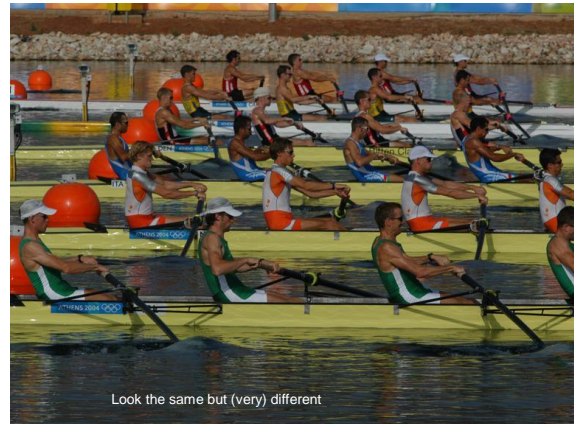


How do rowers balance endurance training regarding intensity and volume?

Kurt Jensen

The Department of Sports Science and Clinical Biomechanics, Faculty of Health Sciences at the University of Southern Denmark (SDU)

UNIVERSITY OF SOUTHERN DENMARK, DK



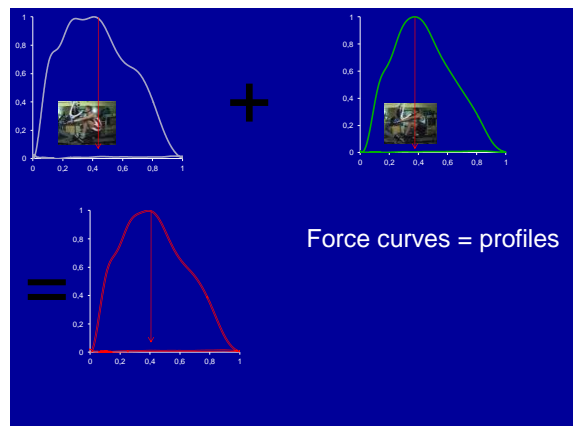
Look the same but (very) different

Important knowledge about rowing

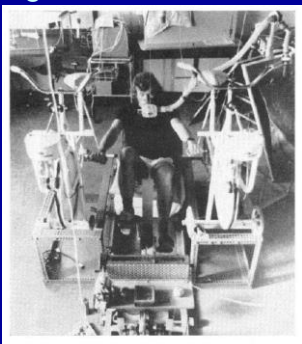
- Rowing, the ultimate challenge for the human body – (work demands in elite rowing)
- How to evaluate the balance between aerobic and anaerobic training including strength training
- How to use testing in rowing – special force curve in ergometer and in the boat
- How to find the right balance in the training programme – including individualization – ergometer training



Specific testing in rowing

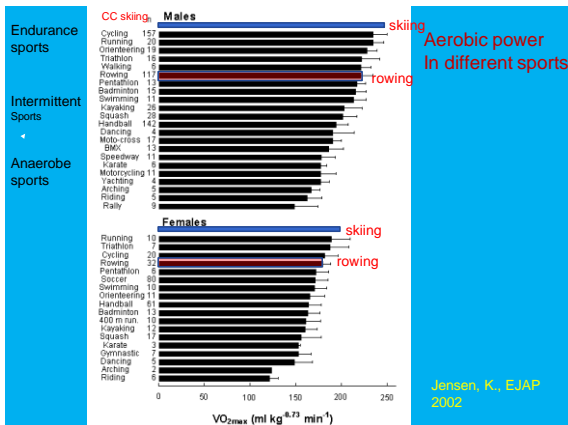
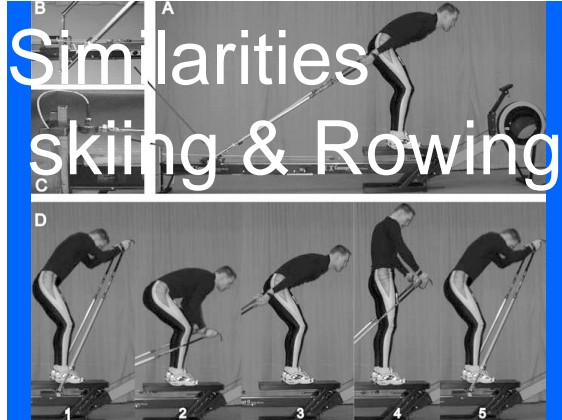


Working with both arms and legs



Secher, 1974
Obs:
Legs horizontal

fig. 1. Experimental setup for arm (A), leg (L), and combined arm plus leg (A + L) exercise. (Note that legs are horizontal.)



