MOXY MONITOR

Théorie & Pratique

Sean Seale, Préparateur Physique


2006


2011


2013
ELEIKO
105.0


2018


2019

2021


PUMA
2024


BikeErg:
5 Ways to
Improve Yo
Conditioni
for CrossF
cross equip
cross equip
built to max your limits

2025

Programme

13h00-14h15

Théorie 1: Filières Énergétiques,
Spectre d'Intensité & Moxy Monitor

14h15-15h30

Pratique 1: Évaluation de Terrain
Avec le Moxy Monitor

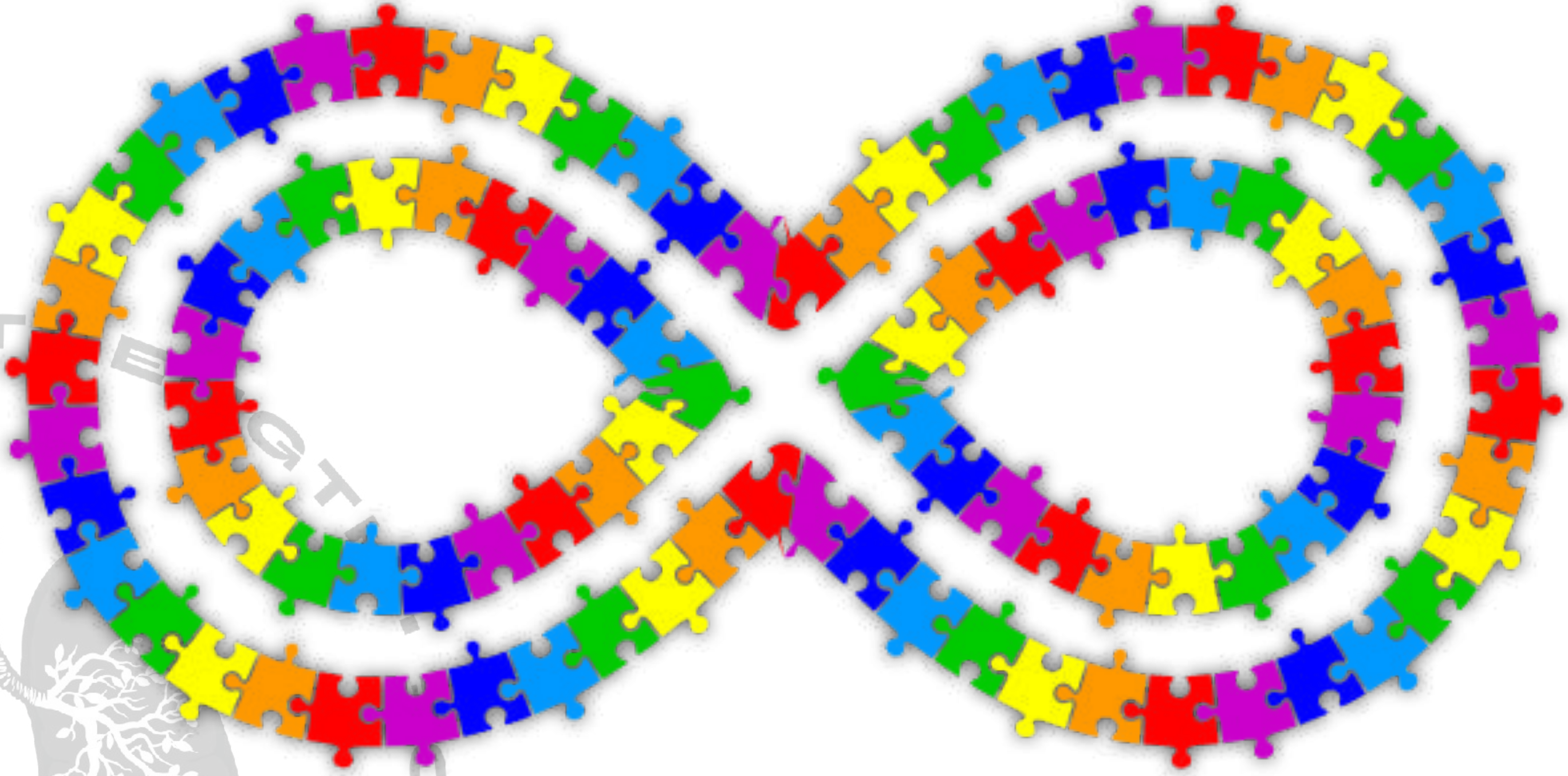
15h30-16h30

Théorie 2: Interprétation & Cas d'Études

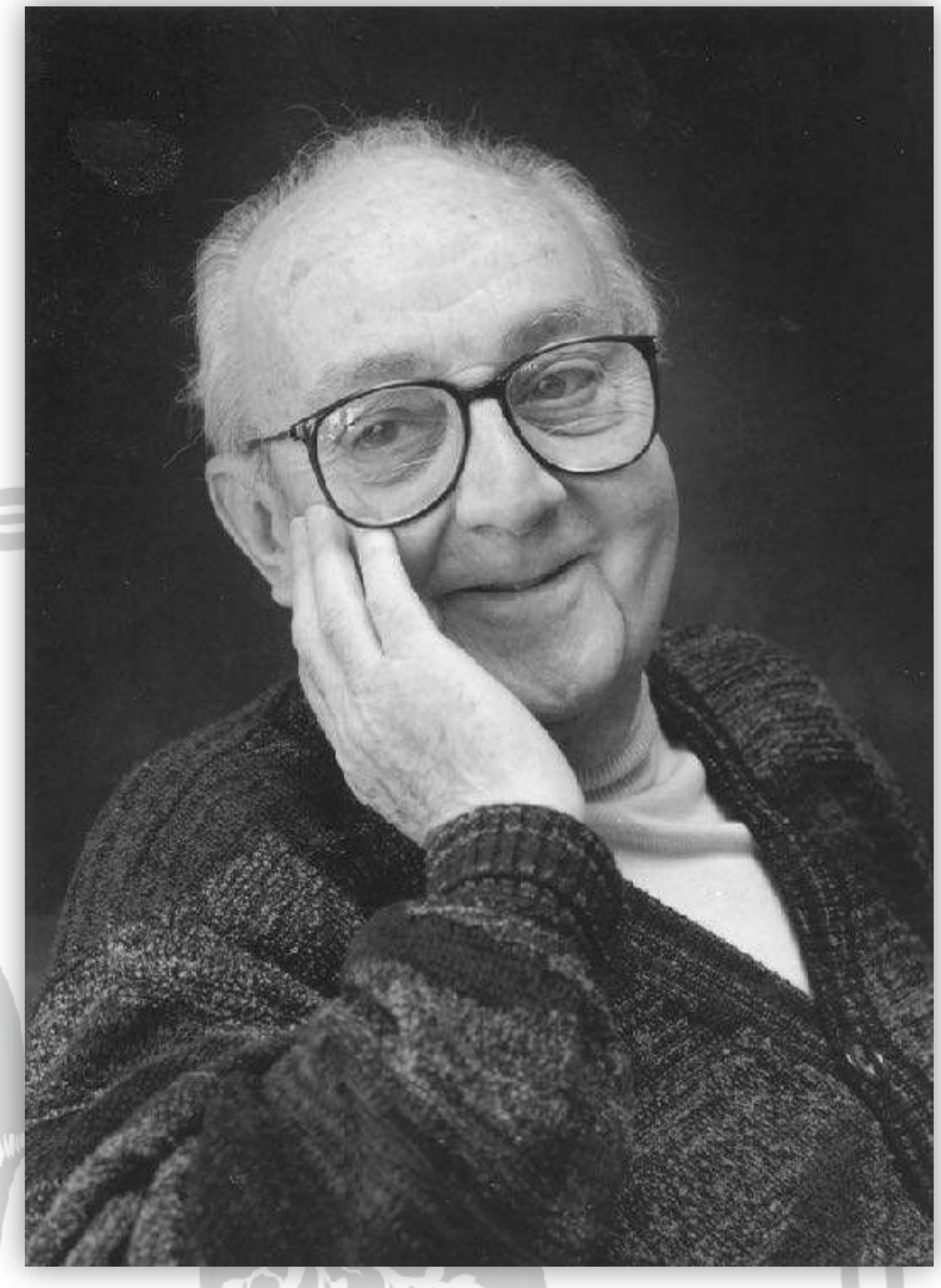
16h30-17h00

Discussion & Questions


FACE
REALITY
AS IT IS



George Box (1919 – 2013)



“Tous les modèles sont faux mais certains sont utiles”

THÉORIE 1

Les Filières Énergétiques

Le Spectre d'Intensité

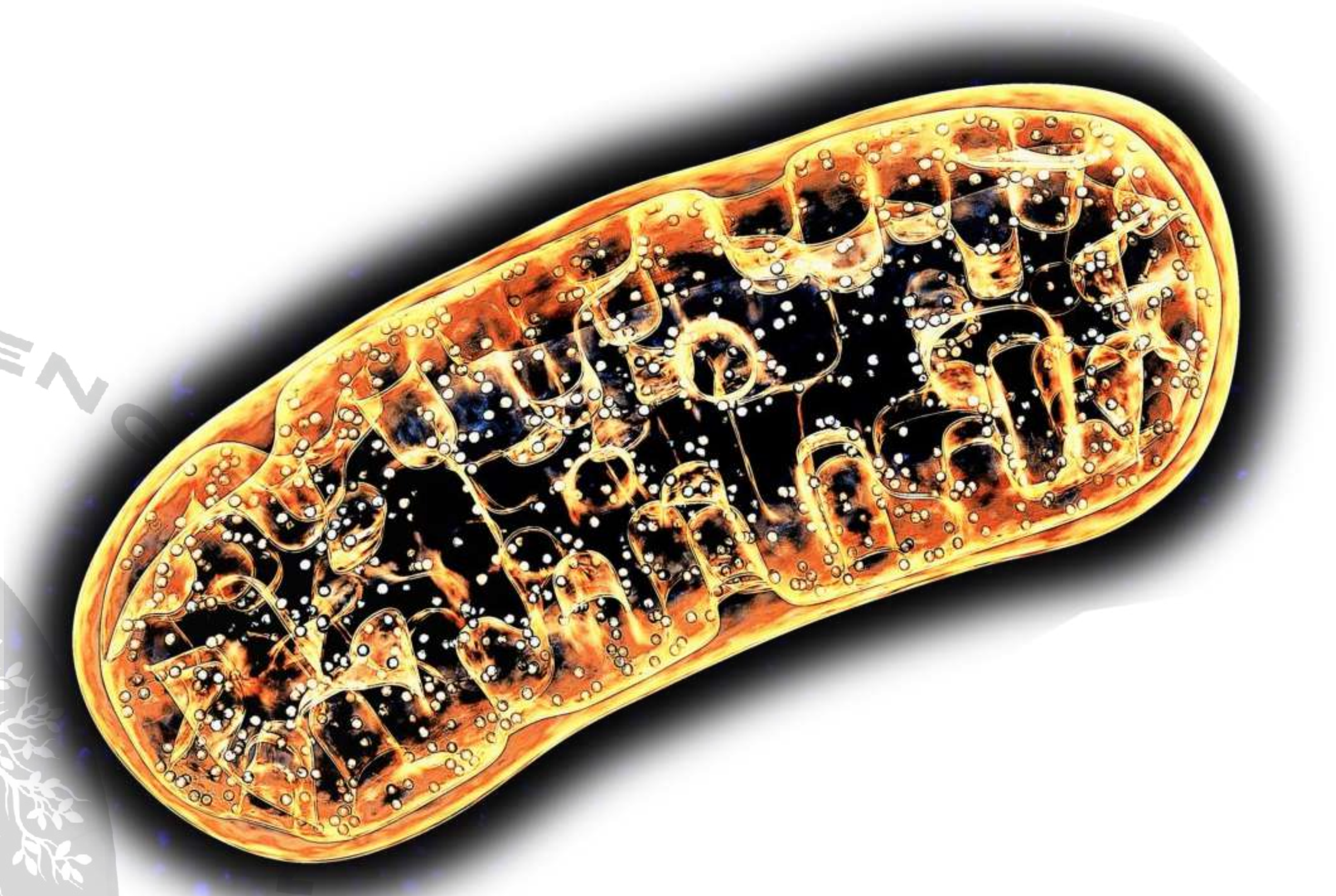
Moxy Monitor (NIRS)

