Cycling and walking: a strengthening evidence-base of their co-benefits to health, environment and society

Pekka Oja

Side event of the Sixth Ministerial Conference on Environment and Health

Scaling up active mobility in Europe: THE PEP from Paris 2014 to Vienna 2019

13-15 June 2017

Ostrava, Czech Republic
Physical activity and health outcomes

Source: St George et al. 2014

- All-cause mortality: 29%
- Cardiovascular mortality: 30%
- Stroke: 21%
- Coronary heart disease: 70%
- Hypertension: 10%
- Metabolic syndrome: 20%
- Type 2 diabetes: 31%
- Hip fractures (women): 38%
- Hip fractures (men): 45%
- Dementia: 14%
- Cognitive decline: 23%
- Lung cancer: 28%
- Pancreatic cancer: 19%
- Breast cancer: 27%
- Proximal colon cancer: 26%
- Distal colon cancer: 18%
- Gastroesophageal cancer: 12%
- Renal cancer: 20%
- Bladder cancer: 19%
- Prostate cancer: 18%
- Endometrial cancer: 24%
- Pre-eclampsia: 36%
- Ovarian cancer: 36%

Per cent decrease in risk of outcome

Source: St George et al. 2014
Domains of physical activity

- Physical activity
  - Occupation
  - Domestic
  - Transportation
  - Leisure
Physiological effects of walking and cycling to work

Physically active commuting to work—testing its potential for exercise promotion

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ABSTRACT

VUORI, J. M., P. OJA, and O. PARONEN. Physically active commuting to work—testing its potential for exercise promotion. Med. Sci. Sports Exerc., Vol. 26, No. 5, pp. 804–808, 1994. Physical activity has considerable health-enhancing potential. It will be realized, however, only if large numbers of people participate in adequate activity. This summary report describes the main results of four studies conducted to find out whether physically active commuting as work (PACW) meets the requirements of health and fitness enhancing activity. Three successive mail inquiries (N = 204) indicated that PACW provided habitual exercise in one third of a employed urban population, and that more than one-fifth expressed willingness and being able to increase PACW. A randomized controlled trial on active middle-aged men and women revealed that PACW (0.7 activity 145) increased VO(2max) by 4.5% ($p = 0.02$), maximal treadmill time by 10.3% ($p = 0.007$), and HDL cholesterol by 5% ($p = 0.00$). A demonstration project on a large industrial plant showed that PACW can be successfully promoted by low cost measures. In conclusion, these studies suggest that PACW may offer substantial potential as health and fitness enhancing measure provided that it can be practiced safely.

CYCLING, HDL, CHOLESTEROL, HEALTH PROMOTION, MAXIMAL OXYGEN UPTAKE, PHYSICAL FITNESS, TRAFFIC SAFETY, WALKING

Physically active commuting to work—testing its potential for exercise promotion

Daily walking and cycling to work: their utility as health-enhancing physical activity

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Abstract

The substantial health-enhancing potential of physical activity can be realized on population level best if people can incorporate physical activity into their daily routine. Physically active commuting to work and from work provides a means for such activity. In a series of three studies we explored more specifically the population prevalence, the physiological effectiveness, and the promotional possibilities of commuting to and from work by walking and cycling. The studies were performed in Finland with middle-aged workers employed in a large industrial plant

safety, walking.

1991

1994

1998
Nearly 20 years ago....... While preparing for the Third Ministerial Conference on Environment and Health (London, 1999), Cycling and walking made their first entry as an important positive health dimension of transport policies.
A rapidly developing evidence-base

