The influence of an active steering assistance system on the cyclist's experience in low-speed riding tasks

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1 ABSTRACT

At low speeds, older cyclists have a higher risk of losing balance and having an accident on a pedelec than younger cyclists. A stability assistance system with an electric motor acting on the handlebars can provide steering assistance and help stabilize a pedelec. However, the steering interventions can possibly affect the cyclist and his riding experience. Using a steer assisted pedelec, this study investigates the influence of these interventions on the cyclist and his riding experience at low speeds.

30 men and 30 women between 59 and 84 years of age participated in a field test. Each participant completed two riding tasks using an instrumented pedelec with a steering assistance. The participants had to ride at low speeds (5 km/h and 6 km/h) and complete a cycling course with five riding tasks that require low speeds. The riding tasks were repeated alternately with an activated and deactivated assistance system. Participants were not told whether the system was activated or not. After each ride, the participants compared the current ride with the previous one using a Likert scale with 5 items (2=much better, 1=slightly better, 0=no difference, -1=slightly worse, -2=much worse). Stability was evaluated by recording several stability-related measures during the rides.

The measurement results show that the steering assistance system provides significant stability improvement, yet 43 % rated these rides as slightly to much worse, 28 % as slightly to much better and 29 % saw now difference.

Three factors were found that explain the cyclists' ratings: The assistance system and the cyclist interact with each other via the handlebar; this is unfamiliar to the cyclist and the benefit is not directly recognizable (I). The assistance system compensates for a lack of stabilization skills or ineffective steering interventions by the cyclist through countermovement, that gives the cyclist the feeling of losing control (II). The subjective loss of control, which in this case affects a safety-critical component of the pedelec (the handlebar), consequently reduces the cyclist's sense of safety (III).

These results indicate that a steering assistance system is not immediately seen as beneficial by the cyclists. To increase the acceptance, training courses could be offered that allow cyclists to get used to the system over a longer period. To counteract the feeling of losing control, the system's intervention should be as minimal as possible.

Highlight Statements

- Evaluation of a steer assisted pedelec while riding at low speeds.
- A controlled electric motor providing steering assistance can improve stability.
- 60 cyclists compared their riding experience with and without steering assistance.
- Most cyclist perceives the steering assistance as unfamiliar and not beneficial.
- Steering interventions help with stabilization, but can be felt as counterproductive.