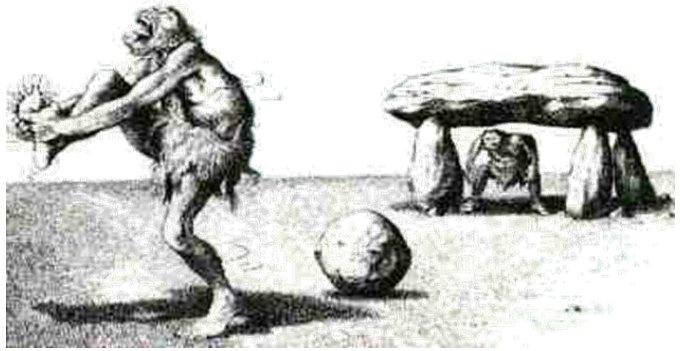
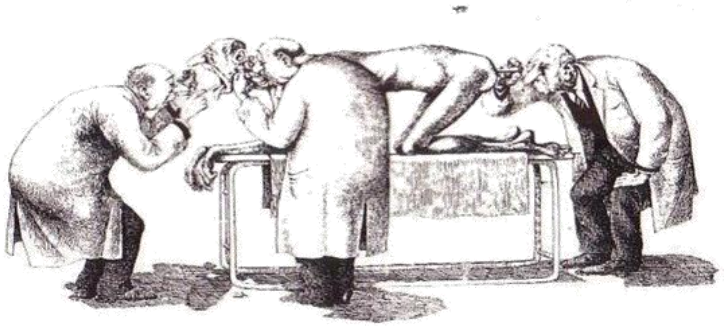
SWINCO

PRESENTS

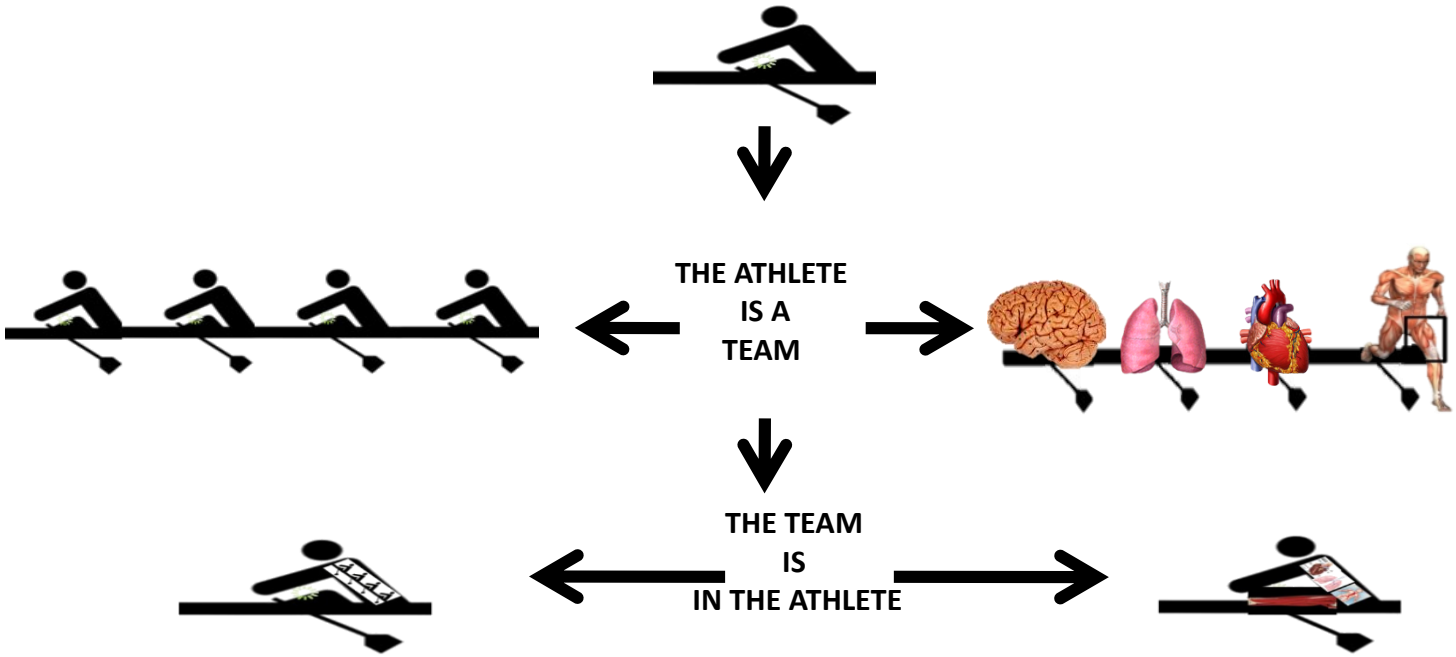
CLOSING THE GAP BETWEEN

PRACTICAL APPLICATIONS **&** **PHYSIOLOGICAL SCIENCE & LAB**





The LIMITER and COMPENSATOR idea .



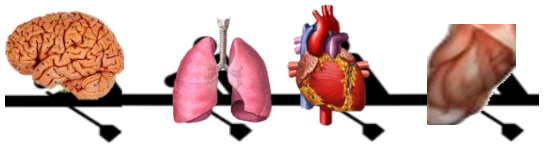
QUESTION ?
WHO IS " THE "LIMITER" ?
AND WHO IS THE "COMPENSATOR" ?

ANDRI & JUERG FELDMANN

GETTING USED TO A NEW IDEA

TRADITIONAL INFORMATION

START



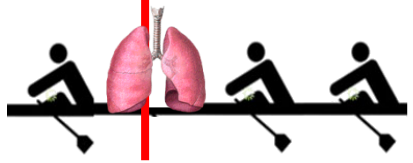
IPHAD -
INDIVIDUAL PHYSIOLOGICAL ASSESSMENT
of HOMEOSTASIS DISRUPTION

TIME - WATTAGE - DISTANCE - SPEED
PHYSICAL INFORMATION TO EXPLAIN
THE
END RESULT
FROM
THE TEAM

CARDIAC – RESPIRATORY- METABOLIC-
TISSUE OXYGENEATION
PHYSIOLOGICAL INFORMATION TO EXPLAIN
THE
END RESULT
FROM
THE TEAM

QUESTION ?
WHO WAS THE "LIMITER" ?

FINISH



ANSWER ?
RESPIRATORY SYSTEM
WAS THE "LIMITER" ?

