Healthy Ageing
And the importance of physical activity
Hans Hobbelan
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Lotte Kunst
Master Geriatric physical therapist
Careyn Utrecht

Board members of the Dutch association for Geriatric Physical Therapists (NVFG)
Members of the International association for Physical Therapists working with Older People (IPTOP)
9:00   Opening.
9.10  Healthy Ageing and the importance of physical activity.
10:00 Differences between countries

11:00   Coffee

11:15  Exercise programs, practicing the Otago Program

12:30   Lunch

13:30  Tertiary prevention (real patient)
14:30  Fall prevention
15:00  Frailty / sarcopenia and training principles
16:00  The end!
Healthy Ageing And the importance of physical activity

overview

- Life expectancy
- Ageing
- Factors involved in ageing and disease
- Prevention
- Focus on Physical Activity
Every man desires to live long, but no man would be old. Jonathan Swift, Thoughts on Various Subjects 1711
- Who are you?
- In what fase are you in your education?
- What are your plans for the future?
- What thoughts do you get talking about ageing and older people?
What is the life expectancy of women in the Netherlands?

A: 72
B: 78
C: 81
D: 83
Health

The life expectancy has increased the last 30 years. What about the years without disease:

- A: also increased
- B: equal
- C: a bit decreased
- D: severe decreased
Bevolkingsprognose 2010–2060: sterkere vergrijzing, langere levensduur

C. van Duin en J. Garssen
• Demografische ontwikkelingen
Increased life expectancy
Christensen et al 2009

Figure 2: Best-practice life expectancy and life expectancy for women in selected countries from 1840 to 2007. Linear regression trend depicted by solid grey line with a slope of 0.26 per year. Data from supplementary material of reference 12 and the Human Mortality Database.
Greying society

Figuur 2. Percentages jongeren en ouderen in enkele Europese landen, 1850-2050
Grey-pressure in NL 2010-2025

Hanzehogeschool Groningen

Grijze druk 2010
per gemeente

Aantal 65-plussers per honderd 20-64 jarigen

- 12 - 20
- 20 - 25
- 25 - 30
- 30 - 35
- 35 - 49

provincies

Bron: CBS-StatLine
Every man desires to live long, but no man would be old. Jonathan Swift, Thoughts on Various Subjects 1711
Every man desires to live long, but no man would be old. Jonathan Swift, Thoughts on Various Subjects 1711

Het is mooi om oud te worden maar niet om oud te zijn.
## Tabel 2.1

(Gezonde) levensverwachting in jaren, 1981 en 2009

<table>
<thead>
<tr>
<th></th>
<th>1981</th>
<th></th>
<th>2009</th>
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<th>verandering</th>
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<tbody>
<tr>
<td></td>
<td>mannen</td>
<td>vrouwen</td>
<td>Mannen</td>
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<td>mannen</td>
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<tr>
<td>levensverwachting bij geboorte</td>
<td>72,7</td>
<td>79,3</td>
<td>78,5</td>
<td>82,6</td>
<td>5,8</td>
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Bron: CBS Statline
years of life without disease
Pomp 2011, CBS Statline

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(gezonde) levensverwachting in jaren, 1981 en 2009

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<td>5,8</td>
</tr>
<tr>
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<td>79,3</td>
<td>82,6</td>
<td>5,8</td>
<td>3,3</td>
<td></td>
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<tr>
<td>levensverwachting zonder chronische ziekte</td>
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<td></td>
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<tr>
<td>mannen</td>
<td>54,5</td>
<td>53,9</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>vrouwen</td>
<td></td>
<td></td>
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Bron: CBS Statline
### (Gezonde) levensverwachting in jaren, 1981 en 2009

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<td>54,5</td>
<td>53,9</td>
<td>47,6</td>
</tr>
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</table>

**Bron:** CBS Statline
Questions

• What factors do you think are involved in the decrease of healthy life years?
The maximal lifespan 115-120-130-140-1..?

- Hendrikje van Andel-Schipper:
  - “Born too early and died too late”

- Jeanne Calment 122 (born 21-02-1875, died 04-08-1997)
development 0-25/30

- Maximal bone density
- Maximal muscle mass
- Nervous system completely Myelinated
- Brain functions are developing through age 30 → new connections are developing during total lifespan!
Figure 17: Maintaining functional capacity over the course of life

- **Early Life**: Growth and development
- **Adult Life**: Maintaining highest possible level of function

**Disability threshold**

Source: WHO (1997)
Ageing

Progressive decline of functions and processes in the body which lead to a decline in resistance against the dangers from outside world. This eventually leads to illness and death. Kirkwood 2005
The ageing process
Kirkwood *Cell* 2005
Kirkwood 2011; Systems biology of ageing and longevity
Nervous System
Alzheimer's disease, Parkinson's, stroke, seizures, tremors, developmental delays, deafness, dementia, poor balance, problems with peripheral nerves.

