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Are health effects of cycling underestimated due to inaccurate estimates of the physical activity?

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This is a summary of my perspectives as Discussant at the symposium: “Cycling and health in Europe and beyond – explaining and updating the evidence base” at the 10th HEPA Europe Health Enhancing Physical Activity Europe Conference at Southern University of Denmark in Odense, Denmark, August 28-30, 2019. Contributors to the symposium were Drs Adrian Bauman, Sylvia Titze, Niamph Murphy and Pekka Oja.

I decided to focus on the part of the symposium dealing with health effects. The size of them is not only of academic interest, but may affect traffic planning and thereby have substantial effects on how cities are planned. This is since in many countries, investments in the transport sector are dependent on cost-benefit analyses, and various investment alternatives are most often weighed against each other. This is also the reason for the development of the WHO Health Economic Assessment Tool for cycling and walking.

At the symposium, the current state of knowledge was well described in this respect. So my contribution was instead to describe the risk for that the evaluations undertaken so far are more or less hampered by poor input data in relation to the true levels of physical activity attained from cycling. The effect of that is in such case that the estimates of health effects will be too low. This principal effect was illustrated with data from a study by Ekblom et al. (2015) on self-reported versus accelerometry-based levels of sitting time (Figure 1).

![Figure 1. Ekbloem et al. 2015](image)
It was then further illustrated with objectively and subjectively based studies of the risk for premature mortality with sitting time as summarized by Chau et al. (2013) (Figure 2). Clear differences in the relations were illustrated.

**Figure 2. The study with diverging findings in the relation of hours sitting and mortality rate is based on accelerometry measures, whereas the other studies are based on self-reported data.**

Thereafter, the same phenomenon as in Figure 1 was illustrated with self-reported vs accelerometry-based levels of physical activity (Ekblom et al. 2015) (Figure 3).

**Figure 3.**
Then the relation between self-reported leisure-time versus objectively measured physical activity and all-cause mortality was shown with data from Paffenbarger et al. (1986) and Manini et al. (2006). Again, clear differences in the relations were illustrated, with greater effects with the objective methods.

All forms of physical activity can be evaluated on the basis of: \textit{frequency} x \textit{duration} x \textit{intensity}. I have, however, not seen any published data with validated methods establishing these three constituents for transport cycling. This is reason enough to doubt that there the currently used effect sizes related to cycling and health are adequate.

Neither have I seen any reproducibility studies of these variables. But I have, through several studies realized that it is, or may likely be, rather or very difficult to measure these matters correctly. For example there is, or may be, a great variability over the year in frequency of cycling trips (Stigell & Schantz 2015)(Figure 4).

![Active commuting trips per week for female active commuters](image)

\textit{Figure 4.}

Furthermore, self-reported durations may include various number of resting periods because of red lights or other stops, and systematic errors appear to be coupled to duration reports using the last digits 0 and 5 in minutes of cycling reported (Schantz 2017). Finally, intensities of cycling, as mirrored in estimated cycling velocities, vary greatly (Schantz 2017), which means that it is difficult to specify in MET-values and MET-hours per week, etc. for the cyclists (Figure 5).
As a consequence of this information it is very difficult to establish a valid or even near valid measure of the physical activity in transport cycling, at least if we are interested in greater groups of individuals needed for epidemiological studies. I therefore argued during the symposium that it is inevitable that epidemiological studies of health effects of cycling up to this date, which are all based on self-reports, underscore the magnitude of the health effects.

To develop the understanding of cycling and health there is therefore a strong need for methodological studies and development. When refined methods exist there is indeed a great need for a second generation of epidemiological studies in this important field of science.

References


Schantz, P. 2017. Distance, duration and velocity in cycle commuting – analyses of relations and determinants of velocity. *Int J Environ Res Public Health* 14 (10)