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Hans Selye 1907 – 1982
G.A.S.
General Adaptation Syndrome

The three phases in G.A.S will give us the ultimate information we look for in any physiological assessment

Alarm Phase (Overshoot)

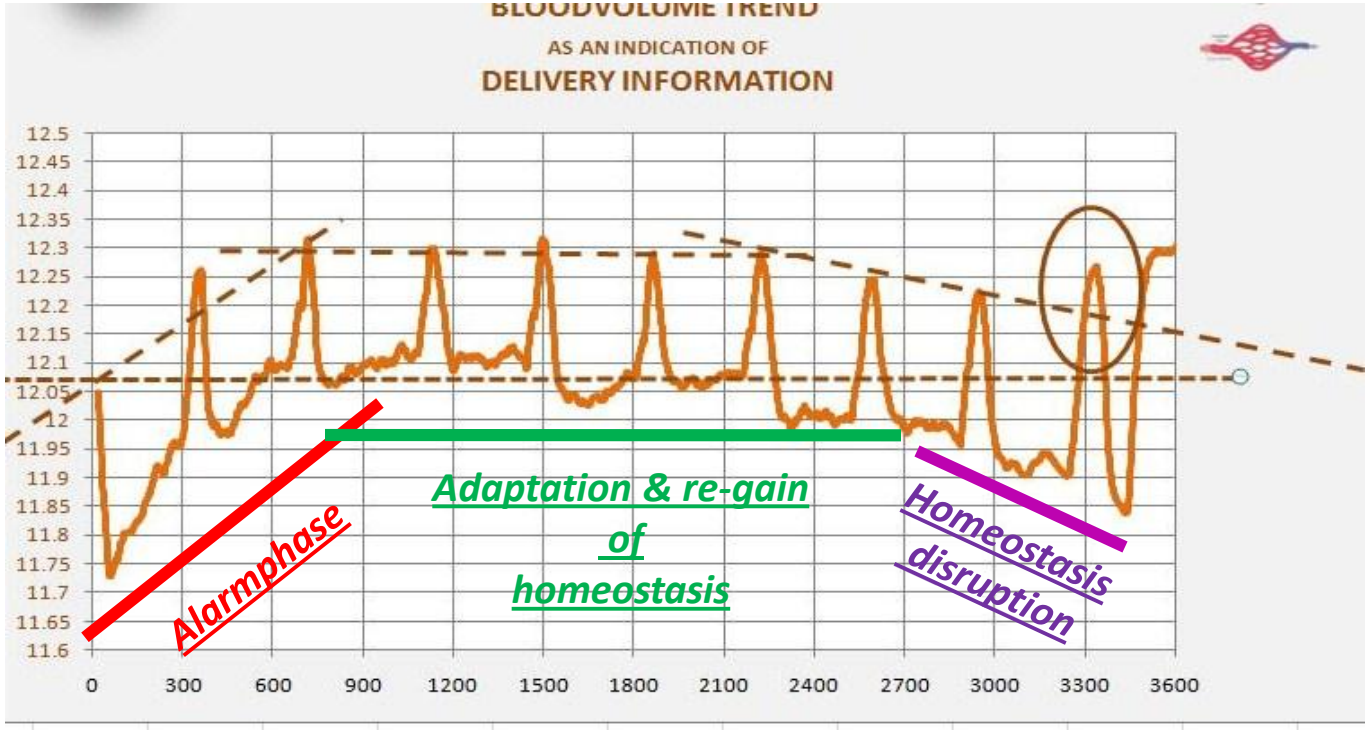
Adaptation and re-gain of homeostasis

Homeostasis disruption

G.A.S.

General Adaptation Syndrome

Hans Selye 1907–1982



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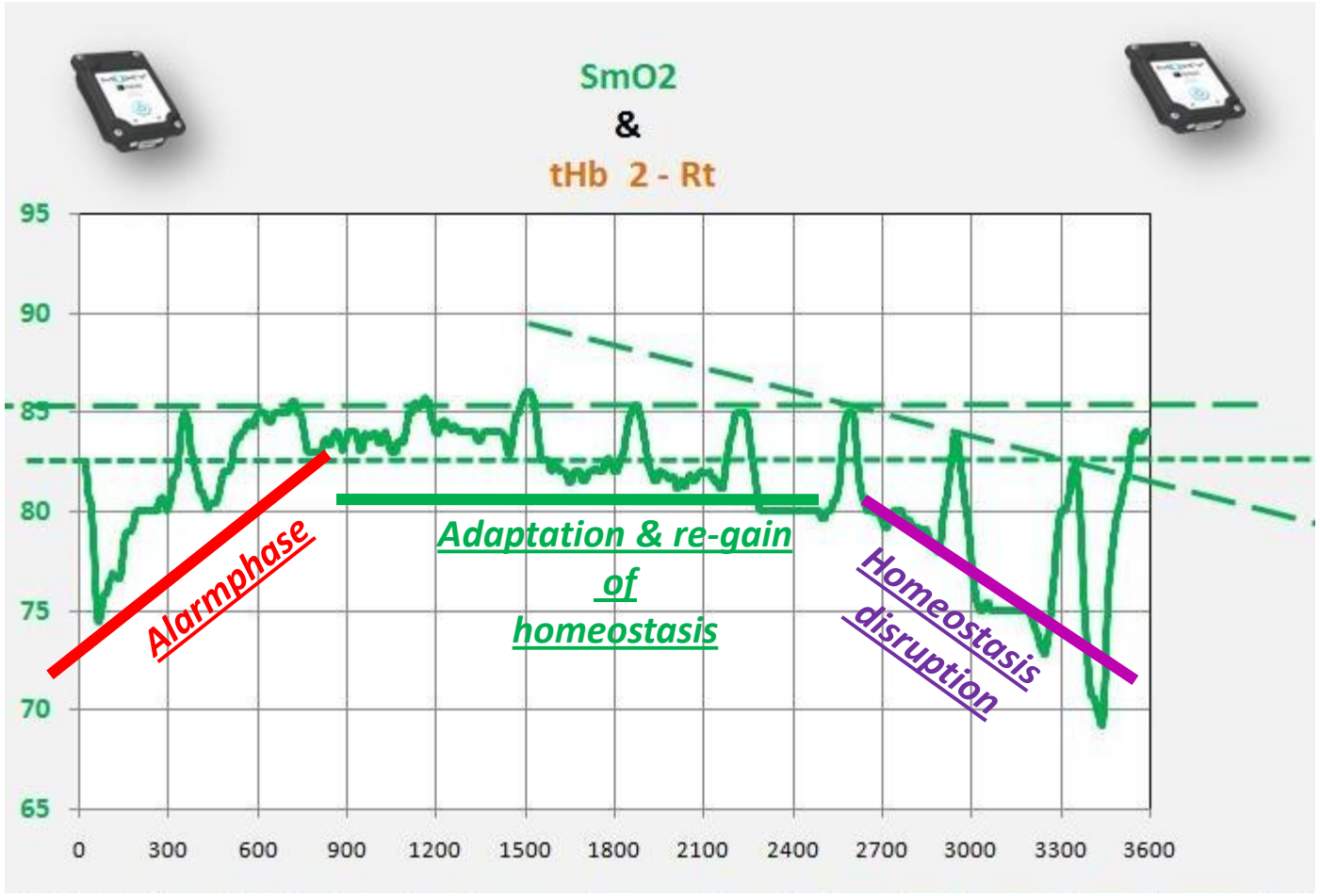
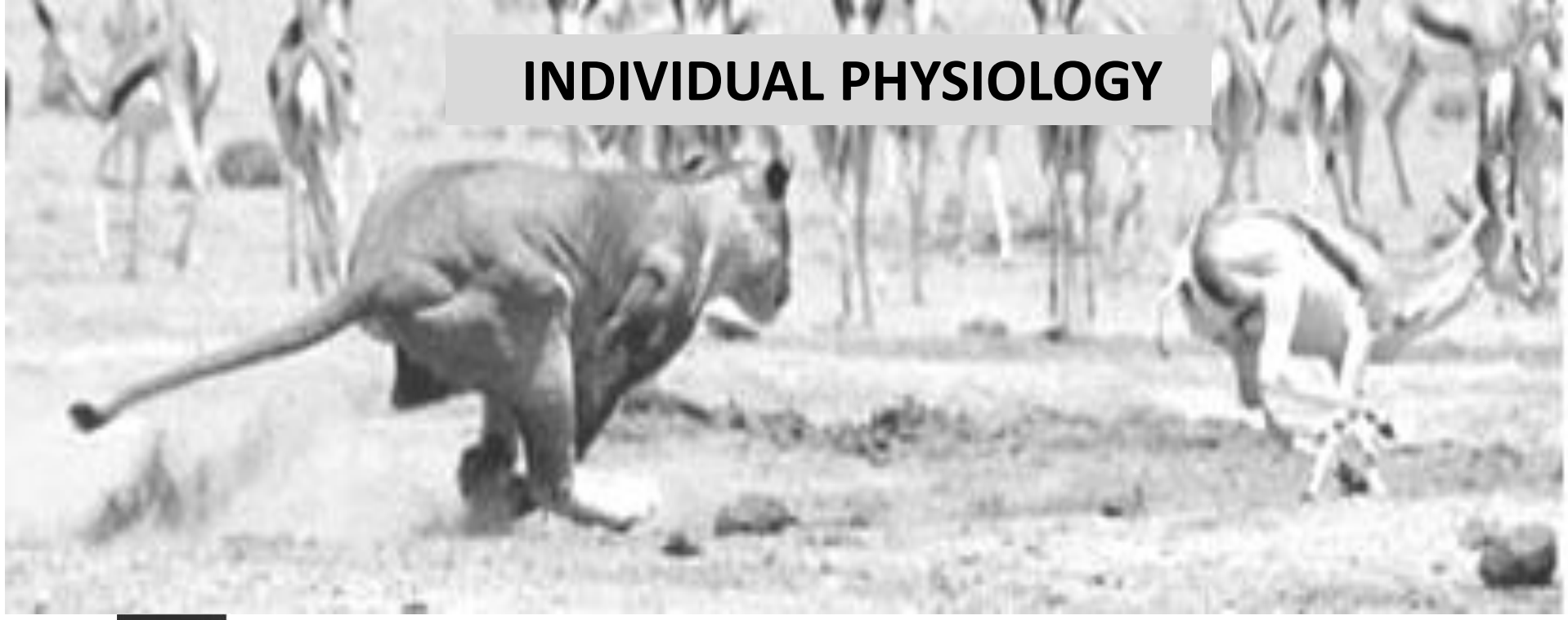
Hans Selye 1907–1982

