Exercise and Physical Activity in Prevention & Treatment of Civilization Diseases
Background

- **Drugs**
  Drugs are expensive together with negative Adverse Events

- **Prevention**
  Exercise Training provides lifelong prevention for the most important „Civilization Diseases“

- **Exercise**
  Exercise as Medicine (!) with many positive Side Effects

- **Treatment**
  Evidence Based Medicine proofs a Relative Risk Reduction even better than Drug Treatment

Dr. Rainer Wieching MSc & PhD in Exercise Physiology
Dyslipidemia

Elevated triglycerides, Low HDL-C concentrations, High LDL-C concentrations, = independent risk factors for CAD

- **Drugs -22%**
  Relative Risk Reduction (CV Events) due to Statins...

- **Exercise -35%**
  Relative Risk Reduction (CV Events) due to Exercise...

---

Dr. Rainer Wieching
MSc & PhD in Exercise Physiology


Obesity

- Elevated BMI and Waist Circumference,
- Independent Predictor of CAD disease,
- Increased Incidence of Metabolic Syndrome

**Drugs -24%**
Relative Risk Reduction (CV Death) due to Rimonabant…

**Exercise -22%**
Relative Risk Reduction (Death) due to Exercise…

Rimonabant, for Management of Obesity. Circulation 2006;114;974-984.


*Dr. Rainer Wieching*
*MSc & PhD in Exercise Physiology*
Diabetes

Directly Associated with CAD, Severe End Organ Damages, Bad Prognosis & High Death Rates, Strongly Growing Incidence Worldwide.

- **Drugs -36%**
  Relative Risk Reduction (Mortality) due to Metformin…

- **Exercise -58%**
  Relative Risk Reduction (Incidence) due to Exercise…


*Dr. Rainer Wieching*
MSc & PhD in Exercise Physiology
Hypertension

Independent Risk Factor, of Coronary Artery Disease, Severe End Organ Damages, Globally Important Epidemic, Silent Disease (no pain).

- **Drugs** -66%
  Relative Risk Reduction (Incidence) due to Candesartan…

- **Exercise** -50%
  Relative Risk Reduction (Incidence) due to Exercise…


*Dr. Rainer Wieching*
*MSc & PhD in Exercise Physiology*
CAD (incl. MI)

High Incidence in Western Countries, Angina, Myocardial Infarction, High Mortality Rates, Worldwide.

- **Drugs -15%**
  Relative Risk Reduction (Mortality) due to Eplerenone…

- **Exercise -27%**
  Relative Risk Reduction (Mortality) due to Exercise…

Dr. Rainer Wieching  
MSc & PhD in Exercise Physiology


Heart Failure

Bad Prognosis, High Mortality Rates, High Hospitalizations Rates, Disease of the Elderly.

- **Drugs -34%**
  Relative Risk Reduction (Mortality) due to ConcorCORNelipsis

- **Exercise -35%**
  Relative Risk Reduction (Mortality) due to Exercise…

CIBIS II Investigators and Committees.


Dr. Rainer Wieching
MSc & PhD in Exercise Physiology
Peripheral Claudication, Arterial Occlusive Disease, High Amputation Rates, Associated with CAD, Low Quality of Life.

- **Drugs +30%**
  Pain Free Walking Distance due to Pentoxiphylline...

- **Exercise +179%**
  Pain Free Walking Distance due to Exercise...


*Dr. Rainer Wieching*  
MSc & PhD in Exercise Physiology
Breast Cancer

Very Serious Disease, High Mortality Rates, Psychological Involving, Genetic Predisposition, Bad Prognosis.

- **Drugs -34%**
  Relative Risk Reduction (OS) due to Herceptin...

- **Exercise -40%**
  Relative Risk Reduction (Death) due to Exercise...


Dr. Rainer Wieching
MSc & PhD in Exercise Physiology
Colon Cancer

Very Serious Disease, High Mortality Rates, High Incidence, Bad Prognosis.

- **Drugs** -15% Relative Risk Reduction (PFS) due to Erbitux...

- **Exercise** -50% Relative Risk Reduction (Death) due to Exercise...


Dr. Rainer Wieching
MSc & PhD in Exercise Physiology
Lung Cancer

Very Serious Disease, High Mortality Rates, High Incidence, Bad Prognosis.

