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How to measure intensity during on-water sprint kayaking?

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INTRODUCTION:

In cycling the use of power meters is the most used way to assess the intensity of the athlete. It is an objective measure of intensity, and it is not dependent of the slope and/or weather conditions. The measurement of power is relatively easy and mechanically transparent. However, the measurement of power in on-water sprint kayaking is actually very complicated. The reason is that for measuring power you need a force and a velocity. The force one could get from an instrumented paddle, but the question remains which velocity to take and at the same time make sure that the calculated power output is independent from for example wind conditions.

In this work, we present therefore an alternative method to calculate the intensity of a kayaking athlete using impulse based on measured paddle forces.

METHODS:

One male national athlete (Age: 20; Body mass: 91.5 kg; Height: 179.5 cm) participated in a test. The athlete did an all-out effort on a 500m on-water kayak sprint. Paddle forces, footrest forces, and velocity were obtained with a sample rate of 100 Hz using the E-kayak system (APlab, Rome, Italy). Bonaiuto et al. (1) has described this system in more detail. The impulse was calculated as a moving integral of the absolute paddle force values over a window of 5 seconds and is expressed in N s.

RESULTS:

The time over the 500 meter was done in 115 s. The moving impulse over 5 seconds peaked already at 10 seconds with a value of 1500 N s after which the produced impulse decreased over time. The velocity shows the same development as the 5-second impulse indicating that the intensity goes down because of fatigue.

CONCLUSION:

The advantage of using impulse is that the calculation is straightforward, transparent, and mechanically sound. The calculation of impulse is based on the forces delivered by the athlete and is, therefore, independent of environmental conditions. Therefore, with headwind the same athlete would produce the same kind of impulse, but the speed would be lower. There is great potential that in the kayak community, impulse could be used as an intensity measure like power output is used in the cycling community using wearable devices. However, the expectation is that the interpretation and acceptance of impulse as an intensity measure will need time and more athlete data before kayak athletes and coaches will use it.

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REFERENCES:

1) Bonaiuto et al., Sensors, 2020

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