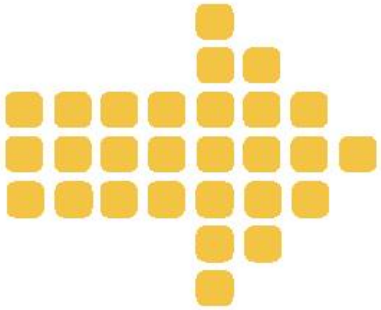


Rigging - Simplified

Stuart Wilson

Rigging

Rigging and the setting up of racing boats can be a difficult and confusing area for junior coaches to come to terms with.

The aim of this Workshop is to try and simplify a number of theory issues and cover some practical points.

What is a Rig?

- The settings made to the boat to ensure the crew is comfortable and able to row an efficient and effective stroke.
- Selection of oars that are suitable for the strength of the crew or can be adjusted to suit the requirements.
- (Assuming correct boat size)

Most Important Points

- Understanding rigging and the effect of changes can be daunting and coaches who understand the theory well, often take years to be at ease with the choices they make.
- The biggest direct affects on a rower are oar/oarlock pitch, oarlock height and heel/feet height and positioning in the boat.
- Get this right and you are well on the way to a comfortable row.

Span/Spread

Measurements you find with the equipment you use

- **Sculling**
  - Common Span range 157-160 cm
  - Not a big range when considering all athletes in our sport and between Single Scull and Quad
- **Rowing**
  - Common Spread range 83-87 cm
  - Again, not a big range, when considering boat types (2-, 4-, 4+, 8+) from school to elite.

concept 2 SYKES

Why is this?

- History and development of our sport and conservative nature of making changes.
- Changes in Span/Spread across boat classes were mainly based on the same fixed length oars being used across boat classes, not relative today but we still follow past trends. Faster boat class also having narrower span/spread for longer catch angles.
- In theory, all sweep boats could row on the same spread and all sculling boats could row on the same span.

What are we trying to achieve?

- An arc or stroke length within the rage of accepted and proven values.
- Professionals working in this area using modern measuring equipment provide us with this information.

Arc Trends

- Sculling (elite)
  - 104 -110deg average total (LWTW-HWTM)
  - Catch angle average 61- 66deg
  - Finish angle average 42- 44deg
- Rowing (elite)
  - 87- 90deg average total (LWTM – HWTM)
  - Catch angle average 53 -55- 56deg
  - Finish angle average 32 -33 -35deg

concept 2 SYKES

Span / Spread in Practice

1. Altering span in isolation has little impact on loading felt by the rower.
2. Altering span and inboard changes the arc → alters gearing / feeling of load.

   Biorow Vol.7 No.72 (Kleshnev, 2007b)

   – Volker Nolte, in Kleshnev Vol 7, No 71 (2007a):
     - "Practical experience shows that changing the outboard had more of an effect than the span."

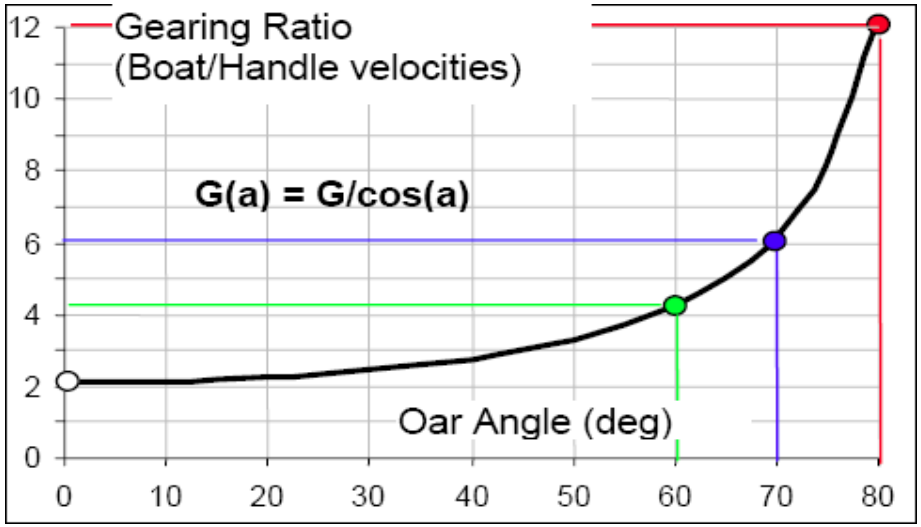
   – Kleshnev Vol 7, No 71 (2007a)
     - Lateral movement of the pin has minimal effect of the gearing/load itself. (1cm span = 0.5deg arc)

Span / Spread in Practice

- With the introduction of adjustable length oars and more efficient blade shapes, coaches have understood this point better.
- Where loading is altered by leaving span and inboard the same and increasing/decreasing outboard.
- Advantage: athlete has familiar setup but with different loading.