Eyes
Drooping eyelids (ptosis), inability to move eyes from side to side (external ophthalmoplegia), blindness (retinitis pigmentosa).

Heart & Arteries
Atherosclerosis, heart attacks, cardiomyopathy (heart failure, conduction block).

Skeletal Muscle
Muscle weakness, exercise intolerance, cramps.

Liver
Liver failure.

Pancreas
Diabetes.

Kidneys
Fanconi syndrome (loss of essential metabolites in urine).

Digestive Tract
Acid reflux, vomiting, chonic diarrhea, intestinal obstruction.

Bones & Joints
Osteoarthritis, osteoporosis.
Decline in physiological processes
Age-related diseases in people
Increase of chronic illnesses

Bron: CPB, Economische verkenningen, maart 2010
Healthy Ageing

- Prevention is the key
- Primary prevention → to prevent new disease
- Secondary prevention → to trace new developing diseases early
- Tertiary prevention → to prevent a relapse or a worsening of disease
Nieuwe indeling van preventie
Van ziekte-denken naar risico-denken

- Fietspaden
- Autogordels
- Rookverbod

- Screening op risicofactoren
- Opsporen en toeleiden

- Gedefinieerd hoog risico / diagnose 'risico-aandoening'

- Gericht op ziekte / meerdere gezondheidsproblemen
Persoonlijke Preventie

Doelgroep profilering
Bewustmaking (groep) (participatie)

Persoonlijke risicoprofilering:
Breng individuele risicofactoren, motivatie en voorkeuren in kaart

Intervention Mapping:
Breng (regionale) best-practice interventies in kaart en match het individuele profiel met de beschikbare interventies

Advies op maat

Bewustmaking (individu) (motivatie)

- Gewoon gezond leven
- Voorlichting en bewustwording
- Op eigen kracht
- Signaleren en adviseren
- Er op tijd bij zijn
- Preventie-interventies
- Bijsturen met hulp
- Behandeling
- Behandelen
- Zorg
- Voorkomen van erger
Healthy Ageing

Development and maintenance of **optimal physical, mental and social well-being and function** in older adults.

(West Virginia Rural Healthy Ageing Network; Hansen-Kyle et al., 2005)
A healthy lifestyle is a prerequisite for healthy ageing

<table>
<thead>
<tr>
<th>Risicopopulatie</th>
<th>Loss of life-years</th>
<th>Loss of Healthy Life-years (HALE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>4,1 (3,7-4,6)</td>
<td>4,6 (4,1-5,4)</td>
</tr>
<tr>
<td>Overweight</td>
<td>1,2 (1,0-1,5)</td>
<td>2,1 (1,8-2,3)</td>
</tr>
<tr>
<td>Obesitas</td>
<td>3,0 (2,3-3,6)</td>
<td>5,1 (4,5-5,6)</td>
</tr>
<tr>
<td>Alcohol abuse</td>
<td>0,6 (0,5-0,7)</td>
<td>0,9 (0,8-1,0)</td>
</tr>
<tr>
<td>Inactivity</td>
<td>0,9 (0,8-1,1)</td>
<td>1,2 (1,1-1,4)</td>
</tr>
</tbody>
</table>

HALE = ‘health-adjusted life expectancy’
Approximate Mortality Reduction Potential of Lifestyle and Dietary Changes Estimated From Studies in CAD Patients and the General Population

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Mortality Risk Reduction Estimated From Studies in CAD Patients</th>
<th>Mortality Risk Reduction Estimated From Cohort Studies in General Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking cessation</td>
<td>35%</td>
<td>50%</td>
</tr>
<tr>
<td>Physical activity</td>
<td>25%</td>
<td>20%–30%</td>
</tr>
<tr>
<td>Moderate alcohol</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>Combined dietary changes</td>
<td>45%</td>
<td>15%–40%</td>
</tr>
</tbody>
</table>

Iestra et al. Circulation 2005;112:924-934
Health promotion and disease prevention does work for older adults

• Longer life
• Reduced disability
  – Later onset
  – Fewer years of disability prior to death
  – Fewer falls
• Improved mental health
  – Positive effect on depressive symptoms, social connectedness
  – Delays in loss of cognitive function
• Lower health care costs
Focus on Physical Activity