Risks

Benefits

Injuries

Exposure to air pollution

Less use of public space

More physical activity

Less emissions of air pollutants and GHG

Less congestion
## Domains of physical activity and all-cause mortality

<table>
<thead>
<tr>
<th>Domain of PA</th>
<th>No of studies</th>
<th>RR (95% CI)</th>
<th>P-value</th>
<th>%reduction in all-cause mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total physical activity</td>
<td>21</td>
<td>0.65 (0.60-0.71)</td>
<td>&lt;0.001</td>
<td>35%</td>
</tr>
<tr>
<td>Occupation</td>
<td>6</td>
<td>0.83 (0.71-0.97)</td>
<td>&lt;0.001</td>
<td>17%</td>
</tr>
<tr>
<td>Domestic</td>
<td>6</td>
<td>0.64 (0.55-0.75)</td>
<td>0.039</td>
<td>36%</td>
</tr>
<tr>
<td>Transport</td>
<td>6</td>
<td>0.88 (0.79-0.98)</td>
<td>0.016</td>
<td>12% (red circle)</td>
</tr>
<tr>
<td>Leisure</td>
<td>41</td>
<td>0.74 (0.70-0.77)</td>
<td>0.018</td>
<td>26%</td>
</tr>
<tr>
<td>Exercise and sports</td>
<td>13</td>
<td>0.66 (0.61-0.71)</td>
<td>0.046</td>
<td>34%</td>
</tr>
</tbody>
</table>

Samitz et al. *Int J Epidem* 2011;1-19
Cycling for transport

Relative risk = 0.90 (0.87-0.94)

7 studies, 187,000 individuals and 2.1 million person-years
Mean age = 56; Mean follow-up = 14.2 years
Exposure = 11.25 MET.hrs per week

Risk of all-cause mortality reduced by 10% in the group that cycles compared to non-cyclists

Kelly et al. *IJBNPA* 2014;11(1)
Walking for transport

Relative risk = 0.90 (0.87-0.94)
7 studies, 187,000 participants, 21 milj. person-years
Mean age = 56; mean follow-up = 14.2 years
Exposure = 11.25 MET-hours per week

Risk of all-cause mortality reduced by 11% in the group that walks compared to non-walkers
Fig 1 Hazard ratio for all cause mortality, cardiovascular disease (CVD) incidence and mortality, and cancer incidence and mortality by commuting mode.

<table>
<thead>
<tr>
<th></th>
<th>No of events</th>
<th>Total</th>
<th>Hazard ratio (95% CI)</th>
<th>Hazard ratio (95% CI)</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td>All cause mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-active (reference)</td>
<td>1379</td>
<td>186763</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>103</td>
<td>12848</td>
<td>1.03 (0.84 to 1.26)</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>Cycling</td>
<td>37</td>
<td>6301</td>
<td>0.59 (0.42 to 0.83)</td>
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</tr>
<tr>
<td>Mixed mode: walking</td>
<td>122</td>
<td>21765</td>
<td>0.96 (0.80 to 1.15)</td>
<td>0.66</td>
<td></td>
</tr>
<tr>
<td>Mixed mode: cycling</td>
<td>58</td>
<td>11588</td>
<td>0.76 (0.58 to 1.00)</td>
<td>0.05</td>
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<tr>
<td>CVD mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-active (reference)</td>
<td>420</td>
<td>199141</td>
<td>1.00</td>
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<tr>
<td>Walking</td>
<td>18</td>
<td>13780</td>
<td>0.64 (0.45 to 0.91)</td>
<td>0.01</td>
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<tr>
<td>Cycling</td>
<td>8</td>
<td>6613</td>
<td>0.48 (0.25 to 0.92)</td>
<td>0.03</td>
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<tr>
<td>Mixed mode: walking</td>
<td>29</td>
<td>23142</td>
<td>0.78 (0.53 to 1.15)</td>
<td>0.21</td>
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<tr>
<td>Mixed mode: cycling</td>
<td>20</td>
<td>12200</td>
<td>0.92 (0.58 to 1.46)</td>
<td>0.72</td>
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<tr>
<td>CVD incidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-active (reference)</td>
<td>1029</td>
<td>198536</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>Walking</td>
<td>51</td>
<td>13749</td>
<td>0.73 (0.54 to 0.99)</td>
<td>0.04</td>
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</tr>
<tr>
<td>Cycling</td>
<td>18</td>
<td>6603</td>
<td>0.54 (0.33 to 0.88)</td>
<td>0.01</td>
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<tr>
<td>Mixed mode: walking</td>
<td>86</td>
<td>23085</td>
<td>0.84 (0.66 to 1.07)</td>
<td>0.16</td>
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<tr>
<td>Mixed mode: cycling</td>
<td>42</td>
<td>12178</td>
<td>0.82 (0.59 to 1.14)</td>
<td>0.24</td>
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<tr>
<td>Cancer mortality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-active (reference)</td>
<td>912</td>
<td>193205</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>74</td>
<td>13230</td>
<td>1.10 (0.86 to 1.41)</td>
<td>0.45</td>
<td></td>
</tr>
<tr>
<td>Cycling</td>
<td>25</td>
<td>6428</td>
<td>0.60 (0.40 to 0.90)</td>
<td>0.01</td>
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<tr>
<td>Mixed mode: walking</td>
<td>81</td>
<td>22296</td>
<td>0.97 (0.77 to 1.22)</td>
<td>0.80</td>
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<tr>
<td>Mixed mode: cycling</td>
<td>31</td>
<td>11822</td>
<td>0.64 (0.45 to 0.91)</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>Cancer incidence</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-active (reference)</td>
<td>3504</td>
<td>190617</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
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<tr>
<td>Walking</td>
<td>241</td>
<td>13065</td>
<td>0.93 (0.81 to 1.07)</td>
<td>0.30</td>
<td></td>
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<tr>
<td>Cycling</td>
<td>89</td>
<td>6364</td>
<td>0.55 (0.44 to 0.69)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Mixed mode: walking</td>
<td>333</td>
<td>22044</td>
<td>0.99 (0.88 to 1.11)</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td>Mixed mode: cycling</td>
<td>135</td>
<td>11718</td>
<td>0.68 (0.57 to 0.81)</td>
<td>&lt;0.001</td>
<td></td>
</tr>
</tbody>
</table>

