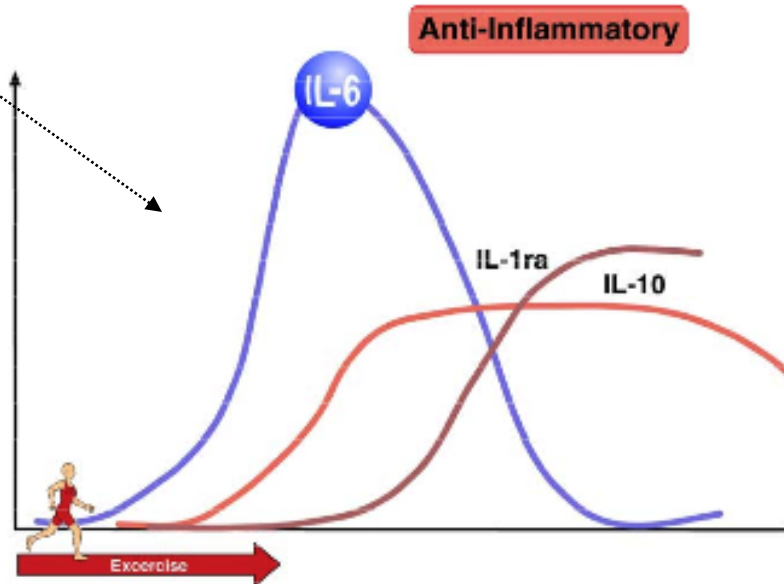
- Ageing, dementia, atherosclerosis, obesity, smoking and type 2 diabetes mellitus are associated with increased resting plasma levels of TNF- $\alpha$ , IL-6, IL-1ra, sTNF-R and CRP (2- to 3-fold).
- TNF-  $\alpha$  impairs insulin-stimulated rates of glucose storage in cultured human muscle cells and impairs insulin mediated glucose uptake in rats muscles.

The cytokine response to exercise differs from that elicited by severe infections.



No increase in pro-inflammatory cytokines with exercise!

Exercise provokes an increase primarily in IL-6, followed by an increase in the anti-inflammatory cytokines IL-1ra and IL-10



# The Myokine Concept

- Low-grade chronic systemic inflammation accompanies chronic diseases such as cardiovascular disease and type 2 diabetes.
- Regular exercise induces an anti-inflammatory response.
- During exercise, skeletal muscle releases IL-6.
- IL-6 has anti-inflammatory actions and modulates glucose and lipid metabolism.
- Muscle-derived cytokines, termed myokines, are likely to mediate the health benefits against chronic diseases.

# Österreichische Empfehlungen

für gesundheitswirksame Bewegung



**When will we treat physical activity as a legitimate medical therapy...even though it does not come in a pill?**

Timothy S. Church, Steven N. Blair, 2009

Individuelle Verhalten  
und  
ragen

**„Exercise is Medicine!“**