

To bike or not to bike?

Physical strength and short term memory influence cycling kinematics

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ABSTRACT

In the Netherlands, cycling is an important mean of transportation for all age groups. Cycling is a good habit since it contributes to health and quality of life. However, elderly cyclists have a high risk of being involved in a fall with their bicycle and sustaining an injury [1]. While recent studies focussed on general cycling behaviour and accident causes, still little is known about the underlying personal accident mechanisms [1,2]. The aim of this study was to analyse how physical and cognitive characteristics are related to cycling kinematics of younger and older cyclists.

Fourteen young (18-40 years) and 33 elderly (65-82 years) cyclists, with and without a bicycle fall history, participated. Clinical assessments were performed and include: knee proprioception, Berg Balance Scale, hand-grip strength, short-term memory and reaction time. Bicycle motion was recorded with Inertial Measurement Units during normal cycling, slow cycling and cycling with a dual-task. FUSION software was used to assess kinematic parameters: the standard deviation (SD) of the steer, roll and sway angle and angular velocity. First, differences in clinical and kinematic parameters between the three groups of young and elderly cyclists were identified. Second, the correlation coefficient (CC, Pearson) was used to study the relationship between clinical and kinematic parameters.

As expected, the older group performed less good on the clinical tests compared to the youngsters ($p < 0.05$). For the elderly cyclists, the mean cycling velocity (9 vs. 14 km/h) was lower and the SD's of the sway (1.8 vs. 1.4 deg) and roll angle were higher (0.88 vs. 0.72 deg) compared to the younger cyclists. Worse performance on dual task, hand-grip strength and short-term memory tests was related to reduced cycling velocity (CC 0.4-0.5) and increased SD of the roll angle (CC 0.3). Furthermore, handgrip strength was significantly lower for the older cyclists with a fall history. We conclude that handgrip strength, short-term memory and dual-task performance may be predicting factors in the fall-risk of elderly cyclists.

Keywords: cycling kinematics, elderly, physical strength, short term memory, fall risk

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