Arc Length and Gearing

- From Kleshnev Vol 7, No 72 (2007b)
  - 60deg – twice as heavy
  - 70deg – three times heavier
  - 80deg – six times heavier
- Applies to both catch and finish angles
  - However: generally expected finish angles do not exceed 45deg so therefore effect becomes insignificant)



Kleshnev, 2007b

Arc Length, Catch and Finish Angles

- Body position
  - Finish Position
    - good trunk stability - flat low back
    - outside hand/knuckles under lower ribs
  - Legs held down, pushing through the balls of the feet.
  - Looks strong and comfortable

Arc Length, Catch and Finish Angles

- Body position
  - Catch Position
    - Avoid excessive inefficient length by over reaching
    - Good trunk stability and compression at the catch.
    - Shins vertical, but not essential but not over vertical.
    - Legs stable not with outer leg falling to one side,typical of reaching too far through the legs.

Do not forsake body position and force application to achieve desired arc (over reach).

Adjustments and settings within the boat

- Oarlock Height
- Feet Height.
- Stretcher Position

* See Handout.

Affects on the stroke of feet height

Feet too high

- Discomfort short stroke forward of the pin, poor timing at the catch, lacking control, opening the shoulders with poor leg drive.

Feet too low

- Uncontrolled slide speed, falling over the feet and skying the blade, poor timing.
- Lack of power applied by the legs.
- Discomfort of slides digging into the calves at the finish.
- * Poor flexibility will affect these settings. ie Masters

