Q&A

Q: *A coach from Brisbane, Australia and former coxswain Brendan McGrath asked: "Would it be more productive to try and keep your heels down on the footplate at the catch?" Other Australian coach and coaches' educator Peter Halliday asked a similar question: "Do the heels rise from the foot stretcher before or at the catch? …Relative to the heel movement when should the blade be locked in the water ready for a drive? ... Does the body weight move onto the 'balls of the feet' before or at the catch?"*

A: As regards the catch, the answer is quite simple. The pressure must be applied on the toes for two main reasons:

1. Pushing with the toes reduces the vertical lever of the handle force ***Vh*** (Fig.1, a) and increases the horizontal lever of the rower's weight force ***Hw***, which allows pulling the handle harder (RBN 2002/05). If the torque at the handle (product of the handle force and ***Vh***) exceeds the gravity torque (product of the rower's weight and ***Hw***), then the rower will lift himself, lose contact with the seat and have to stop rowing. At the catch, the horizontal lever ***Hw*** is the shortest, so it is important to maximise it and minimise the vertical lever ***Vh***.
2. Pushing with the toes also reduces the lever at knee joint, which allows more efficient use of the *quadriceps* muscles and quicker extension of the knee.

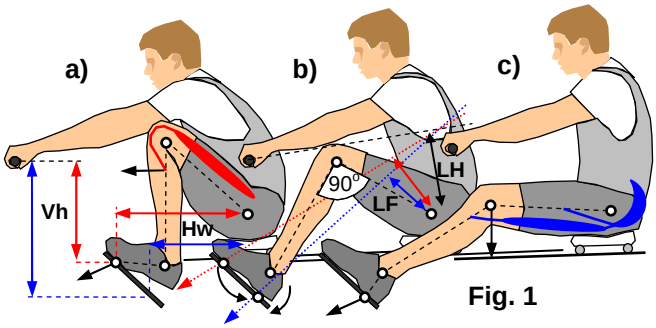

Fig. 1

Also, it would not be possible to push with the heels at the catch, because the range of flexibility of the ankle joint would be smaller than the range of the shin's rotation. In this case, if we set the stretcher angle flatter to support the heels at catch, the rower will experience overextension of the ankle at finish. The moment of raising the heels from the stretcher is defined by the stretcher angle and flexibility at the ankle joint. The main target for the rower during the recovery is to be relaxed for as long as possible, so the heel will rise naturally as the shin rises and the Achilles tendon pulls the heel upwards.

The moment when the heels settle down on the stretcher during the drive is more important. Unfortunately, we don't have any measured data here, so we can use biomechanical modelling only. The key point is the position of the rower, when the knee angle is passing 90 degrees (Fig. 1, b):

- Before this point, the rower must push the stretcher with the toes, **extend the knee** using the quads (Fig. 1, a) and refrain from opening the trunk, because use of the muscles of the back of the thigh (hamstrings and gluts) would flex the knee.
- After this point, the rower must push the stretcher with the heels and start using the trunk, emphasising **pushing the knee down** with hamstrings and gluts, which mechanically extends the knee (Fig. 1, c). Pushing with heels is more effective because it reduces the lever of the stretcher force at the hip joint (see below).

At a 90deg knee angle, the rower should quickly put the heels down on the stretcher plate and transfer the pressure onto them. This movement affects the boat acceleration and temporal structure of the drive (RBN 2004/01). The moment of heel-placement coincides with the D4 microphase with a hump on the boat acceleration curve.

This phenomenon can be well explained using the excellent model of Einar Gjessing (1), which defines levers of the stretcher and handle forces relative to the hip joint. When the point of force application on the stretcher suddenly moves lower from the toes to the heels (Fig. 1, b), the lever of the stretcher force relative to the hip joint ***LF*** becomes shorter, but the lever of the handle force ***LH*** remains the same. At constant muscle torque, the stretcher force increases and the handle force remains the same. This causes lower boat acceleration, but higher acceleration of the rower's CM.

Conclusion: It is necessary to push the stretcher with toes at catch and with heels during the second half of the drive. The ability to shift the pressure smoothly and coordinate it with the trunk movement depends on the rower's skill and is very important for effective rowing technique.

References

Einar Gjessing (1979) Kraft, Arbeids og Bevegelsesfordeling I Roing en Analysemodell. Presented during FISA seminar in Tata, Hungary.

Contact Us:

✉ ©2008: Dr. Valery Kleshnev,
kleval@btinternet.com , www.biorow.com