

**Q&A**

We have received very positive feedback on the previous Newsletter about vertical movement of the oar. Here we try to answer some questions, which were asked or can be asked.

**Q:** Can we accelerate the vertical speed of the oar at catch by means of changing its balance (shifting position of CM)?

**A:** The effect is very insignificant. Quite a big shift of CM (centre of mass = the point of balance) of the oar by 20cm towards the blade increases gravitational acceleration only by 10%. This shift requires an extra 200g weight on the tip of the blade, which makes the oar heavier and increases its moment of inertia by 10%. The latter reduces the oar acceleration when a constant force is applied, completely eliminating the effect of CM shifting. Alternatively, one can make the handle lighter, but this method has limitations because the handle can't be weightless.

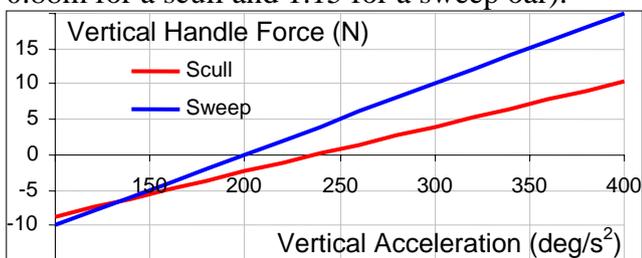
Another problem with shifting of the CM is that it makes it more difficult to remove the blade from the water at the finish. Therefore, we would not recommend it at all.

**Q:** What sort of force should be applied to the handle to achieve good vertical acceleration of the oar?

**A:** The handle force  $F$  is related to the moment  $M$  and lever  $L$ , where  $M$  is related to the angular acceleration  $\omega$  and moment of inertia of the oar  $I$ :

$$F = M / L = I \omega / L$$

We measured the moment of inertia  $I$ , which was 3.2kgm for a standard scull and 6.6kgm for a sweep oar. These allow us to plot the relationship between vertical acceleration and extra force (in addition to gravity force) applied by a rower at the tip of the oar. (We took the standard inboard to be 0.88m for a scull and 1.15 for a sweep oar).

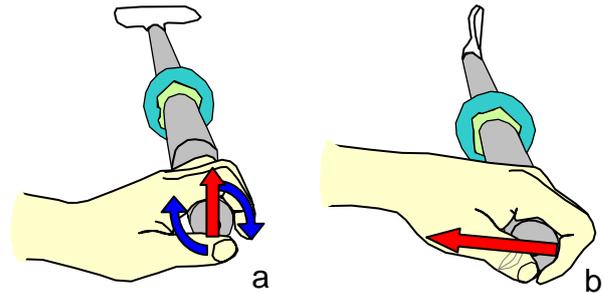


As you can see, a sculler needs to apply upwards only 10N (= a force of 1 kg-weight) extra vertical force at each handle to achieve a good level of the oar acceleration before catch. A rower needs to apply twice that force (about 2kgF) for the same acceleration. This force must be applied very quickly, like a kick, not a push.

**Q:** How can a faster vertical acceleration before the catch be achieved?

**A:** The main problem for a rower before the catch is combining the vertical push upwards with squaring the oar. It is much easier to separate these two movements and to do the squaring first and then to place the blade into the water. This method should be recommended for beginners and young rowers. However, as we showed before (RBN 2006/4), early squaring dramatically increases the aerodynamic resistance of the blade. Also, rough water conditions do not allow early squaring. Therefore, elite rowers very often practice a combination of squaring with simultaneous upwards acceleration of the handle.

Effective usage of the thumb is really important. It is easier to do in rowing, but in sculling the task is more difficult because the thumb also has to push the handle outwards to keep the oar button in contact with the swivel. The thumb must be placed at the outer-bottom edge of the grip and holds it with the base of the distal phalange (Fig. a).



During the recovery, the thumb must control the vertical position of the handle and push it forward. Suddenly, before catch the thumb switches from pushing forward to kicking upwards in combination with bending backwards (Fig. b), this allows a quick squaring of the oar followed immediately by placing it in the water.

**Q:** What sort of drills can be used for practicing quick catches?

**A:** The simplest drill is doing the catch only and targeting the shortest possible slip of the blade. As the ratio of handle to boat speed is lowest at long angles (RBN 2007/03), rowers can practise a good catch quite comfortably. It is more difficult to achieve a good catch at shorter angles, when the oar is close to perpendicular to the boat. So, the vertical kick at the catch must be emphasised during the "arms-only" and "quarter-slide" drills.

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