Les Filières Énergétiques

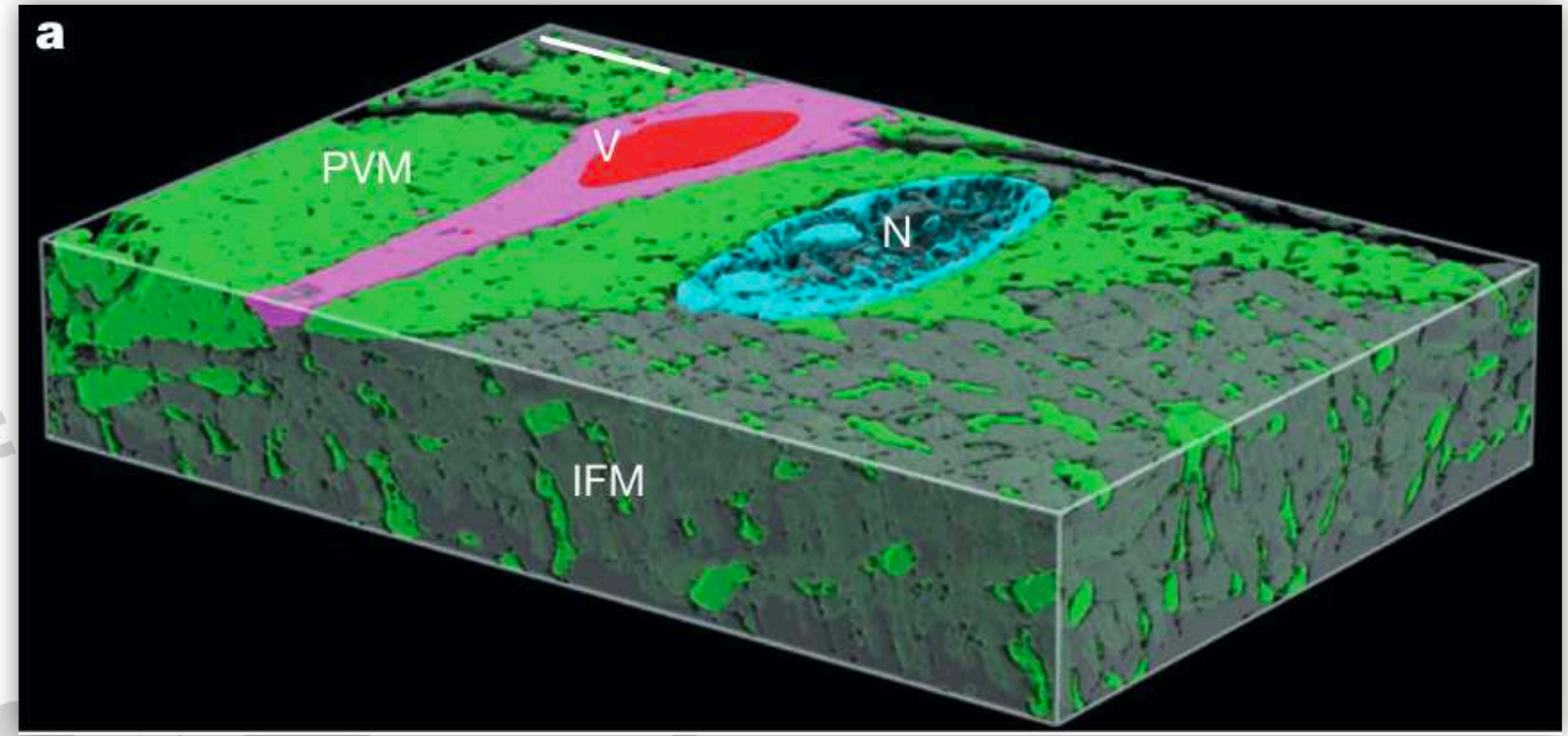
Les Filières Énergétiques


LES FILIÈRES ÉNERGÉTIQUES
38
SEAN
imgflip.com

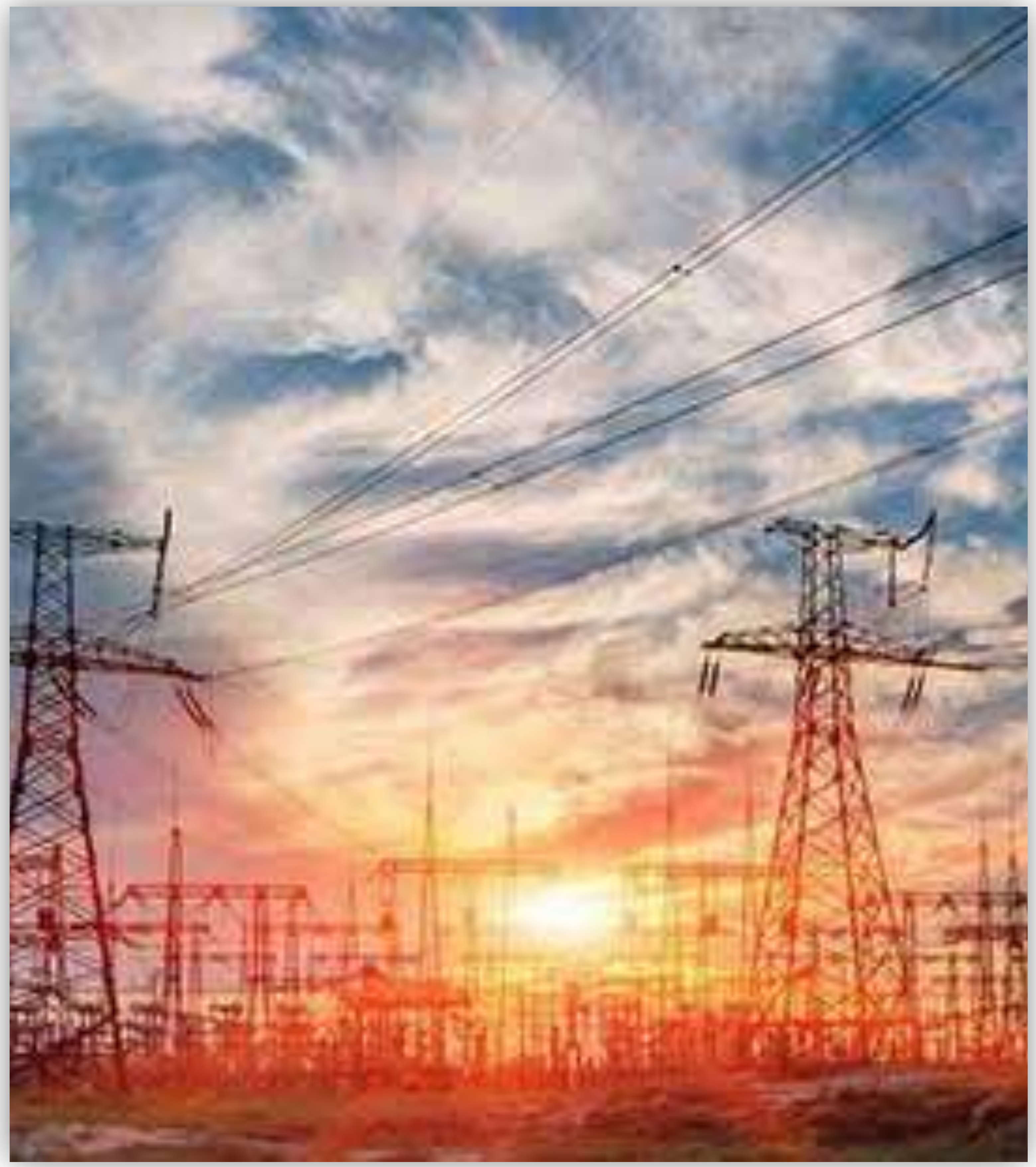
La Mitochondrie

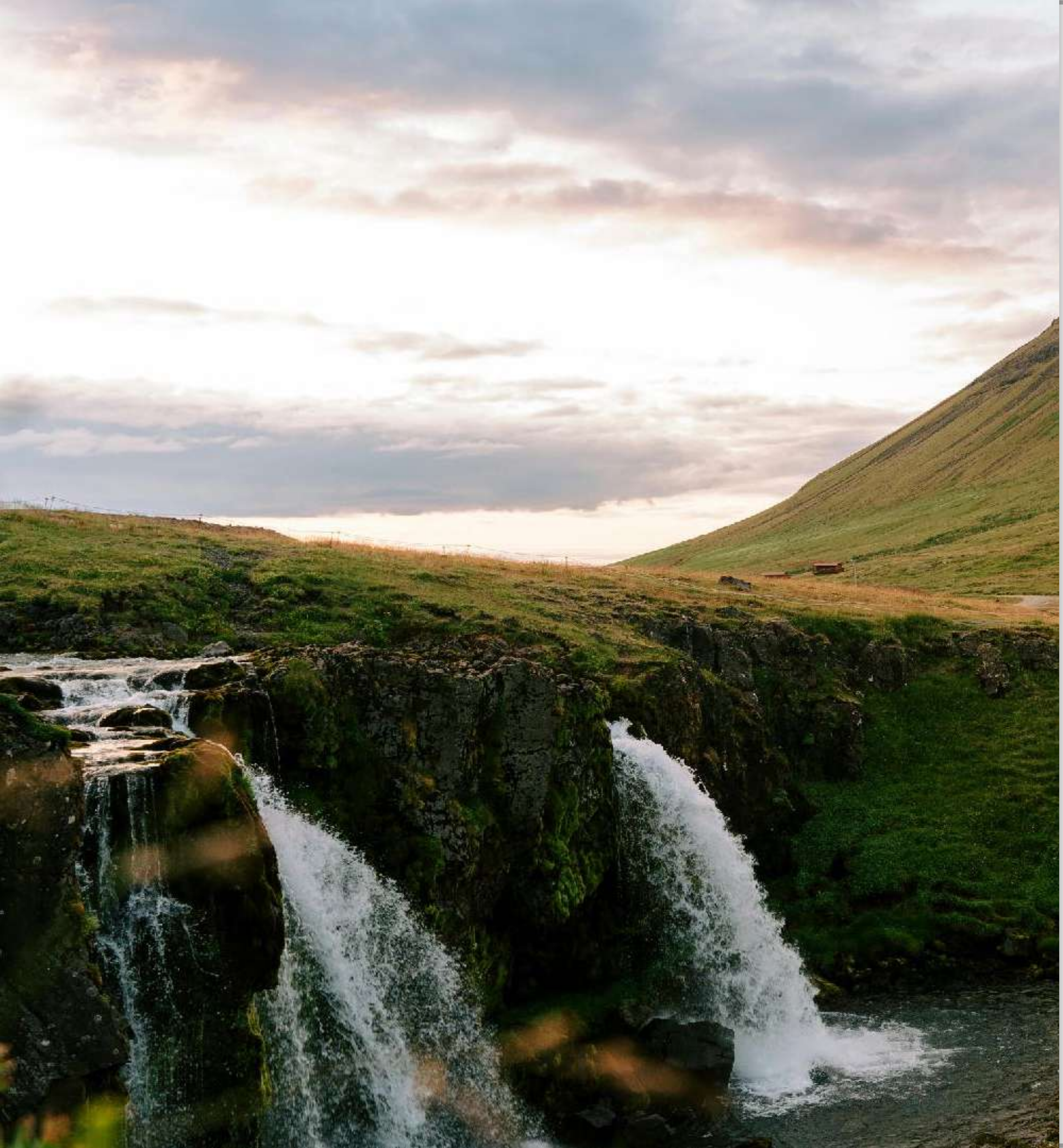


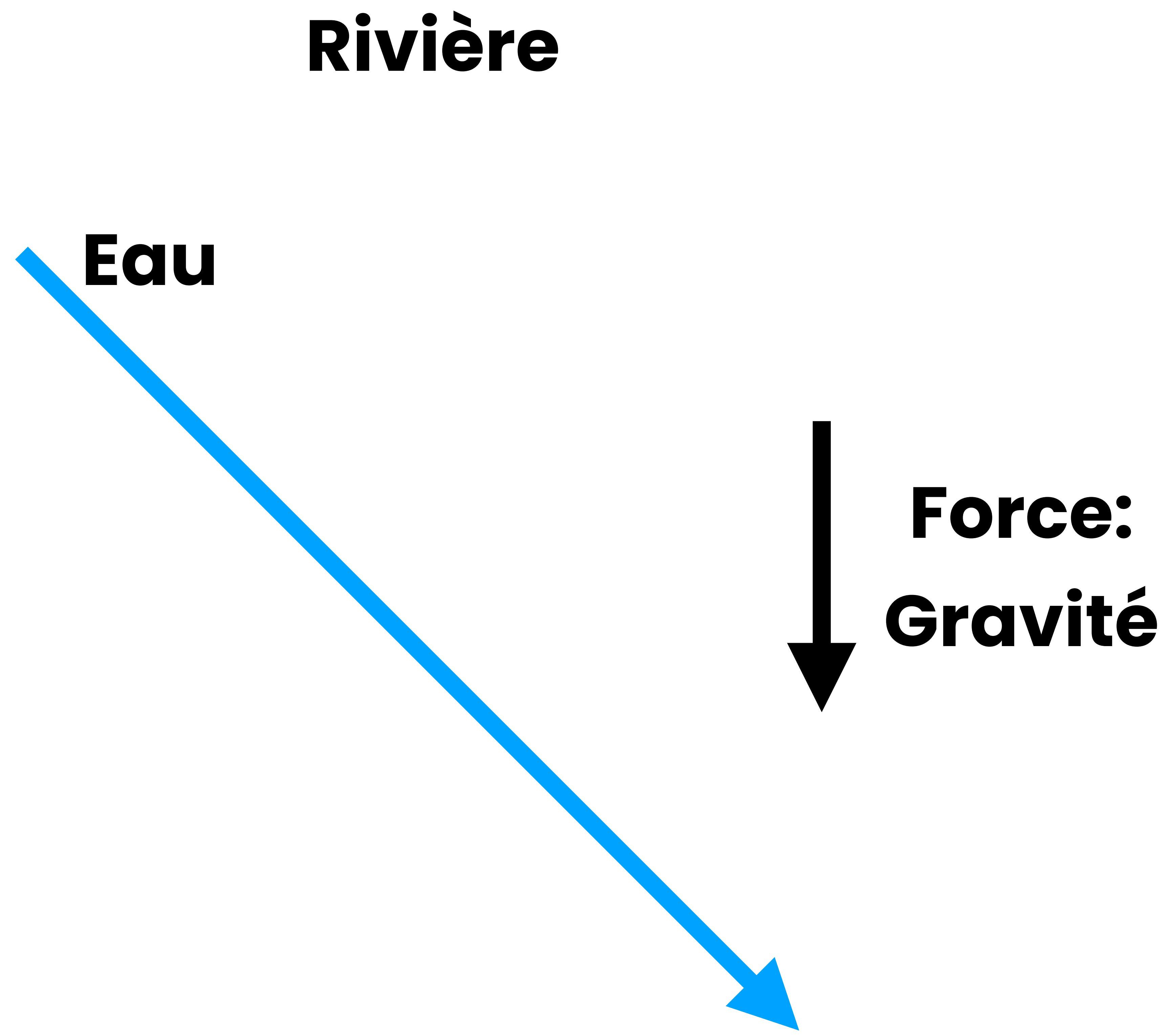
Le Reticulum Mitochondrial



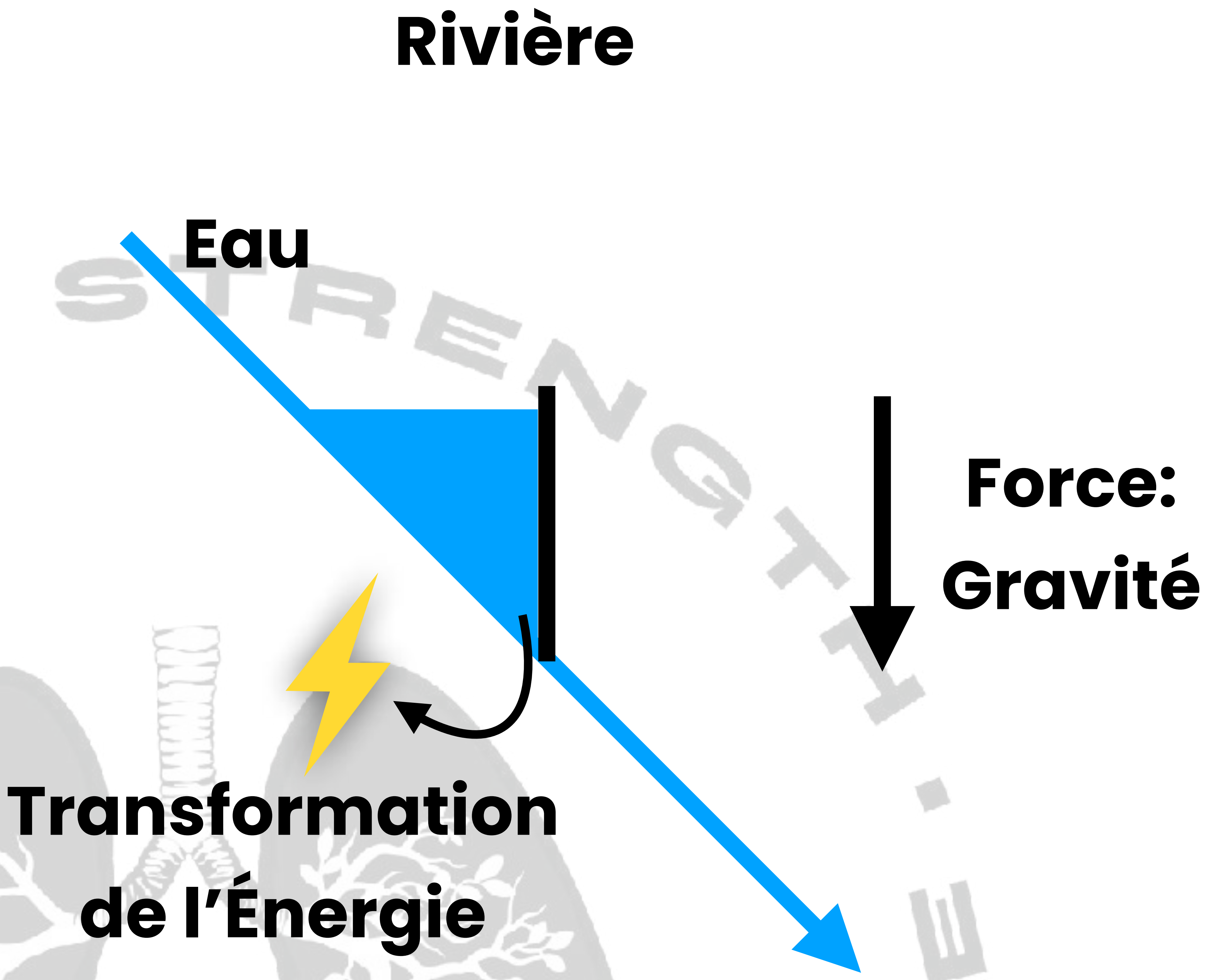
Glancy & al. (2015)

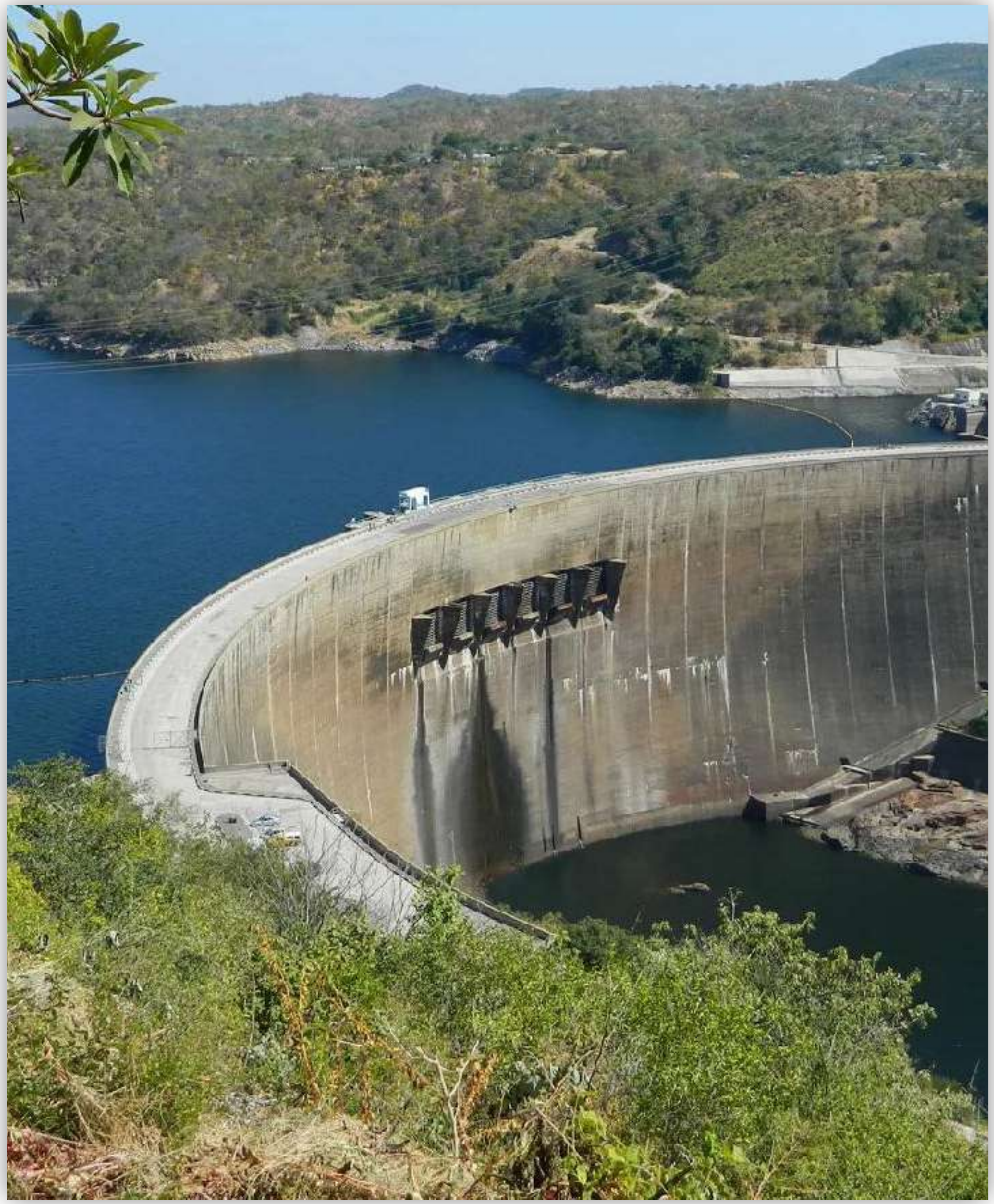




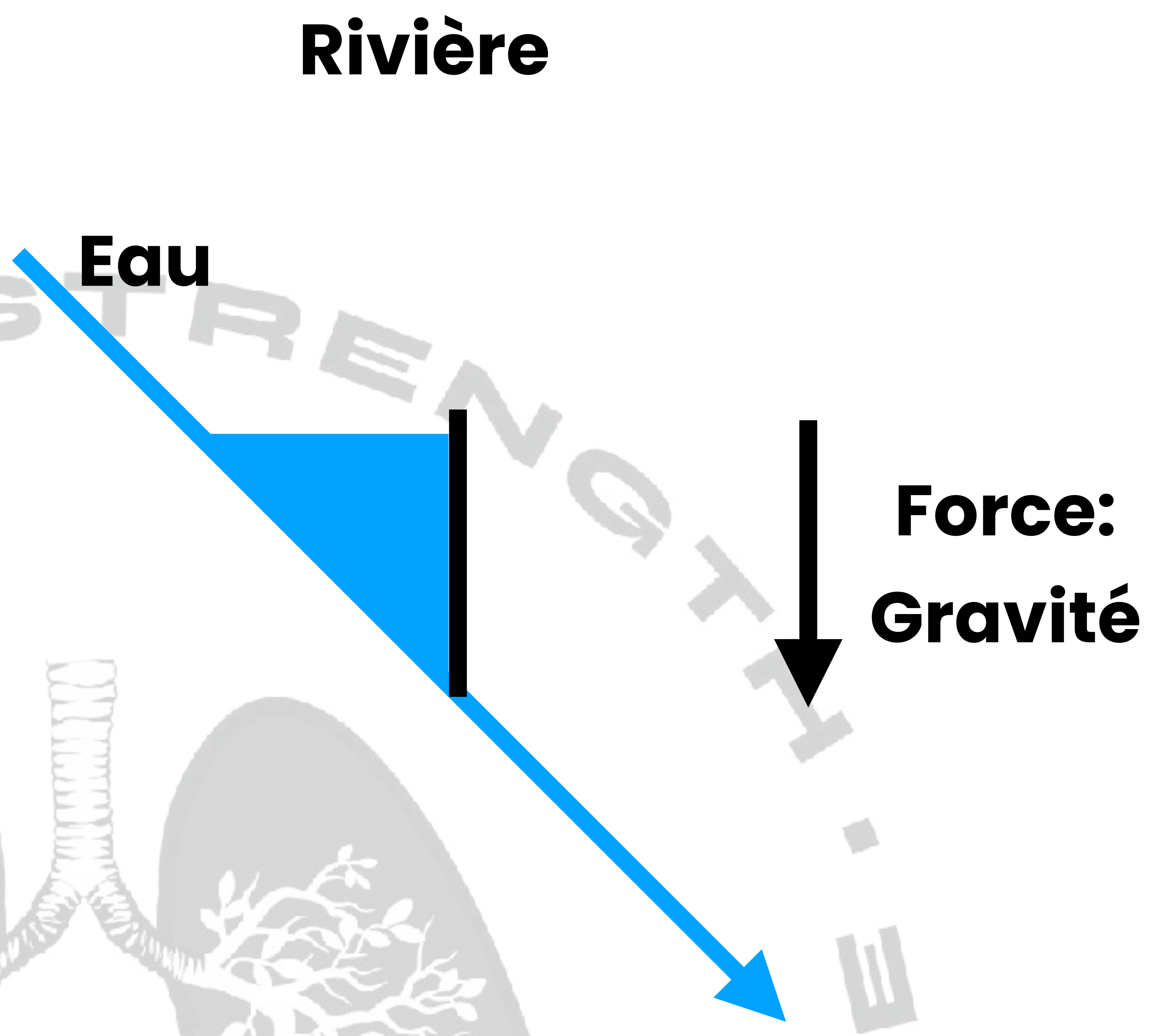

Rivière
Eau
Force:
Gravité

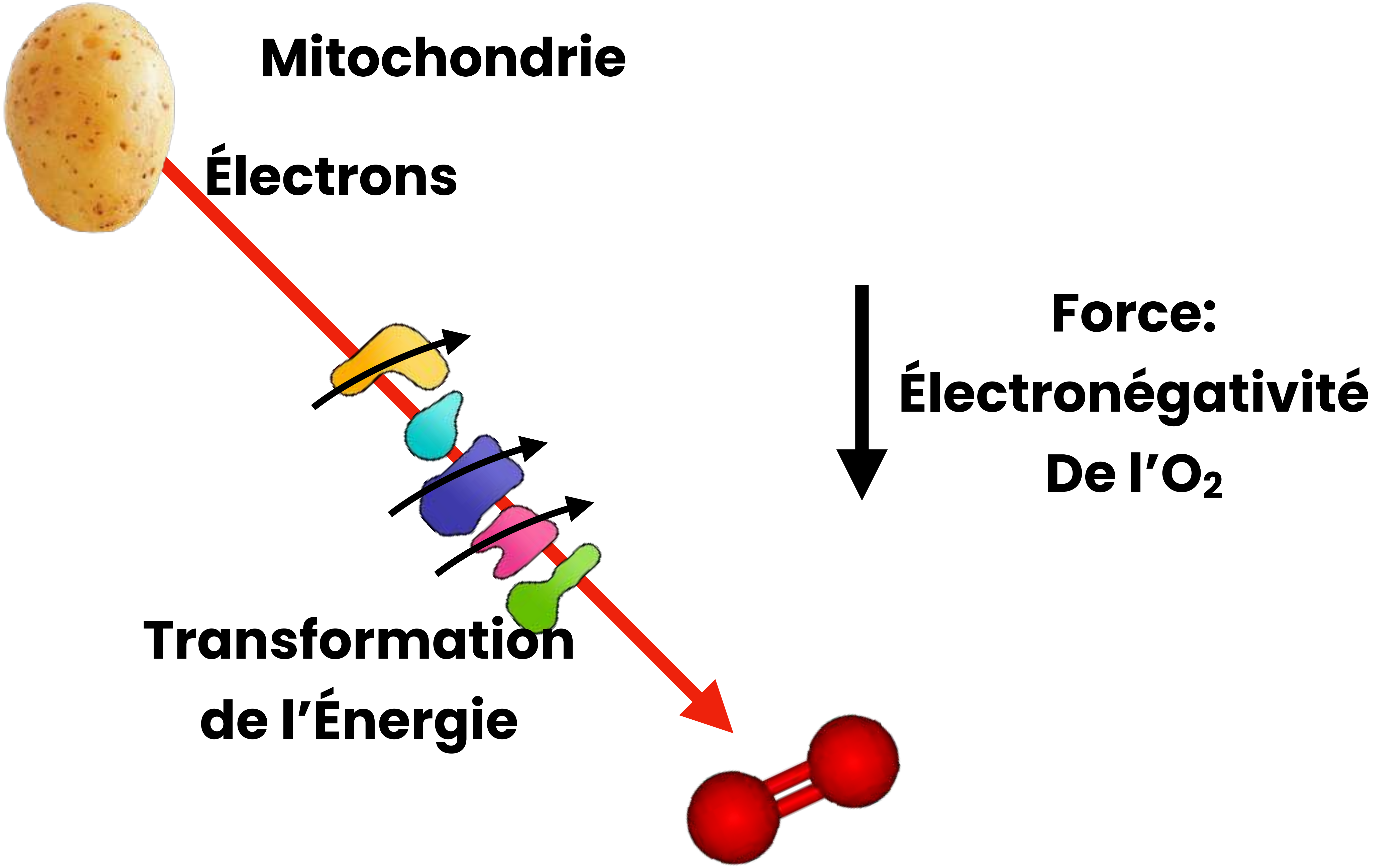
Mitochondries: Fonctionnement



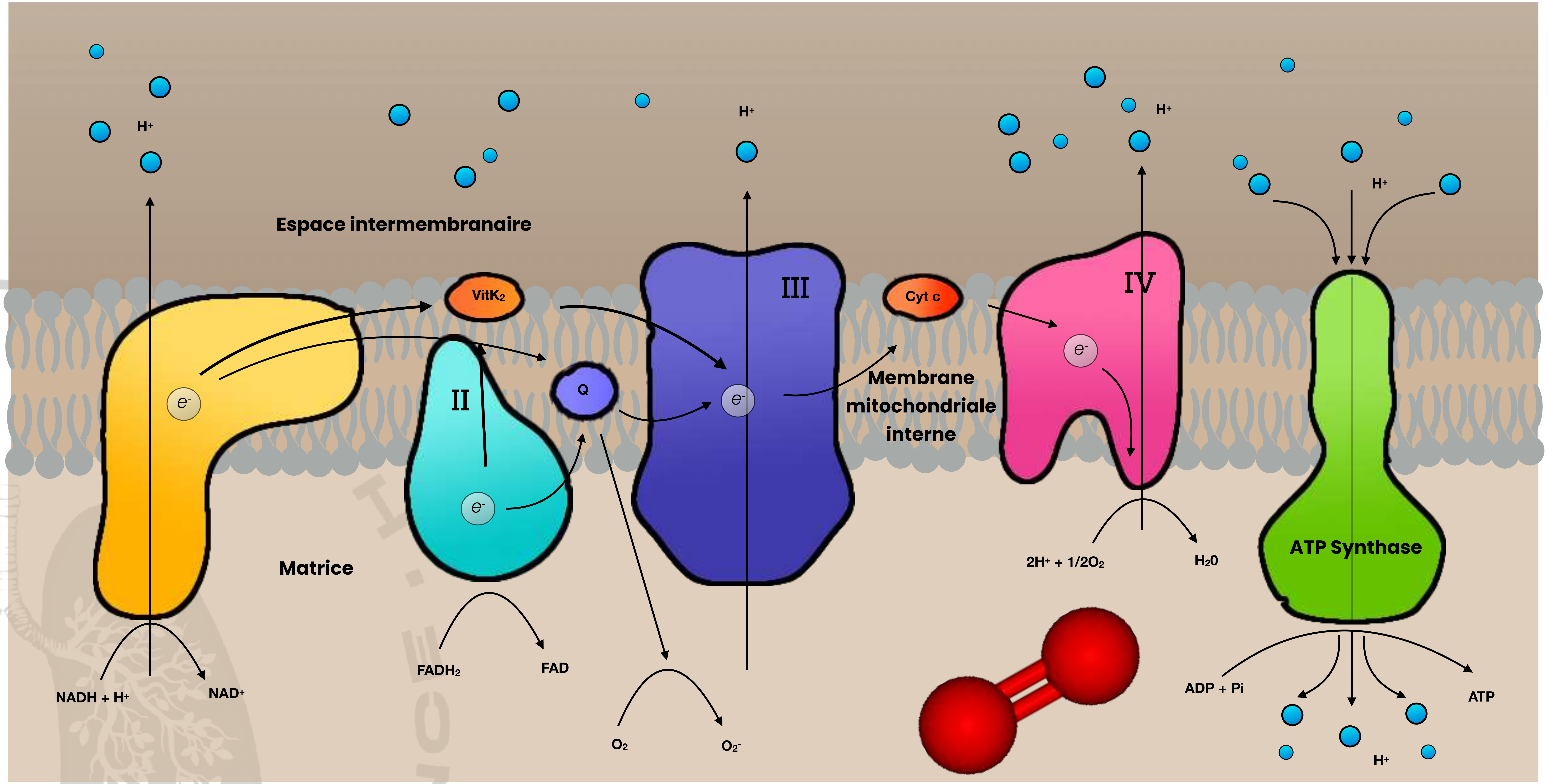


Mitochondries: Fonctionnement





Système de Transport des Électrons



Les Filières Énergétiques

PCr & Oxygène

Role of the phosphocreatine system on energetic homeostasis in skeletal and cardiac muscles

Lucas Guimarães-Ferreira [1]

Phosphocreatine is known as its quickest form of regeneration, by means of the enzyme creatine kinase. Thus, the primary function of this system is to act as a temporal energy buffer.

