Q&A

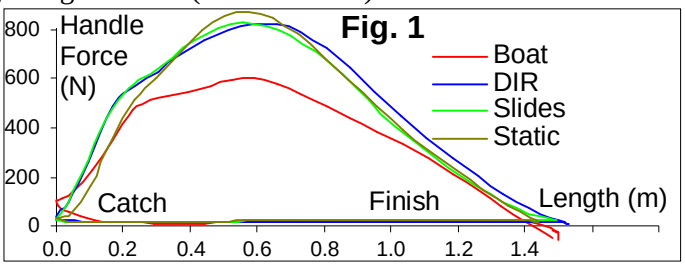
Recently, together with Concept2, we performed a pilot study of the new Dynamic Indoor Rower (DIR) and compared its biomechanical features with a stationary erg, erg on slides and on-water rowing in a boat.

On DIR - Hamish Bond, stroke of 2-NZL, World Champions -2009

Below you can find answers to some coaches' questions:

Q: "What are the main characteristics of the Dynamic erg, compared to other ergs and on-water rowing?"

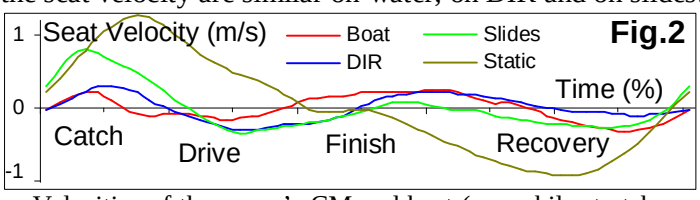
A: Rowing on DIR is quite similar to rowing on an erg on slides: the force increases faster at the catch then on a stationary erg (Fig.1), which is caused by a smaller moving mass and lower inertia forces (RBN 2003/10). The magnitude of the handle force is similar on all types of ergs and significantly higher than on-water, due to the presence of a gearing in a boat (RBN 2005/03).



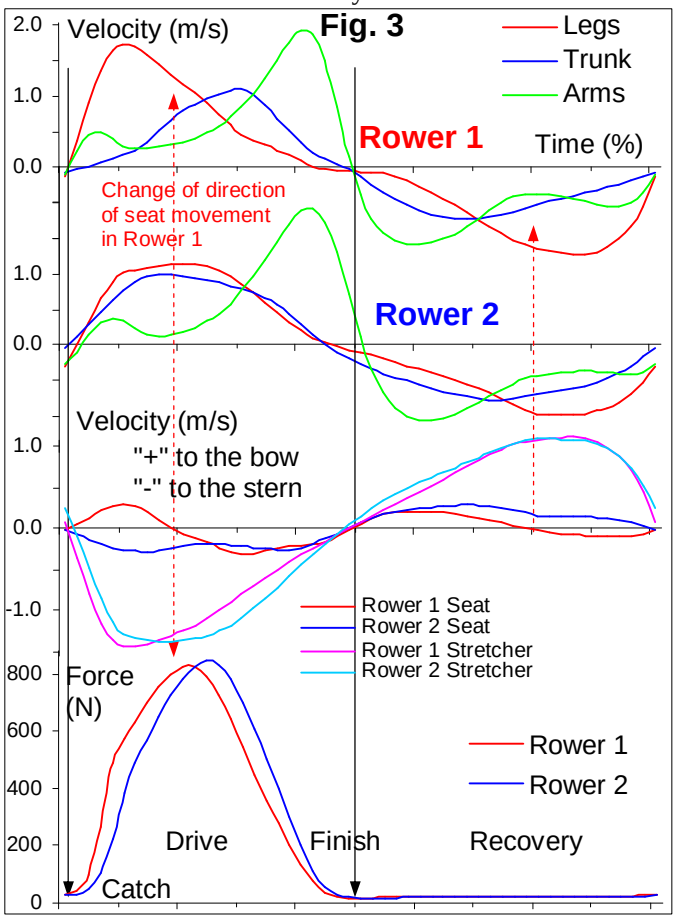
The DIR had the largest inertial efficiency (RBN 2010/07) 98.1% at 37 str/min,, compared to a boat (95.3%), slides (91.6%) and stationary erg (82.1%). This allows for higher stroke rate on DIR and, possibly, faster times than on stationary erg.

Q: "What sort of interpretation can be given for the seat movement on DIR?"

A: The seat velocity is closely associated with velocity of the rower's centre of mass (CM). On water, it can be presented as the velocity relative to the frame of reference, which moves with a constant velocity, equal to the average speed of the boat over stroke cycle. In this case, patterns of the seat velocity are similar on-water, on DIR and on slides:



Velocities of the rower's CM and boat (or mobile stretcher on DIR, or erg on slides) are integrals of their accelerations, which depend on the ratio of handle and stretcher forces. Emphasis on the stretcher force accelerates rower's CM, but decelerates boat CM and vice versa. A rower can control these forces by executing various rowing styles. Using legs to initiate the drive increases the stretcher force and acceleration of rower's CM, but decelerates the boat. Using trunk early in the drive increases the handle force and accelerates the boat, but decelerates rower's CM. Fig.3 shows body segments velocities and associated seat and stretcher velocities of two rowers with different styles on the DIR at 37 str/min:



Rower 1 exhibited a consequential rowing style (in between Rosenberg or Ivanov style, RBN 2006/03), where the drive begins with emphasis on leg drive only. The seat (and rower's CM) moves to the bow first and then starts moving to the stern, when the rower's legs slow down and the upper body becomes more active. The stretcher decelerates sharply to the stern at catch, but then its velocity increases faster, which is similar to the boat acceleration on-water. During recovery, Rower 1 returns trunk first, then follows with legs later but faster, then he pushes the stretcher earlier and seat velocity changes the direction from bow to stern.

Rower 2 has a simultaneous style (in between Adam and DDR) with legs and trunk working together after catch. The seat moves slowly to the stern through out the drive. Also, the stretcher velocity is much more even: no sharp deceleration at catch, but no fast acceleration during the drive either. During recovery, Rower 2 returns legs and trunk closer to each other (mirror principle, RBN 2006/03), which causes continuous movement of the seat to the bow.

It is interesting that Rower 1 had a faster increase of the handle force than Rower 2, which could be considered as an advantage and demonstrates greater effectiveness of the consequential style.

Conclusion: **seat movement on Concept2 Dynamic Erg is a good indicator of rowing style**: Consequential style causes change of the direction of the seat movement during the drive and recovery; in simultaneous style the seat moves continuously towards the stern during the drive and to the bow during recovery. A similar phenomenon can be observed on-water or with erg on slides, but it is more obvious on DIR because the seat moves relative to the stationary frame.

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