G.A.S.

General Adaptation Syndrome



INDIVIDUAL PHYSIOLOGY



Walter Cannon
1871 – 1945
FIGHT OR FLIGHT

Symptoms of "Fight or Flight"

•Increased cardiac output (CO)

•Increased blood flow -

•Increased ventilation (VE) –

•Vasodilatation of arteries to body's periphery (arm and legs) -

Increased muscle activation

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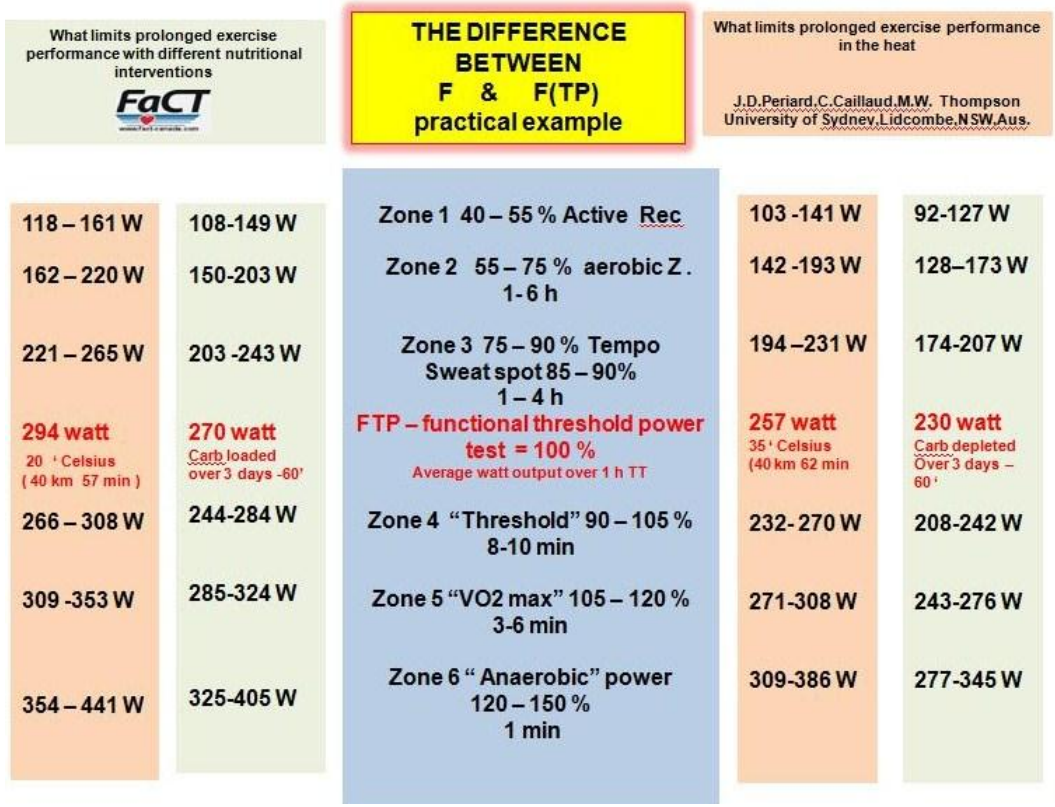
Practical example bike test 5 1 5

Here first a basic feedback fro people , who do not use a MOXY yet.
Problem: This idea of " ZONING" is NOT a future idea of physiological training and assessments.
Traditional thinking is what forces us to create a zoning despite the knowledge , that we destroy the incredible abilities direct physiological feedback equipment's actually give us. WHY would I create a zoning , knowing that at any day I am different in many physiological reactions due to heat or nutritional situation and previous training and so on.
FTP , VO2 max and lactate threshold are examples , where we use calculated zoning based on a single point information and than with a lot of fantasies we create a very un-physiological, but great looking Zoning sheet. Below a simple example , how a FTP Zoning simply does not work.