- **Drugs -13%**
  Relative Risk Reduction (OS) due to Erbitux...

- **Exercise -39%**
  Relative Risk Reduction (Incidence) due to Exercise...

---


Dr. Rainer Wieching
MSc & PhD in Exercise Physiology
Stroke (TIA)

Growing Incidence Worldwide,
High Rates of Disabilities,
High Mortality Rates,
Families Involved.

- **Drugs** -30%
  Relative Risk Reduction (of Stroke) due to Antiplatelet Drugs...

- **Exercise** -27%
  Relative Risk Reduction (of Stroke) due to Exercise...


Dr. Rainer Wieching
MSc & PhD in Exercise Physiology

Alzheimer

Growing Incidence Worldwide, Families Seriously Involved, Bad Prognosis, Low Mortality.

- **Drugs** -24% Risk Reduction due to NSAID Treatment...


- **Exercise** -62% Risk Reduction (of Alzheimer’s Disease) due to Exercise...

Depression

Strongly Growing Incidence
Families Seriously Involved
Very High Mortality Rates
Suicides & Death

- **Drugs -33%**
  Relative Risk Reduction
due to Trevilor…

- **Exercise -45%**
  Prevalence of Symptoms Reduction due to Exercise…

Venlafaxine for Major Depression.


*Dr. Rainer Wieching*

*MSc & PhD in Exercise Physiology*
COPD

Stable Incidence
Intermediate Mortality Rates
Exercise Capacity Important
Bad Prognosis

- **Drugs** -12%
  Relative Risk Reduction (Mortality) due to Drug Treatment...

- **Exercise** -55%
  Relative Risk Reduction (Mortality) due to Exercise...

Salmeterol and Fluticasone Propionate and Survival in COPD.

Respiratory rehabilitation after … COPD …

*Dr. Rainer Wieching*
*MSc & PhD in Exercise Physiology*
Summary

Dr. Rainer Wieching MSc & PhD in Exercise Physiology
# Conclusion

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious Adverse Events</td>
<td>Positive Side Effects</td>
</tr>
<tr>
<td>Very High Costs</td>
<td>Low Costs</td>
</tr>
<tr>
<td>=&gt; Depression &amp; Fatigue</td>
<td>=&gt; Active &amp; Well Being…</td>
</tr>
</tbody>
</table>

Dr. Rainer Wieching  
MSc & PhD in Exercise Physiology
PHYSICAL ACTIVITY FOR THE ELDERLY
Physical Activity (PA)

“Any bodily movement associated with muscular contraction that increases energy expenditure above resting levels”

- Leisure-time PA
- Occupational PA
- PA at or near the home
- PA connected with transport
BENEFITS OF PHYSICAL ACTIVITY

Primary Prevention

- Secondary Prevention
  - Management of the disease
Advantages of Physical Activity

- **Prevents**
  - Diabetes
  - Colon cancer
  - Breast cancer
  - Osteoporosis
  - Falls and fractures
  - Cognitive decay
  - Helmrich SP et al, NEJM 1991
  - Thune I et al, NEJM 1997
  - Thune I et al, NEJM 1997
  - Price RL et al, NEJM 1991
  - Brukner PD et al, MJA 2005

- **Prevents and heals**
  - Hypertension
  - Coronary disease
  - Stroke
  - Obesity
  - Brukner PD et al, MJA 2005
Loss of functional capacity with ageing

- Muscle resistance 1-2% per anno
- Muscle force 3-4%
- Aerobic capacity 3-4% per anno
- Bone density male 1%
- Bone density female 2-3%
- Flexibility and balance
- Proprioception and coordination
- Kinesthetic Perception
- Temperature Regulation
The Problem

- 40 – 60 % of the EU adult population leads a sedentary lifestyle
- 23.5 % is completely sedentary