Affects on the stroke of oarlock height

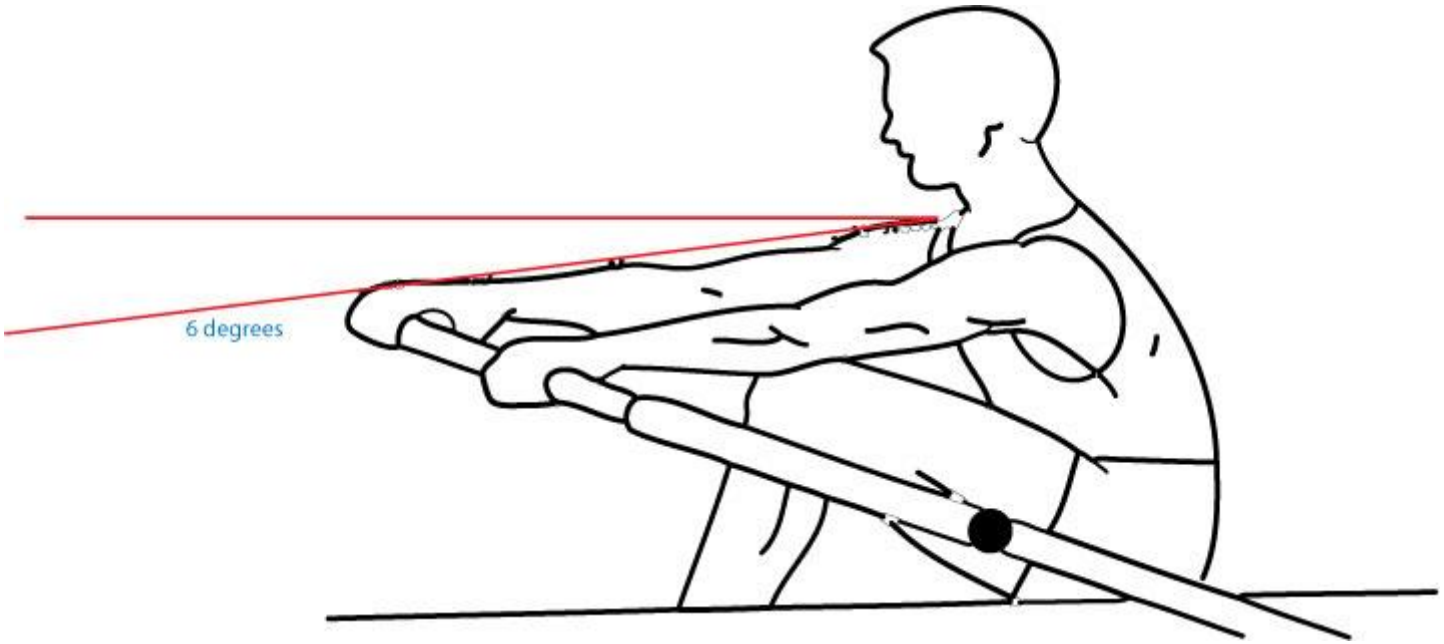
Oarlock too high

- Cannot bury the blade properly, washing out, muscle tension poor power application.

Oarlock too low

- Poor power application, blade clearance and control over the thighs.
- General discomfort, shorter finish angle.
- Both make relaxation difficult.

Model for body positioning relating to oarlock height just after the catch.



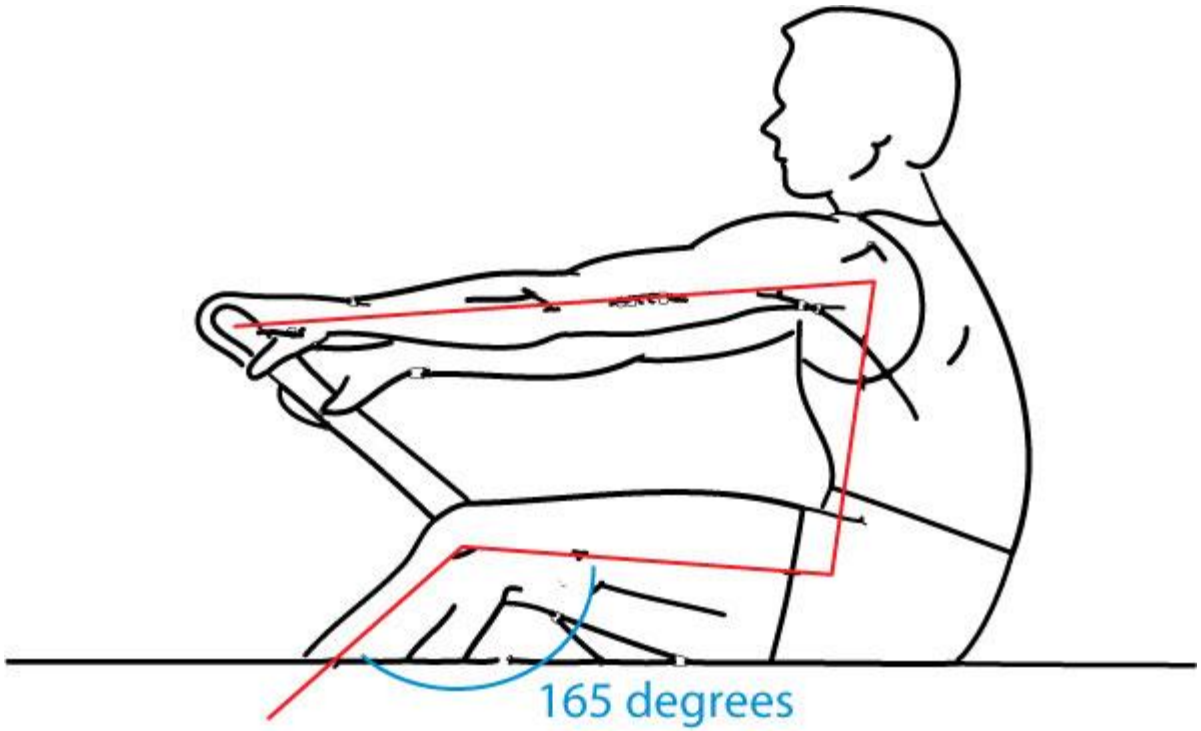
Affects on the stroke of Stretcher Position

- Positioning within the Stroke Arc of the Rower.
- Position at the finish of the oar handle/handles.
- Heavy Catch
- Lighter Catch
- Efficiency of blade extraction.

