

# DECLARATION OF CONFLICT OF INTEREST

- None

**Intensity versus duration of cycling:  
impact on all-cause and coronary heart  
disease mortality:  
The Copenhagen City Heart Study.**

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# The Copenhagen City Heart Study

- A prospective cardiovascular population study of a random sample of 20,000 men and women aged 20-100 years.
- The first examination was carried out from 1976 to 1978. This presentation is based on the 3rd examination from 1991 to 1994.
- A total of 16,563 people was invited, out of these 10,135 (61.2%) participated in the examination. Participants who had experienced myocardial infarction, stroke or cancer (n = 1669) were excluded from the analysis, so were the non-cyclists (n = 3430).
- leaving **5106** healthy people, **2398 men** and **2708 women** aged 21 to 90 years for analysis.

# Intensity and Duration

- **INTENSITY** was graded into: **Slow, average, fast**  
based on the individual's own perception of intensity.
- We found that a relative scale of intensity is more appropriate than an absolute scale, when the age-span is large (21-90 years), and when the participants have wide differences in levels of physical fitness.
- **DURATION**, 3 levels: **< 0.5 h, 0.5-1 h, and >1 h** on average per day.

# End points

- Participants were followed for an average of 18 years from the examination in 1991-1994 until 2009 or death.
- Total number of deaths during follow-up was: 1172, of these 146 were CHD deaths.

# Statistical methods

- Relative risks calculated from **Cox proportional hazards regression** analysis with age as the underlying timescale.
- The expected lifetime was calculated by integrating the predicted survival curve estimated in the Cox-model.
- We adjusted for the following potential confounders:
  - Age
  - HDL-cholesterol
  - Number of different sports activities
  - Household income
  - BMI
  - Smoking
  - Systolic BP
  - Alcohol consumption
  - Diabetes

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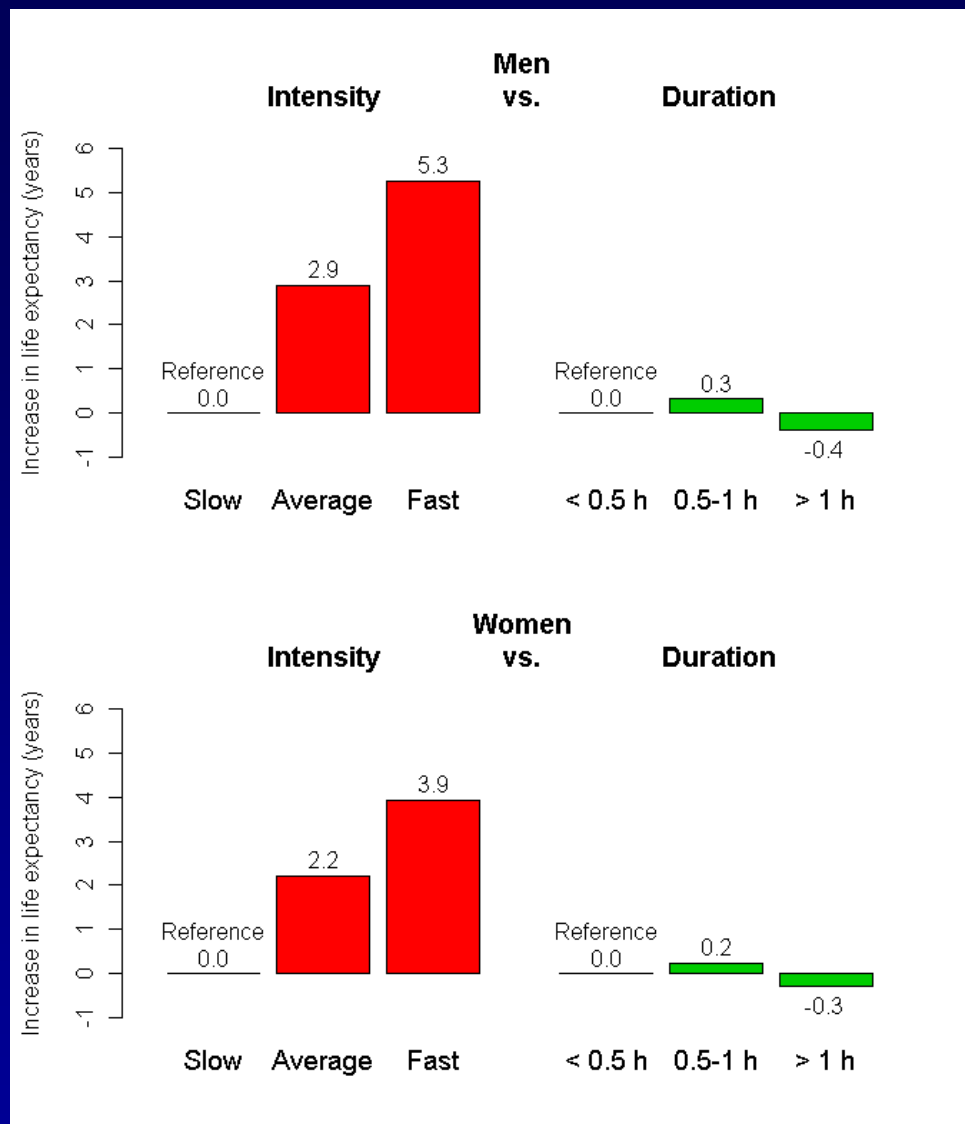
## Relative risk of all-cause and coronary heart disease death for men and women in relation to duration and intensity of cycling.

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Duration	Intensity	Total death	CHD death
		Multivariate adjusted <sup>a</sup> HR (95% CI)	Multivariate adjusted <sup>a</sup> HR (95% CI)
< 0.5 h/day	Slow	1 (ref.)	1 (ref.)
	Average	0.67 (0.49-0.92)	0.43 (0.20-0.90)
	Fast	0.54 (0.31-0.94)	0.18 (0.02-1.42)
0.5-1 h/day	Slow	0.87 (0.57-1.33)	1.20 (0.50-2.89)
	Average	0.70 (0.51-0.95)	0.32 (0.15-0.67)
	Fast	0.44 (0.28-0.69)	0.26 (0.07-0.96)
> 1 h/day	Slow	0.85 (0.53-1.35)	1.03 (0.40-2.61)
	Average	0.71 (0.52-0.97)	0.49 (0.24-1.00)
	Fast	0.68 (0.46-1.01)	0.27 (0.08-0.89)

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<sup>a</sup>Adjusted for age, gender, number of sports activities, BMI, systolic blood pressure, HDL-cholesterol, smoking, income, alcohol, and diabetes.



Multivariate-adjusted survival benefit for a person with BMI 20-25, without diabetes, systolic BP under 140 mm Hg (and no use of antihypertensive medication), mean value of HDL-cholesterol, current smoker, income above average, has fewer than 21 drinks per week, and with one other sport activity. The reference person is one that in addition to these criteria rides a bicycle slowly (red) or less than 0.5 h/day (green).



# Effects of exercise

- Maximal oxygen uptake improves
- Insulin sensitivity increases
- Lipid profile improves
- Blood pressure lowers
- Platelet aggregation increases
- Fibrinolytic activity increases
- Cardiac function improves
- Immune function improves
- Inflammation markers reduces
- Obesity reduces
- Psychological function improves (stress reduces, well-being improves)
- **These improvements are all more pronounced in high-intensity exercise**

# Conclusion

- This observational study has shown that the intensity and not the duration of cycling (and walking) is of most importance in relation to all-cause and to CHD mortality.
- This association was even more pronounced for CHD death.
- Recommendation to all adults would be that brisk cycling is preferable to slow.