EVALUATION OF THE BIKE POWER SAVER THROUGH 3D KINEMATICS AND EMG ANALYSIS

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Introduction

The importance of saving cycling energy is still relevant and remains as an active research area for both sport and daily activities. The famous yearly competition – Tour de France – is essentially a competition of human power and energy-saving strategies. Bike Power Saver (BPS) is a new product which changes the angle of pedaling forces and reduces applied power dead range (Product Ad). However, no research is found to examine how the new product affects pedaling as well as its influence on fatigue of cycling. The proposed study attempts to address this problem.

Objective

The goals of this proposed research were:

1. To study a new bike power saver product available on the market (A scientific evaluation of a new industry product is essential for protection of customer's interests).
2. To reveal the influences of the new device on control patterns.
3. To quantify the effectiveness of the product using biomechanics.

Setting

The measurements were conducted in the Biomechanics Lab at the University of Lethbridge.

Subjects

This study involved 10 kinesiology students aging from 20 – 27 years old (5 females and 5 males) from the University of Lethbridge.

Intervention/Main Outcome Measures

From motion capture, we can obtain anatomical positions that allow the modeling of the skeletal structure, which enables the calculation of dynamic joints' angles. In order to evaluate the effectiveness of BPS, we used parameters of pedal paths and joints' ranges of motion with and without BPS. To contrast the neural muscular differences, we collected, through EMG, the intensity of muscle activation, the average muscle activity and the muscle power generation. For evaluating muscle fatigue process, the decline rate of EMG's mean power frequency from long-time tests was applied.

Main Results

The BPS can be summarized: 1) to entice instability in ankle control, 2) to change improperly the pedal-crank length during cycling, 3) to increase the activities and the bio-energy consumed by dominant muscles (i.e. quadriceps and tibialis anterior) and 4) to induce an accelerated fatigue process for these muscles. These results lead to the conclusion that the Bike Power Saver Device decreases the efficiency of bicycling.

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