

# EFFECT OF SPEED AND PHYSICAL CONDITION ON EXPOSURE OF CYLISTS TO PM AND UFP IN TRAFFIC

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**Background and aims:** Cyclists are more exposed to air pollution compared to motorists, due to increased ventilation which the SHAPES project estimated is 4.3 times higher for cyclists. We examine whether this higher exposure is linked to cycling speed. We define the optimal speed that minimizes inhalation of pollution and compare this to field trips to determine the scope for reducing exposure.

**Methods:** Maximal Exercise Test data (with heart rate and minute ventilation measured simultaneously at increasing intensities) are used to convert power into cycling speed. We check the results with heart rate and speed recorded during real life cycling. We group persons according to gender and VO<sub>2</sub>max to check if differences depend on the physical condition of the test persons.

**Results:** There is an optimal cycling power range that minimizes exposure associated with a minute ventilation below the first ventilatory point. When power is converted into speed the optimal interval is 18.6-21.8 km/h for men and 15.3-19.2 km/h for women. Higher speeds increase exposure to air pollution. When comparing the optimal cycling speed with the self-selected speed during the field trips, we conclude that cyclists tend to cycle at a speed that is slightly too high. Cyclists could have cycled 2.5 km/h slower than their self-selected speed, resulting in 10.7 % less pollution exposure and 14.0 L/km less air intake. There are no differences in ventilation (L/km) between well trained and less trained cyclists around the optimal speed interval.

**Conclusions :** Reduced ventilation associated with cycling at the optimum speed will not offset the large exposure difference between cyclists and car passengers. Well trained cyclists can cycle at higher speeds without increasing their exposure per kilometre. Their interval of optimal speed tends to get wider when physical condition improves, but it is important not to train in highly polluted areas.