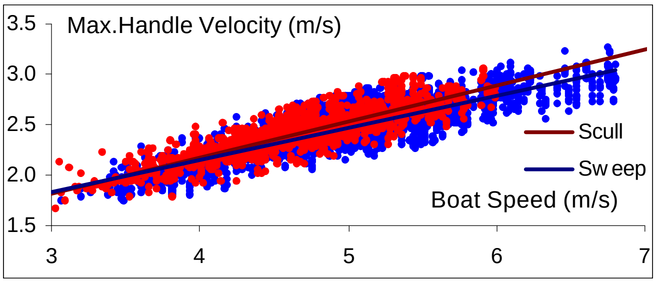
No.6 Volume 3 **Rowing Biomechanics Newsletter** June 2003

Facts. Did you know that...

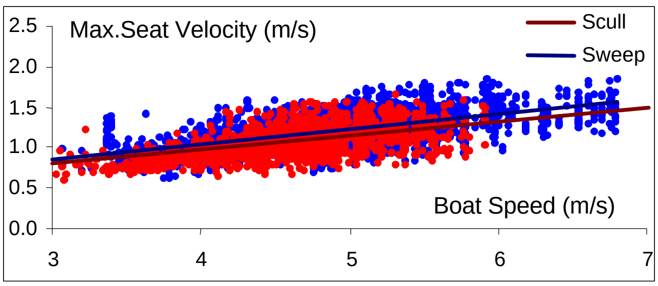
✓ …handle velocity has a strong positive correlation (r=0.88) with boat speed? Below are scatter graph and regression lines of maximal handle velocity ***Vh.max*** relative to average boat speed ***Vb.aver*** in sweep and sculling boats:



Equations of the regressions are:
Vh.max = *0.32* ***Vb.aver*** + *0.87* for sweep rowing,
Vh.max = *0.36* ***Vb.aver*** + *0.75* for sculling.

It is interesting that the gain *0.32-0.36* in these equations should be equal to the gearing ratio (inboard to outboard ratio) and an offset *0.87-0.75* should be equal to velocity of the blade slippage relative to the water. However, they differ because of the following factors: boat velocity at the time of ***Vh.max*** is lower than average; centers of force at the blade and/or handle differ from the middle points; blade slippage is different at different boat speeds (and force at the blade).

✓ …maximal seat velocity has moderate correlation (r=0.61) with ***Vb.aver***? Therefore, it correlates also with ***Vh.max*** (r=0.65). **On average, max. seat velocity equals half of max. handle velocity and a quarter of average boat speed.** Below are regression and normative data for max. seat velocity.

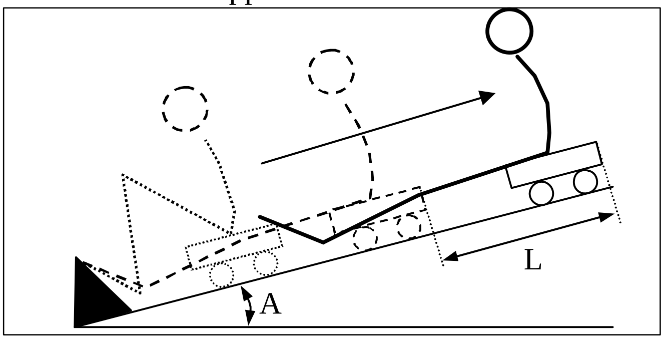


Max. Seat Velocity (m/s) at different average boat speed:

Boat Speed (m/s)	3.0	3.5	4.0	4.5	5.0	5.5	6.0
Very Low	0.51	0.57	0.64	0.73	0.83	0.94	1.06
Low	0.67	0.73	0.81	0.89	0.99	1.10	1.22
Average	0.88	0.96	1.04	1.13	1.23	1.33	1.43
High	0.99	1.06	1.13	1.22	1.31	1.42	1.54
Very High	1.16	1.22	1.29	1.38	1.48	1.58	1.70

Ideas. What if…

? …you use quite a simple device for testing and training maximal legs speed? The device consists of a seat and slides mounted on a slope of a variable angle. The slope has a foot-stretcher. It is also possible to put another foot-stretcher shaped carriage on the slides to support the rower's heels.



The distance of free travel L (m) is proportional to the slope angle ***A*** and the seat speed (in fact, a speed of rower's center of mass) at the take off (assuming zero friction in the seat):

Slope Angle	Seat Speed at take off (m/s) 0.6	0.8	1.0	1.2	1.4	1.6	1.8
5°	***0.21***	***0.37***	***0.58***	***0.84***	***1.15***	***1.50***	***1.89***
10°	***0.11***	***0.19***	***0.29***	***0.42***	***0.58***	***0.75***	***0.95***
20°	***0.05***	***0.10***	***0.15***	***0.21***	***0.29***	***0.38***	***0.48***
30°	***0.04***	***0.07***	***0.10***	***0.15***	***0.20***	***0.26***	***0.33***

You can mount a straw or a door-bell button on the slope to check the desired distance. Angle ***A*** and the seat speed also affect the ***stroke rate (str/min)*** (assuming 0.5m legs drive):

Slope Angle	Seat Speed at take off (m/s) 0.6	0.8	1.0	1.2	1.4	1.6	1.8
5°	***20***	***19***	***18***	***16***	***15***	***14***	***13***
10°	***25***	***27***	***28***	***27***	***25***	***24***	***22***
20°	***30***	***35***	***38***	***39***	***39***	***38***	***37***
30°	***31***	***38***	***43***	***45***	***47***	***47***	***47***

You can emphasize legs power production by adding extra weights on the slide, which needs a back support in this case. It is important to accelerate legs quickly after the catch and achieve the maximal speed at 15-25cm of the drive. Therefore, it makes sense to limit legs drive to a half by, say, putting a spring link between the seat and heels (or an extra supporting carriage).

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