In 1970, Gudbjarnason et al. noted that in skeletal muscle submitted to ischemia, contractile activity was interrupted when PCr was depleted, despite the levels of ATP being reduced by only about 20%.(4)

Les contractions musculaires sont interrompues quand la concentration de phosphocreatine est diminuée

PCr & Oxygène

Resynthesis of creatine phosphate in human muscle after exercise in relation to intramuscular pH and availability of oxygen

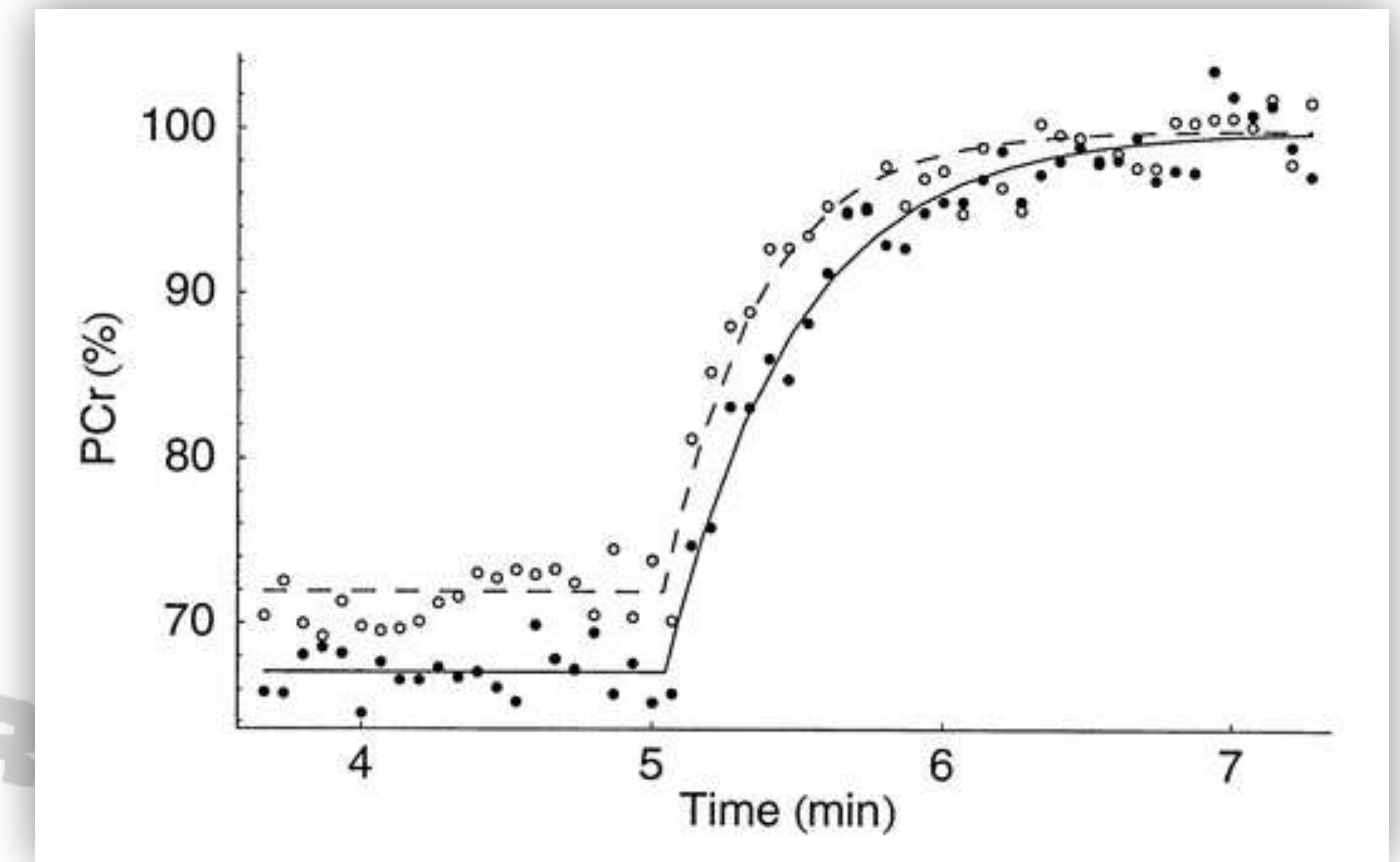
K Sahlin, R C Harris, E Hultman

After exhaustive exercise the muscular store of creatine phosphate (CP) is almost completely depleted. The resynthesis of CP during recovery normally occurs rapidly, but is totally inhibited if the local circulation to the muscle is occluded.

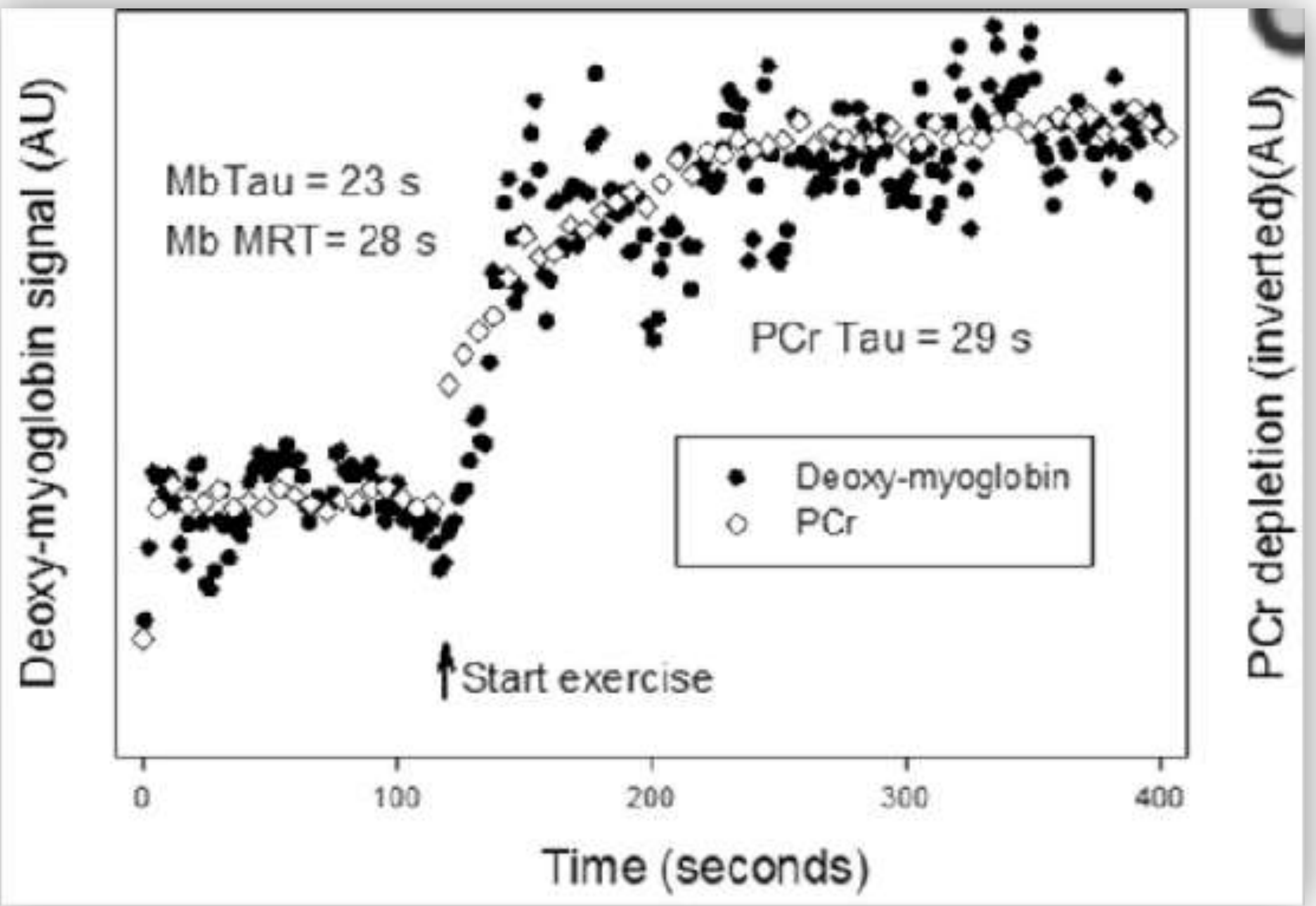
It is suggested that the initial fast phase of CP resynthesis is limited by the availability of oxygen whereas the subsequent slow phase is limited by the hydrogen ion transport out from the muscle.

La resynthèse de la phosphocreatine dépend de l'oxygène disponible

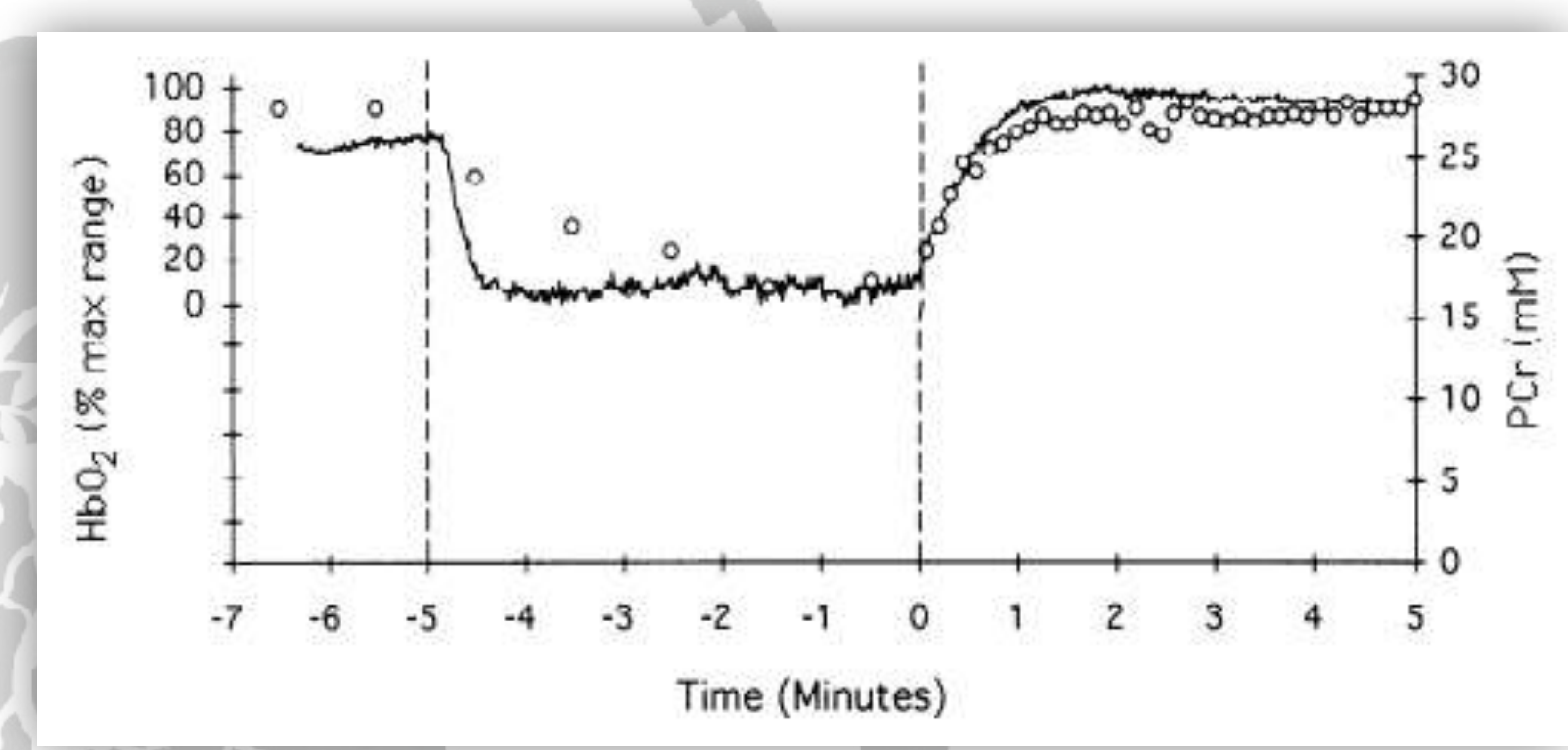
PCr & Oxygène



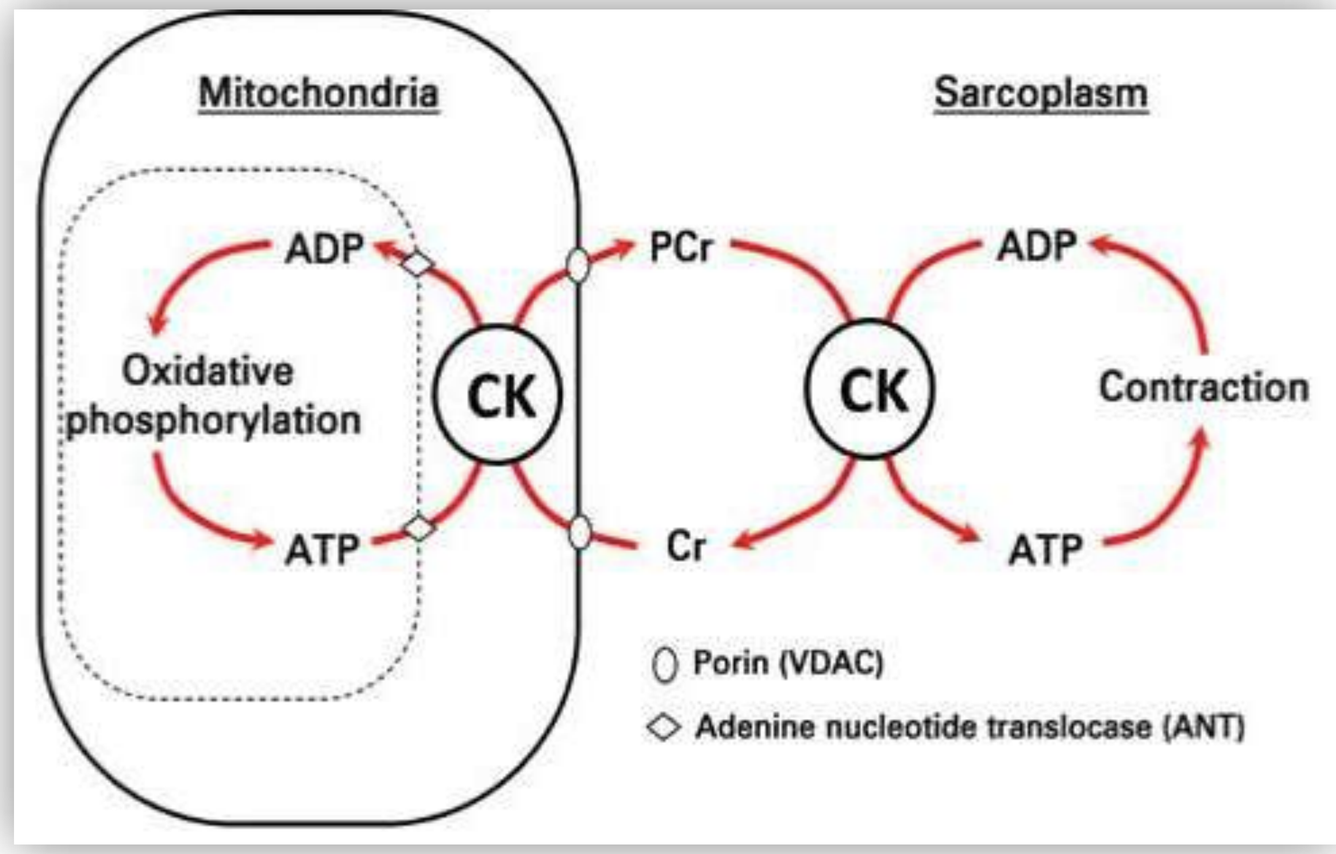
Haseler et al. (1999)



Richardson & al. (2015)



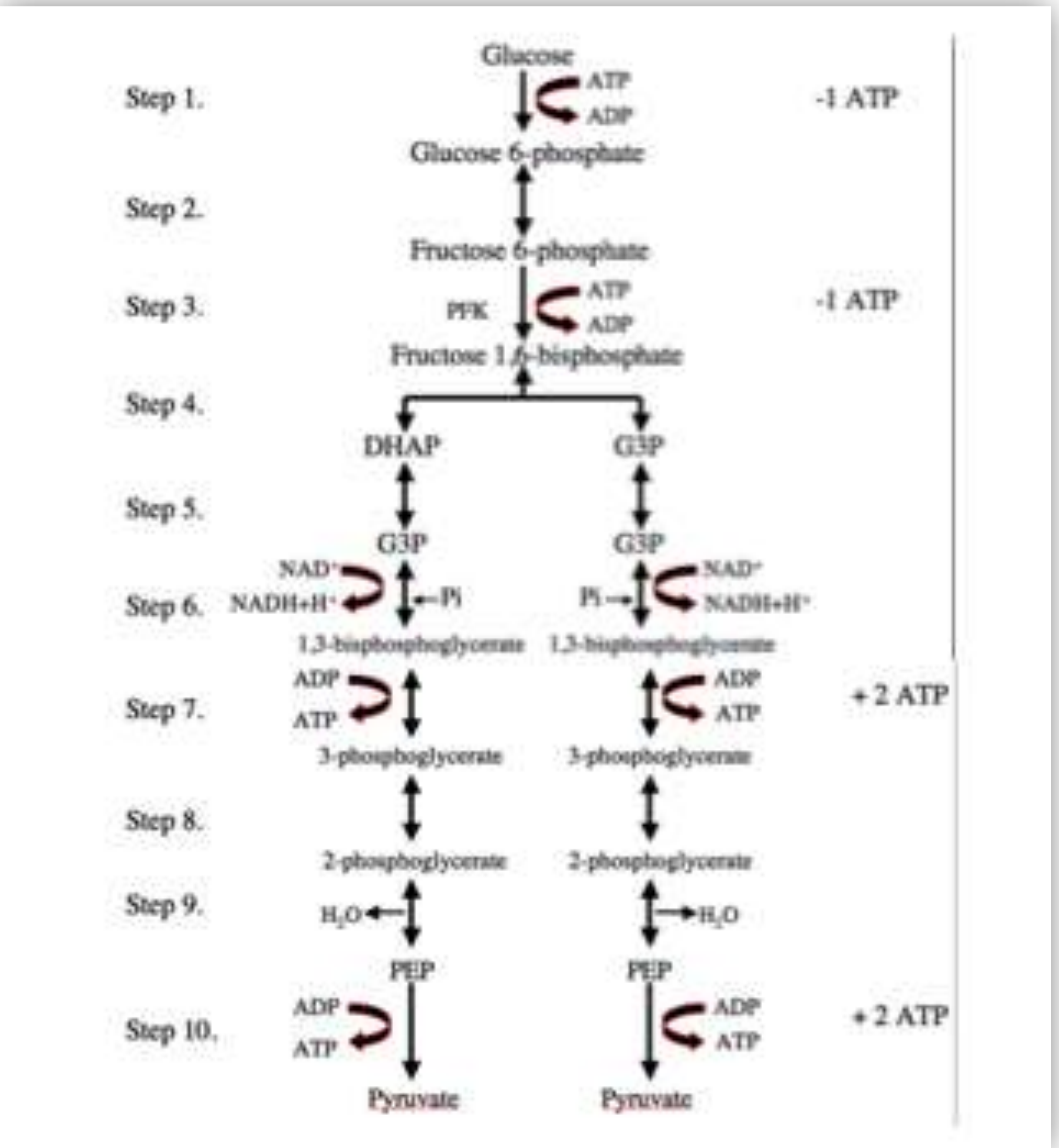
McCully et al. (1994)

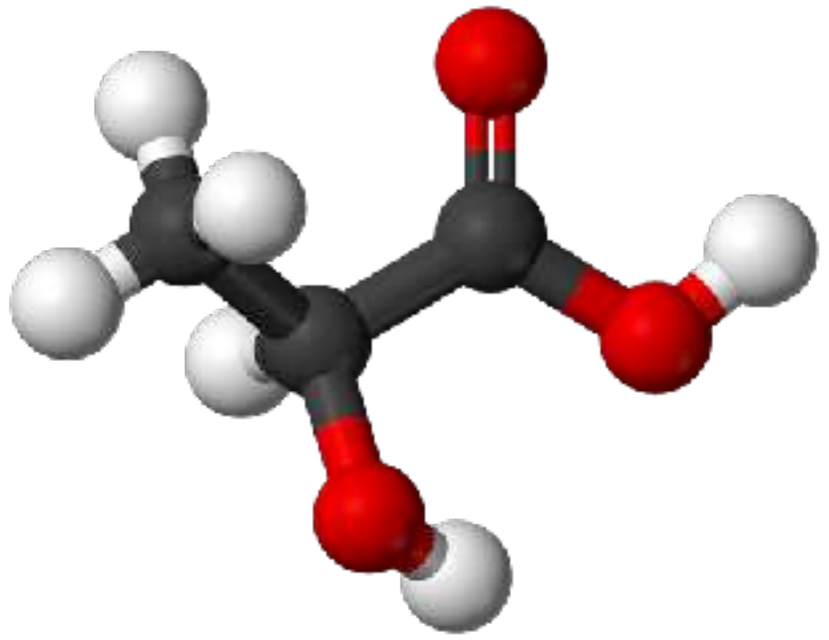


Guimarães-Ferreira et al.

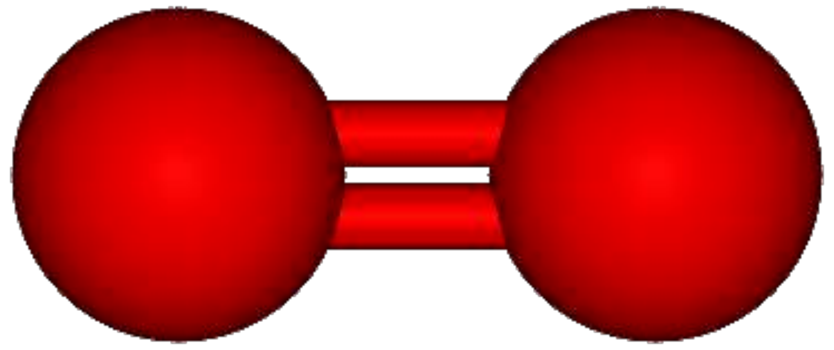
PCr & Oxygène

Glycolyse & Oxygène





Rogatzki et al. (2015)



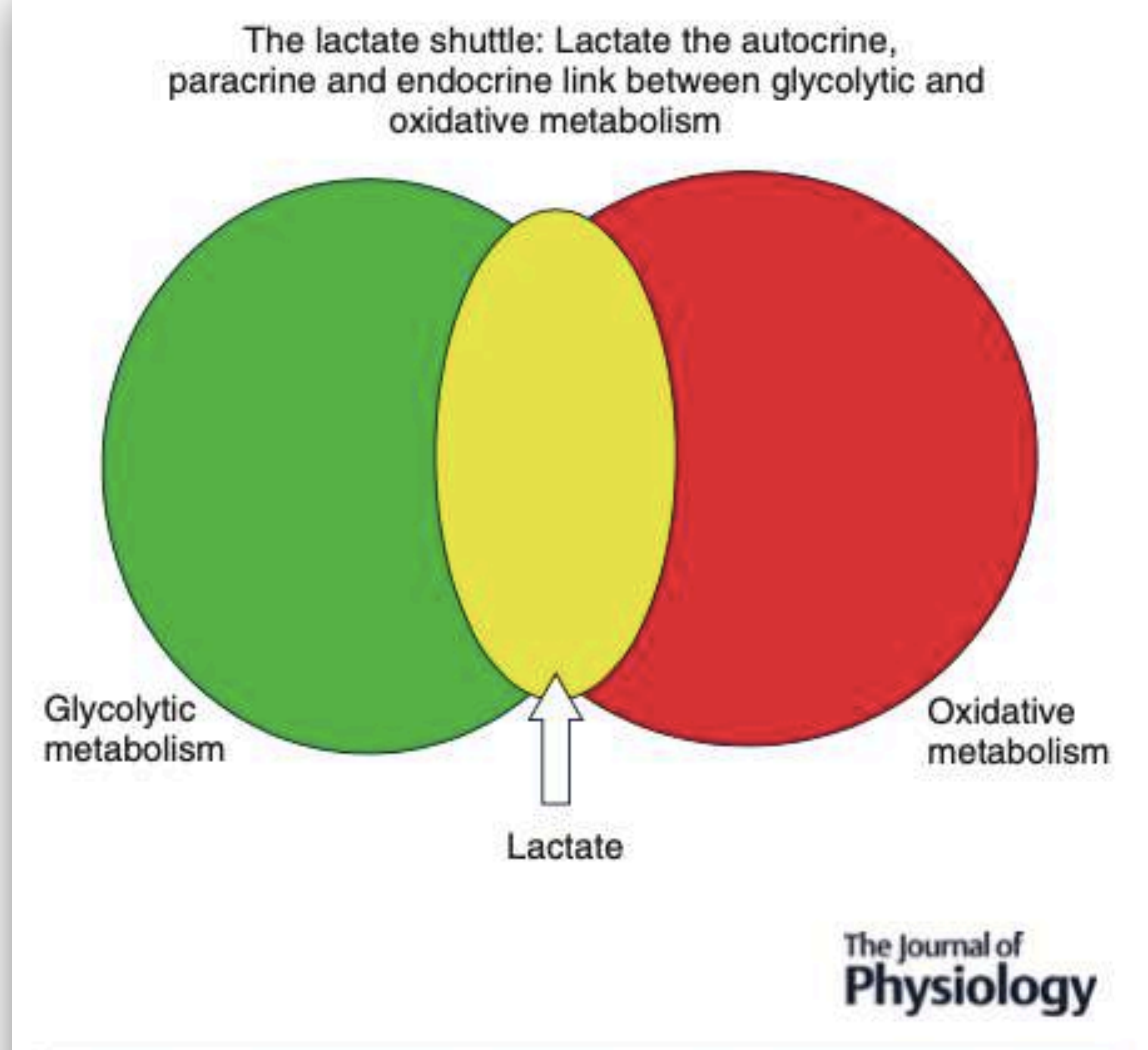


Figure 1. The concept of lactate shuttling between producer (driver) cells and tissues and consumer (recipient)
By this mechanism lactate has autocrine-, paracrine- and endocrine-like influences on metabolism that fulfil at least three purposes. Lactate is: (1) a major energy source; (2) the major gluconeogenic precursor; and (3) a signalling molecule. Revised from Brooks (2018).