Stroke Length

- Alter oar length and the span/inboard relationship → position rowers to make use of longer catch angle.
- Consideration of “back-choc”setting i.e. 62cm (33deg)
- Inexperienced rowers
  - Actual useful arc rowed is in the most effective part of stroke (first half)
  - Manage poor reach and minimise inefficient blade placement

Model for body position at the ¾ slide usage during the draw, hang on the handle



Key Messages

- Setting the rigging appropriately for a crew is important but is only one part of what contributes to a crew going fast.
- As the feel of load varies greatly with stroke length, and speed of force application more often than not, more gains can be made from good technique than rig changes unless rigging is very poor.
- Be careful explaining rig changes to crews, it will never feel ”easy”
- Coach good posture and power application on the ergometer, faults do transfer to the boat

Consideration when selecting oars and span/spread on occations.

- Length of the race
- Course conditions
- Fitness and strength of crew
- Crews optimum rating
- Crews optimum length of stroke

- With higher boat speed class
  - higher gear ratio
  - smaller spread/span
  - longer outboard

Reasons for Variations in Rig

- Blending rowers together
  - In phase
  - In time
- Improves rhythm and collective force applied

What can we get from equipment

vs.

What can we get from rower?

Where to Next?

- Final selection of rigging and oar length governed by:
  - Race distance
  - Desired rating
  - Maintaining stroke length
  - Technique

Practical Experience

- Experiment with oar length/gearing during the racing season.
  - Working with crew on this point builds relationship and feedback.
  - 2000m racing determines full impact of change better than a series of 500m pieces.

Oar length-Where it all Started

The Big Blade (cleaver) -1990 was the biggest change in blade shape and size since the 1960's when the 'Macon' blade appeared.

Gearing

- With this new blade came a change in oar length to cope with a more efficient blade shape - less slippage more load.

.Opposite thinking of trends at that time.

- **Example Mens Hwt**
- Macon Oar 383cm
- Cleaver Oar 377cm
- Smoothie Vortex 375cm
- Fat Smoothie Vortex 370cm

Compare Catch Angle Difference between Men and Women

From AIS Rowing Biomechanics Newsletter			
Catch angle (deg.)	low	Average	High
Men scull	60	66.5	73.1
Men Light scull	57.4	64.5	71.6
Men sweep	49.5	56.8	64
Men Light sweep	48.6	54.3	60
Women Scull	55.3	62.2	69
Women Light scull	55.2	61.3	67.4
Women sweep	46.5	53.5	60.5

concept 2 SYKES

Compare Catch Angle Range observed in Sweep Rowing

From AIS Rowing Biomechanics Newsletter			
Catch angle (deg.)	low	Average	High
Men scull	60	66.5	73.1
Men Light scull	57.4	64.5	71.6
Men sweep	49.5	56.8	64
Men Light sweep	48.6	54.3	60
Women Scull	55.3	62.2	69
Women Light scull	55.2	61.3	67.4
Women sweep	46.5	53.5	60.5

concept 2 SYKES

Compare Catch Angle Range Observed from Sweep to Scull

From AIS Rowing Biomechanics Newsletter			
Catch angle (deg.)	low	Average	High
Men scull	60	66.5	73.1
Men Light scull	57.4	64.5	71.6
Men sweep	49.5	56.8	64
Men Light sweep	48.6	54.3	60
Women Scull	55.3	62.2	69
Women Light scull	55.2	61.3	67.4
Women sweep	46.5	53.5	60.5

concept 2 SYKES

Shorter Oars – Smaller Stoke Arc

- Many coaches are sceptical about using shorter oars
- Question the efficiency of acute catch angles
- **Crews rigged for a large catch angle have more potential gain.**
- **www.biorow.com Vol 6-63 June 06**

