DRIVE UNITS OF BICYCLES - OPTIMIZATION OF CAPACITY

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INTRODUCTION: Optimization of performance is very important in all kinds of sports. In this study cycling is especially dealt with and mainly the propulsion unit of a bicycle, because it has a significant influence on the sporting performance of the athlete.
There are two possible ways to modify the instrument to increase the power output. One of them is to reduce the weight of the frame construction, make it more rigid against twisting and to optimize it aerodynamically.
The other way is the object of the present research. The propulsion unit has to be optimized in the sense of biomechanics; this is the scientific term for describing appearance and causal connection of motion by taking the human organism as a basis.
Actually several different alternative forms of propulsions are already existing. Up to the present the profit of these innovations could not be scientifically proved.

METHODS: The aim of this study is to realize the optimal propulsion proceeding from a simulated calculation (Pawlik, 1995). A musculoskeletal model of the lower extremity contributes to the optimization of the pedalling path and a test bed was developed to examine the simulation results. In various experiments sporting performances were determined by using a special dynamometer and a control system which has been developed for this purpose. The results were compared to those of the simulation.
Analyzing the optimized pedalling path led to the development of a new pedalling path by adapting Pawlik's computer simulation program and considering the extension speed of muscles, pedal acceleration and acceleration of the single parts of the lower extremity.

RESULTS: The new pedalling path permits an average increase of human power output of 5.2 % compared to the conventional circular paths. In some cases an improvement by 18 % could be achieved.