Brooks et al. (2021)

Glycolyse & Oxygène

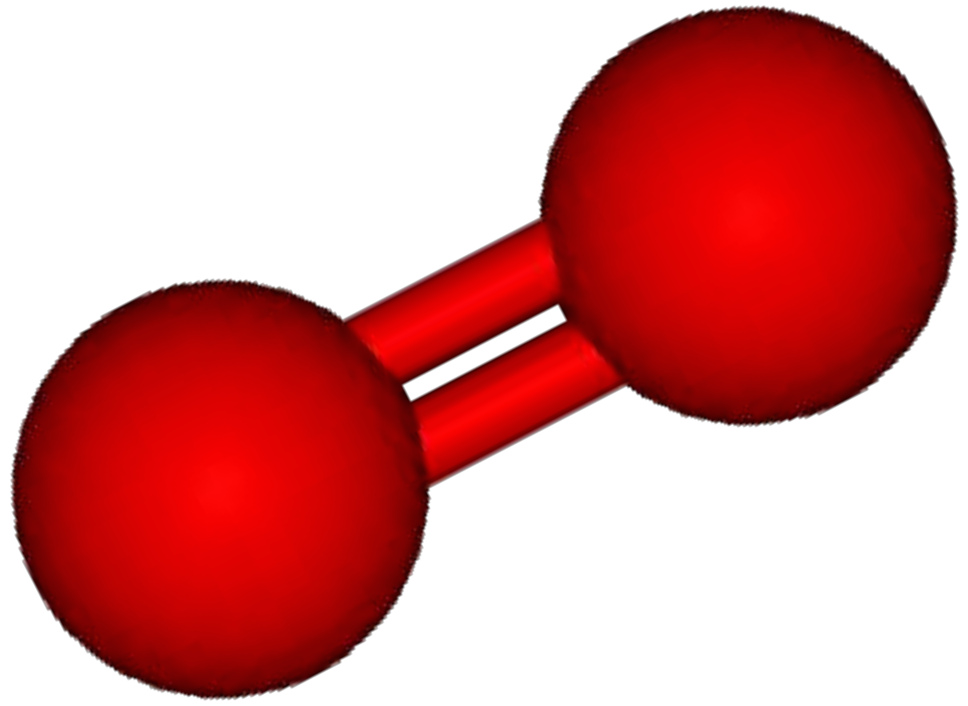
βOxydation & Oxygène

Choosing the right substrate

Xavier Leverve [1], Cécile Batandier, Eric Fontaine

Since the ratio NADH/FADH2 is higher for glycolysis as compared to beta-oxidation, the stoichiometry of ATP synthesis to oxygen consumption is also higher. Lipid oxidation provides more ATP than carbohydrate, but it requires more oxygen per mole of ATP synthesized. (II) The ratio of

L'oxydation des graisses dépend du taux d'oxygène disponible



βOxydation & Oxygène

Novel Molecular Interactions of Acylcarnitines and Fatty Acids with Myoglobin*

Received for publication, August 23, 2016, and in revised form, September 29, 2016 Published, JBC Papers in Press, October 7, 2016, DOI 10.1074/jbc.M116.754978

Sree V. Chintapalli[‡1,2], Srinivas Jayanthi[§1], Prema L. Mallipeddi[¶3], Ravikumar Gundampati[§], Thallapuranam Krishnaswamy Suresh Kumar[§], Damian B. van Rossum[||**], Andriy Anishkin[‡‡], and Sean H. Adams[‡4]

herein (*i.e.* through site-directed mutagenesis). Interestingly, recent studies indicate that oxy-Mb interacts with mitochondria in the muscle cells, initiating a conformational change in the oxy-Mb during the release of oxygen (40, 41). These results must be taken into account in future studies of the retention of fatty acids or acylcarnitines when bound to oxy-Mb that may simultaneously release both oxygen and lipids to the mitochondria.

βOxydation & Oxygène

Les Filières Énergétiques

Bioénergétique Cellulaire

Les Filières Énergétiques

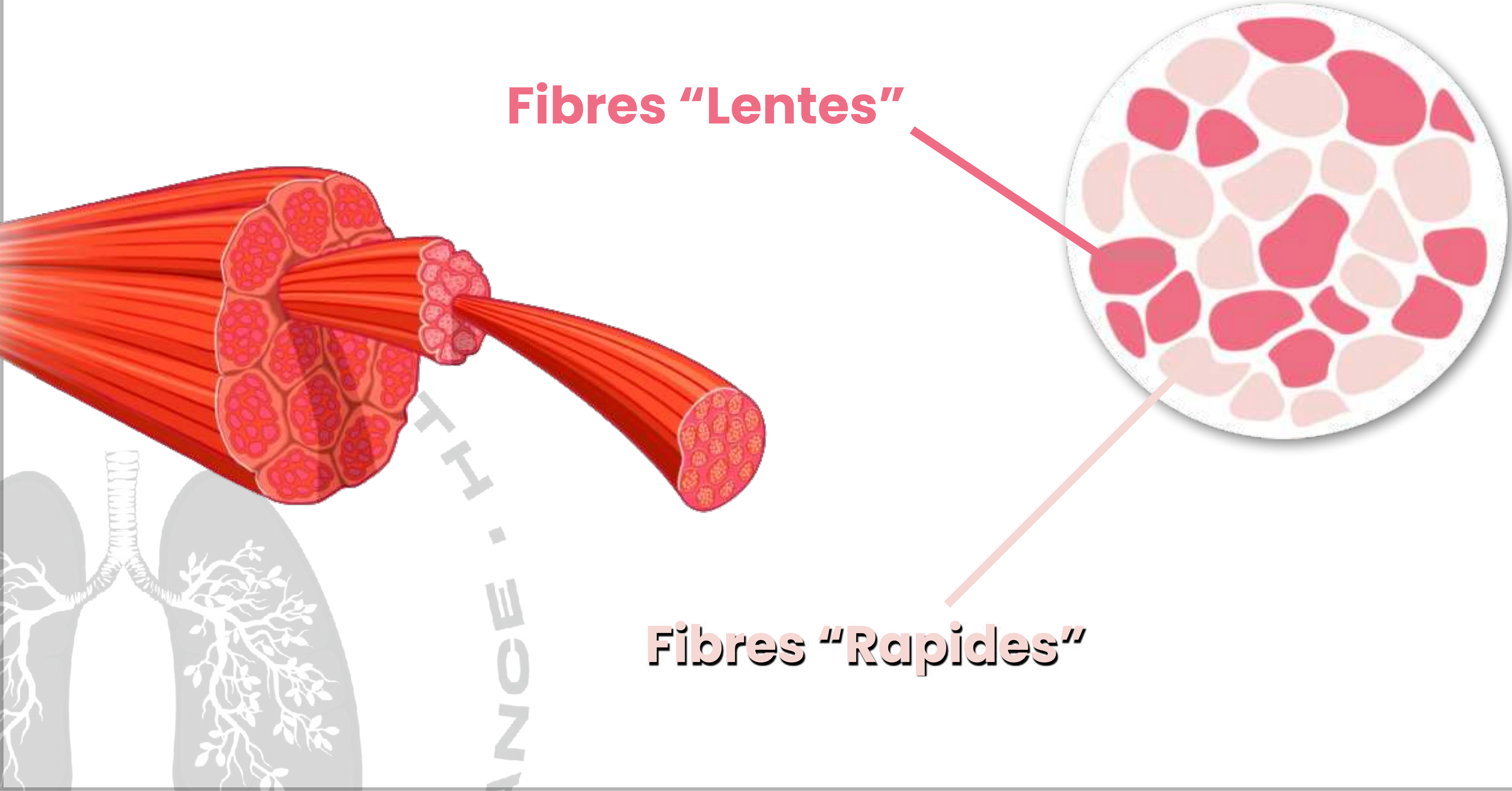
THÉORIE 1

Les Filières Énergétiques

Le Spectre d'Intensité

Moxy Monitor (NIRS)

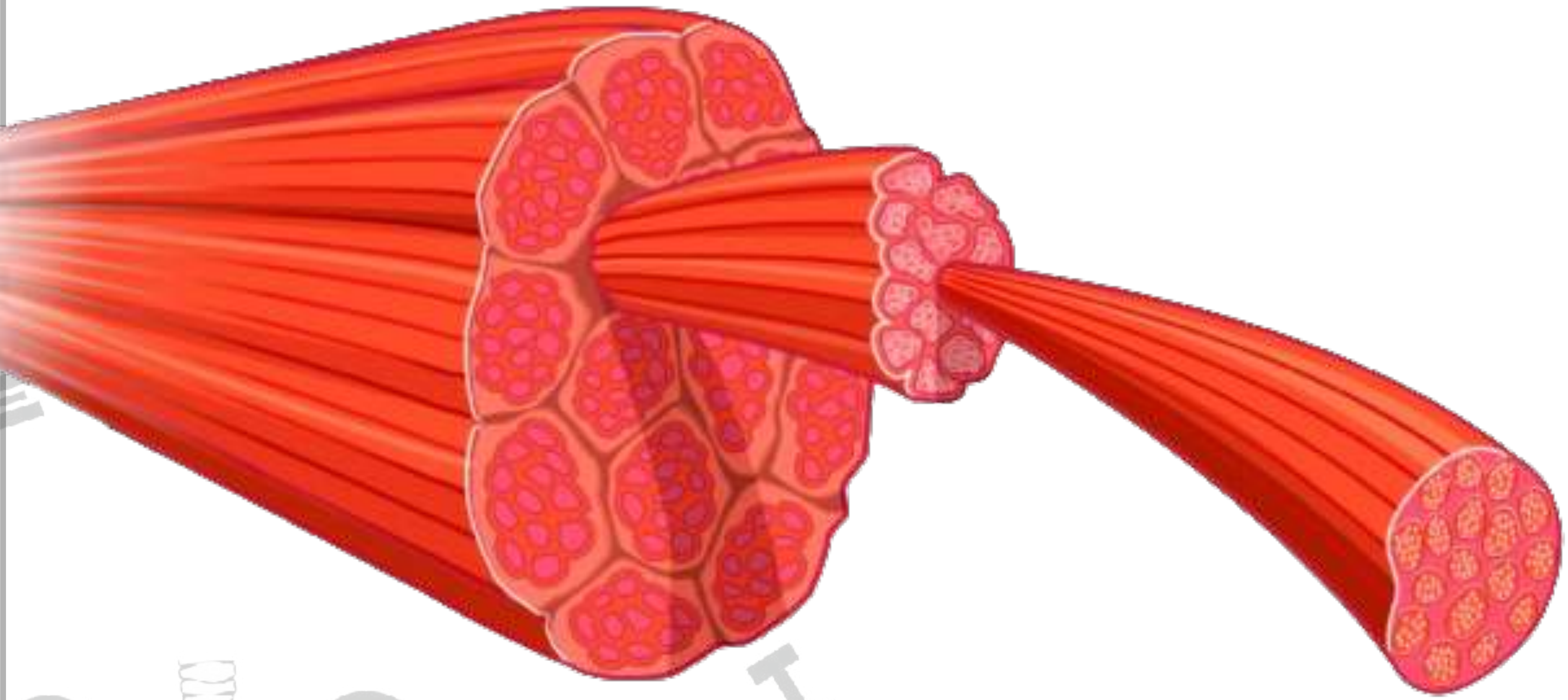
Les Fibres Musculaires

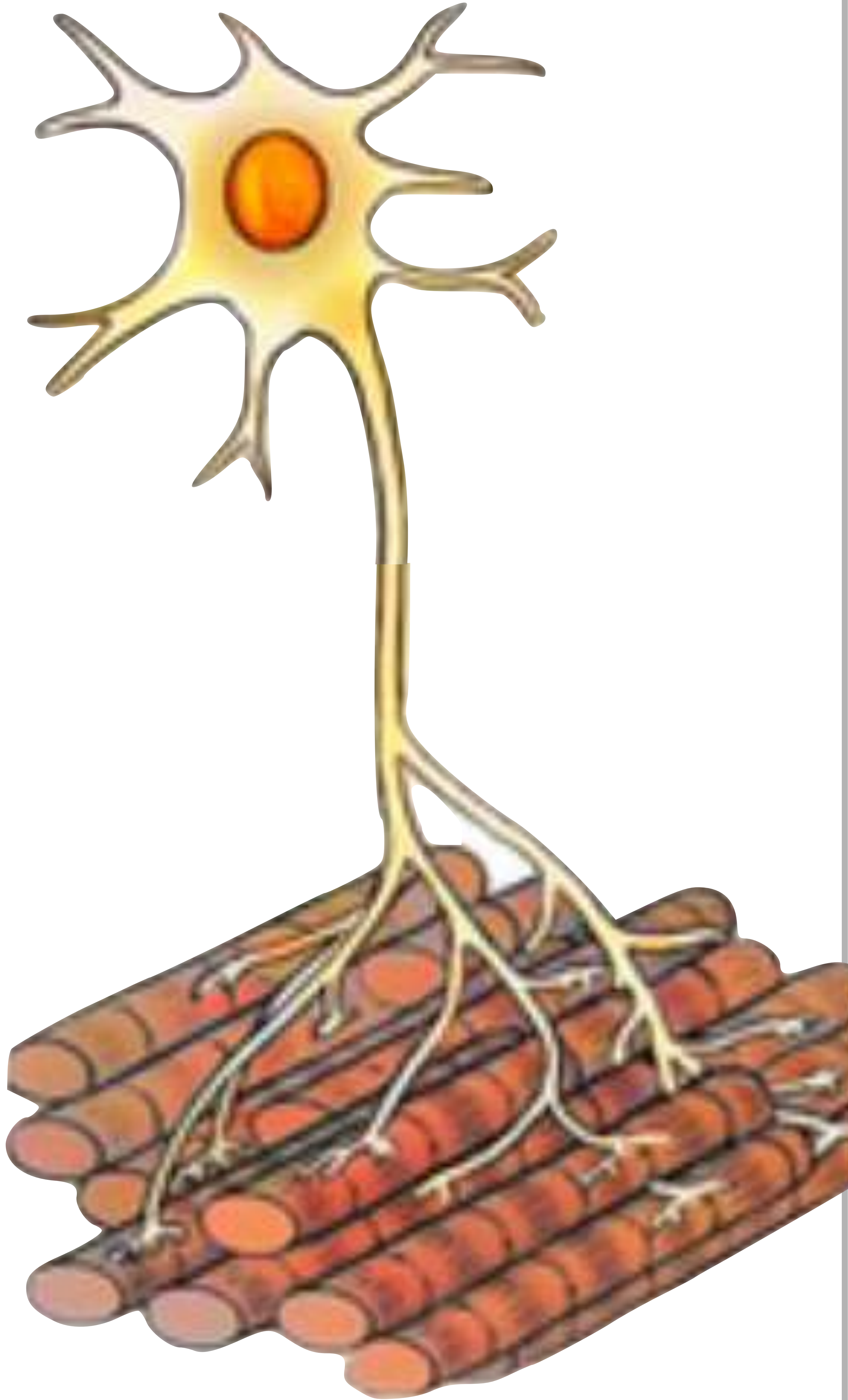


Fibres Musculaires

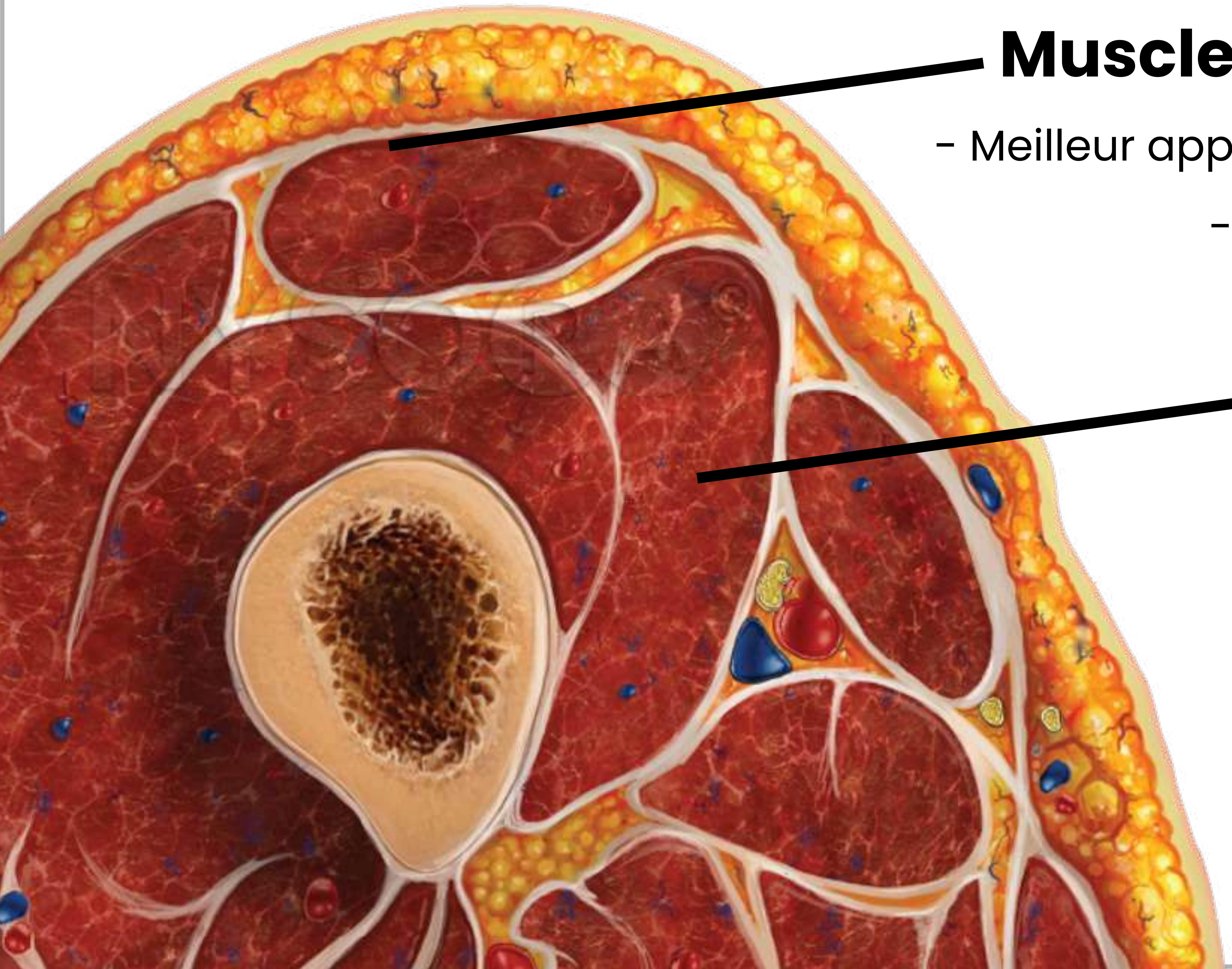
Fibres Musculaires

Unité Motrice





Composition du Muscle



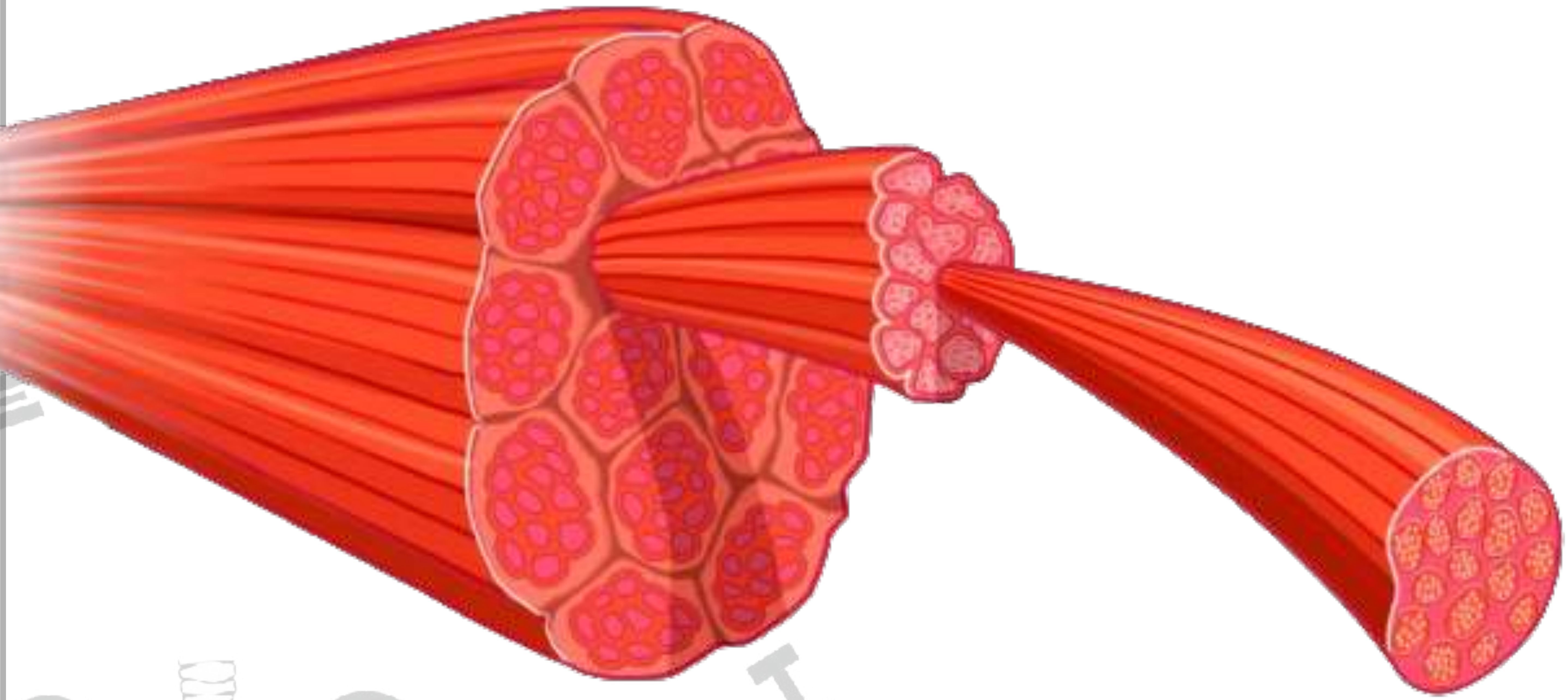
Muscle Superficiel

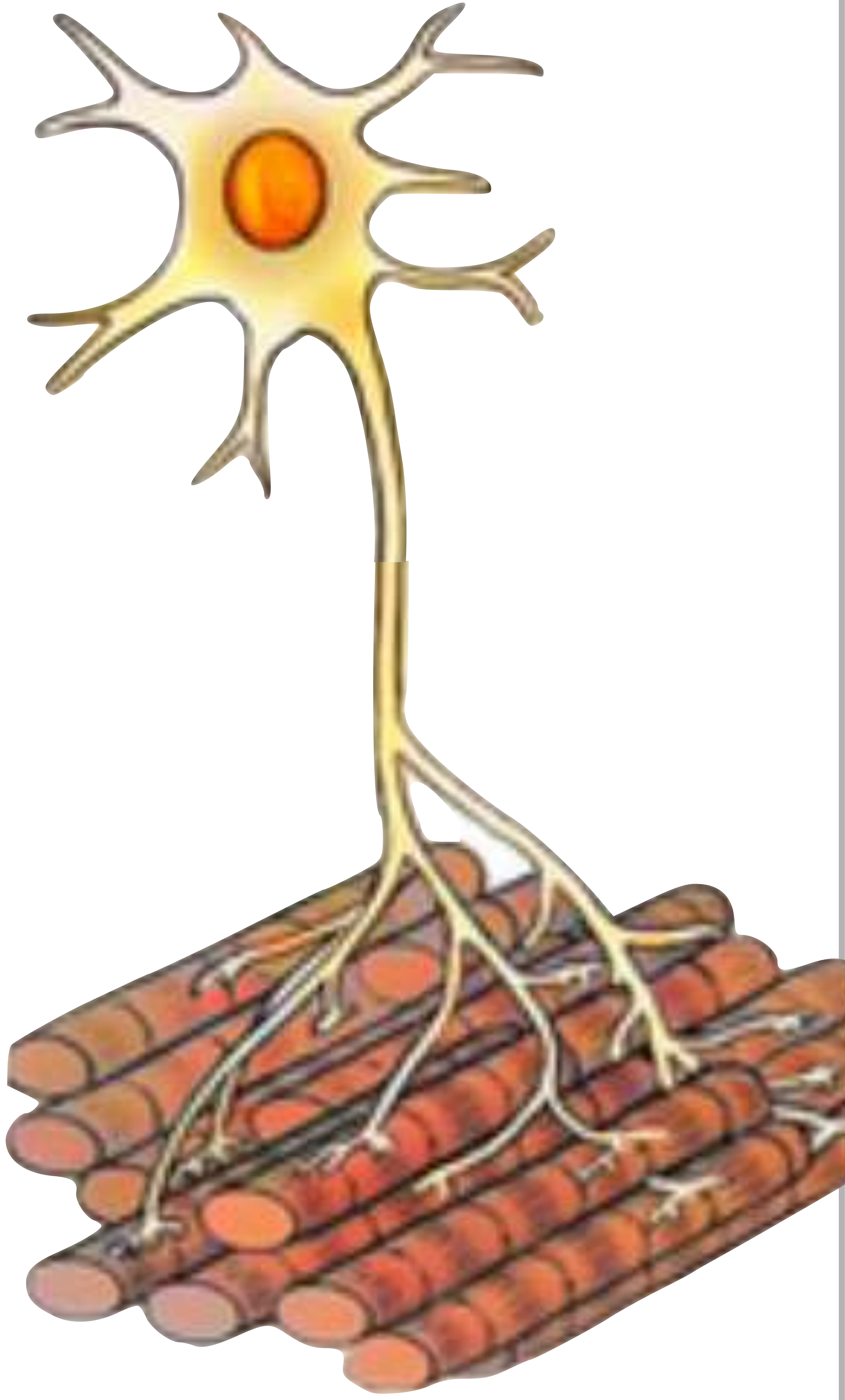
- Meilleur apport sanguin (veines & capillaires)
- Plus de fibres lentes

