BOOK OF ABSTRACTS **Open Access**

Effects of changing seat height on bike handling

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Abstract

Background: According to the Statistical Release by the Department for Transport, in the United Kingdom 19.000 cyclists are killed or seriously injured every year, with losing control being one of the most common reasons. Research on bike handling went under a revival, but it is still inconclusive on how humans balance and control trajectories and direction during cycling. Adjusting body position on a bicycle has been previously addressed with an aim to improve physical performance (Ashe et al., 2003, British Journal of Sport Medicine, 37(5), 441-444) or reduce the risk of injury occurrence (Bini et al., 2011, Sports Medicine, 41(6), 463-476). Based on the research and practice, some authors (Burke, 1994, Clinics in Sports Medicine, 13(1), 1-14) designed guidelines based on kinematics and/or morphological measures to properly set up a bicycle. Seat height has been an issue of interest among researchers (Games et al., 2008, The Engineering of Sport, 255-260; Peveler et al., 2005, Journal of Exercise Physiology Online, 8(1), 51-55), but never with an objective of improving bike handling. Therefore, our aim was to test the effects of different seat heights on bike handling.

Methods: 42 participants (18 males (27.1 ± 11.3 years) and 24 females (24.3 ± 7.7 years)) volunteered to take part in this study. Participants were asked to ride a commuting bike for 7 m in the middle of the 60 cm wide cycling lanes as straight as possible. They repeated this task five times at four different seat heights. Initial seat height (100%) was defined as 109 % of the inner leg length. Two lower seat heights (97% and 94%) and one higher (103%) of the initial seat height completed the experimental conditions. Trials at different seat height were carried out in a random order. We assessed lateral deviation from the centre of the lane, steering angle and bike leaning angle (range and standard deviation (SD)). Mean of five trials for each condition were compared among the seat heights by means of repeated measure ANOVA. In case of a statistical significance ($p < 0.05$), Bonferroni post-hoc tests were used for pairwise comparisons.

Results: We found no statistically significant difference for lateral deviation SD ($F(3,123) = 0.927$; $p = 0.430$; $\omega^2 = 0.022$) and range ($F(3,123) = 0.618$; $p = 0.605$; $\omega^2 = 0.015$). There was a statistically significant difference for steering SD ($F(3,123) = 4.121$; $p = 0.008$; $\omega^2 = 0.091$), steering range ($F(3,123) = 4.338$; $p = 0.006$; $\omega^2 = 0.096$), leaning SD ($F(3,123) = 3.006$; $p = 0.033$; $\omega^2 = 0.068$) and range ($F(3,123) = 5.971$; $p = 0.001$; $\omega^2 = 0.127$). The participants perceived subjectively 97% as the most comfortable seat height to cycle at.

Discussion: Results of the present study showed that seat height does not the accuracy of completing a trial. However, we have observed that cyclists completed the trial using different mechanisms of bike handling depending on the seat height. Variability of leaning is increased at seat heights set higher than the current recommended guidelines. Practical implications of the present study are that seat height should be set to fulfil other aims, e.g. comfort and efficiency. Further research should focus on training schemes to improve bike handling skills and on the effects of changing upper body position and how this affects bike handling.

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