Table 13. Time spent walking on a usual day by age

<table>
<thead>
<tr>
<th>Time Spent Walking</th>
<th>15-25 years %</th>
<th>26-44 years %</th>
<th>45-64 years %</th>
<th>65 + years %</th>
</tr>
</thead>
<tbody>
<tr>
<td>No walking for at least 10 minutes</td>
<td>16.7</td>
<td>21.4</td>
<td>21.6</td>
<td>23.5</td>
</tr>
<tr>
<td>30 minutes or less</td>
<td>42.1</td>
<td>38.1</td>
<td>34.6</td>
<td>36.5</td>
</tr>
<tr>
<td>31 to 60 minutes</td>
<td>21.2</td>
<td>20.7</td>
<td>22.7</td>
<td>22.9</td>
</tr>
<tr>
<td>61 to 90 minutes</td>
<td>4.6</td>
<td>5.3</td>
<td>6.9</td>
<td>6.1</td>
</tr>
<tr>
<td>91 to 120 minutes</td>
<td>7.0</td>
<td>6.2</td>
<td>6.4</td>
<td>5.0</td>
</tr>
<tr>
<td>More than 120 minutes</td>
<td>1.4</td>
<td>1.7</td>
<td>1.7</td>
<td>1.6</td>
</tr>
<tr>
<td>DK</td>
<td>7.1</td>
<td>6.5</td>
<td>6.1</td>
<td>4.4</td>
</tr>
</tbody>
</table>
No Physical Activity

- Poor muscle tone
- Risk of fractures
- Obesity
- Diabetes
- Premature Ageing
Energy Cost

1 MET = 3.5 mL • kg\(^{-1}\) • min\(^{-1}\) \(V_{O_2}\)

- Slow walking on a flat surface: 3.0 METs
- Running quickly on a flat surface: 12.0 METs
- Sleeping: 0.9 METs
- Cooking: 2.0 METs
What is a MET?

- 1 MET = resting energy expenditure
- 1 MET = 3.5 ml O₂ / kg / min
- 1 MET = 1 kcal / kg / hour
Exercise Continuum

Intensity of Exercise

Aerobic

Anaerobic

- MAXIMUM
- VERY HARD
- HARD
- MODERATE
- LIGHT
- VERY LIGHT
- REST

METS

1 2 3 4 5 6 7 8 9 10 11 12 +

Concepts of Physical Fitness 14e
Estimate of calories burned from 1 hour of brisk walking in a 70 kg person

walking = 6 METS = 6 kcal / kg / hour

6 kcal / kg / hour x 70 kg = 420 kcal/hour
Relationship PA and mortality

MET = Energy cost

Kaplan-Meier survival curves (age-adjusted) for the VSAQ.

World Health Organisation

The objective

- Goal is to achieve a minimum of 30 minutes of moderate-intensity physical activity 5 days a week or at least 20 minutes of vigorous-intensity physical activity 3 days a week

Recommended in short bursts of 10-15 minutes
Guidelines (2)

- 30 minutes a day → prevention of chronic diseases
- 60 minutes a day → weight management
How to increase physical activity?

Counselling methods:
- Individually or in groups
- In person, by telephone or via internet
- Brief or intensive
- Physical activity only or multiple behaviour changes (including smoking and diet)
Goal setting:

**S**pecific: increase physical activity

**M**easurable: 3 times a week for 30 minutes, 2 weekdays and one weekend day

**A**chievable: walking alone

**R**elevant: walking

**T**imetable: in the next week

“Walk for 30 minutes three times a week”
How to increase physical activity?

- **Type of PA**: choose an activity you enjoy → greater effect
- **PA in daily life**: use the stairs instead of the lift
- **All types of PA are effective**: cycling, walking, tennis, golf etc
- **Try to keep a balance**: 2-3 times a week, every week
- **Try to find family or friends to join you**
Overall improvement in health

- Increase physical activity
- Decrease dietary intake
- Involve family and friends in your behaviour change → they have to change too
FACTORS TO TAKE INTO CONSIDERATION

- TYPES OF EXERCISE
  - Cardiovascular resistance
  - Strength
  - Balance
  - Flexibility

- FREQUENCY AND TIME: see recommendations
  - WHO (World Health Organisation)
  - ACSM (American College of Sports Medicine)

- INTENSITY: Borg Scale
MODERATE PHYSICAL EXERCISE

- Swimming
- Cycling
- Race cycling
- Gardening
- Housework
- Ping Pong
- Rowing
- Dancing
- Golf
MORE INTENSE ACTIVITY

- Going upstairs, going for an uphill walk or in the hills/mountains
- Swimming lengths of a pool
- Going trekking in the mountains
- Going for a trip to the mountains
- Skiing
- Tennis
- Horseriding
Examples of resistance activities

Examples of resistance activities with moderate effort for the average elderly person

**Moderate:**
- Swimming
- Going for a bike ride
- Exercise bike
- Gardening (digging, raking)
- Quick walking on a flat surface
- Sweep or wash the floor
- Tennis (in doubles)
- Volleyball
- Row
- Dance

Resistance activities with more intense effort.