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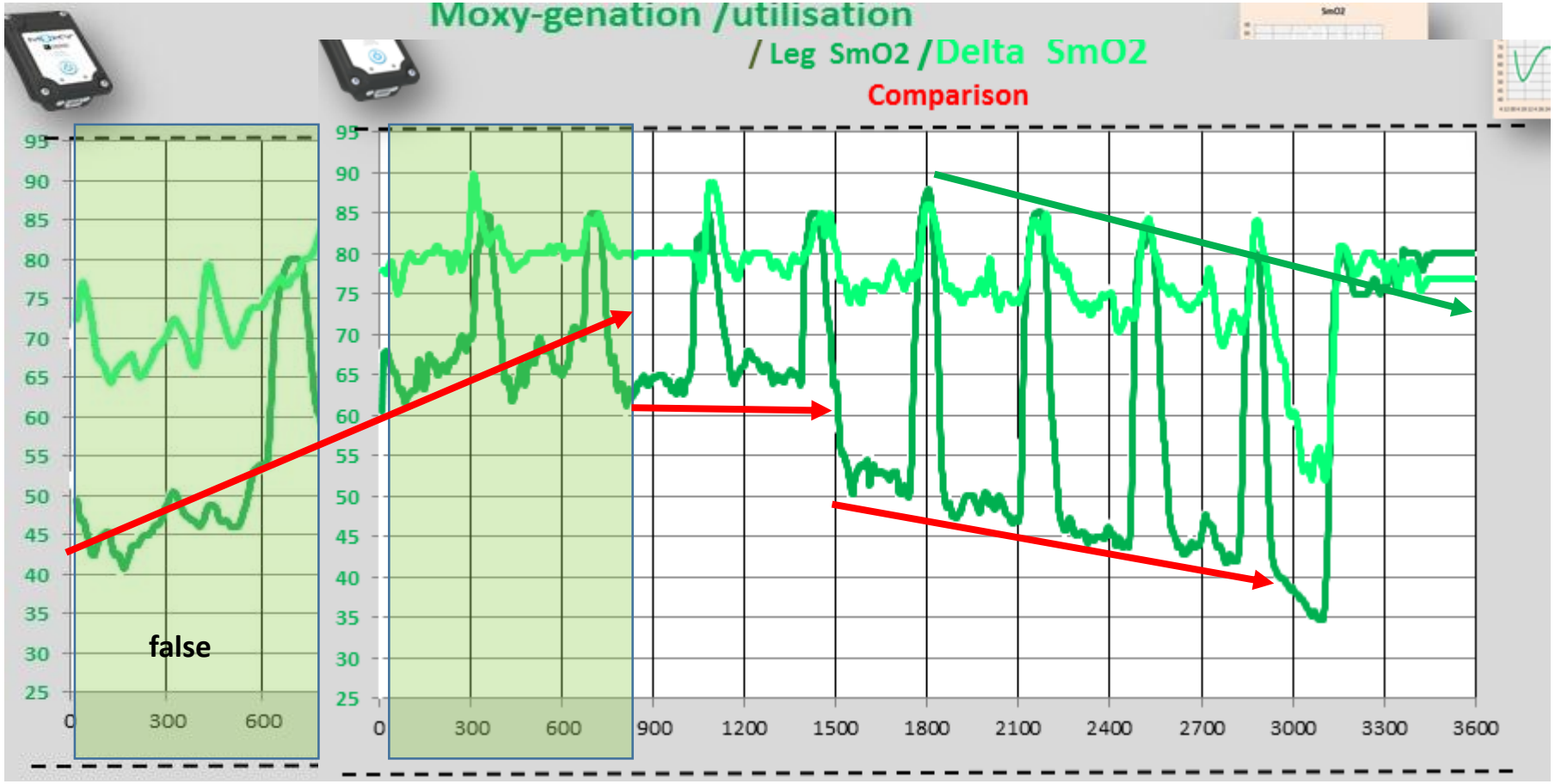
Here the “Zoning “ to please the customer or for people using just HR and or wattage for the training intensity control.

Zoning based on utilization SmO2

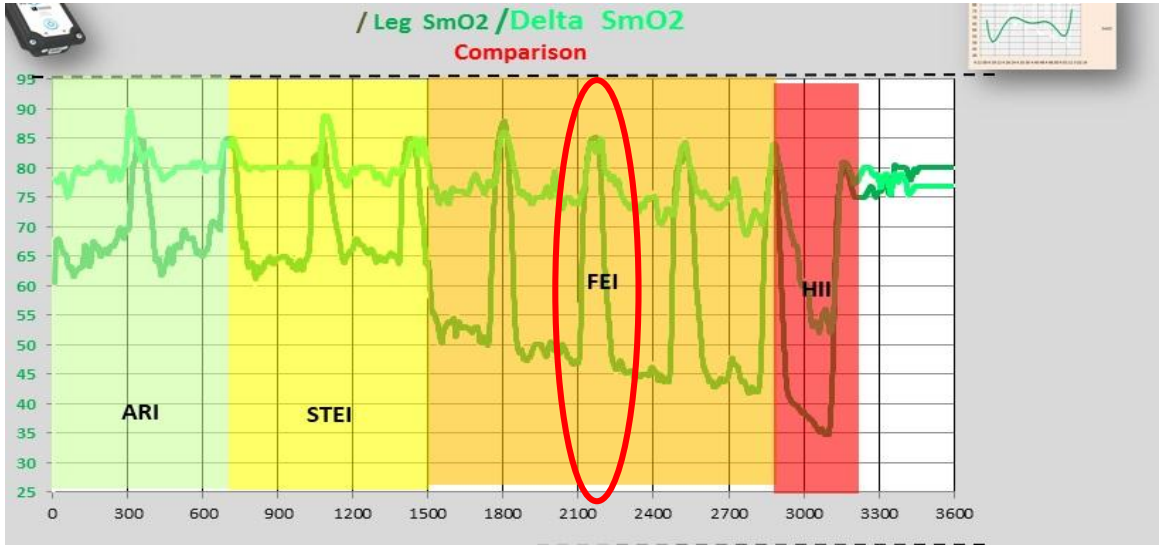
The false section is actually very important, as you can see, otherwise we miss the initial **ALARM PHASE**
Which gives us a lot of information on mitochondria density as well as capillarisation to find limiter and compensator.



Here the “Zoning “ to please the customer or for people using just HR and or wattage for the training intensity control.

Zoning based on utilization SmO2

The False section is not on this as we can see slightly the ARI increase in SmO2 and before we had the full picture.
Some times , if physiology is taken serious mistake turn out as real benefit as we have here a great example how uncontrolled warm up would change information and as such interpretations



This is the Zoning we would give when only looking at SmO2. Difference to any other current Zoning is , that we do not calculate the Zoning but look at physiological trends. Fast simple but bad idea, when we have a MOXY.