Which profile do we want for rowers?

Strength/power

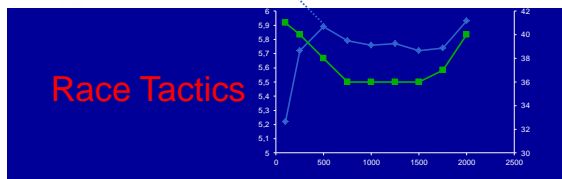
Aerobic capacity

The physical characteristics of the rowing race will dictate the specific physiological characteristics on rowing athletes

Table 2. Analysis of a rowing race by distance travelled where the sub-sections were measured with GPS.

Distance [m]	t _{distance} [s]	Number of strokes	S _R [1/min]	V _B [m/s]	S _B [m]	tΣ [s]
0-100	19.1	13	41.3	5.22	7.6	19.1
0-250	43.7	29	40.3	5.72	8.51	43.7
250-500	42.5	27	37.5	5.89	9.42	86.2
500-750	43.2	26	36.3	5.79	9.57	129.4
750-1000	43.4	26	35.9	5.76	9.63	172.8
1000-1250	43.3	26	35.9	5.77	9.65	216.2
1250-1500	43.7	26	36.1	5.72	9.52	259.9
1500-1750	43.5	27	37.3	5.74	9.23	303.5
1750-2000	42.2	28	39.5	5.93	9	345.6
Total		215	37.3	5.79	9.3	345.6

t = Time



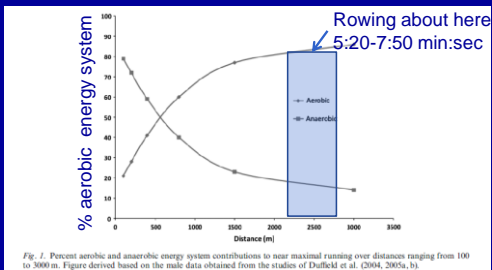


Fig. 1. Percent aerobic and anaerobic energy system contributions to near maximal running over distances ranging from 100 to 3000 m. Figure derived based on the male data obtained from the studies of Duffield et al. (2004, 2005a, b)

The use of Ergometers in performance evaluation

- Indoor rowing performance is related to performance in the boat .. more so in small boat than in big boats (Miculic 2010)
- The 2k performance is the product of several physiological variables that would be important to analyze further to get , more specific knowledge
- +technical, psychological ...

To consider

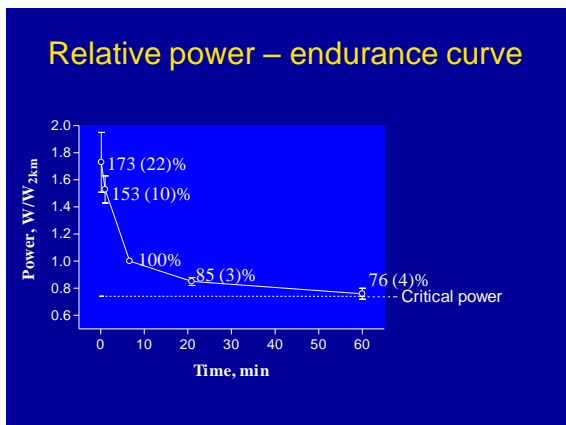
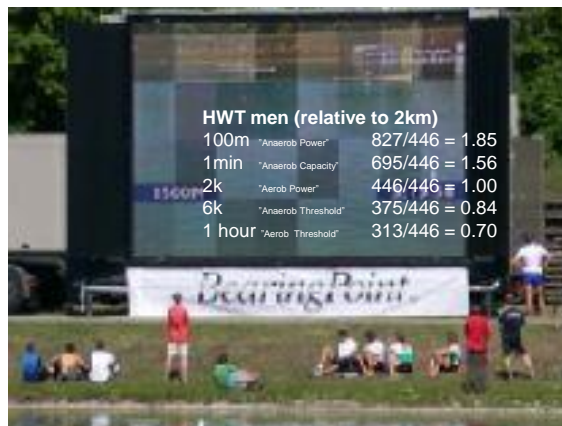
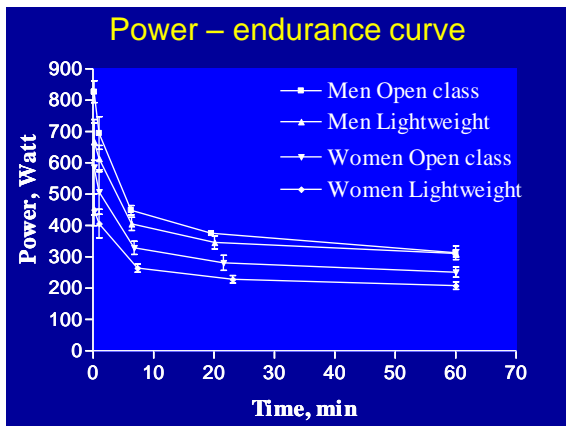
- Rowing Champion Athletes are different regarding strength and weaknesses ...the only thing in common is that they row fast!
- Only knowing the 2k performance and may be their VO2max will not specify the need for developing speed or endurance capacities
- Should everybody train the same program or should we individualize according each individuals physiological profile?