Muscle Profond

- Deoxygenation plus rapide
- Plus de fibres rapides

Unité Motrice





Recrutement des Unités Motrices

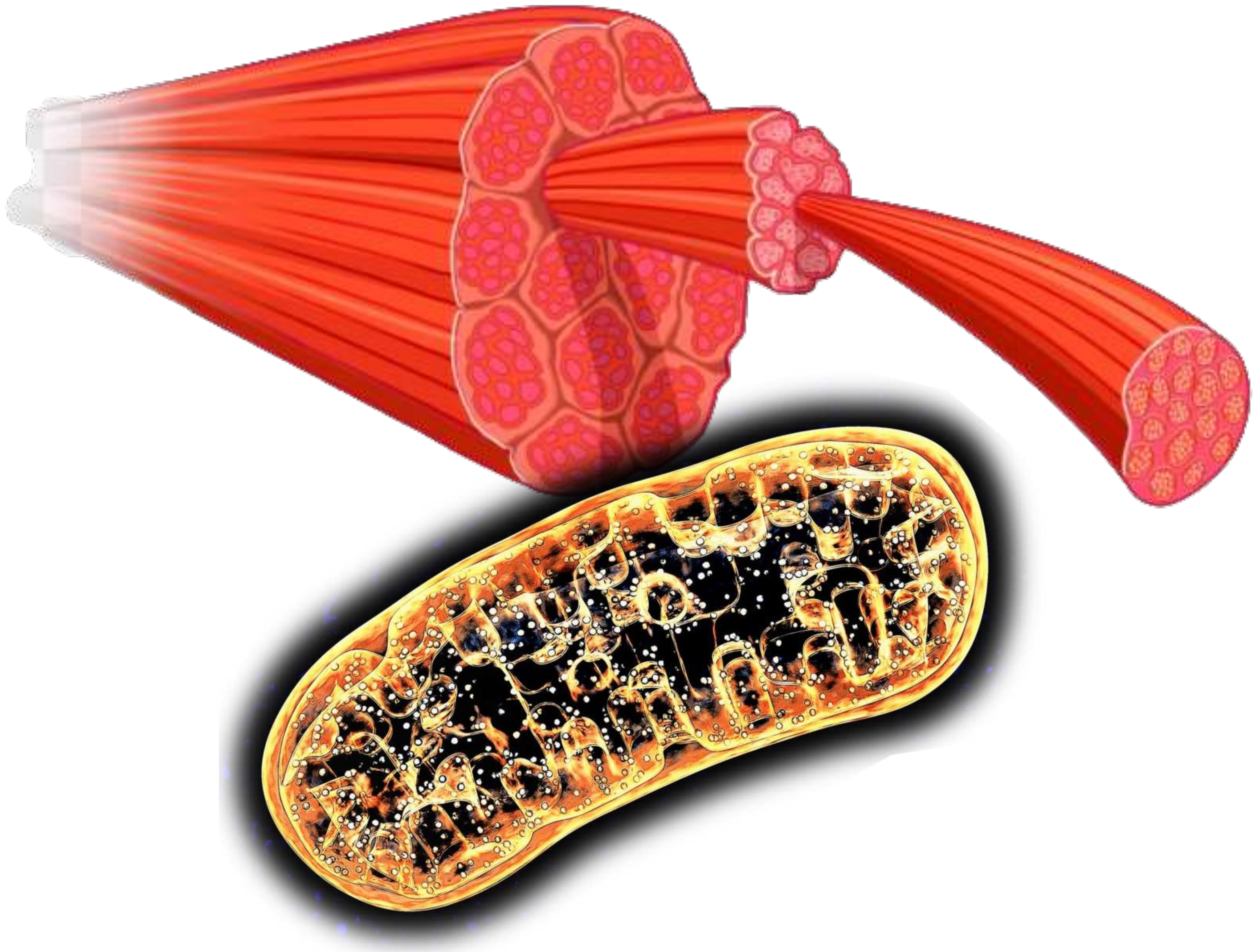
Équilibre Métabolique

Le Spectre d'Intensité

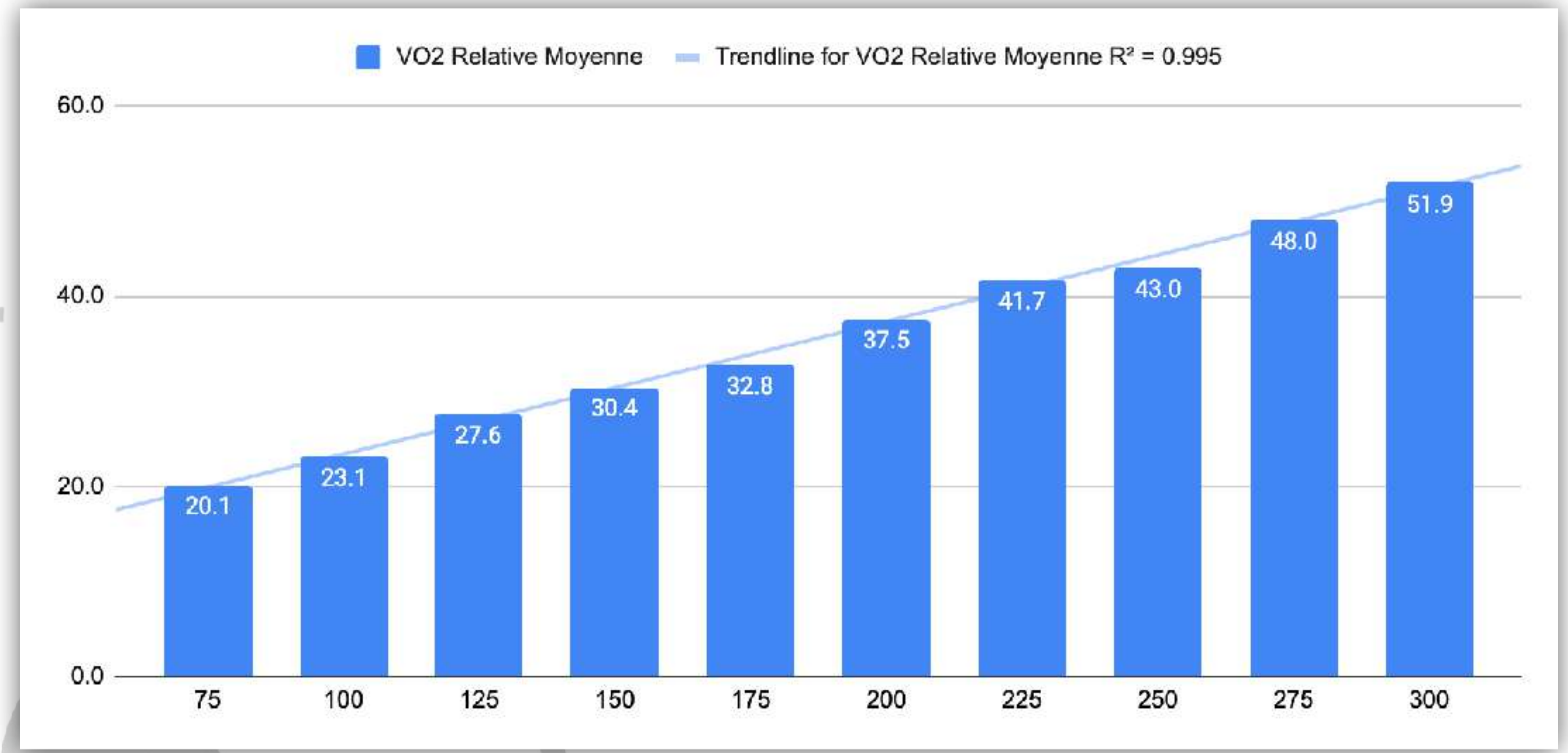
Recrutement des Unités Motrices

Les Fibres Musculaires

Oxygène: Apport & Utilisation



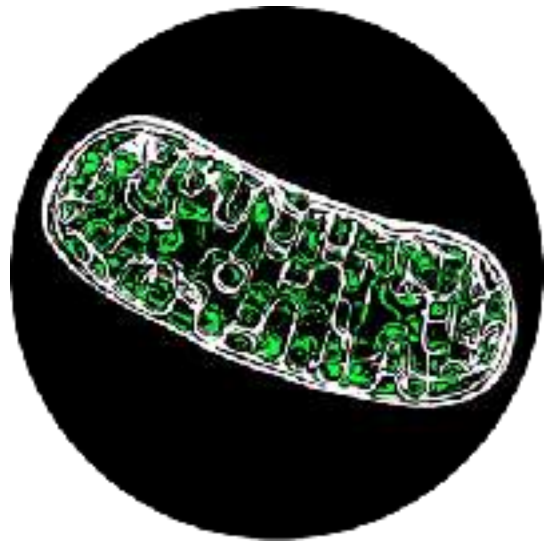
Consommation d'Oxygène



Mesures de la VO2 durant un test d'effort en vélo (Protocole 41)

Consommation d'Oxygène

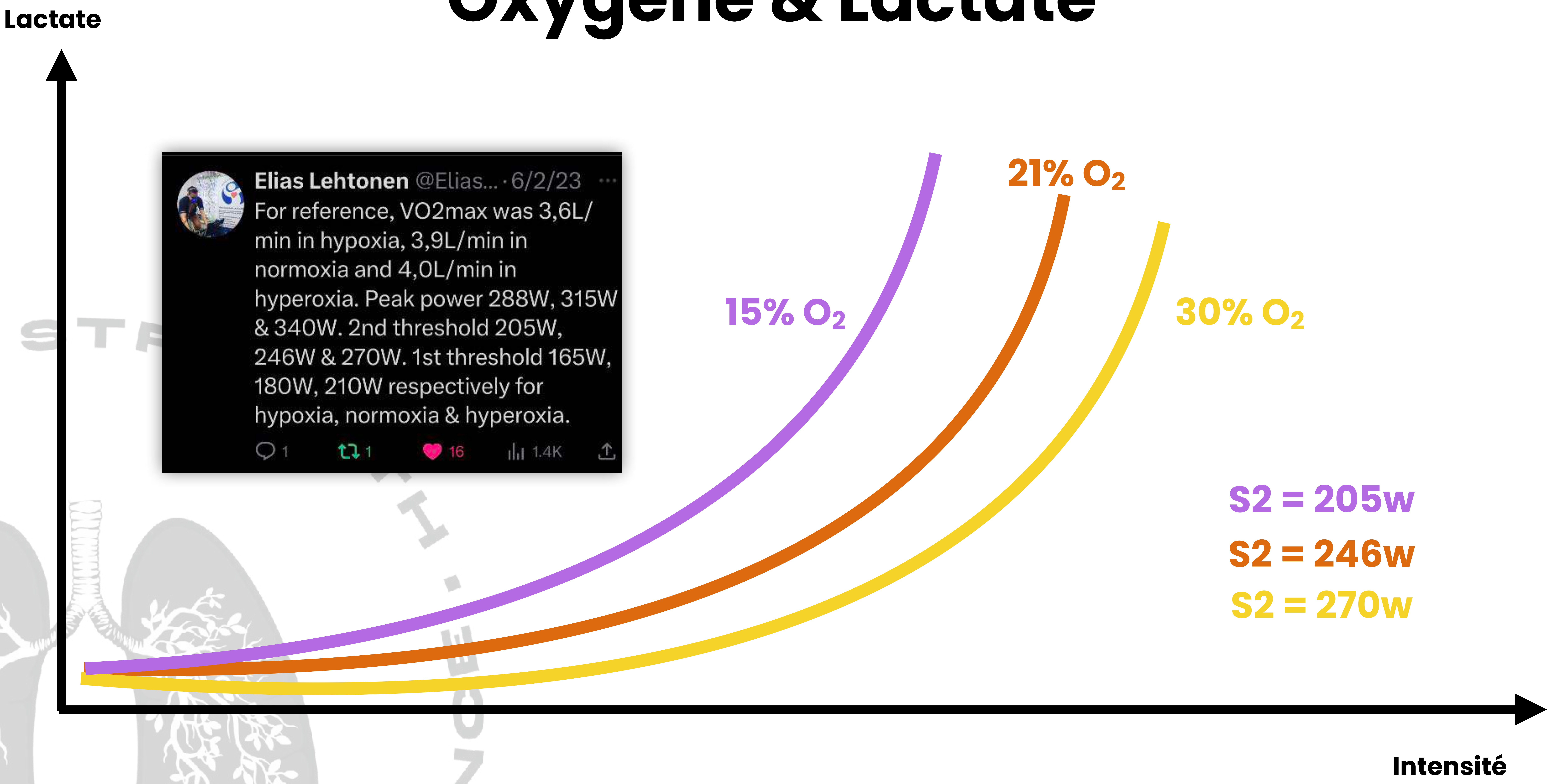
Apport et Utilisation de l'O2



Système Métabolique

Utilisation de l'oxygène & substrats, recyclage du lactate & Pi & H+

Oxygène & Lactate



Le Spectre d'Intensité

- Les unités motrices sont recrutées suivant le principe de taille (Henneman)
Petites UM = Fibres lentes / Grandes UM = Fibres rapides

- Différentes fibres ont différentes caractéristiques énergétiques
Type I = Mito++ & Capillaires++ / Type II = Puissance++ & GLY++

- Les domaines d'intensités émergent de l'interaction entre l'apport (A) et l'utilisation (U) de l'oxygène

A>U	A=U	A<U	A<<U
Basse Intensité *(Moderate Domain)*	**Moyenne Intensité** *(Heavy Domain)*	**Haute Intensité** *(Severe Domain)*	**Très Haute Intensité** *(Extreme Domain)*

Seuil #1 (between Basse and Moyenne) — *Seuil #2* (between Moyenne and Haute)

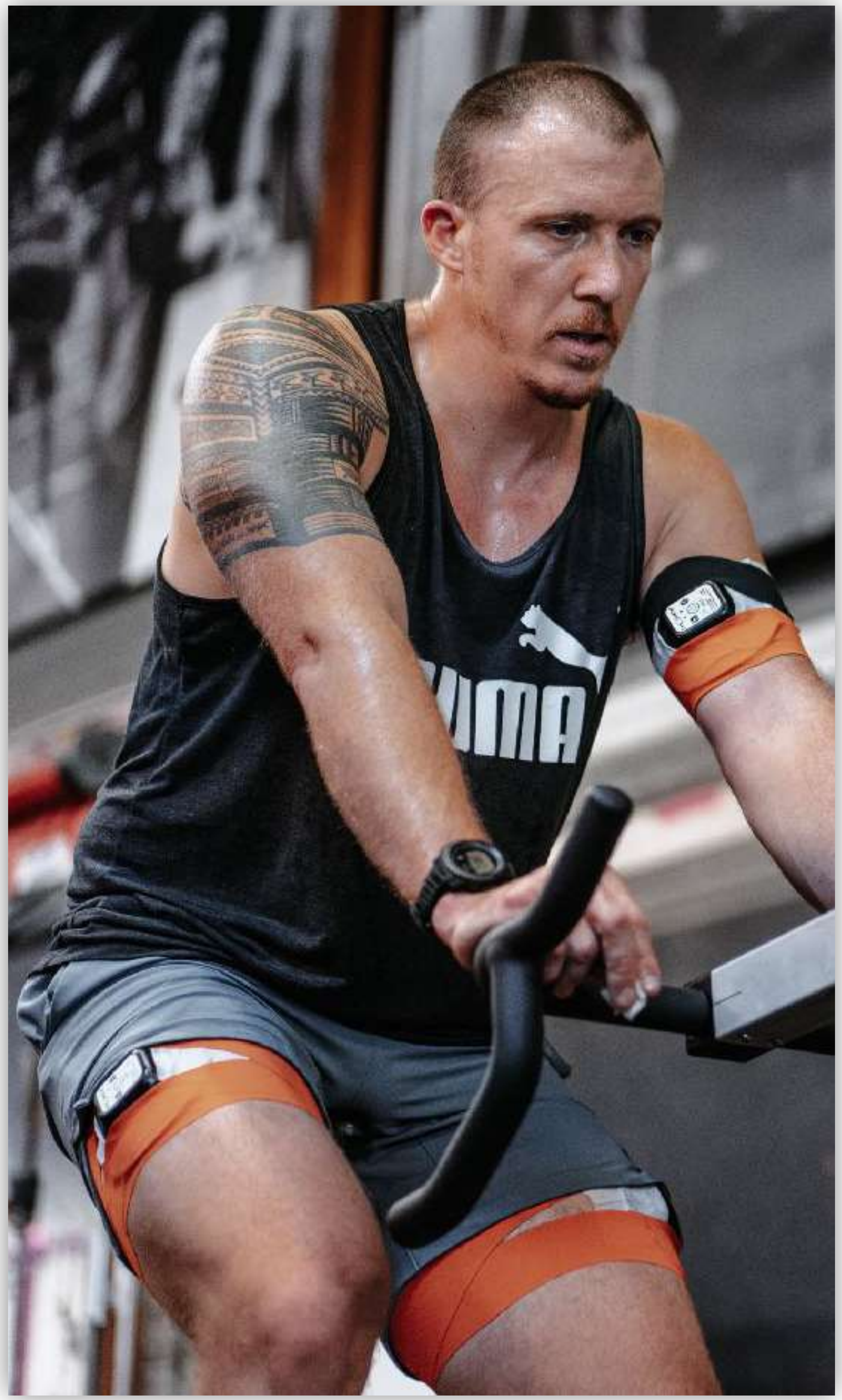
Intensité (Vitesse/Puissance)