I did not looked at his wattage as it is of no physiological interest.
The interesting intensity, where he will loose homeostasis for longer period of loads is by the red circle , which you than can use to find his HR and wattage at this day on this bike in this conditions. Left of the circle the load is sustainable but only due to compensation from the systemic oxygenation. Right of the circle we still have a compensation from the systemic delivery but it can not maintain SmO2 in the working muscles. HII red shows a total disruption from both great utilization but delivers co9llapses and systemic can not compensate anymore

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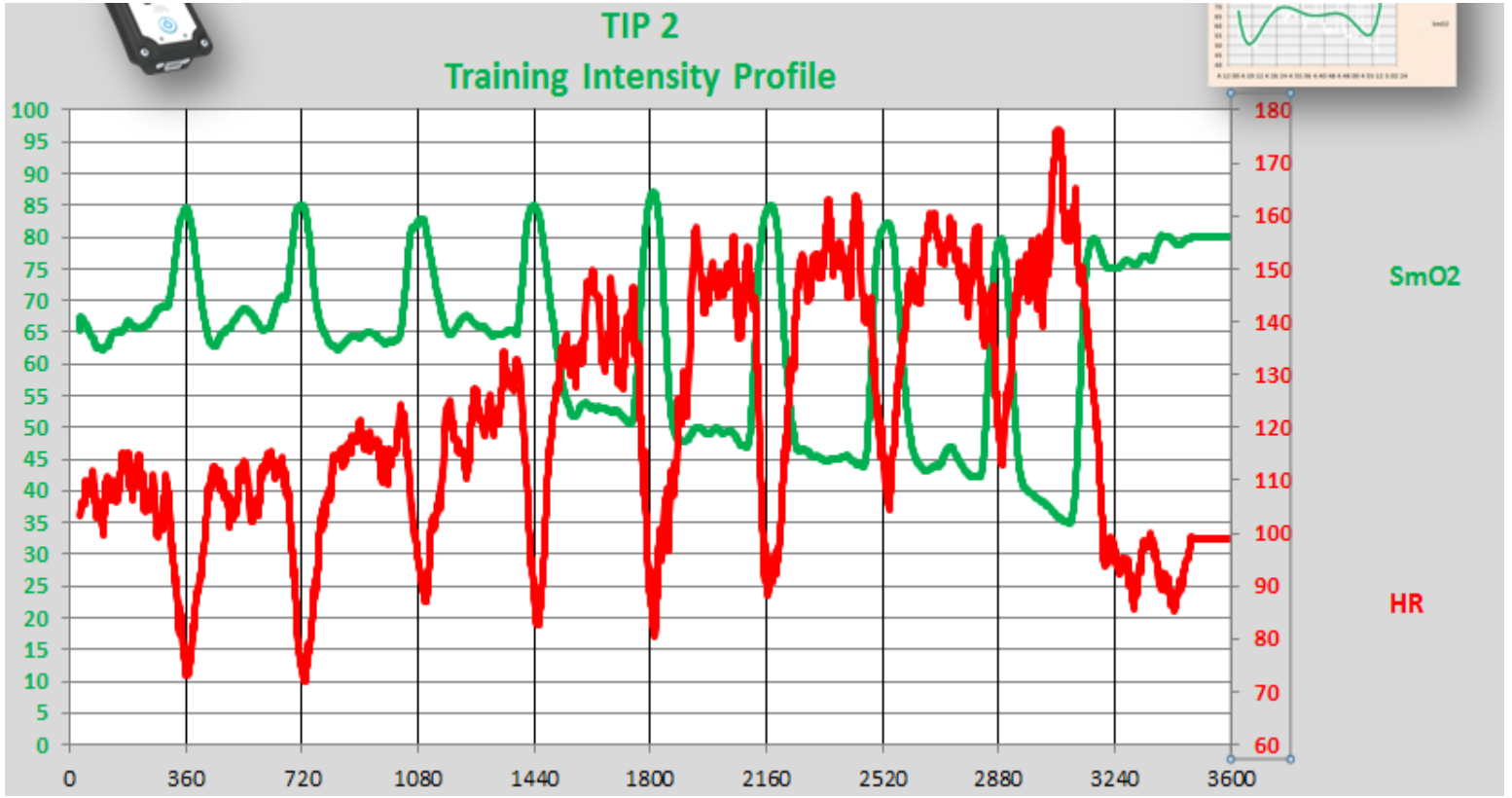
Here the HR and SmO2 trend of the leg

I have problems with the HR quality. I do not know why it is so up and down and therefor the peak in the last step is difficult to understand. It could be possible and if yes it would be an indication that SV will drop there and HR tries to compensate. I would not use the HR in this case and review the quality of the Monitor. It is a pictures we often see now with HR monitors , which are NOT HR monitors but pulse rate sensors and have problems to be used with any sport. We just tested MIO in altitude and cold temperature and we loose lots of information's



Now here the actual physiological use of NIRS MOXY

It is hard to believe, that we still after 15 years of NIRS and more than a quarter century of knowledge , that Lactate can not be used for any other info than metabolic information, the fact , that we have a lag time unknown for lactate dynamic and we abuse NIRS to be pushed in a twinkly theory just to satisfy traditional thinking. MOXY data's are so different from lactate, that we can force them together

MOXY nirs is used fro physiological assessments to fond limiter and compensator and than used for workouts to be sure we are in the physiological intensity during workouts and adjusted to the actual physiological ability on this day.
This makes calculated or fixed Zoning obsolete the MOXY is the zoning.

You find the limiter and now you can train to improve this weak link so it fits into the team

You get from MOXY 2 main feedbacks.

VO2 = CO x a-v O2 difference or in MOXY terms

VO2 = Delivery ability x Utilization ability

Delivery trend is picked up by THb and SmO2 trend

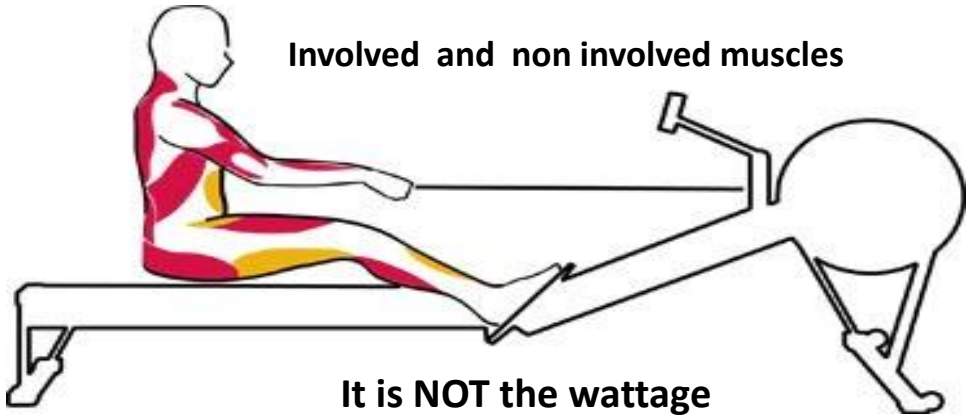
Utilization trend is picked up by SmO2 trend