Catch Angle or “Pinching” Revisited

- Catch angle effects gearing…

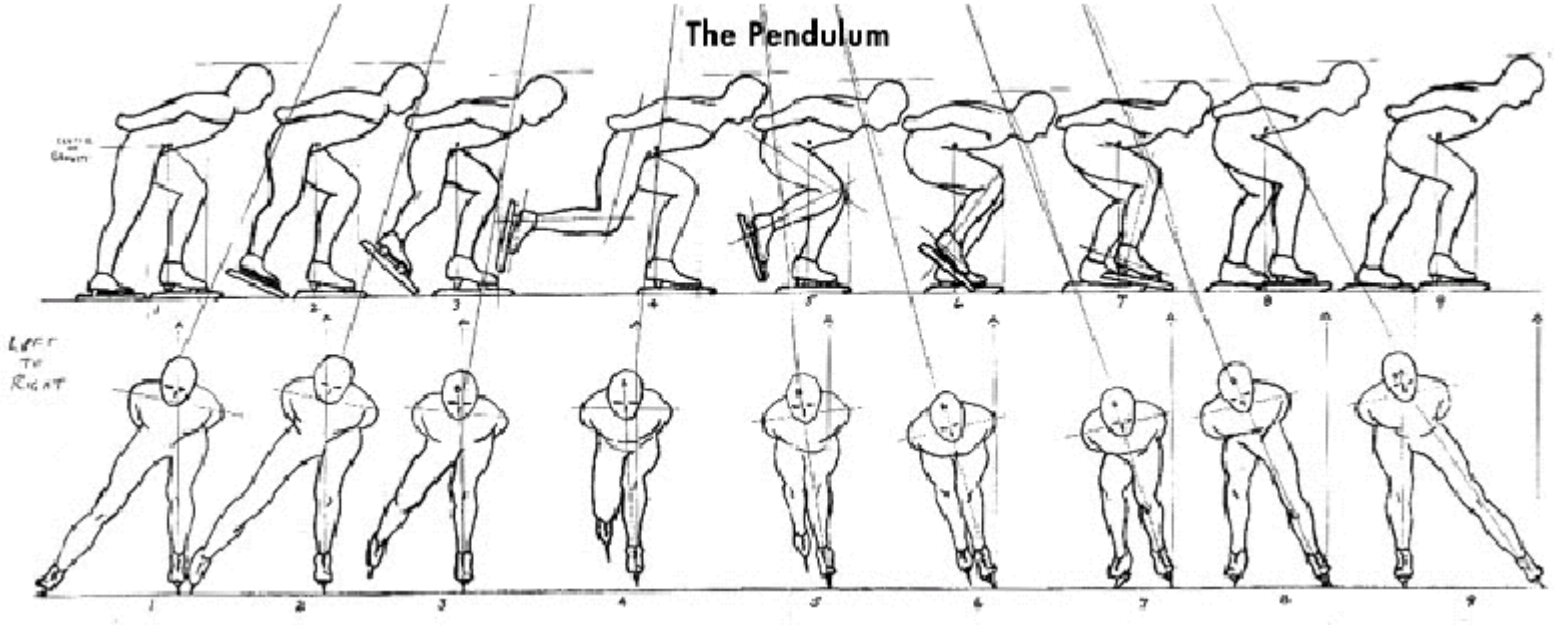
  greater angle = higher gear = heavier load

- Catch angle may effect efficiency, but watch out for overloading.