I have suggested the use of 5 "all-out" erg tests performed over 4 days to give us more knowledge about individual physiological profiles and for use during indoor training?

"The Test Week"

		Intensity	Week test
		Level	
Mon	C	6 km timing	
Tue	B	2 km timing	
Wed	A	3*100m (best result)	
	A	1 min as far as possible	
Thu	D	1 hour as far as possible	





Two different type of rowers: Power vs endurance

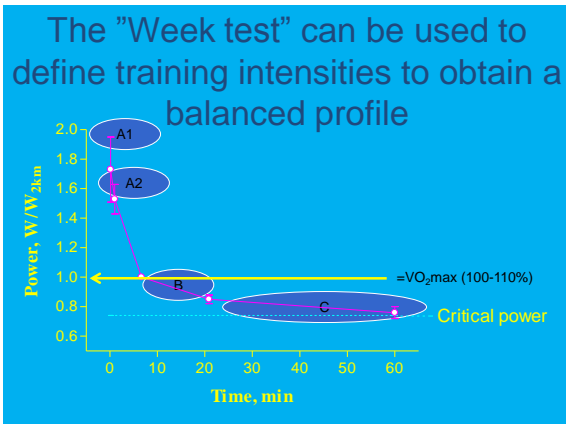
• W100m	906 (191)	797 (159)
• W1'	763 (161)	717 (143)
• W2k	474 (100)	502 (100)
• W6k	363 (77)	417 (83)
• W1h	305 (64)	355 (71)

Now about training schedule:

- Individual needs should be discussed in an open forum with the coach, athlete and ...
- Everyone should/should not be equal?
- Different boats need different physiological profile?
- We have a golden standard for profiling rowers capacity?

To train **physically**, you should go to the limit - then recover

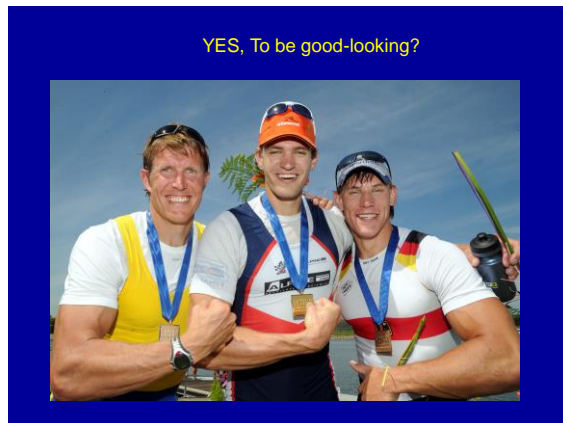
- The limit is what you can do maximally within the time that you have planned to train
- If you have 20 min: go max 20 min (84%)
- If you have 2 h: go max 2 hours (70-75%)
- And do it efficiently
- Your limit is defined by your Week test



In exaggeration looks as follow
Which profile do we want for rowers?

The bar chart shows %20 power for different durations: 1000s (175%), 1 min (150%), 30s (100%), 6s (85%), and 1 hour (75%).

Do we need Strength Training to reach a balanced profile?
May be but who and how much?

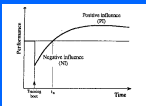


Force is needed in the start – later only 40% of MVC (to be efficient)

The first graph shows Peak force (110-160) and % max (75-105) over 10 strokes. The second graph shows Force-Velocity Relationship with Force (blue), Force at Maximum Power (red), and Velocity at maximum Power (green).