The Hierarchy

of

“ ENERGY “
DEMAND &SUPPLY

Involved and non involved muscles



It is NOT the wattage

who create the physiology, it is the physiology , who creates the wattage

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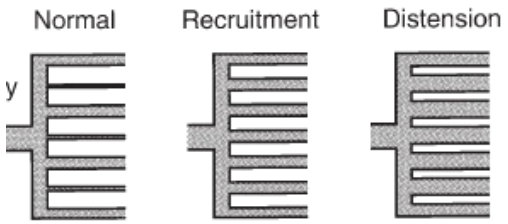
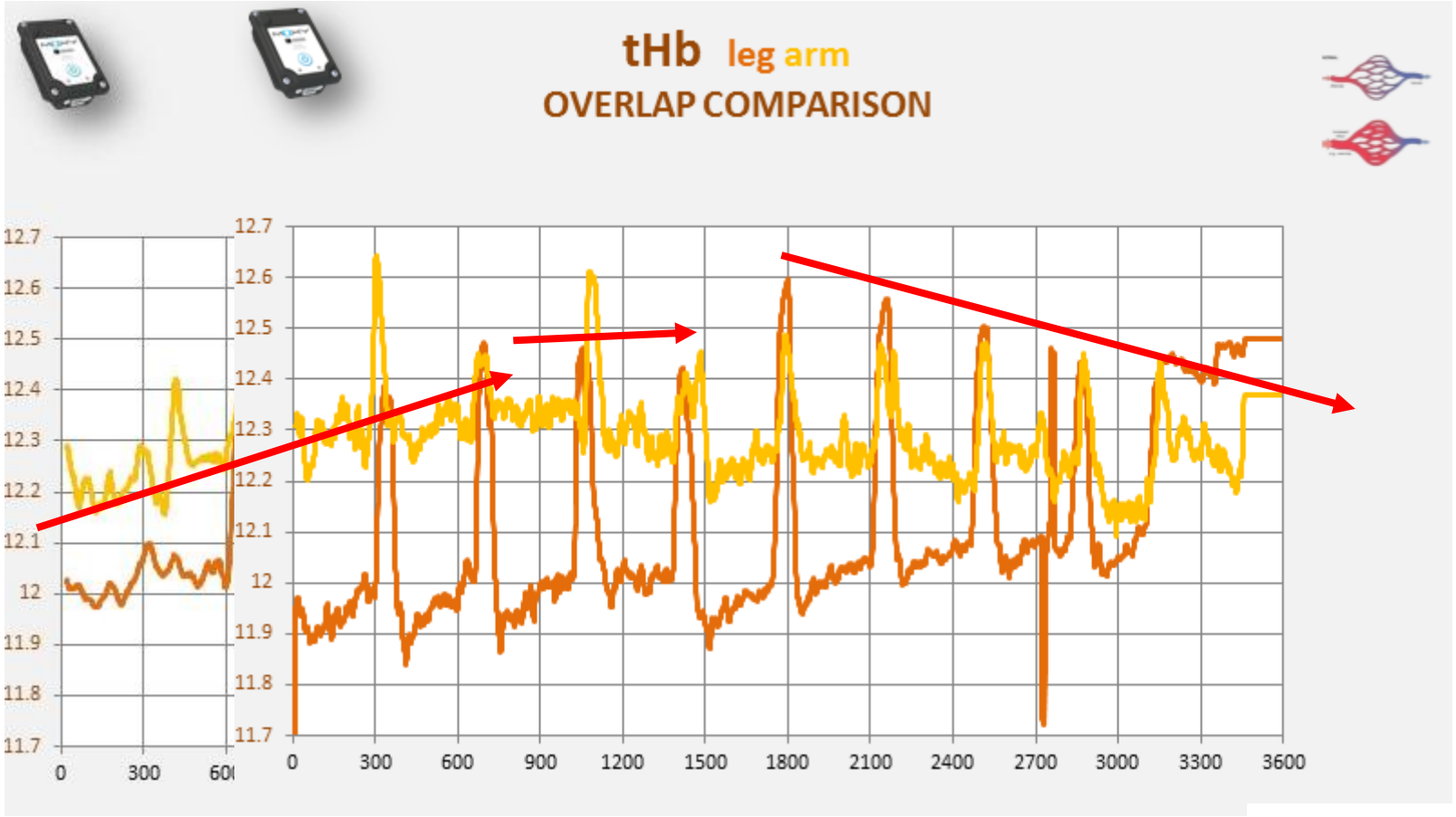
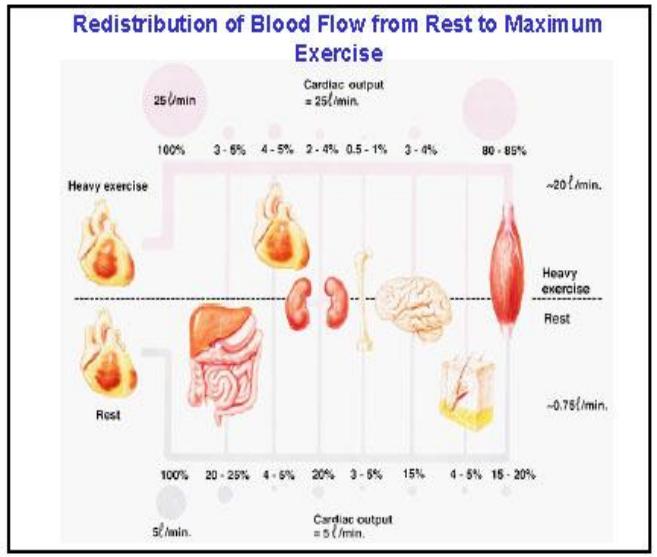
Here the THb blood flow indicator

Nice increase in Blood flow in the non involved muscle . Reason is increase in CO (HR x SV) which creates a vasodilatation including some more reactions in the blood vessels







