Metabolic Syndrome
Prevention

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This presentation…

1. The Amsterdam Growth and Health Longitudinal Study:
   - A longitudinal approach on the study of early causes of the MS
   - Cardiovascular consequences of the MS already in young adulthood (apparently healthy individuals)?

2. Preventing the Metabolic Syndrome or preventing is core cause? How early in life should we start?

3. The importance of primary prevention…

Study Design
The Amsterdam Growth and Health Longitudinal Study

Year of measurement

<table>
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<tr>
<th>Age</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>21</th>
<th>27</th>
<th>32/33</th>
<th>36</th>
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Fitness, fatness & lifestyle

Metabolic Syndrome
Arterial Stiffness

1) Prevalence of MS
   at age 36 yrs (AGAHLS; n=362)

2) Early determinants of MS

Prevention…

Fitness, fatness & lifestyle

Metabolic Syndrome
Arterial Stiffness

Prevention…

Fitness, fatness & lifestyle

Metabolic Syndrome
Arterial Stiffness
2) Early determinants of MS

Cardiopulmonary Fitness & MS

- Physical activity & MS

3) MS and arterial stiffness

(marker of damage in the cardiovascular system)

Conclusions (AGAHLS)

- Multiple mechanisms [fatness and fitness] in the pathogenesis of the MS
- These mechanisms have their roots early in life – particularly increases in body fatness
- Usefulness of life-style interventions targeting young people aiming at the primary prevention of obesity
- These strategies may prevent the development of the metabolic syndrome and, therefore, its complications such as CVD and type 2 diabetes

Obesity & Metabolic Syndrome: Twin Epidemics (adults)

- Approximately 81% of US Adults Are Overweight or Obese

Obesity & Metabolic Syndrome: Twin Epidemics (children)

- Prevalence of the MS increases with severity of obesity:
  - 1/3 of overweight children/adolescents
  - 1/5 of obese children/adolescents
- USA: 1 in each 3 children born in 2000 (onwards) will develop diabetes... (American Diabetes Association); Today’s American children may be the first generation to have shorter life spans than their parents!!!
Obesity as a key factor

Models: causes and consequences of MS. Obesity as a key factor

**Models: causes and consequences of MS: Obesity as a key factor**

Lakka & Laaksonen [Review], Appl Physiol Nutr Metab 2007

Huang et al [Review], Appl Physiol Nutr Metab 2007

**Nutritional strategies in the prevention of the MS**

<table>
<thead>
<tr>
<th>MS traits</th>
<th>Dietary recommendations</th>
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<tbody>
<tr>
<td>Central obesity</td>
<td>Reduced plantist intake (e.g. fruits)</td>
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<tr>
<td>Elevated blood pressure</td>
<td>Low saturated and trans fat and cholesterol intake</td>
</tr>
<tr>
<td>Dyslipidaemia (high triglycerides and low HDL)</td>
<td>Elevated intake of fish and lean meats</td>
</tr>
<tr>
<td>Reduced caloric intake</td>
<td>Reduced intake of refined carbohydrate and saturated fats</td>
</tr>
<tr>
<td>Elevated fasting glucose</td>
<td>Moderate carbohydrate intake in meals and snacks</td>
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</tbody>
</table>

Leenders & Tucker (Review), Appl Physiol Nutr Metab 2007

**Childhood obesity (NL)**

de Volkskrant

Childhood obesity: Prevalence & trends (NL)


Lees de samenvatting van de belangrijkste resultaten of download het volledige rapport:
https://www.tno.nl/overgewicht

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Complications of childhood obesity

1997 vs. 2002-04

overweight

Lees de samenvatting van de belangrijkste resultaten of download het volledige rapport:
www.tno.nl/overgewicht
The (mediate) future...

- Obesity the most important Public Health problem:
  - stillAssoc. smoking as the (modifiable) risk factor that causes more morbidity and mortality*
- Prevalence and associated complications (e.g. metabolic syndrome & type 2 diabetes) is increasing notably among the young
  - Primary prevention
  - Secondary prevention

(Childhood) Obesity: Causes and their determinants

Two important lifestyle factors determine energy balance

\[ \text{Diet} = \text{Energy intake} \]
\[ \text{Physical Activity} = \text{Energy expenditure} \]

Energy output – changes in activity patterns:
- Less physical activity
- More physical inactivity (watching TV, computer games…)

Energy intake – changes in dietary habits:
- higher intake of fast food & snacks
- higher intake of soft drinks/less milk
- lower intake of fruits and vegetables
- skipping breakfast
- bigger portion sizes (‘ supersizing’)

Changes in dietary patterns...

U.S. Per Capita Consumption of Soft Drinks and Milk
1945 – 1997 (1 gallon = 3.8 liter)

Changes in dietary patterns...

Source: Mokdad et al. JAMA 2005
Source: National Geographic Aug 2004
Source: USDA/ERS, 1999
Changes in dietary patterns...
Consumption of soft drinks (ml/day) 13-18 yr (Netherlands)

- Changes in consumption pattern:
  - 50.2% boys
  - 32.5% girls

Changes in physical (in)activity...

- Changes in physical activity:
  - Watching TV replaces physical activity...
  - Watching TV leads to extra energy intake ("exploitative" advertising);
  - Watching TV leads to lower basal metabolism.

Watching TV & overweight:

- Impact of replacing TV viewing with physical activity...

Impact of replacing TV viewing with physical activity...

- Impact on obesity:
  - Reduced physical activity
  - Increased sedentary behavior

Changes in physical (in)activity...

- Changes in watching TV habits:
  - Dutch children & adolescents % watching TV ≥ 2 hours/day

Impact of replacing TV viewing with physical activity...

- Impact on BMI:
  - Increased BMI
  - Decreased BMI

IOF report to the WHO
Obesity in children and young people: a crisis in public health

- The Obesogenic Environment:
  - Increase in use of motorized transport
  - Fall in opportunities for physical activity
  - Increased calorie intake
  - Multiple TV channels
  - Greater variety of foods available
  - Rising levels of advertising of energy-dense foods
  - More food advertising in supermarkets
  - Larger portion sizes for "better value for money"
  - Increased use of disposable plastics
  - Rising use of beverages to replace water, e.g., in schools.


For details see: www.iof.org/childhood.
**Obesity Prevention**

Who?  
How?  
Where?  
...

Prevention of obesity in children and adolescents…

An multi-environmental approach:

- Family  
- School/Neighborhood  
- Government (Media, Industry, Health Care System…)

coordinated action at different levels

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Prevention of obesity in children and adolescents: # levels/partners…

**Home/family (role of parents):**

- Parents as role models  
- Responsible for preparation of healthy meals (e.g. more fruits & vegetables)  
- Promotion of physical activities (e.g. playing outside)  
- Limits on time spent watching TV/playting computer (games <2h/day)  
- Assure children eat breakfast daily  
- (…)

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Prevention of obesity in children and adolescents: # levels/partners…

**School (role of teachers/government – Education System):**

- Physical Education lessons  
- Nutrition Education  
- Healthy cafeteria  
- Ban on vending machines  
- (…)

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Prevention of obesity in children and adolescents: # levels/partners…

**Government (local):**

- Safe playgrounds & cycling routes;  
- Parks and green areas  
- (…)

**Government (national and international):**

- Increase taxes on fast-foods, food labeling  
- Subsidize healthy food  
- (…)

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**Prevention of Metabolic Syndrome**

- Clustering of risk factors (MS) are mainly a consequence of obesity (the common underlying feature)  
- (Primary) prevention (through life-style interventions) should target obesity and start already early in life  
- Demands multi-facet and coordinated approach at different environmental levels