Le Spectre d'Intensité

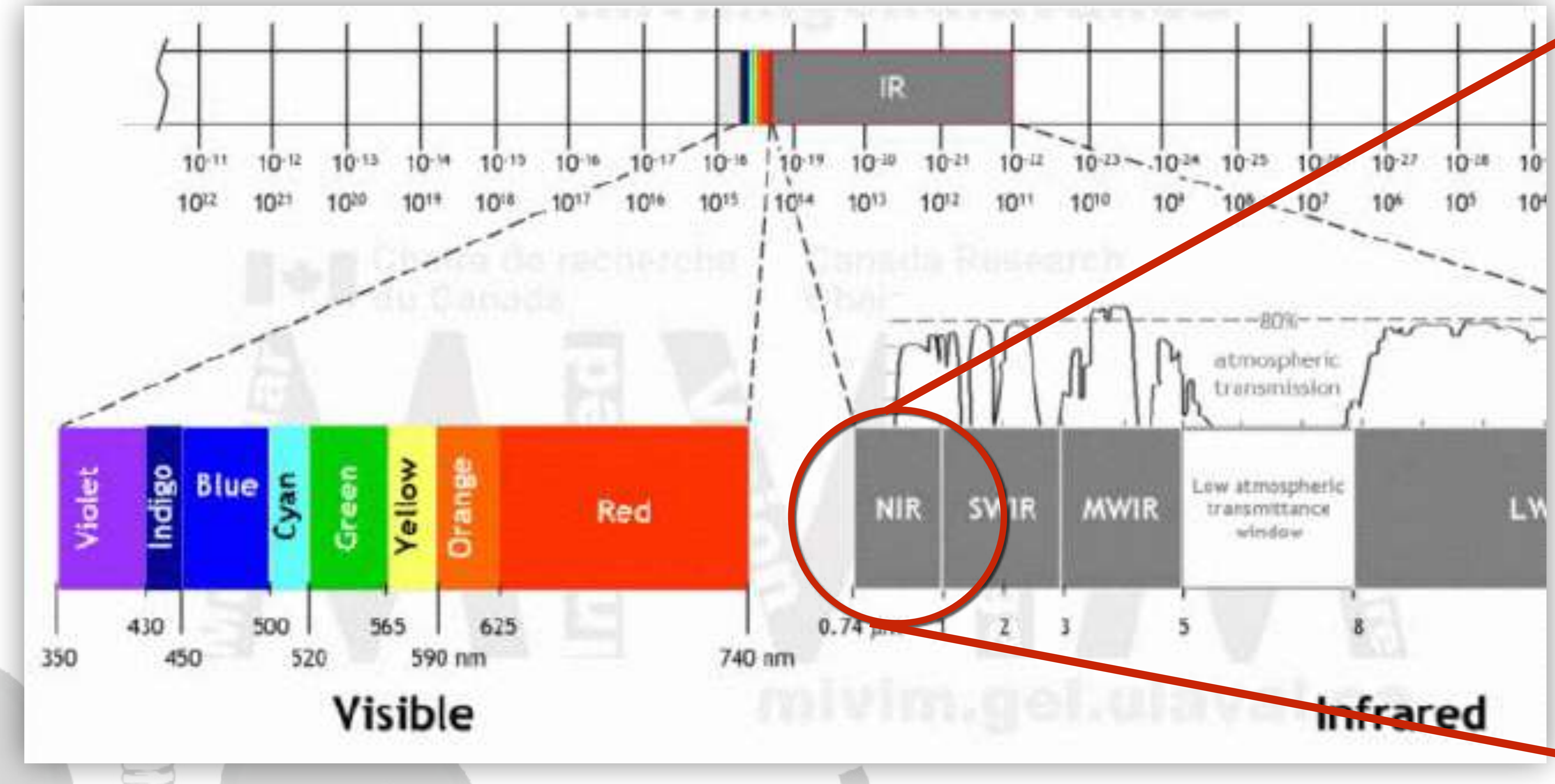
THÉORIE 1

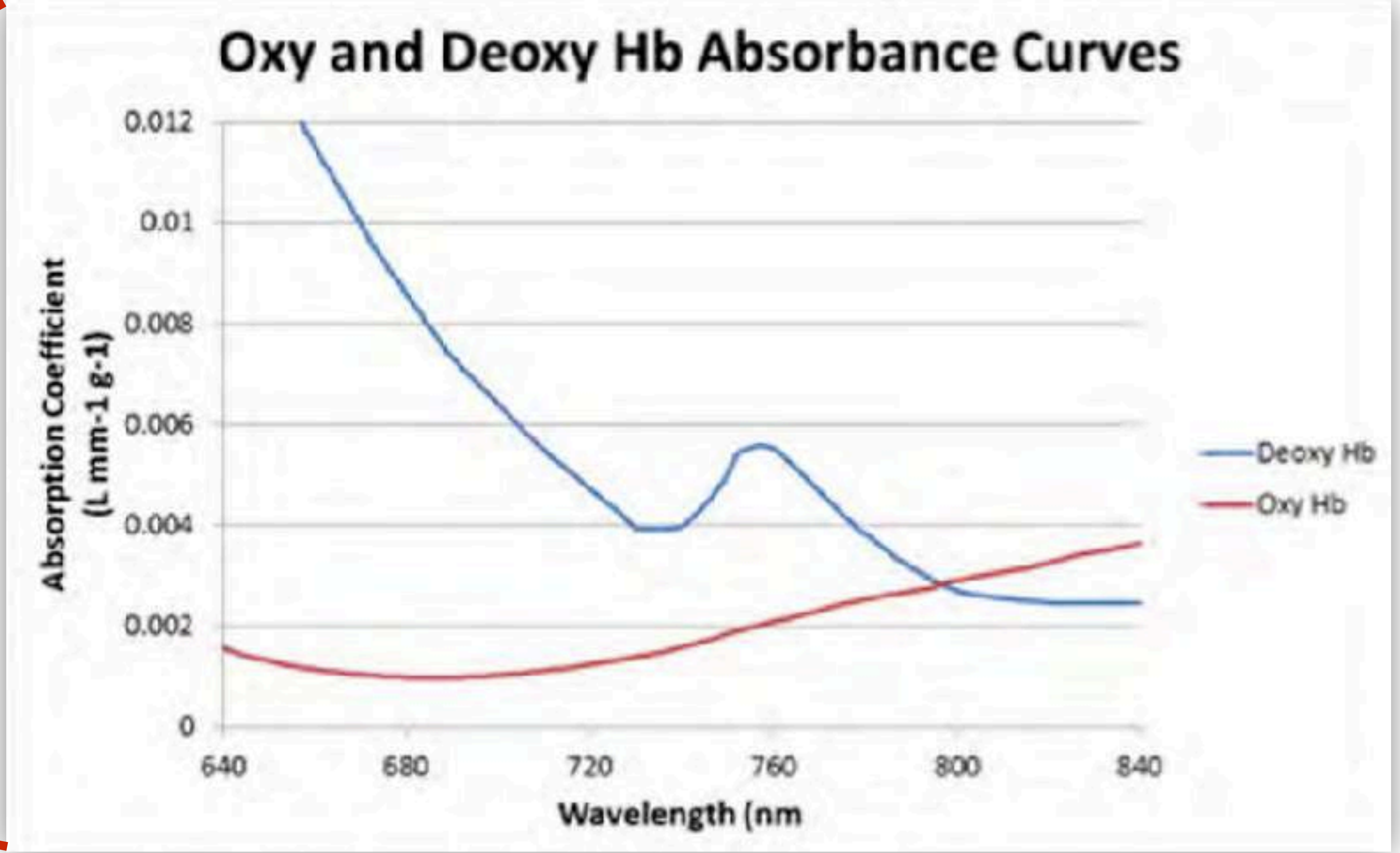
Les Filières Énergétiques
Le Spectre d’Intensité
Moxy Monitor (NIRS)

Moxy Monitor



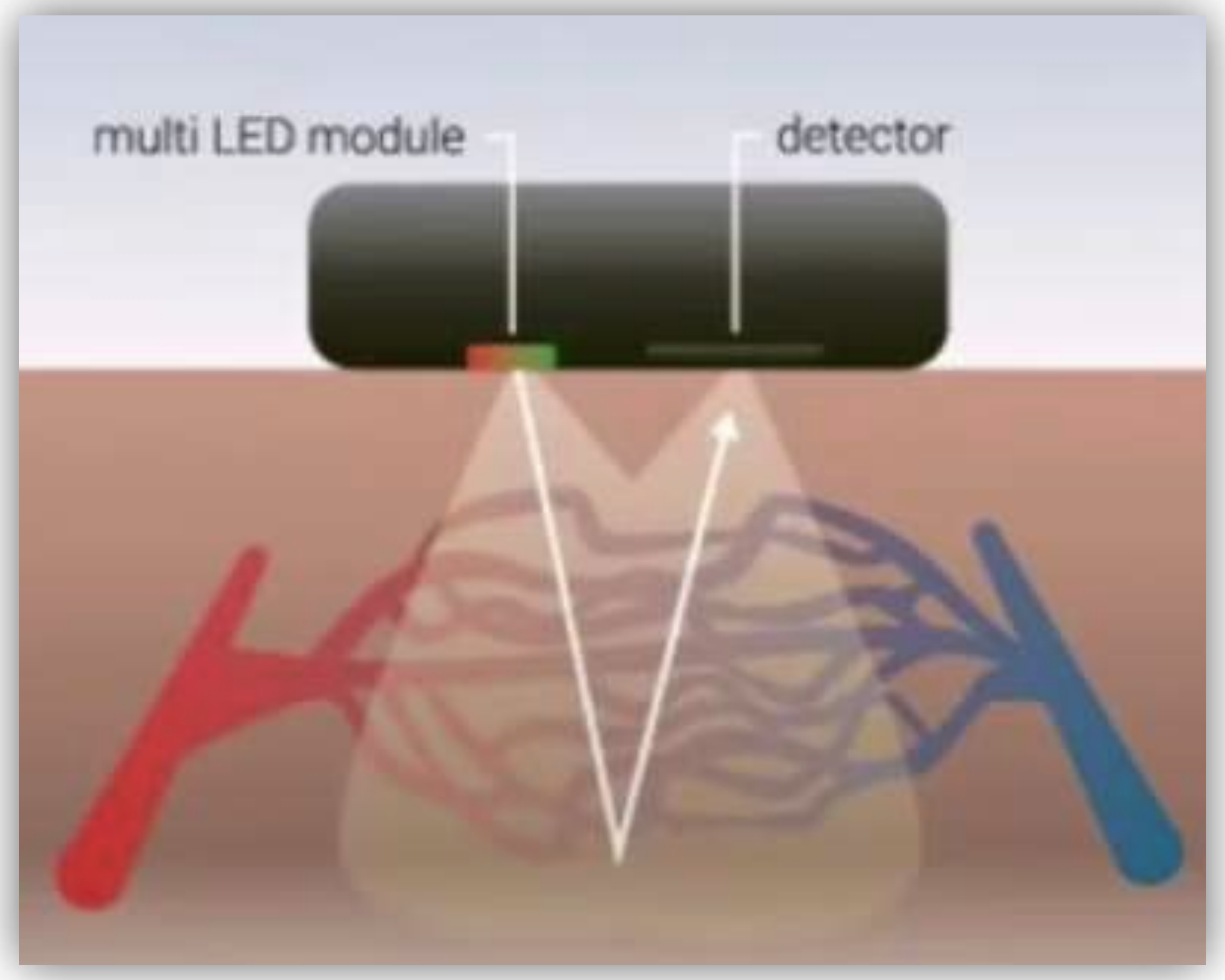
NIRS (Near InfraRed Spectroscopy)