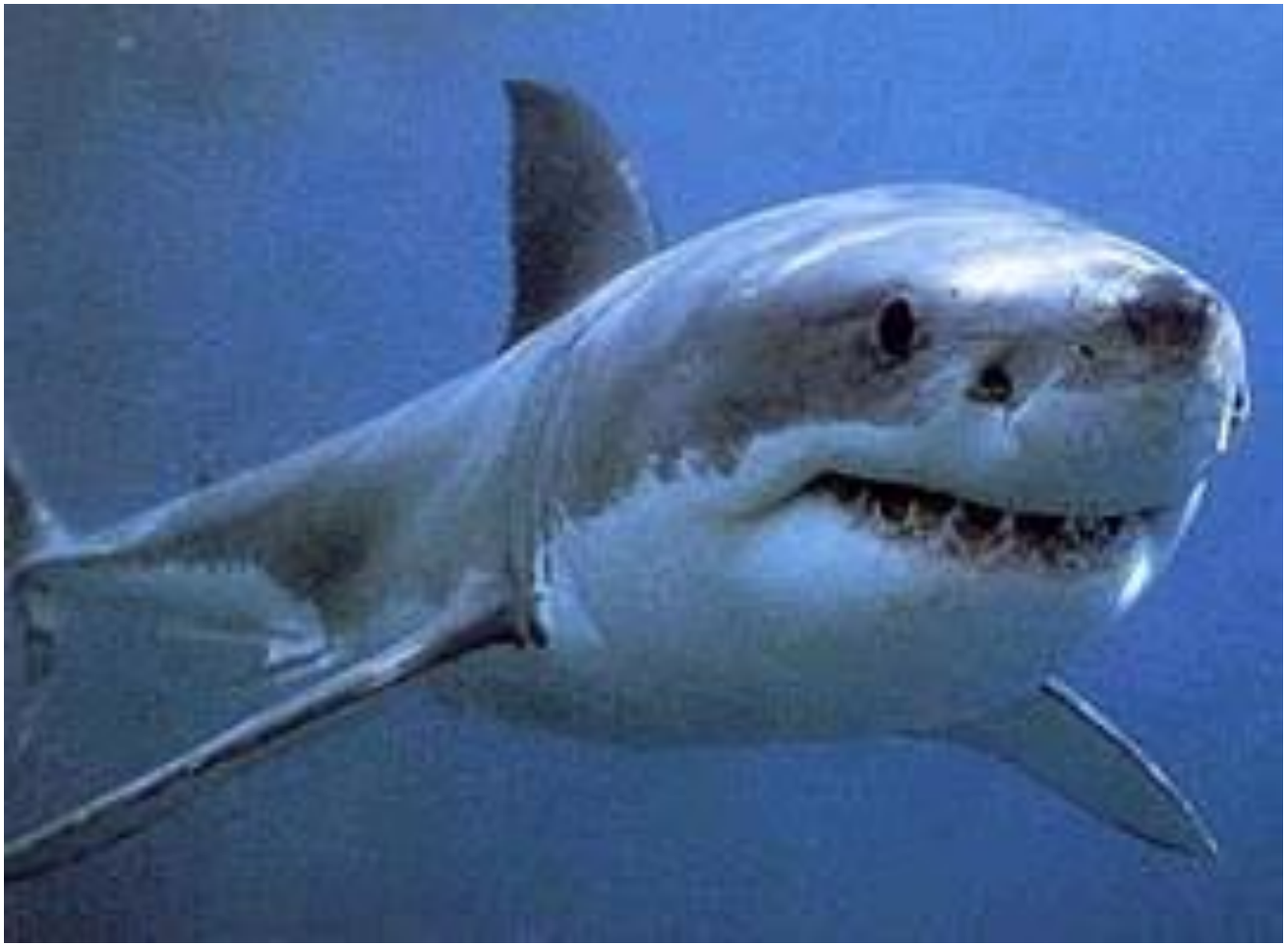
Using ‘The Wedge’ Catch and Finish angles.

- In the rowing stroke we can’t apply all the forces in the direction of travel of the boat.
- Pushing to the side, at an angle, to move forward is not uncommon in sport.

Pushing to the side to go forward Skating



Hunting



Pushing side to side can be more efficient

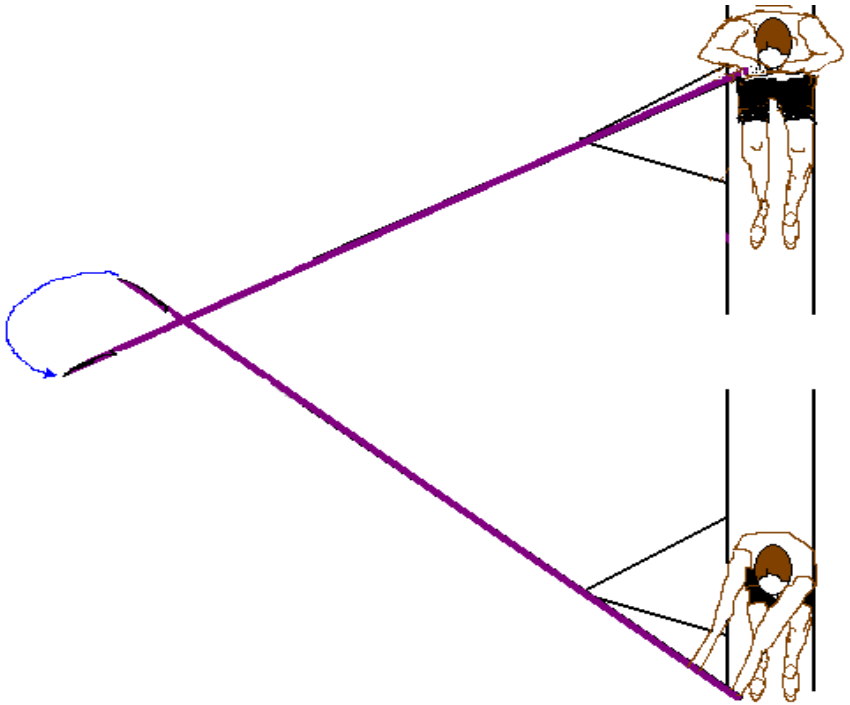
Using ‘The Wedge’