Carlos A Celis-Morales et al. BMJ 2017;357:bmj.j1456

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Studies from different contexts indicate that the health benefits of active travel outweigh the risks

Median benefit to risk ratio: 9:1

N. Mueller et al. / Preventive Medicine 76 (2015) 103–114
http://dx.doi.org/10.1016/j.ypmed.2015.04.010
Active transport may reduce health expenditures

Figure 1: Potential annual NHS expenditure averted by year and health outcome from Increased Active Travel scenario

Total savings
UK£ 17 billion

Active mobility can contribute to mitigate climate change

<table>
<thead>
<tr>
<th>IPCCc</th>
<th>Package of walkways, cycleways and bus rapid transit could reduce emissions by 25% at a cost of US$ 30/tCO₂\textsuperscript{10}. Improved land use could reduce emissions by 21% over a 20-year period at a cost of US$ 91/tCO₂.\textsuperscript{10}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air pollution</td>
<td>++</td>
</tr>
<tr>
<td>Physical activity</td>
<td>++</td>
</tr>
<tr>
<td>Road traffic injury</td>
<td>++</td>
</tr>
<tr>
<td>Noise</td>
<td>++</td>
</tr>
<tr>
<td>Social effects</td>
<td>++</td>
</tr>
<tr>
<td>Land use</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Exploring the job creation potential of active mobility

- Up to **435,000 cycling jobs created** if 56 major cities achieved Copenhagen’s cycling modal share
- Strong correlation between cycling and the number of cycling-related jobs
- Cycling jobs are not only in cities – tourism jobs across wider geographical areas
- The indirect and induced jobs related to cycling can be significant
- Methodological issues remain, and need to be addressed through further research
HEAT

What is the economic value of the reduced all-cause mortality from a given volume of walking or cycling within a defined population?

Welcome to the WHO/Europe Health Economic Assessment Tools (HEAT) for walking and for cycling.

This tool is designed to help you conduct an economic assessment of the health benefits of walking or cycling by estimating the value of reduced mortality that results from specified amounts of walking or cycling.

The tool can be used in a number of different situations, for example:

1. When planning a new piece of cycling or walking
Walking and cycling in transport

• Multiple and significant health benefits from AT conducive to public health gains
• Benefits of AT outweigh the risks
• AT can reduce health expenditures
• AT can mitigate climate change
• AT can create new jobs
• Economic value due to reduced mortality of AT manyfold compared to motor transport