**Vigorous:**
- Climb the stairs or a slope
- Shovel snow
- Cycle up a hill
- Tennis (singles)
- Cross country skiing
- Slope skiing
- Running
STRENGTH AND BALANCE
Examples
STRENGTH AND BALANCE
Examples
FLEXIBILITY
OBJECTIVE
- 30 MINUTES of moderate physical activity
- 5 days per week
- 20 MINUTES of intense physical activity
- 3 days per week

PROGRESSION
- gradually increase the frequency and duration
INTENSITY

BORG SCALE

Least effort
6
7 Very very easy
8
9 Very easy
10
11 Easy
12
13 More or less difficult
14
15 Difficult
16
17 Very difficult
18
19 Very very difficult
20
Most effort
**Borg Scale**

**GENERAL INSTRUCTIONS FOR USE OF THE SCALE (Rating of perceived exertion)**

- While performing these exercises, we would like you to measure your perceived effort – how difficult the exercise seems to you overall, not for any particular part of your body.
- While doing a physical activity, look at the scale which goes from 6 **“no effort”** to 20 **“maximum effort”**.
- Choose the number which best describes the intensity level of your effort. This will give you a good idea of the intensity of effort that you are carrying out, and you can use this scale to raise or lower the intensity of exercise so as to gain the required intensity.
- Try to evaluate your level of effort as honestly as possible without thinking about the physical effort – it is your feeling of effort that counts, not how you compare to others.
- Look at the scale and the numbers which correspond to the levels of intensity, then choose a number.

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Most effort</td>
</tr>
<tr>
<td>19</td>
<td>Extremely difficult</td>
</tr>
<tr>
<td>18</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Very difficult</td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Difficult</td>
</tr>
<tr>
<td>14</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>A little difficult</td>
</tr>
<tr>
<td>12</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Light</td>
</tr>
<tr>
<td>10</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Little effort</td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Very little effort</td>
</tr>
<tr>
<td>6</td>
<td>No effort</td>
</tr>
</tbody>
</table>
According to the levels of physical activity, we can divide people into three groups. A different intensity level is recommended for each group.

- **Sedentary** (at the moment does not do physical activity)
  - from 7 to 9 on the Borg Scale
- **Partially Active** (some physical activity but not that recommended by the WHO/ASCM)
  - from 10 to 13 on the Borg Scale
- **Active** (follow WHO/ASCM recommendations)
  - from 13 on the Borg Scale

It is important to gradually increase the intensity!
<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resistance 20 min. Walk From 7 to 9 Borg</td>
<td></td>
<td>Resistance 20 min. Walk From 7 to 9 Borg</td>
<td></td>
<td>Resistance 20 min. Walk From 7 to 9 Borg</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sunday</td>
<td>Monday</td>
<td>Tuesday</td>
<td>Wednesday</td>
<td>Thursday</td>
<td>Friday</td>
<td>Saturday</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>---------</td>
<td>-----------</td>
<td>----------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td></td>
<td>Strength/ Balance 15 min.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stretching for the legs</td>
<td>Stretching for the arms</td>
<td>Stretching for the legs</td>
<td>Stretching for the arms</td>
<td>Stretching for the legs</td>
<td></td>
</tr>
</tbody>
</table>
### ADVANCED
(Example of Active Profile)

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance 30 min</td>
<td>Resistance 30 min</td>
<td>Resistance 30 min</td>
<td>Resistance 30 min</td>
<td>Resistance 30 min</td>
<td></td>
<td>Resistance 30 min</td>
</tr>
<tr>
<td>Strength/Balance From 15 – 20 min</td>
<td></td>
<td>Strength/Balance From 15 – 20 min</td>
<td></td>
<td>Strength/Balance From 15 – 20 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stretching 10 min</td>
<td>Stretching 10 min</td>
<td>Stretching 10 min</td>
<td>Stretching 10 min</td>
<td>Stretching 10 min</td>
<td></td>
<td>Stretching 10 min</td>
</tr>
</tbody>
</table>
A physically and mentally active life
Successful Ageing