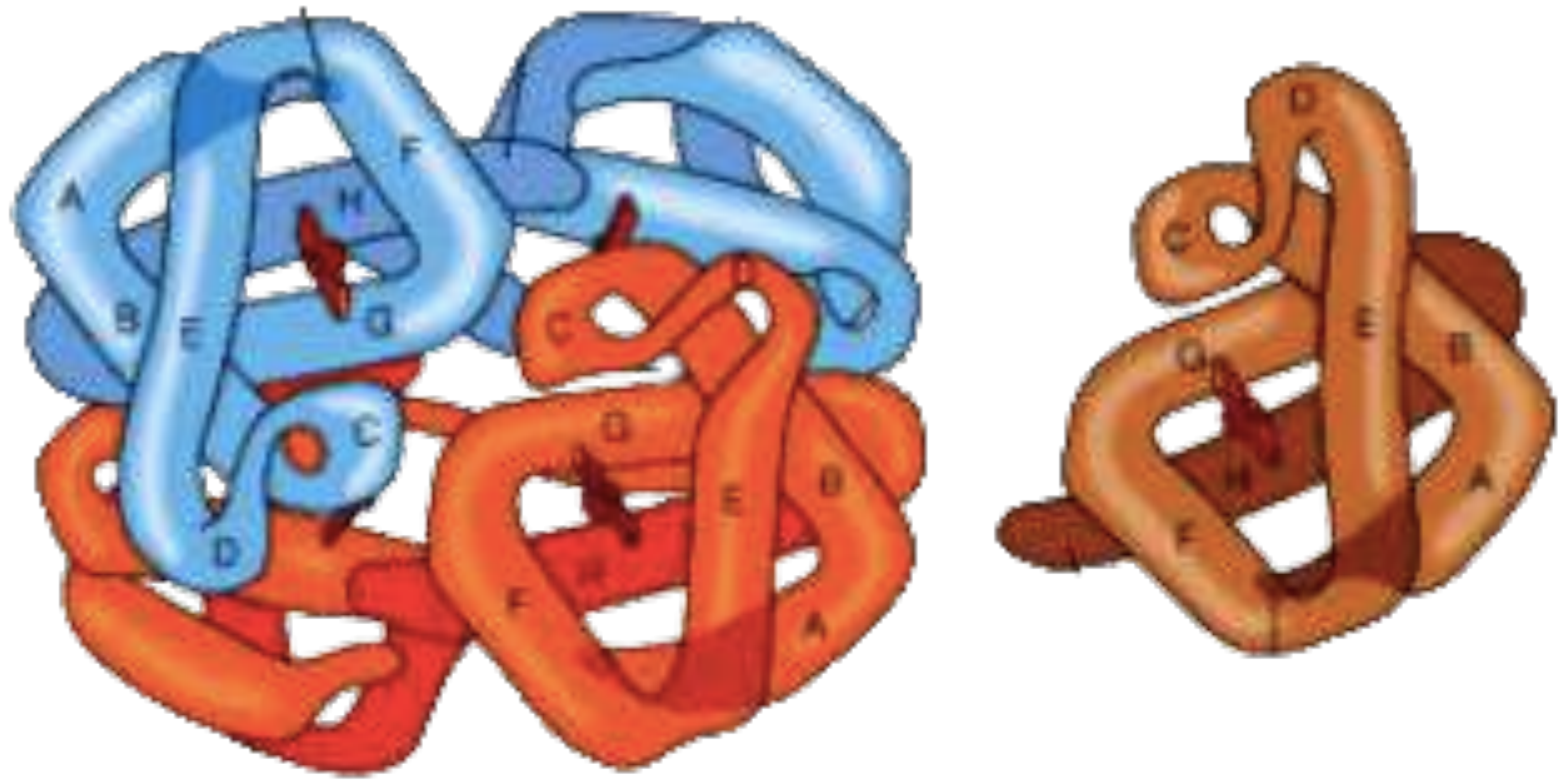




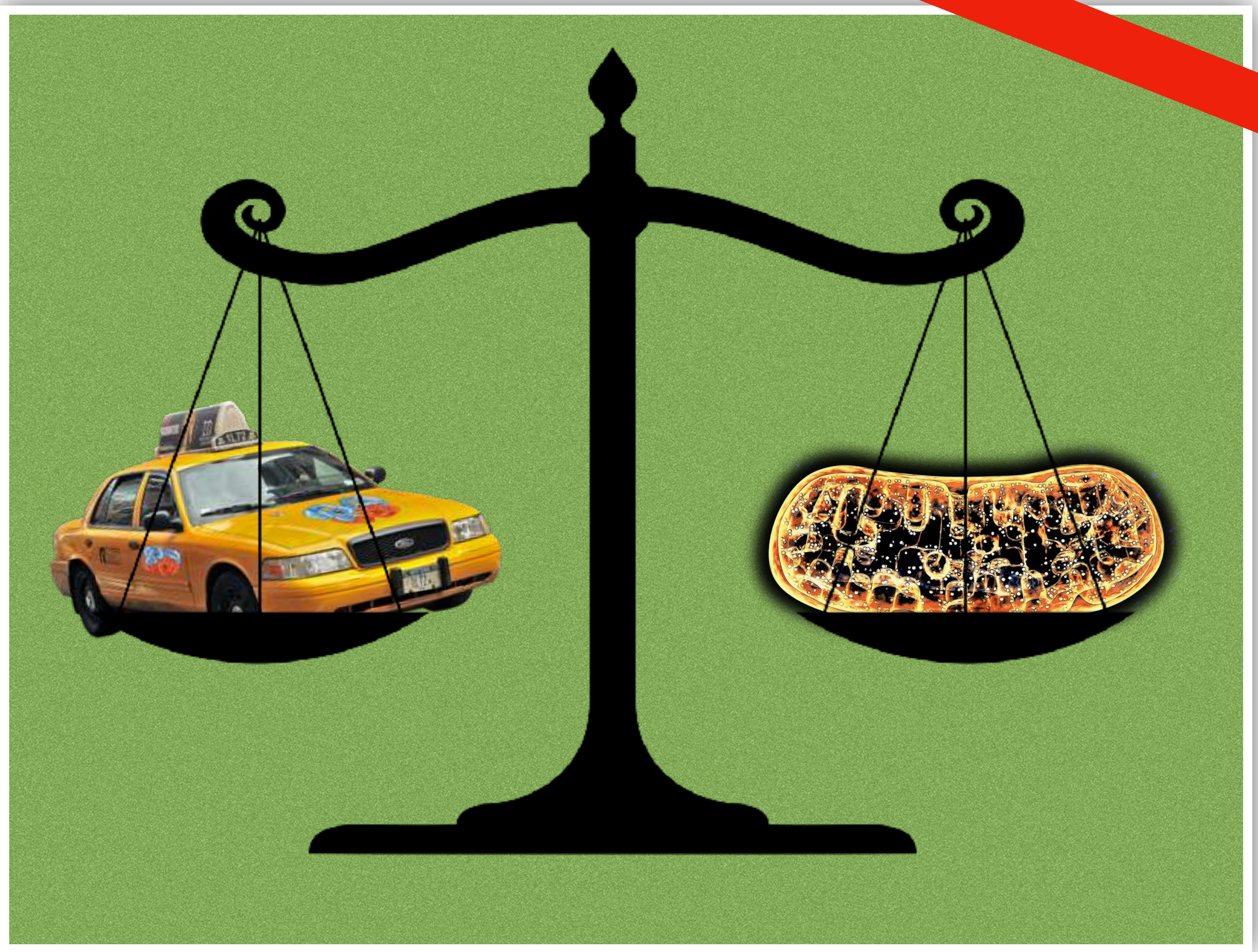
Moxy Monitor: 630 à 850 nm

Moxy Monitor

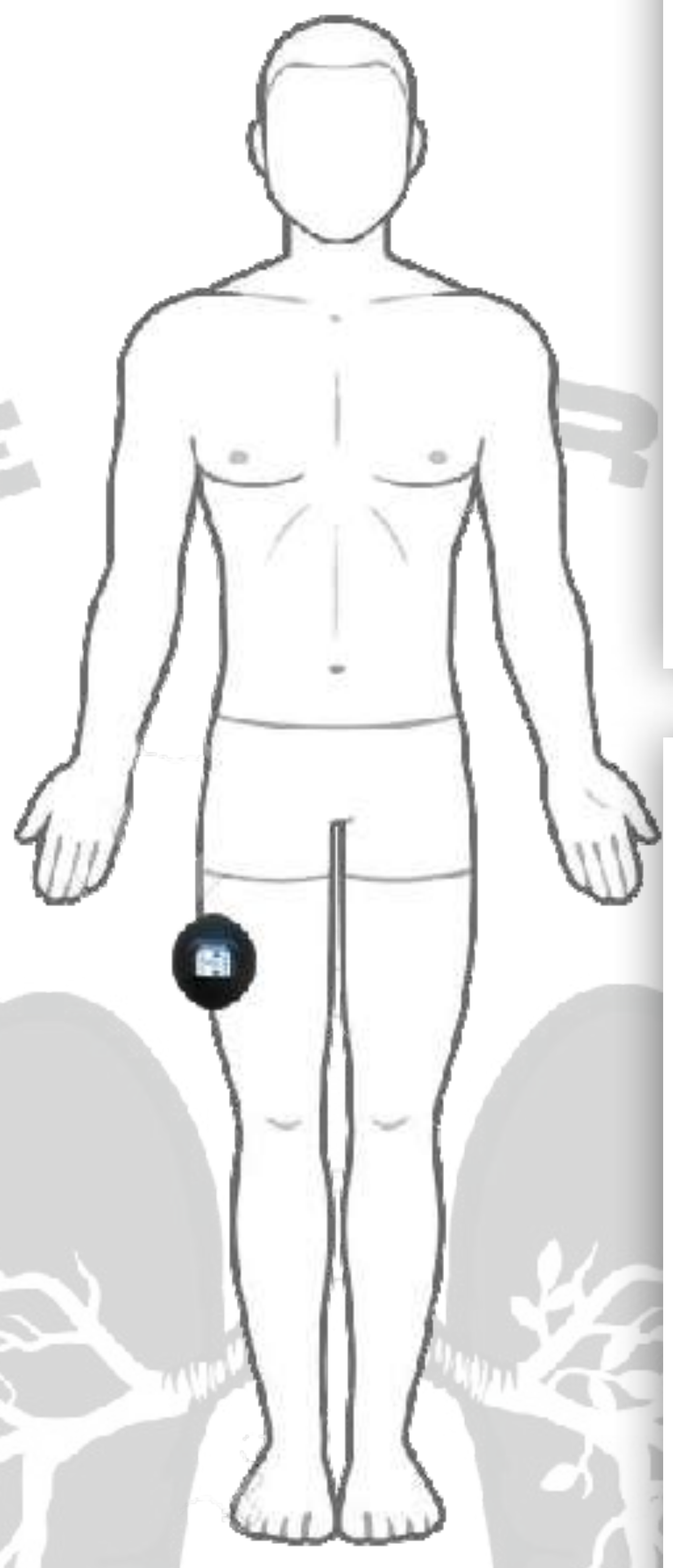


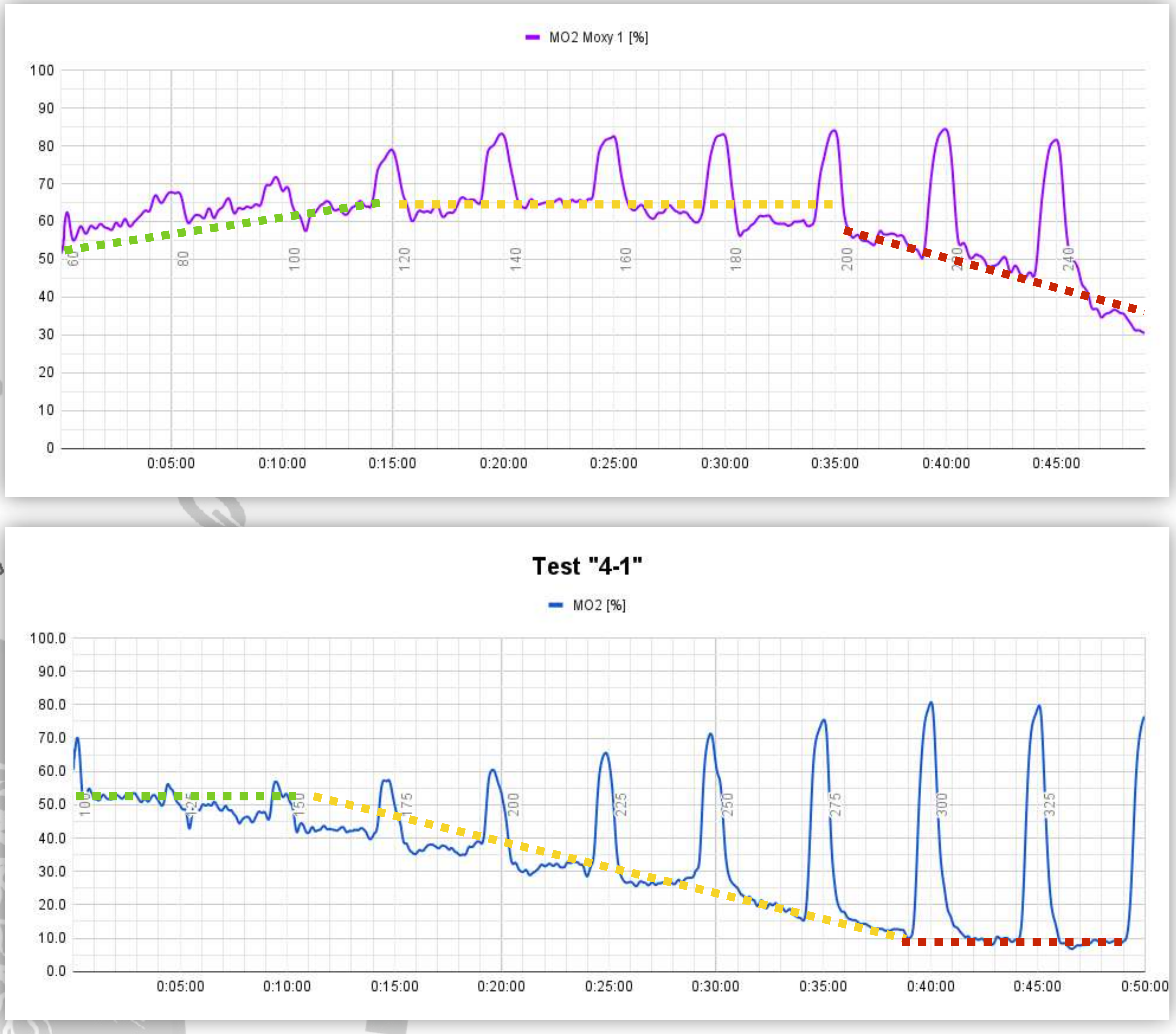


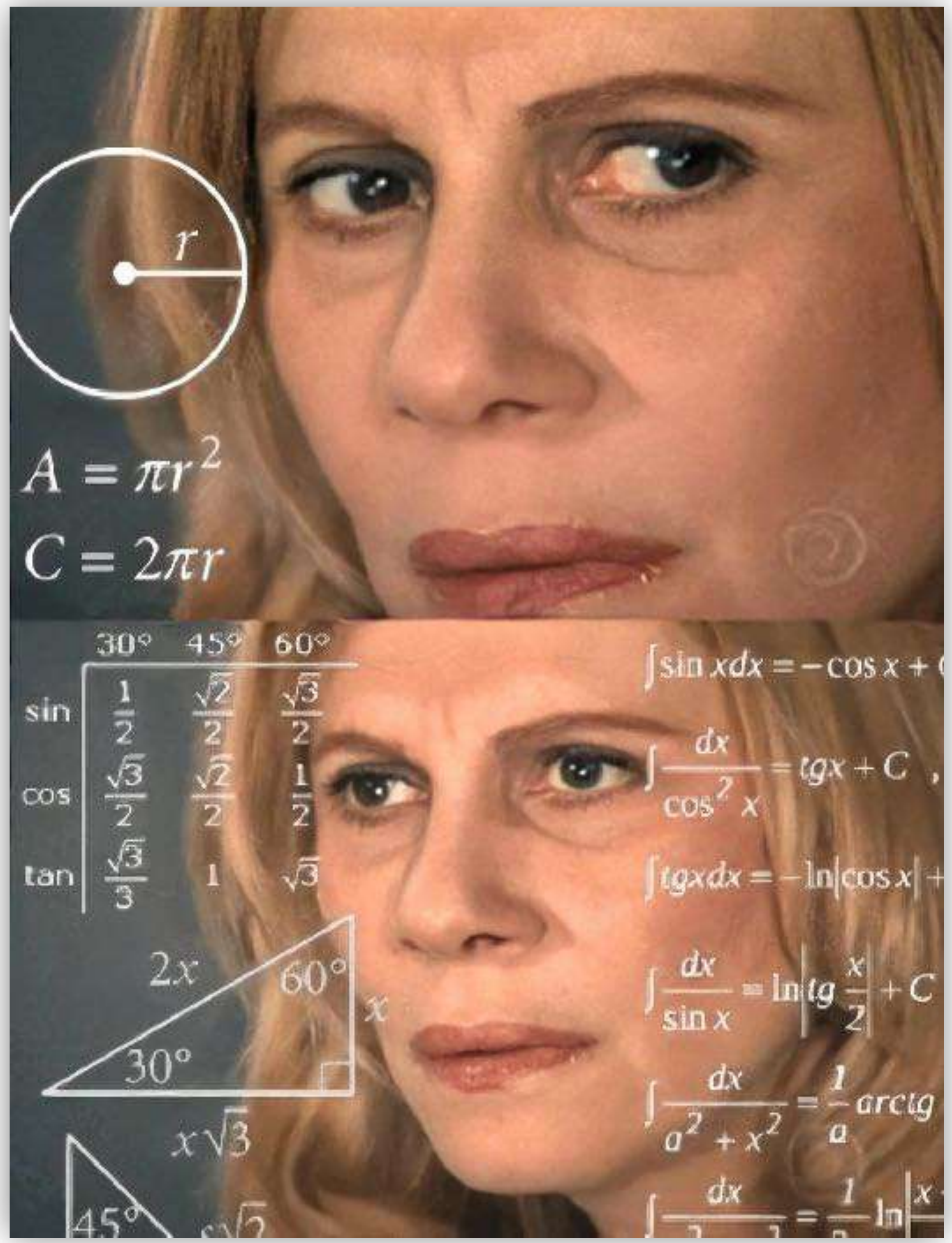
Moxy Monitor



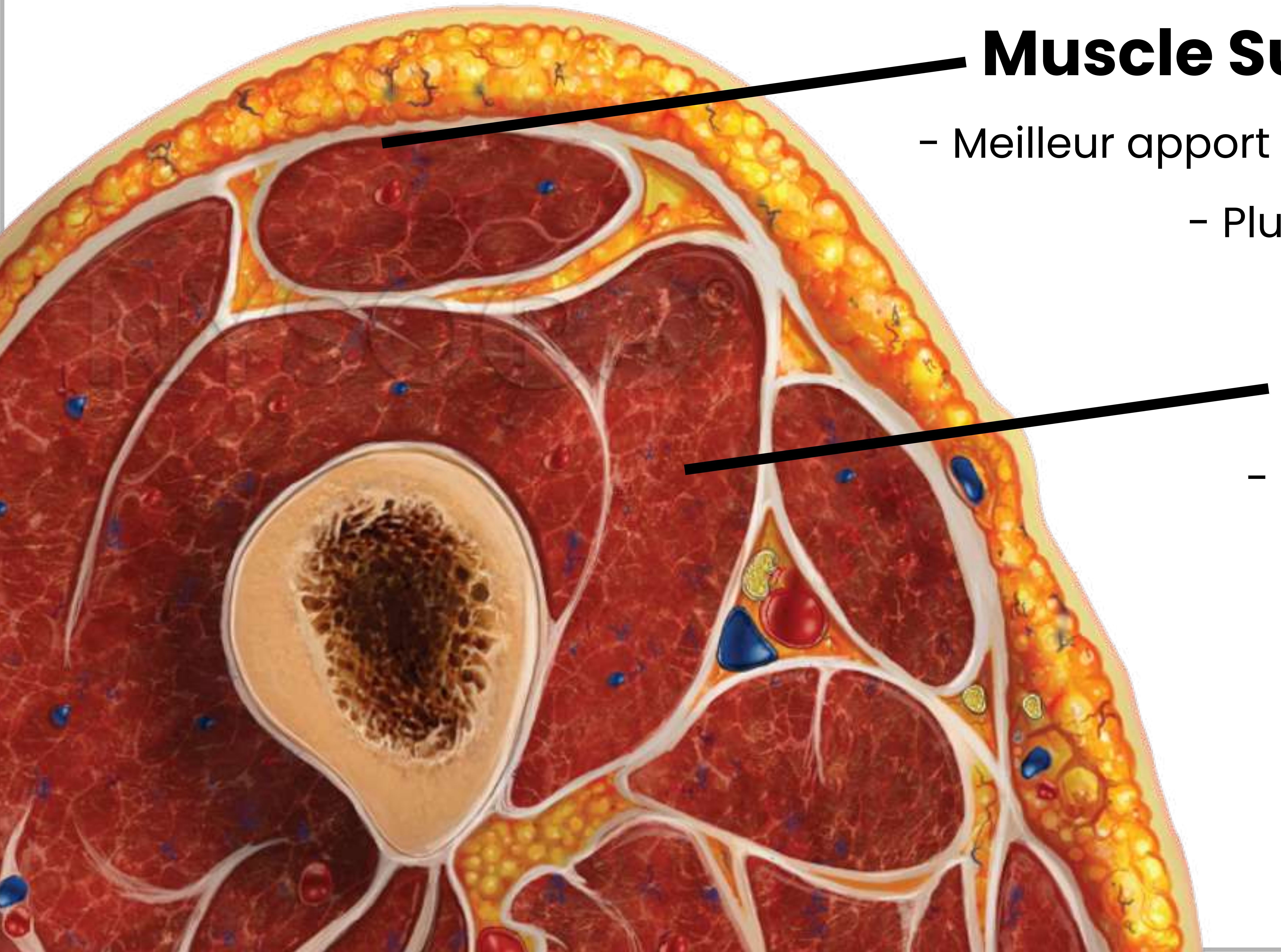
Moxy Monitor







Composition du Muscle



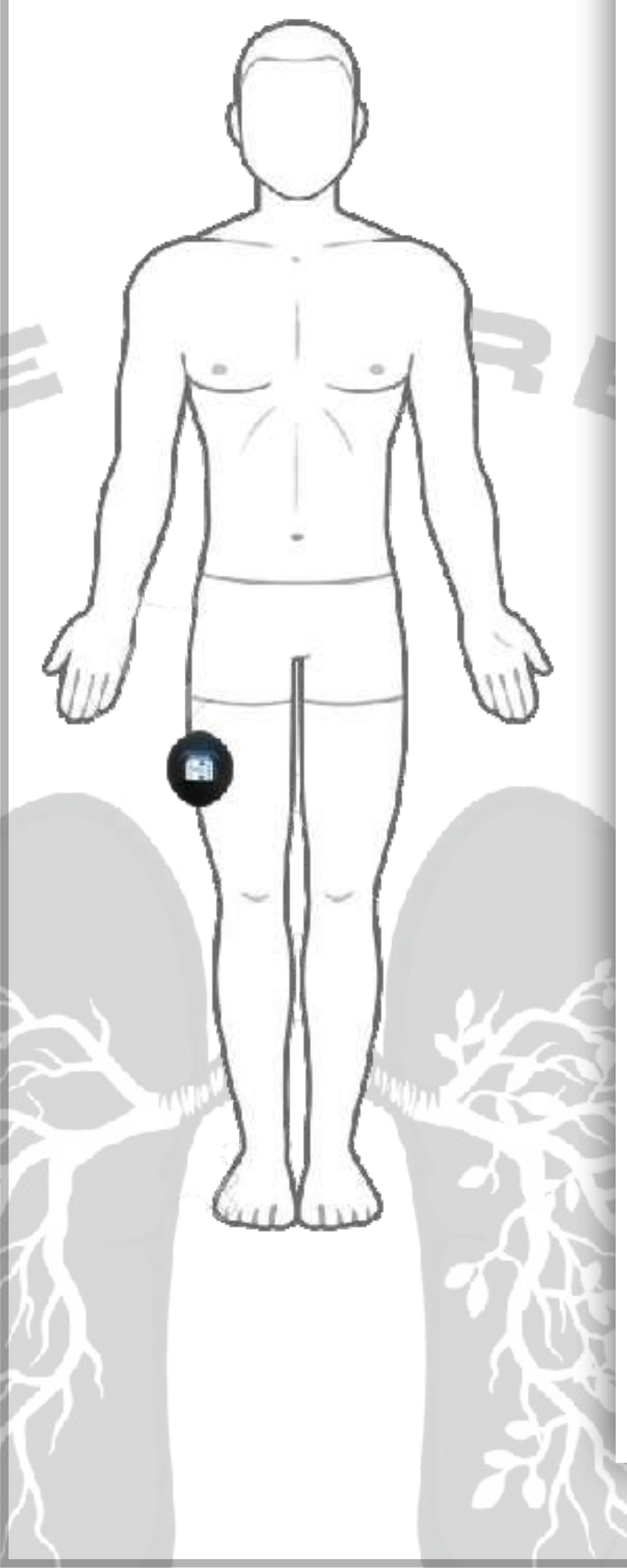
Muscle Superficiel

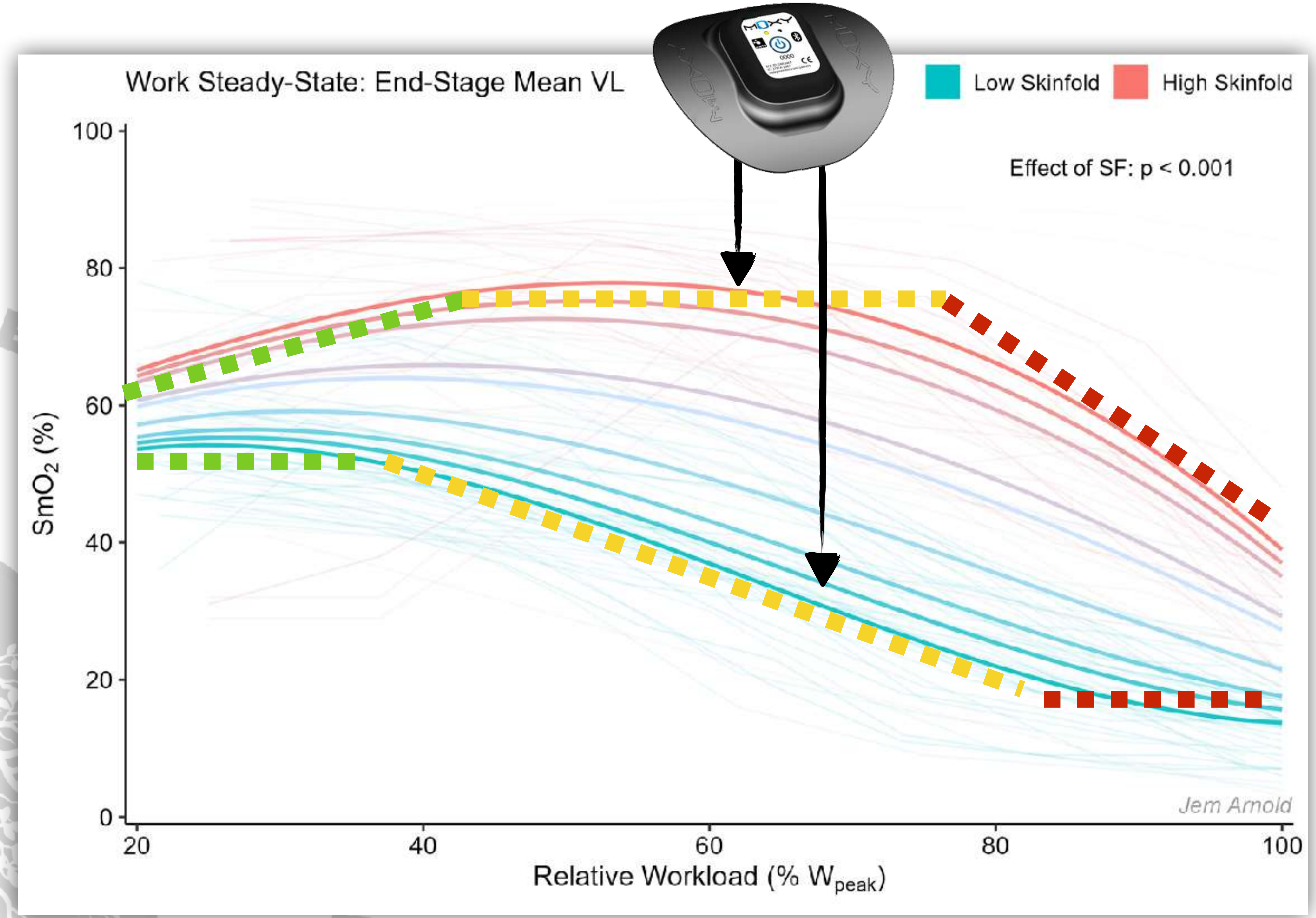
- Meilleur apport sanguin (veines & capillaires)
- Plus de fibres lentes

Muscle Profond

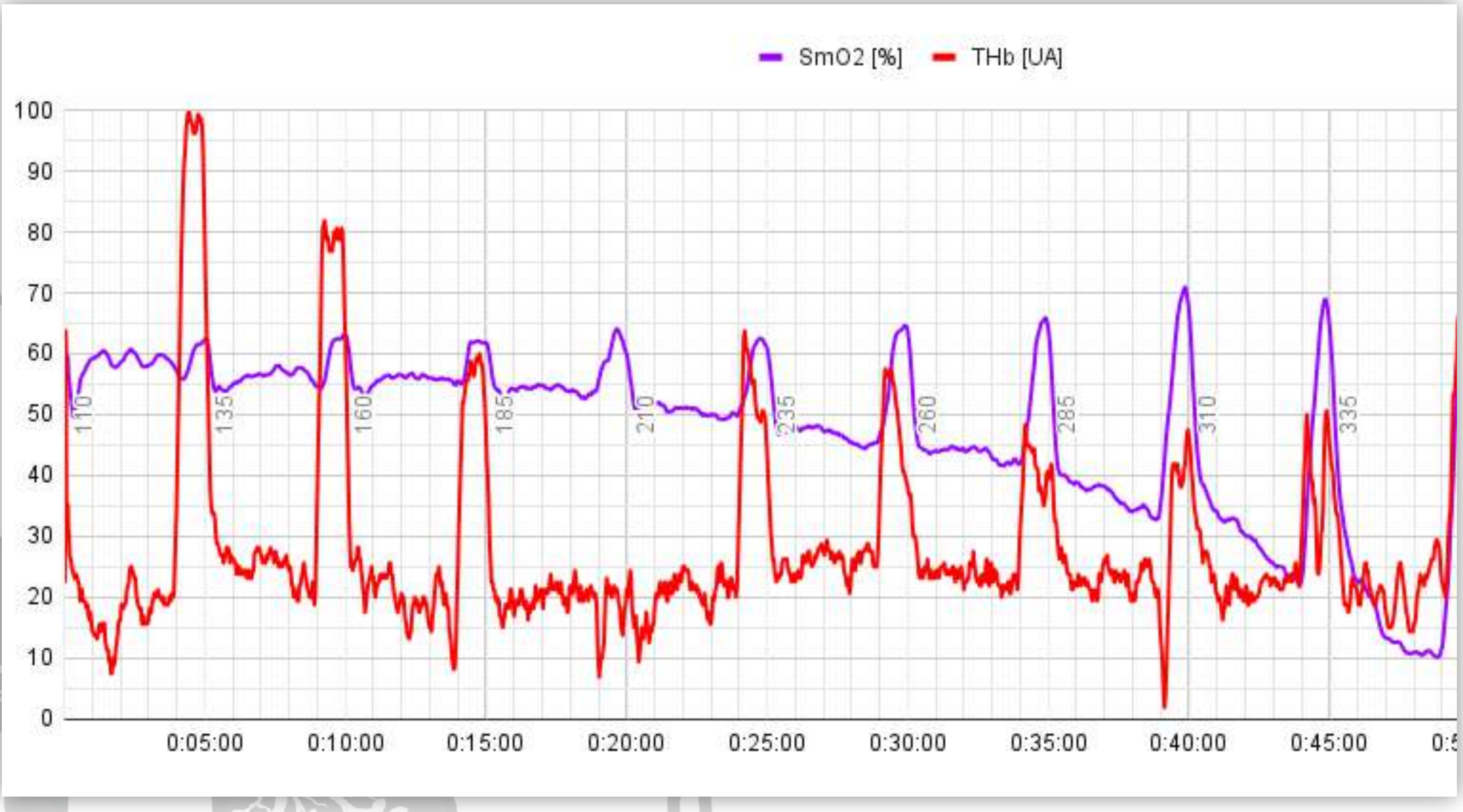
- Deoxygenation plus rapide
- Plus de fibres rapides

Moxy Monitor





Moxy Monitor

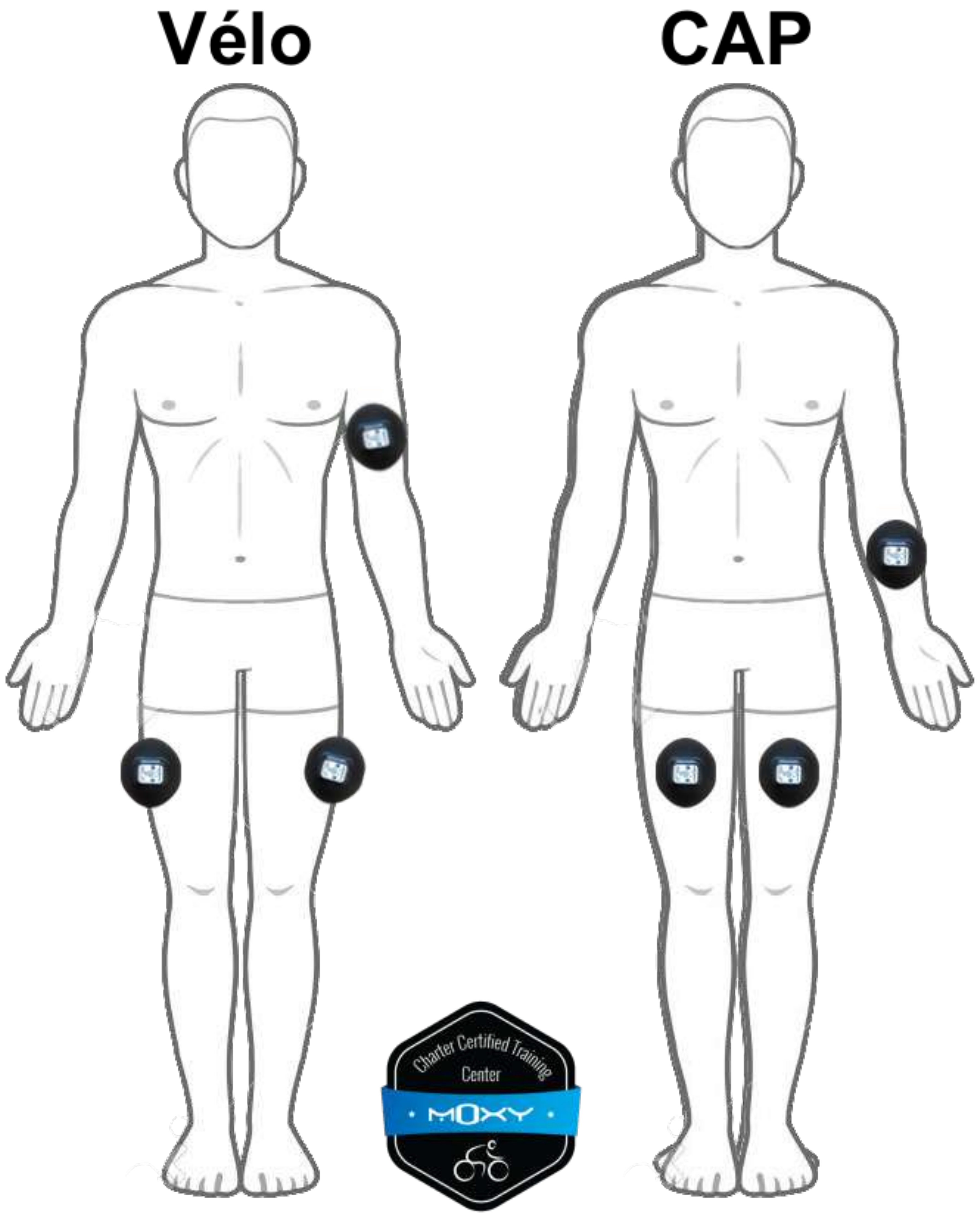


SmO2

Saturation Musculaire
En Oxygène [%]

(**THb**
Hémoglobine Totale [UA])