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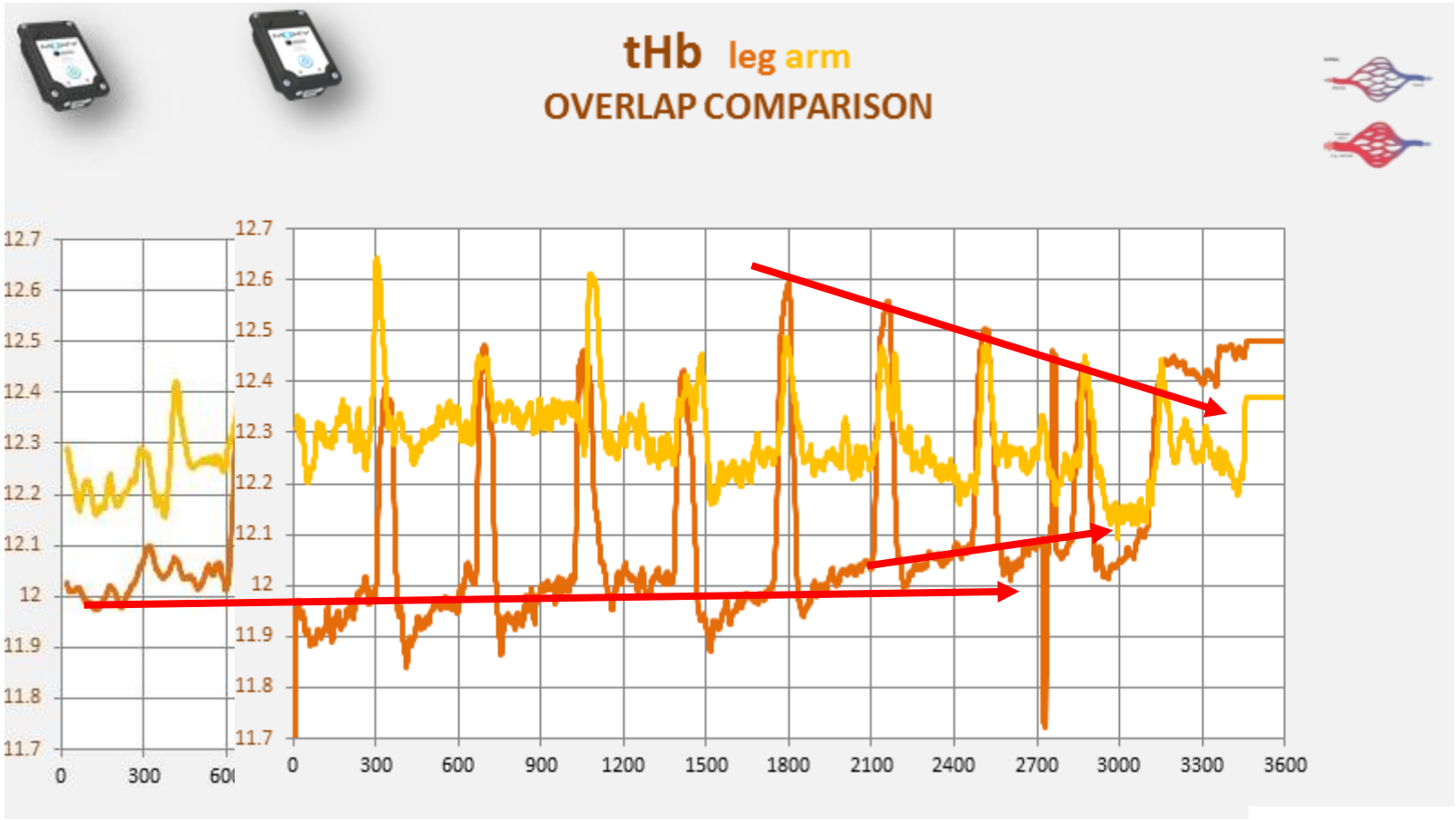
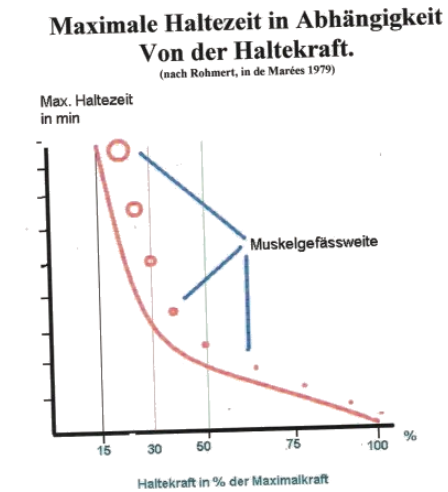
Here the THb blood flow indicator

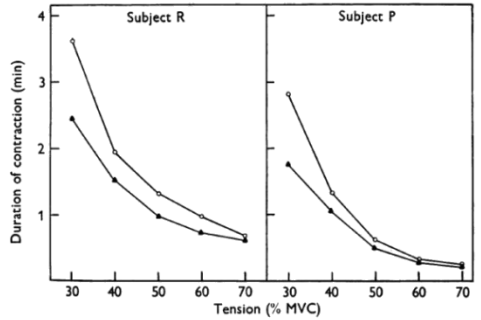
Minimal increase in involved muscles indicating 2 information's. Relative weak CO so the muscle compression overrules a vasodilatation

Again see the dropping arrow and the trend in the resting phase. Despite eliminating the muscular compression in the rest he can not load the THb back up as there is a vasoconstriction there.

2 options . Muscular overload increase SEMG and still a certain compression







'ig. 9. The durations of contractions sustained to fatigue for two subjects at ensions from 30 to 70 % of maximal voluntary contraction, with the forearm cir- ulation free (○) and artificially occluded (▲). The forearms were immersed in a

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Now if it is a SEMG higher activity we would have not a reaction in the non-involved muscle but we have. So there is a delivery limitation and the non-involved muscle starts to have a vasoconstction including a drop in SmO2 . The SmO2 is not dropping due to activity but due to reducing the O2 to a non involved muscle.

What causes the delivery problem.

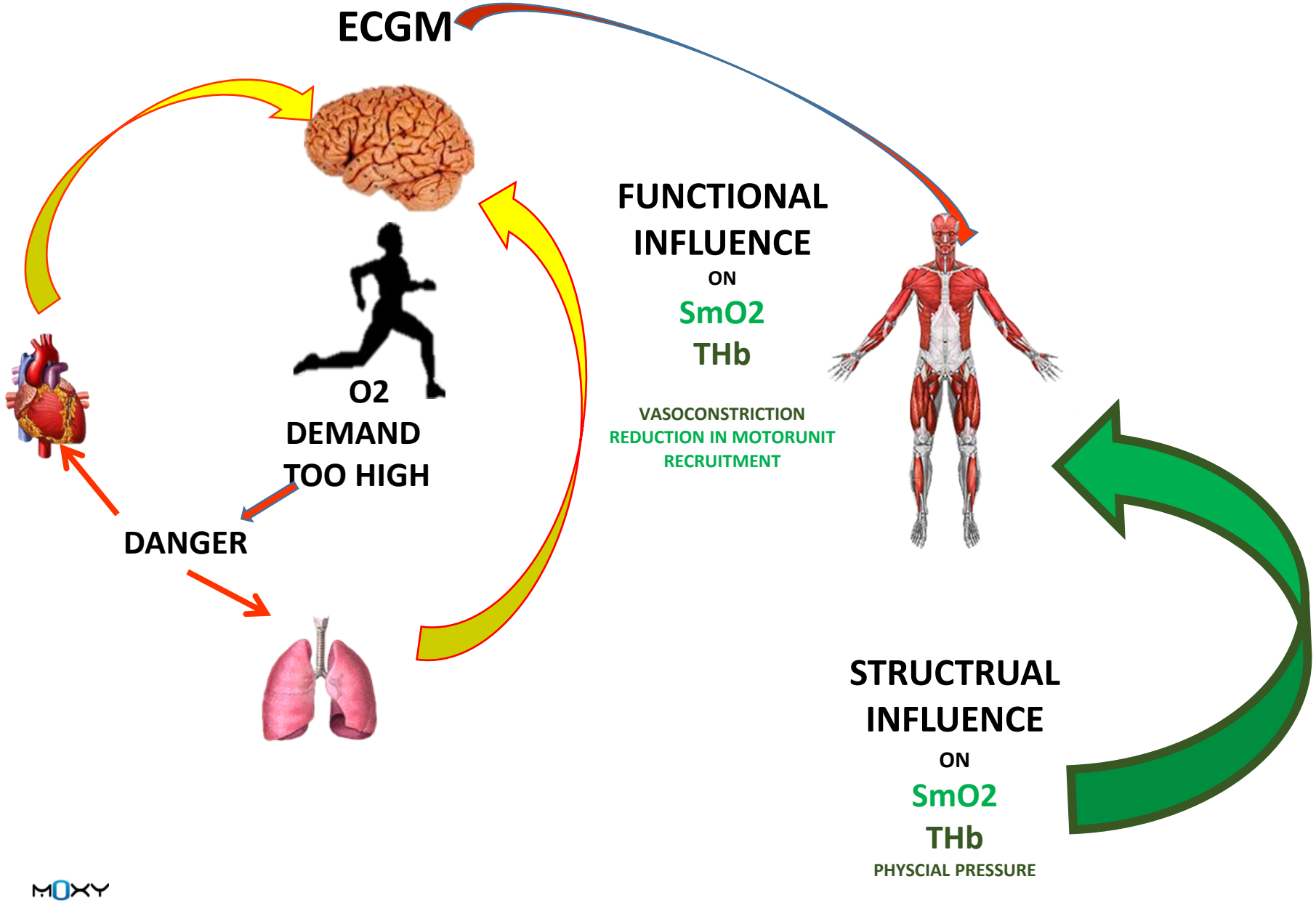
Limitation : If it would be the cardiac system we can not see it as we force the body to a specific load and he quits because he can not reduce the motor units. The peak in HR not sure but if true would be an indication of a drop in SV and an increase in HR to maintain CO.
Problem or fact . We do not see a reduction in tHb as a reduction in venous return so we unlikely have a drop in SV and the HR peak is a fluke possible form the Pulse rate or HR monitor-.