- 1953 → prof. Dr. Jeremy Morris
- Conducters 33% less chance coronary heart disease in contrast with bus drivers
- Activity level only difference in lifestyle
Exercise and Physical Activity for Older Adults

This pronouncement was written for the American College of Sports Medicine by Wojiłek J. Chodzko-Zajko, Ph.D., FACSM, (Co-Chair); David N. Proctor, Ph.D., FACSM, (Co-Chair); Maria A. Fiatarone Singh, M.D.; Christopher T. Minson, Ph.D., FACSM; Claudio R. Nigg, Ph.D.; George J. Salem, Ph.D., FACSM; and James S. Skinner, Ph.D., FACSM.
TABLE 4. Summary of the SORT evidence strength taxonomy.

<table>
<thead>
<tr>
<th>Evidence Statements</th>
<th>Evidence Strength: A = Highest, D = Lowest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section 1: Normal human aging</strong></td>
<td></td>
</tr>
<tr>
<td>Advancing age is associated with physiologic changes that result in reductions in functional capacity and altered body composition.</td>
<td>A</td>
</tr>
<tr>
<td>Advancing age is associated with declines in physical activity volume and intensity.</td>
<td>B</td>
</tr>
<tr>
<td>Advancing age is associated with increased risk for chronic diseases but physical activity significantly reduces this risk.</td>
<td>A/B</td>
</tr>
<tr>
<td><strong>Section 2: Physical activity and the aging process</strong></td>
<td></td>
</tr>
<tr>
<td>Regular physical activity increases average life expectancy through its influence on chronic disease development, through the mitigation of age-related biological changes and their associated effects on health and well-being, and through the preservation of functional capacity. Individuals differ in how they age and in how they adapt to an exercise program. It is likely that lifestyle and genetic factors contribute to the wide interindividual variability seen in older adults.</td>
<td>A</td>
</tr>
<tr>
<td>Healthy older adults are able to engage in acute aerobic or resistance exercise and experience positive adaptations to exercise training.</td>
<td>B/C</td>
</tr>
<tr>
<td>Regular physical activity can favorably influence a broad range of physiological systems and may be a major lifestyle factor that discriminates between those individuals who have and have not experienced successful aging.</td>
<td>A/B</td>
</tr>
<tr>
<td>Regular physical activity reduces the risk of developing a large number of chronic diseases and conditions and is valuable in the treatment of numerous diseases.</td>
<td>A/B</td>
</tr>
<tr>
<td><strong>Section 3: Benefits of physical activity and exercise</strong></td>
<td></td>
</tr>
<tr>
<td>Vigorous, long-term participation in AET is associated with elevated cardiovascular reserve and skeletal muscle adaptations, which enable the anaerobically trained older individual to sustain a substantial exercise load with less cardiovascular stress and muscular fatigue than their untrained peers. Prolonged aerobic exercise also seems to slow the age-related accumulation of central body fat and is cardioprotective.</td>
<td>B</td>
</tr>
<tr>
<td>Prolonged participation in RET is consistently associated with higher muscle and bone mass and strength, which are not seen as consistently seen with prolonged AET alone.</td>
<td>B</td>
</tr>
<tr>
<td>RET programs of sufficient intensity (≥80% of peak heart rate), frequency, and length (≥3 d wk⁻¹ for ≥16 wk) can significantly increase VO₂max in healthy middle-aged and older adults.</td>
<td>A</td>
</tr>
<tr>
<td>Three or more months of moderate-intensity AET elicits cardiovascular adaptations in healthy middle-aged and older adults, which are evident at rest and in response to acute dynamic exercise.</td>
<td>A/B</td>
</tr>
<tr>
<td>In studies involving overweight middle-aged and older adults, moderate-intensity AET has been shown to be effective in reducing total body fat. In contrast, most studies report no significant effect of AET on FM. AET can induce a variety of favorable metabolic adaptations including enhanced glycemic control, augmented clearance of postprandial lipids, and preferential utilization of fat during submaximal exercise.</td>
<td>A/B</td>
</tr>
<tr>
<td>AET may be effective in counteracting age-related declines in BMI in postmenopausal women.</td>
<td>B</td>
</tr>
<tr>
<td>Older adults can substantially increase their strength after RET.</td>
<td>A</td>
</tr>
<tr>
<td>Substantial increases in muscular power have been demonstrated after RET in older adults.</td>
<td>A</td>
</tr>
<tr>
<td>Increases in MO are similar between older and younger adults, and these improvements do not seem to be sex-specific.</td>
<td>B</td>
</tr>
<tr>
<td>Improvements in muscular endurance have been reported after RET using moderate- to high-intensity protocols, whereas lower-intensity RET does not improve muscular endurance.</td>
<td>A/B</td>
</tr>
<tr>
<td>The effect of exercise on physical performance is poorly understood and does not seem to be linear. RET has been shown to favorably impact walking, chair stand, and balance activities, but more information is needed to understand the precise nature of the relationship between exercise and functional performance. Favorable changes in body composition, including increased FM and decreased FM have been reported in older adults who participate in moderate or high-intensity RET.</td>
<td>C/D</td>
</tr>
<tr>
<td>High-intensity RET preserves or improves BMD relative to sedentary controls, with a direct relationship between muscle and bone adaptations.</td>
<td>B/C</td>
</tr>
<tr>
<td>Evidence of the effect of RET on metabolic variables is mixed. There is some evidence that RET can alter the preferred fuel source used under resting conditions, but there is inconsistent evidence regarding the effect of RET on BMR. The effect of RET on a variety of different hormones has been studied increasingly in recent years; however, the exact nature of the relationship is not yet well established.</td>
<td>B/G</td>
</tr>
<tr>
<td>Multimodal exercise, usually including strength and balance exercises, and tai chi have been shown to be effective in reducing the risk of nonfallus and sometimes minor falls in populations who are at an elevated risk of falling.</td>
<td>C</td>
</tr>
<tr>
<td>Few controlled studies have examined the effect of flexibility exercise on ROM in older adults. There is some evidence that flexibility can be increased in the major joints by ROM exercises; however, how much and what types of ROM exercises are most effective have not been established.</td>
<td>D</td>
</tr>
<tr>
<td>Regular physical activity is associated with significant improvements in overall psychological well-being. Both physical fitness and AET are associated with a decreased risk for clinical depression of anxiety. Exercise and physical activity have been proposed to impact psychological well-being through their modifying and mediating effects on constructs such as self-concept and self-esteem. Epidemiological studies suggest that cardiovascular fitness and higher levels of physical activity reduce the risk of cognitive decline and dementia. Experimental studies demonstrate that AET, RET, and especially combined AET and RET can improve cognitive performance in previously sedentary older adults for some measures of cognitive functioning but not others. Exercise and fitness effects are largest for tasks that require complex processing requiring executive control. Although physical activity seems to positively associated with some aspects of QOL, the precise nature of the relationship is poorly understood. There is strong evidence that high-intensity RET is effective in the treatment of clinical depression. More evidence is needed regarding the intensity and frequency of RET needed to elicit specific improvements in other measures of psychological health and well-being.</td>
<td>A/B</td>
</tr>
</tbody>
</table>

