THE EFFECT OF SEAT TYPE ON KINEMATICS DURING MAXIMAL KAYAK ERGOMETER PADDLING

Willmott, AP., López-Plaza, D.
School of Sport & Exercise Science, University of Lincoln (Lincoln, UK)

Introduction

Kayakers have traditionally used a fixed seat but in 2005 a "swivel seat", able to rotate in the horizontal plane, was approved for use in races. To date only limited data are available with regard to how the swivel seat influences technique and performance. The aim of this study was to investigate the effect of the swivel seat on kinematics during maximal intensity paddling on an ergometer.

Methods

Nine experienced kayakers (five male and four female) completed two maximal trials of 30 s duration at a free pace on a Lawler ergometer, one with a Nelo swivel seat and the other with a fixed seat. Flywheel, trunk, arm, leg, seat and paddle kinematics during the middle 10 s of each trial were recorded at 200Hz using eight Qualisys ProReflex MCU500 cameras. After Shapiro-Wilk tests of the normality of the data, differences between the two seat conditions were analysed using paired t-tests or Wilcoxon signed-rank tests, as appropriate.

Results

The use of the swivel seat resulted in a higher peak and mean flywheel angular velocity ($p = 0.033$ and $p = 0.052$, respectively). There was an increased rotation of the shoulders ($p = 0.076$) and pelvis ($p < 0.001$) with the swivel seat, but a decreased rotation of the shoulders relative to the pelvis ($p = 0.019$) and the pelvis relative to the seat ($p < 0.001$). The knee range of motion between simulated paddle catch and exit was greater when using the swivel seat ($p < 0.010$) but there was no difference between the two seat conditions in elbow range of motion over the same period ($p > 0.200$).

Discussion

This study has extended our understanding of the impact of the swivel seat on performance and technique, building on previous research that has analysed the effects

at lower stroke rates (Fohanno et al., 2011) or from a physiological perspective (Michael et al., 2010). Greater knee range of motion with the swivel seat results in increased pelvis and shoulder rotation during maximal paddling, aiding performance, while an accompanying decrease in torso rotation could potentially benefit the spine through mechanisms such as reductions in pulposus pressure and endplate damage (van Deursen et al., 2001; Aultman et al., 2004). As expected, upper limb kinematics are less affected by the choice of seat than lower limb kinematics.

References

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Contact

swillmott@lincoln.ac.uk