

## Assessment of Mountain Biking Balance for Physiotherapy Interventions

Mountain bikers often have to cut short their competitive races due to injuries or illness. Falling, in particular, causes varying levels of injury. If falling can be reduced, racers may be more likely to complete their races and avoid injuries. Deficiencies in balance and control are correlated to the performance of a racer in mountain biking and may be related to the risk of injury. Many interventions exist within the fitness realm which purport to have beneficial effects, but these interventions have not been rigorously assessed for effectiveness.



This project will have two aspects, one done by an engineering student at TU Delft and one done by a physiotherapy student at LUNEX University. The students will work together via data sharing, experiment design, and analysis.

The goal of the TU Delft student will be to develop simple, inexpensive, non-invasive measurement techniques that are transferable to a clinician's practice and to deliver metrics that accurately predict deficiencies in balance and control through the use of a human control model and the associated theory. Measurements using IMUs, wearables, and/or video analysis will be used to identify neural time delays, comparative strength in sensory feedback signals, and irregularities in muscle activation and coordination. The data from these methods will provide the physiotherapists with deeper insight into the deficient sensing and actuation in the mountain bike balance and control task.

The goal of the LUNEX student will be to develop an intervention programme to improve bicycle control skills. This intervention should include a six-week programme of bicycle-based exercises, and will be monitored by the student at LUNEX. Using the methods developed by the TU Delft student on previously validated bicycle balance and agility tests, the student will analyse the data from pre- (baseline) and post-intervention to determine whether the intervention was effective at improving bicycle skills. These data will determine whether the intervention was effective and clinically meaningful in improving control on a bicycle.

Example videos of current balance assessment tests: [\[dynamic balance\]](#) [\[agility\]](#)

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