The Magic of exercise
(Morley 2008)

- More muscle strength
- Less sarcopenia
- More balance
- Less falls
- Less bone loss
- Less pain
- Less constipation
- Less incontinence
- Better sleep
- Better control blood glucose
- Better state of mind
- More quality of life
What effect has exercise/movement on our body
Evidence on the effects of exercise therapy in the treatment of chronic disease

Kujala

"myokine" pathway

Muscle as ar Skeletal Muscle e-Derived

The Centre of Inflammation Research Centre, Rigshospitalet and Cellular and Molecular Medicine Copenhagen Muscle
Copenhagen, Denmark; Melbourne, Australia
Chronic low-grade inflammation and age-related sarcopenia

Ingo Beyer\textsuperscript{a,b}, Tony Mets\textsuperscript{a,b,c}, and Ivan Bautmans\textsuperscript{a,b,c}

KEY POINTS

- CLIP is related to decreased muscle mass and performance in elderly persons.

- CLIP interferes with mitochondrial oxidative capacity, protein kinase B (Akt) signalling and transcription factor nuclear factor kappa-light-chain-enhancer of activated B cells (NFκB), as well as Hsp, all linked to sarcopenia.

- Adiposity probably contributes to CLIP.

- Exercise interventions are able to favourably influence CLIP and muscle parameters.
The sit-to-stand activity involved a cooperative effort between the healthcare aides and the residents. Healthcare aides encouraged residents to slowly stand up and sit down as many times as possible on two occasions each day and evening shift. Part of the resident’s usual activities of daily living such as toileting or dressing.
Many challenges ahead for physiotherapists with their knowledge and skills to be engaged in healthy ageing.
Thank you for your attention!

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