- The angle of the “Wedge” influences the gearing
- Pushing side to side can be more efficient when we consider biomechanical principles.
- More even power distribution.
- **www.biorow.com Vol 6-63 June 06**

Application to Rowing Issues

- Overall Gearing
- Oar blade design and sizing
- Working “through the pin”
- Setting foot stretchers
- Long and short rowers

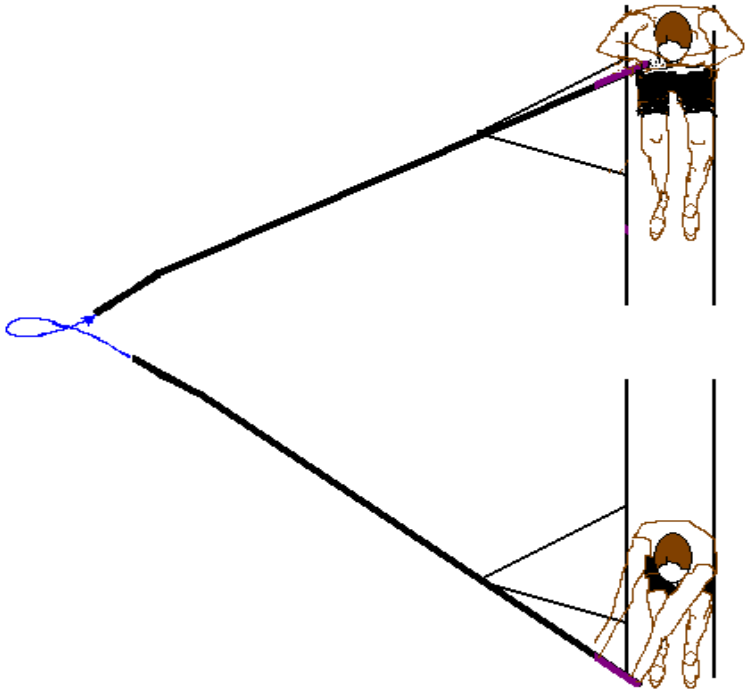
High Slip Blade



This blade slips a lot in the direction perpendicular to the shaft. The outboard must be longer to achieve optimal load. (i.e.optimal force, speed, and angles at the catch and finish)

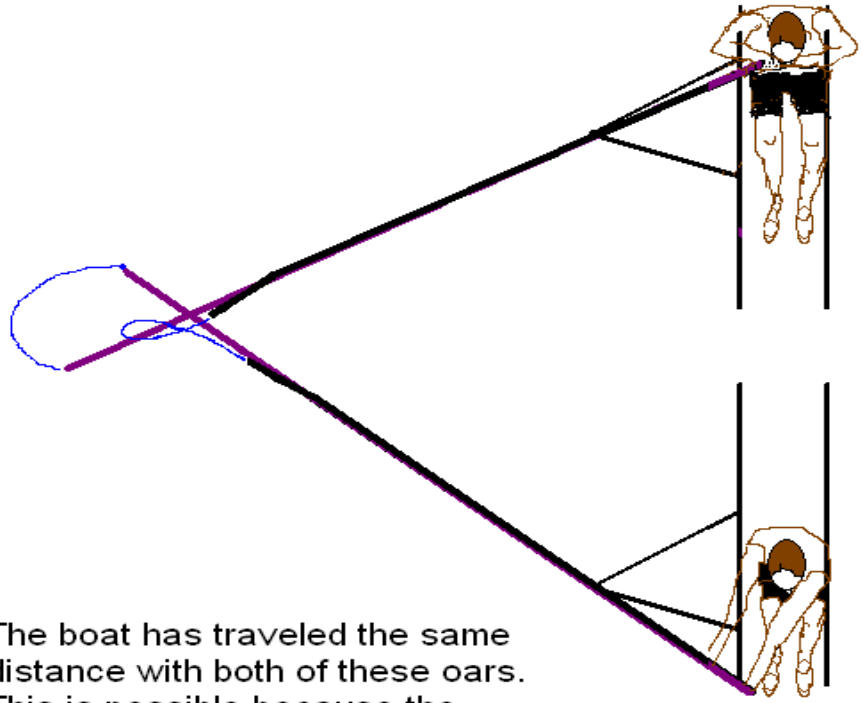
concept 2 SYKES

Low Slip Blade



This blade does not slip much in the direction perpendicular to the shaft. Outboard length must be decreased to achieve optimal load. (i.e. force, speed, and angles at catch and finish)

