KNRB
Koninklijke Nederlandsche Roeibond

Measuring in Rowing

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KNRB – Royal Dutch Rowing Federation

Hoofdsponsor
AEGON
2016 world rowing

Sense and nonsense of measuring

- The aim of measuring is to collect data and acquire knowledge. But to what purpose? If there is no purpose, there is no need
- Possible purposes can be two types of processes: changes or choices, short term or long term
- Used in the right way, knowledge is a very powerful tool. But the biggest threat is the reliability of the data and of our perception of the data
  - Is the process of data collection reliable
  - Is our perception of the data objective
- And … never forget the power of intuition. Don't use data collection for justification of what you already know or have decided

What we could measure

Model of Crew Race Performance *

Time = $f_{split = 1\text{-}n}$ (H + B + P + W + Q + R + S + T)

where n = 1, 2, 4, 8, 20, 40, 200, or 10,000

Base Capability:

H = Human Talent: Anthropometrics, age, gender, health, talent and experience

B = Biomechanics: Equipment, ergonomics, mechanics, kinematics and rowing style

Race Scenario:

P = Physiology: Training and fitness, race distance, fatigue, energy expenditure and pacing

W = Weather and Environment: Water, wind, temperature, turns, lane fairness, random interventions

Performance Execution:

Q = Quality of Execution: Strategy exec., performance errors, steering, synchronization and swing theory

R = Race Psychology: Race importance, morale and character, motivation and effort, concentration and focus

Decisions:

S = Strategy and Race Plan:

Coach: Competitive assessment, goals and planned contingencies, rigging, pacing, drives

T = Tactics and Contingencies:

Coxswain: Situation awareness, options and risk assessment, pacing, drives, communication

* J. Cornett, et al: An 8-factor model for evaluating crew race performance
ISSN 1750-9823 (print) International Journal of Sports Science and Engineering Vol. 02 (2008) No. 03, pp. 169-184

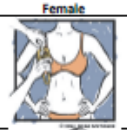
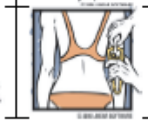
Anthropometrics

- Body measurements are widely used for talent ID
  - Length or expected length
  - Armspan or expeced armspan
  - Body composition
- Body composition is as important for lightweight as for heavyweight rowers
- Methods to establish body composition
  - Body density (submerging)
  - Dual energy X-ray absorptiometry (DXA)
  - Air displacement plethysmography (Bodpod)
  - Bioelectrical impedance analysis (BIA)
  - Skinfolds, circumferences
- Every method has limitations. Most important is consistency of measurement in between each test

Body composition: skinfolds

- Taking skinfolds is simple and cheap
- There exist many different protocols that use different sites and different calculations
- Most common:
  - ISAK protocol
  - 4-site Durnin/Womersley
  - 7-site Jackson/Pollock
- We use 7-site JP, in general when we perform physiological tests

Skinfold Measurement

Site	Description	Male	Female	J7	J4	J3	D
Chest Torace / Petto	Diagonal fold - midway (M) / one third of the way between upper armpit and nipple			X		M	
Midaxillary Ascellare	Horizontal fold - directly below armpit			X			
Bicep Bicipite	Vertical fold - halfway between shoulder and elbow, directly on bicep						X
Abdominal Addominale	Vertical fold - one inch to the right of navel			X	X	M	
Suprailiac Sopraliaca	Diagonal fold - directly above iliac crest			X	X	F	X
Thigh Coscia	Vertical fold - midway between knee cap and top of thigh			X	X	X	
Calf Polpaccio	Vertical fold - inside of leg on largest part of calf						
Subscapular Sottoscapolare	Diagonal fold - directly below shoulder blade			X			X
Tricep Tricipite	Vertical fold - midway between elbow and shoulder			X	X	F	X

Body composition: DXA

Hogeschool van Amsterdam

Sex: Female
Ethnicity: White
Height: 182.0 cm
Weight: 75.0 kg
Age: 25

Referring Physician: MdBK

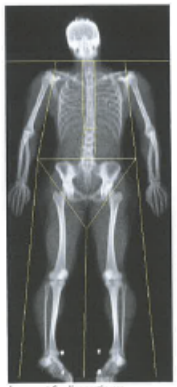


Image not for diagnostic use
k = 1.179, d0 = 41.3
327 x 150
DAP: 13.1 cGy*cm²

Scan Information:

