The German Naturalistic Cycling Study- Comparing cycling speed

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ABSTRACT

In recent years, the distribution of e-bikes has increased worldwide [1]. Today, 11% of all bicycles sold in Germany are e-bikes [2]. Given their potential to reach higher maximum speeds, concerns have been raised about a possible increase in crash risk associated with e-bike use [3]. However, as of now, it is unclear if and how often the potentially higher speed is actually reached in everyday cycling. As part of the German Naturalistic Cycling study we measured and compared the speed of three bicycle types (conventional bicycles, pedelecs (pedalling supported up to 25 km/h), S-pedelecs (pedalling supported up to 45 km/h)) under naturalistic conditions. Eighty-five participants, divided in three age groups, took part in our study. Participants used their own bikes or e-bikes. The bicycles were equipped with a data acquisition system, which included sensors to record speed and distance, as well as two cameras. Data was collected over a period of four weeks for each participant. Nearly 17,000 kilometres of cycling were recorded in total. The statistical analysis revealed significant differences in mean speed between all three bicycle types. Pedelec riders were, on average, 2 km/h faster than cyclists. S-pedelec speed was even 9 km/h higher. A similar pattern was also found when analysing free flow conditions and uphill or downhill cycling separately. The highest speed was measured on road and bicycle infrastructure, regardless of bicycle type. Participants aged over 65 years rode significantly slower than younger participants. Data on acceleration from standstill largely confirm the differences between bicycle types and age groups. The results show that electric bicycles indeed reach higher speeds than conventional bicycles regularly. Although it is unclear if this also leads to an increase in crash risk, it can be assumed that the consequences of a crash might be, on average, more severe.

Keywords: e-bikes, speed, acceleration, infrastructure types, Naturalistic Cycling Study.

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