Limiter is his respiratory system and not as a respiratory muscle weak ness, but as a weakness over metaboreflex. He has a very nice vascularisation and as well a nice mitochondria density but the delivery system can not deliver enough blood and O2 to keep everybody happy so he has to reduce blood flow) vasoconstriction to the working muscle. This creates a relative early compensation form the non-involved muscles but there is a limit of this as well.

Metaborelfex reactions is : 1 Vasoconstriction in the system so he can not open in the 1 min rest.
The incredible increase in CO2 due to the energy demand will still not be balanced and the CO2 shifts the O2 disscurve to the right and he will have a problem to load O2 from lungs to blood. SpO2 would have shown this and would have dropped and be named EIAH exercise induced arterial hypoxia.

Conclusion.
A good trained athlete with a great muscular level which now creates a limitation from the delivery system mainly the respiratory system.
Next part is a limited cardiac system who has a limitation in vasodilatation CO so he would benefit from respiratory training as well as cardiac out put improvement mainly first for the left cardiac ventricle.
So his coach can now very specific work on this weaknesses and build a program around this . The " Zoning " is a help to see, in what SmO2 trend he can train Stroke volume as well as respiratory actions.

The athlete gets a simple program for limiters and basic program to bring the team together. One or two page , The coach gets a specific indication, where the training has to be improved.


ECGM
FUNCTIONAL
INFLUENCE
ON
SmO2
THb
VASOCONSTRICTION
REDUCTION IN MOTORUNIT
RECRUITMENT
O2
DEMAND
TOO HIGH
DANGER
STRUCTRUAL
INFLUENCE
ON
SmO2
THb
PHYSCIAL PRESSURE
MOXY
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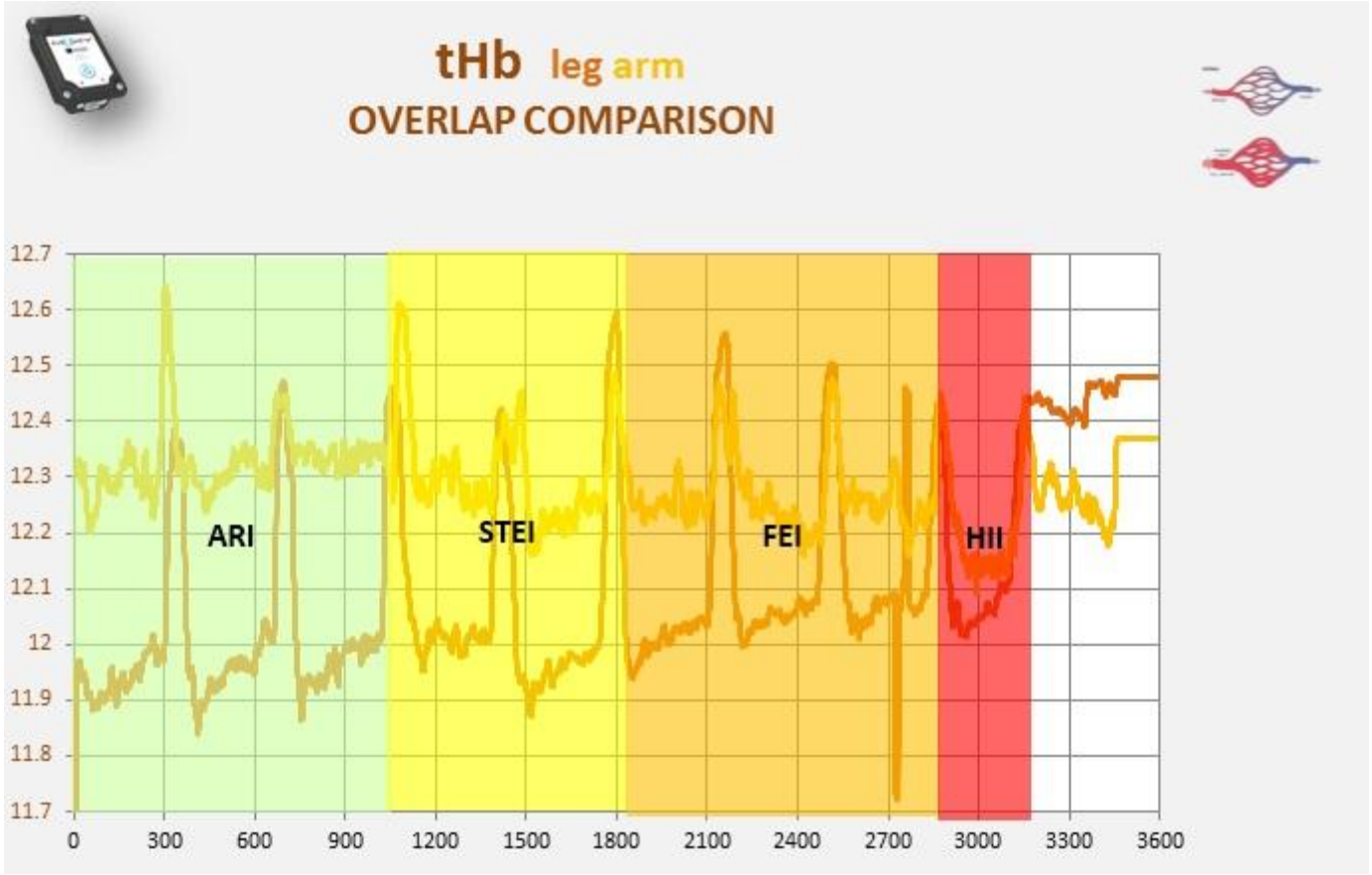
Here the "Zoning " to please the customer or for people using just HR and or wattage for the training intensity control.

Zoning based on Delivery THb



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