Same Distance Travelled by the Boat



The boat has traveled the same distance with both of these oars. This is possible because the blades travels a different path through the water depending on how much they slip perpendicular to the shaft during the stroke.

Is a Shorter Outboard Better?

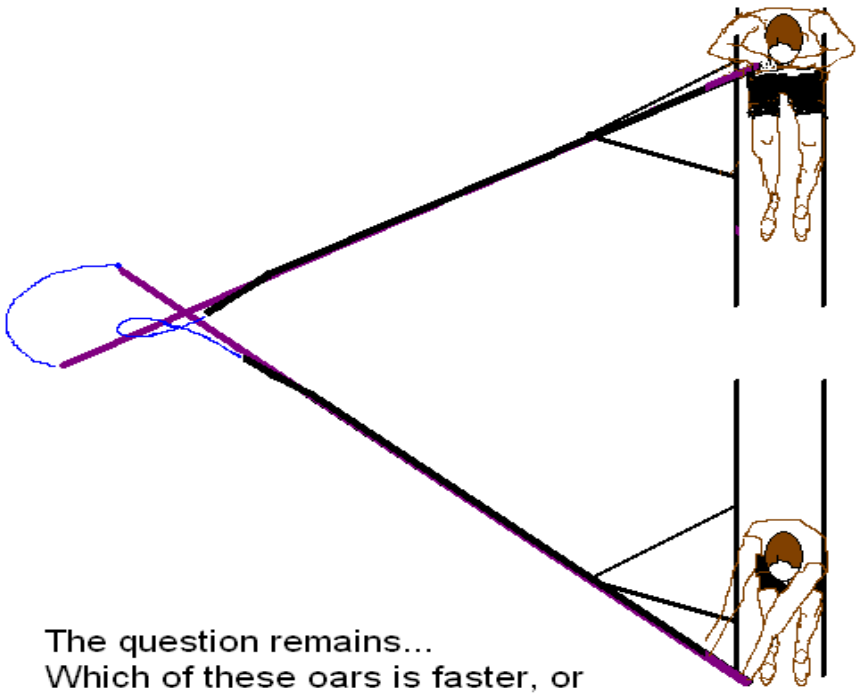
Assume an oarsman rows identically with oar A and oar B.

- Spread is the same.
- Inboard is the same.
- Catch angle and finish angle are the same.
- Time spent on the drive is the same
- Force on the handle is the same

Is a Shorter Oar Better?

- But oar A has a blade that slips less perpendicular to the shaft during the drive.
  - At the same length oar A would be more heavily loaded than oar B
  - The only adjustment that needs to be made is to shorten the outboard of oar A.
  - Now everything is the same except oar A slips less and has a shorter outboard.
  - What does this do to the forces acting on this system?

Which is Faster



The question remains…
Which of these oars is faster, or will they be the same speed, or will one oar be best for one rower but not the next?
We can contemplate forever, or we can test on the water.

Oars that are too long for the Crew

- If certain requirements are forced on the crew, i.e.. Rate, length, then they **will** find a way to cope.
  - Washing out
  - Low Rate
  - Poor acceleration
  - Poor work rest ratio.

On Water Testing

- Test Procedure
  - Row at least 6 pieces switching between the two oars each piece.
  - Do not change anything other than the oars being tested.
  - * **See handout**

On Water Testing

- Row all pieces at maximum effort.
- Time accurately.
- Do not look at results until finished.
- Test on calm days.

Evaluating Results

- Graph results and calculate the difference in speed as a percentage.

- Do not compare the speed achieved from one day to the next because day to day variation is too great.

Evaluating Results

- Test the same variable several days before making a conclusion.
- Test results only directly apply to the crew doing the testing.
- (Test Protocol available as a handout)

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