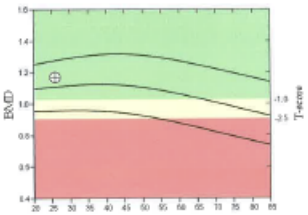
Scan Date: 12 January 2015 ID: A01121507
Scan Type: a Whole Body
Analysis: 21 January 2015 09:40 Version 13.4.2:3
Auto Whole Body Fan Beam
Operator: SvdP
Model: Discovery A (S/N 87764)
Comment:

DXA Results Summary:

Region	Area (cm²)	BMC (g)	BMD (g/cm²)	T-score	Z-score
L Arm	249.68	202.30	0.810		
R Arm	250.08	200.89	0.803		
L Ribs	147.25	107.81	0.732		
R Ribs	144.45	94.97	0.658		
T Spine	152.05	144.90	0.953		
L Spine	72.02	90.01	1.250		
Pelvis	324.10	400.48	1.236		
L Leg	428.14	516.36	1.206		
R Leg	428.94	543.19	1.266		
Subtotal	2196.71	2300.93	1.047		
Head	254.48	569.57	2.238		
Total	**2451.19**	**2870.49**	**1.171**	**0.8**	**0.8**

Total BMD CV 1.0%, ACF = 1.028, BCF = 1.018

Total



Fracture Risk

Not Increased | Increased | High

Comment:

T-score vs. White Female; Z-score vs. White Female. Source:2008 NHANES/Hologic White Female.

HOLOGIC®

Hogeschool van Amsterdam

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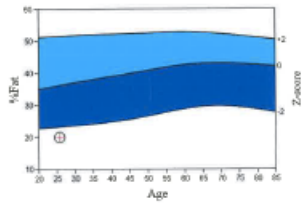
Images not for diagnostic use

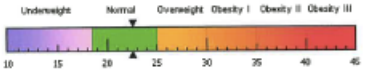
Fat Lean Bone

Total Body % Fat



Source: 2008 NHANES White Female

World Health Organization Body Mass Index Classification
BMI = 22.6 WHO Classification Normal



BMI has some limitations and an actual diagnosis of overweight or obesity should be made by a health professional. Obesity is associated with heart disease, certain types of cancer, type 2 diabetes, and other health risks. The higher a person's BMI is above 25, the greater their weight-related risks.

Body Composition Results

Region	Fat Mass (g)	Lean + BMC (g)	Total Mass (g)	% Fat	%Fat Percentile YN	%Fat Percentile AM
L Arm	724	3827	4551	15.9	1	1
R Arm	849	3608	4457	19.1	1	1
Trunk	5190	30503	35692	14.5	1	1
L Leg	3812	10625	14438	26.4	1	1
R Leg	3925	10475	14400	27.3	1	1
Subtotal	14500	59038	73538	19.7	1	1
Head	1119	3655	4774	23.4		
Total	**15619**	**62694**	**78312**	**19.9**	**1**	**1**
Android (A)	792	4147	4939	16.0		
Gynoid (G)	2961	9455	12415	23.8		

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Adipose Indices

Measure	Result	Percentile YN	Percentile AM
Total Body % Fat	**19.9**	**1**	**1**
Fat Mass/Height² (kg/m²)	4.72	6	6
Android/Gynoid Ratio	0.67		
% Fat Trunk/% Fat Legs	0.54	6	5
Trunk/Limb Fat Mass Ratio	0.56	9	9
Est. VAT Mass (g)	131		
Est. VAT Volume (cm³)	142		
Est. VAT Area (cm²)	27.3		

Lean Indices

Measure	Result	Percentile YN	Percentile AM
Lean/Height² (kg/m²)	18.1	88	88
Appen. Lean/Height² (kg/m²)	8.17	91	91

Est. VAT = Estimated Visceral Adipose Tissue
YN = Young Normal
AM = Age Matched

THAR353 - NHANES BCA calibration

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REST TO FOLLOW, STILL WORK IN PROGRESS