- First 10 strokes: from 90 to 75% of MVC
- Later in the race "only" 40-50%
- This fits the classical F-V relationship and makes sense
- Force needs to be "sufficient" not more

Training
Balanced approach (mixed)
Individualisation

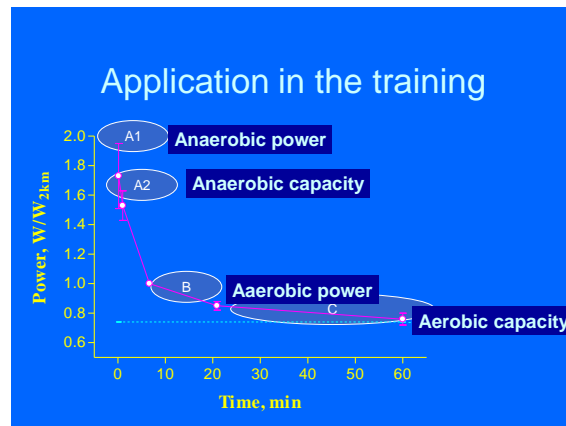


Training, individualization

To improve rowing performance

- The role of intensity
- To improve efficiency and technique
- To improve anaerobic energy system
- To improve aerobic transportation system
- The role of duration:
- To improve efficiency and technique
- To improve aerobic endurance capacity
- To improve training resistance, adaptation and recovery

Giving you the 2k performance trainability (robustness)



Training week: Two rower profiles

- Profile one (fast twitch, powerfull type)
- Continuously longer SS
- Profile II (endurant, steady type)
- Shorter more intense. +strength training

<ul style="list-style-type: none"> • Mo D • Tue C • Wed D • Tue C • Fri D/E • Sa Team • Su Team 	<ul style="list-style-type: none"> • Mo D +A1 • Tue B • Wed C • Tue B/A • Fri D/E +A1 • Sa Team • Su Team
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How we change intensity during the season

Periodisation

• Winter	A, B, C, D, E
• Pre-season	A, B, C, D, E
• Season	A, B, C, D, E
• Peak competition	A, B, C, D, E
• Recovery	D, E

- Size of letter indicate priority

We have models now is time for program

How to prepare the program for 6 workouts per week on the base of Testing?

Priorities

- The rowing training (boat+ergometer) is priority no 1. ("homework") (8-12hours/week)
- Classical strength training was taken away "If you have the time it won't hurt you, but keep focus on rowing"
- Rowing training **can not** be substituted by running or cycling – only for supplements (if you have the time and motivation)

The format of a day

- Total about 2 h per day all incl.
- Morning or afternoon:
 - Erg 20-30 min (level A/B/C)
 - Stretching 12 min
 - Boat 1-1.5h (level C-E)



Example of 6 workouts per week training program

- Monday (C+D)
ERG: 2750m at 6k split
BOAT: 3x4k at SR 22, 24, 26
- Tuesday (B+C)
ERG: 4'2" at SR 30 (split 2k max + 4"), +2'1" SR 32 (split 2k max + 2"), +1'1" SR 34 (split 2k max)
BOAT: 3x3000m T 28
- Wednesday (C+D)
ERG: 6'+4" SR 26+28 (split 6k+6k-2")
BOAT: 3x4k at SR 22, 24, 26
- Thursday (B+C)
ERG: 3x750m/1' split 2000m max,
BOAT: 3x3000 m T28
- Saturday (D-B+C)
ERG: MAP TEST: 2' steps start 70+5%
Boat: 6000m time trial
- Sunday (A/C+D)
ERG: Athletes with no power 8x(10'750" full pull)
Athletes with power 30 min. 1h split
BOAT: 3x4k at SR 22, 24, 26

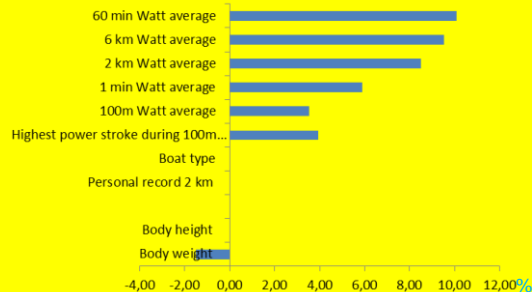
Does it work ?

Yes, it does.

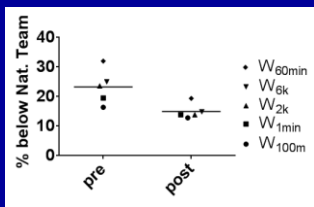
This program was tried with the student athletes in one of the Dutch training centers

As the result of it they made very significant improvements on the erg and on the water.

Theta/Vidar University 16 weeks



Result



And passed their exams at university

Discussion/Conclusion

- 1 This study demonstrated that aerobic endurance increased by 9-10% during winter season in this group of relative unexperienced (<23years) rowers after 16 weeks and by only 6-8 hours of weekly training.
- 2 More importantly the rowers changed their profile from more strength and power dependent to be more aerobic trained.

ARE THERE ANY QUESTIONS ?