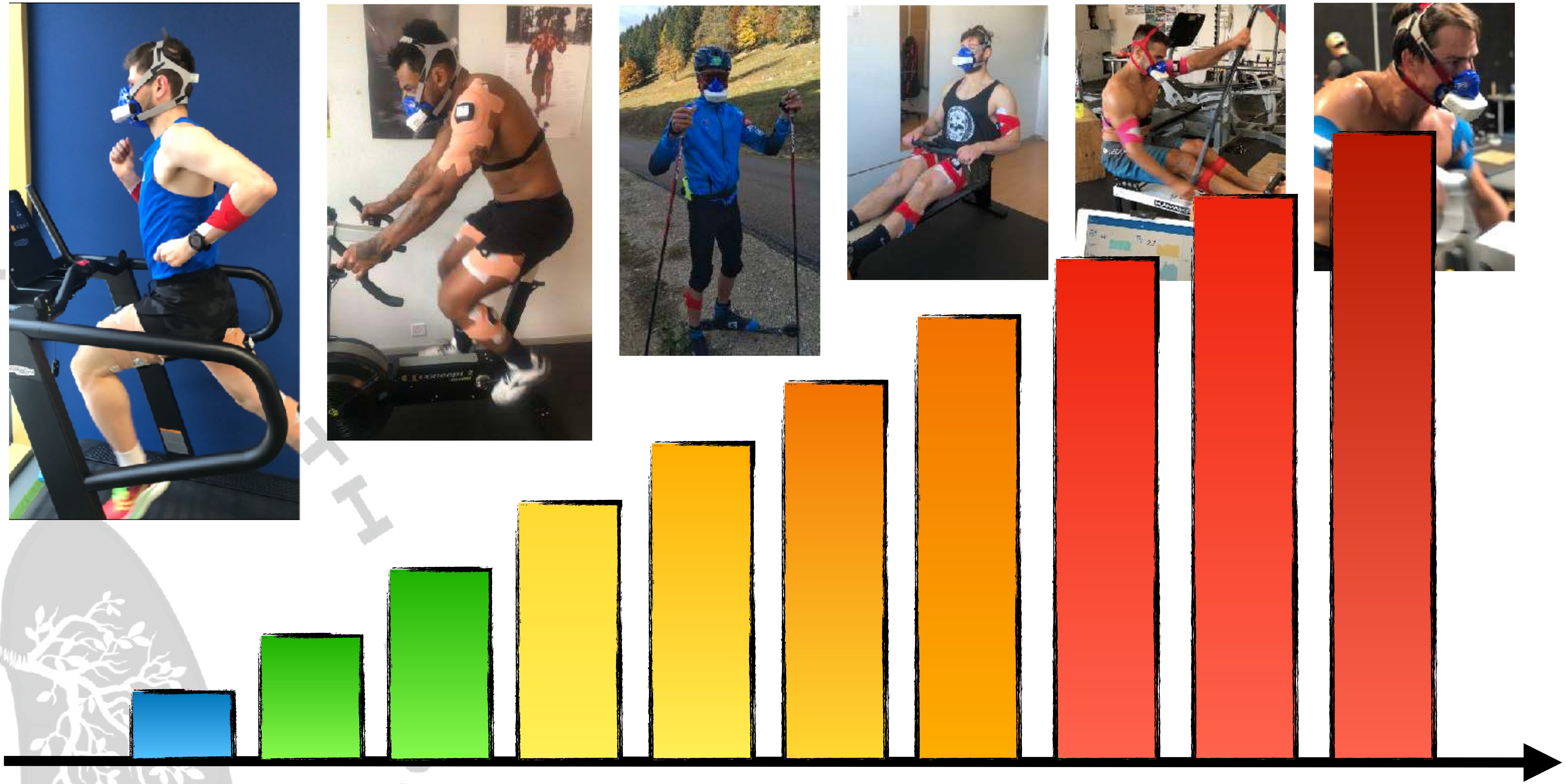
Moxy Monitor



Pratique 1

Test d’Effort avec Moxy Monitor

Protocole 41

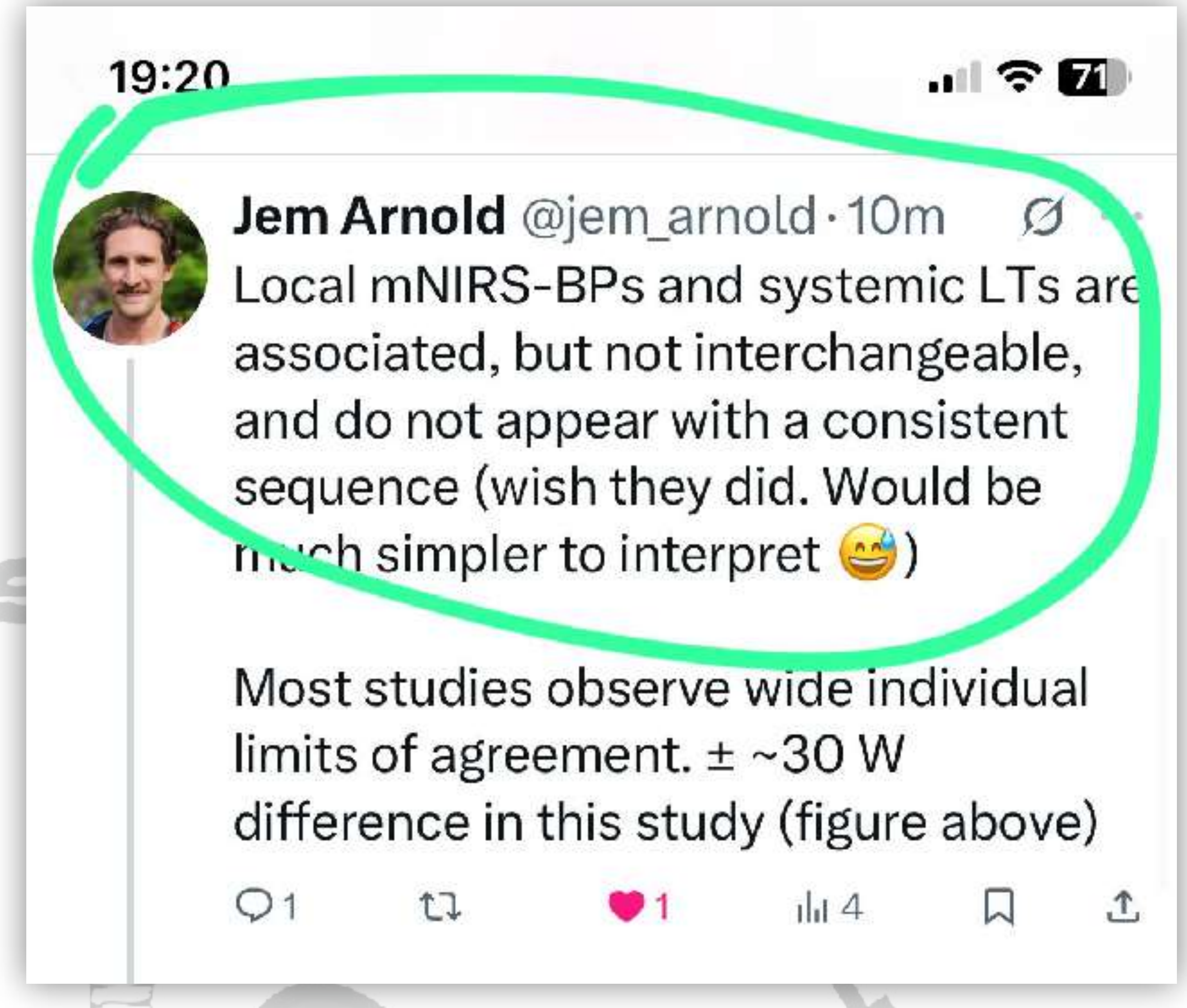


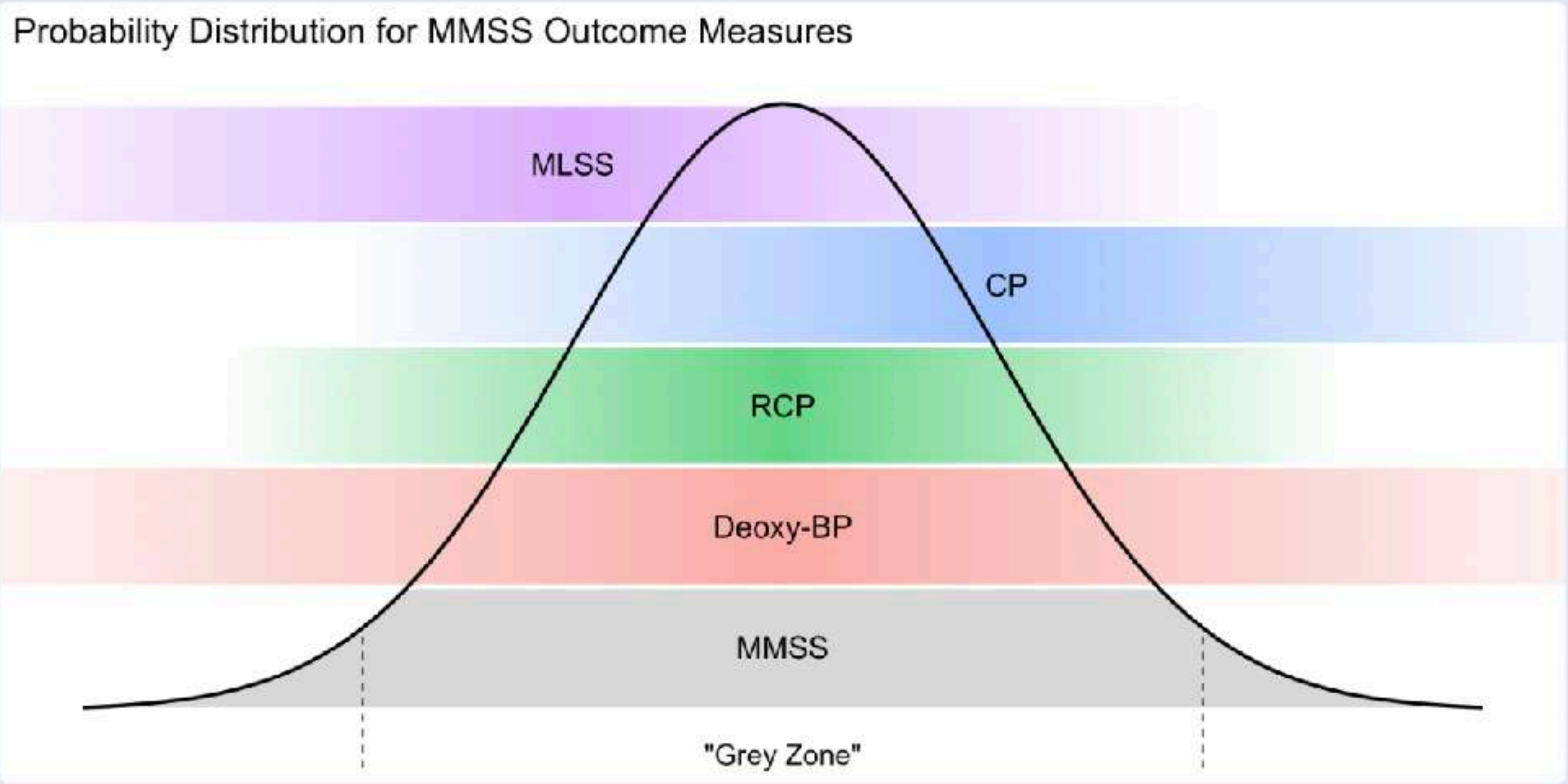
Théorie 2

Interprétation & Cas D'Études

Discussion & Questions

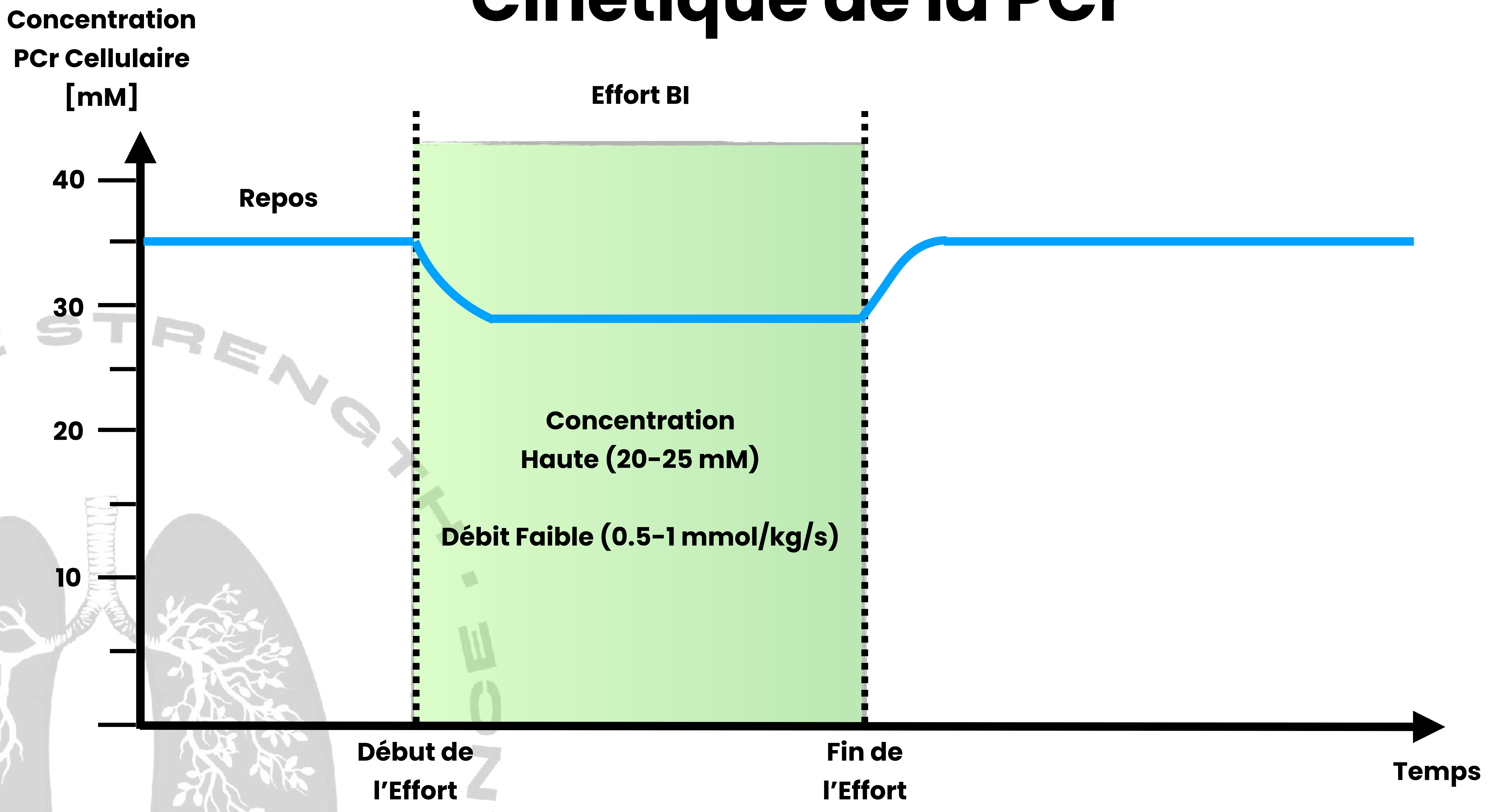
Interprétation





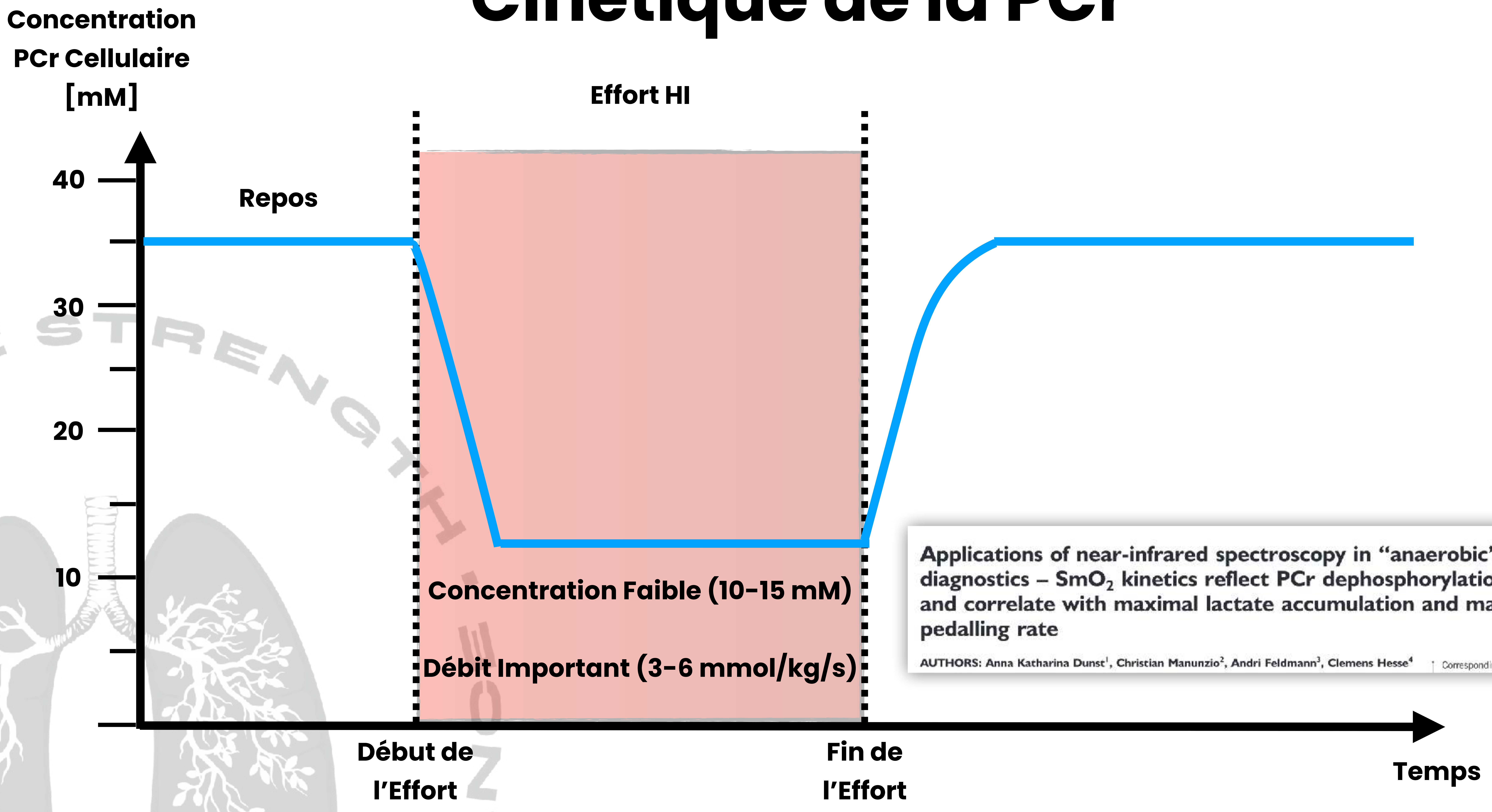
Schematic representation of MMSS construct probability distribution, implying a “grey zone” within a 95% confidence interval. Associated threshold measurements have their own distributions and 95% CI.

Cinétique de la PCr




Cinétique de la PCr
Concentration
PCr Cellulaire
[mM]
Effort MI
40
30
20
10
Repos
Concentration
Moyenne (15-20 mM)
Débit Modéré (1.5-3 mmol/kg/s)
Début de
l'Effort
Fin de
l'Effort
Temps

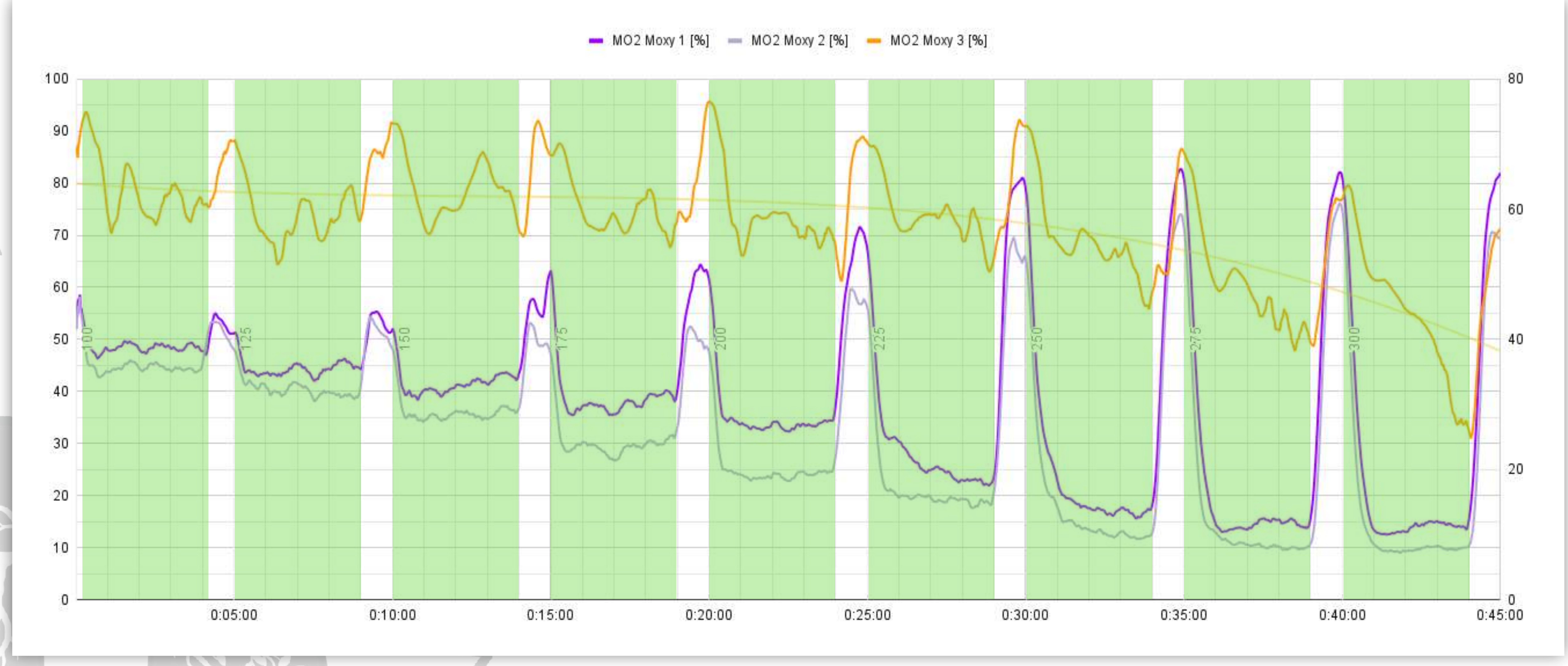
Cinétique de la PCr



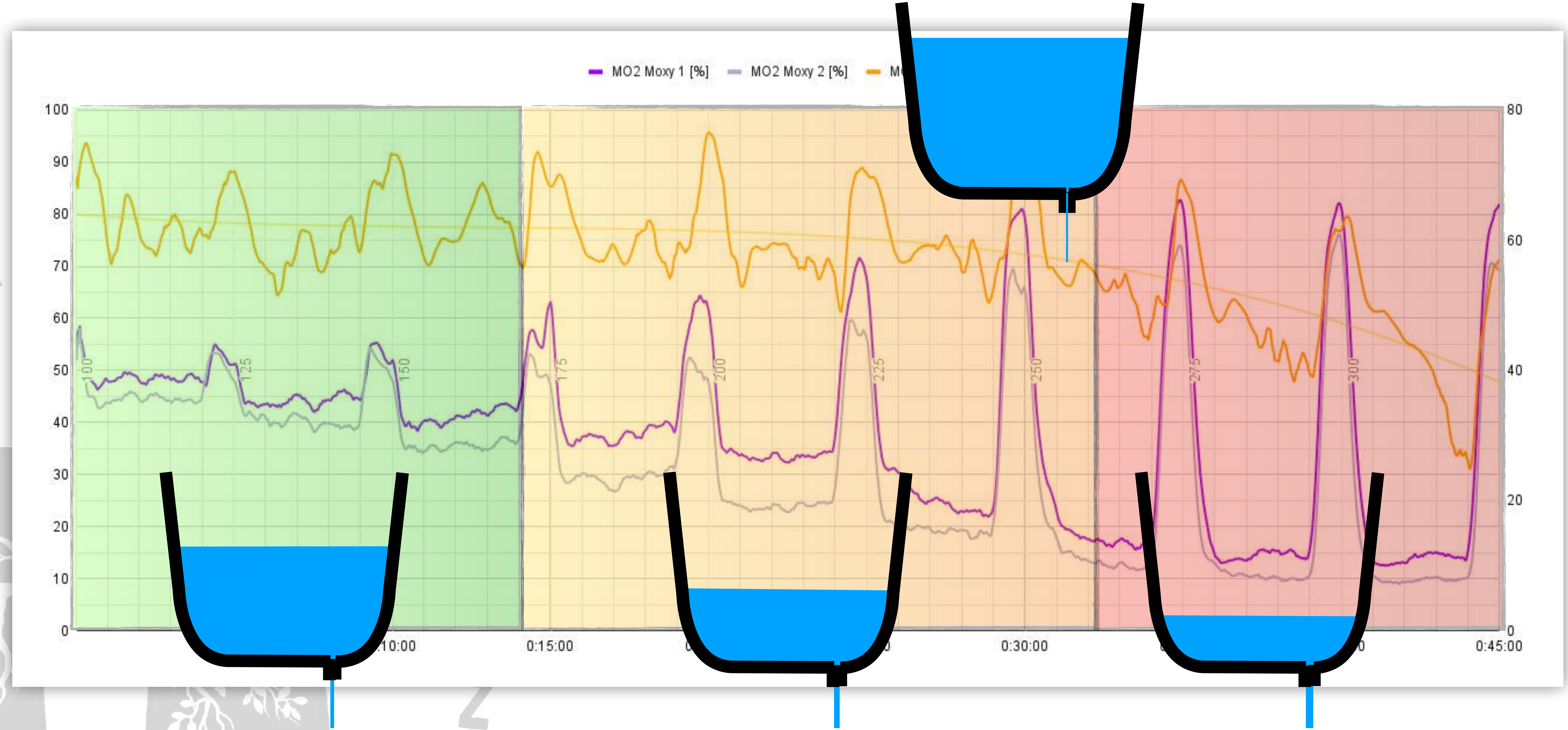
Applications of near-infrared spectroscopy in "anaerobic" diagnostics – SmO_2 kinetics reflect PCr dephosphorylation and correlate with maximal lactate accumulation and maximal pedalling rate

AUTHORS: Anna Katharina Dunst[1], Christian Manunzio[2], Andri Feldmann[3], Clemens Hesse[4] Corresponding author:

Interprétation

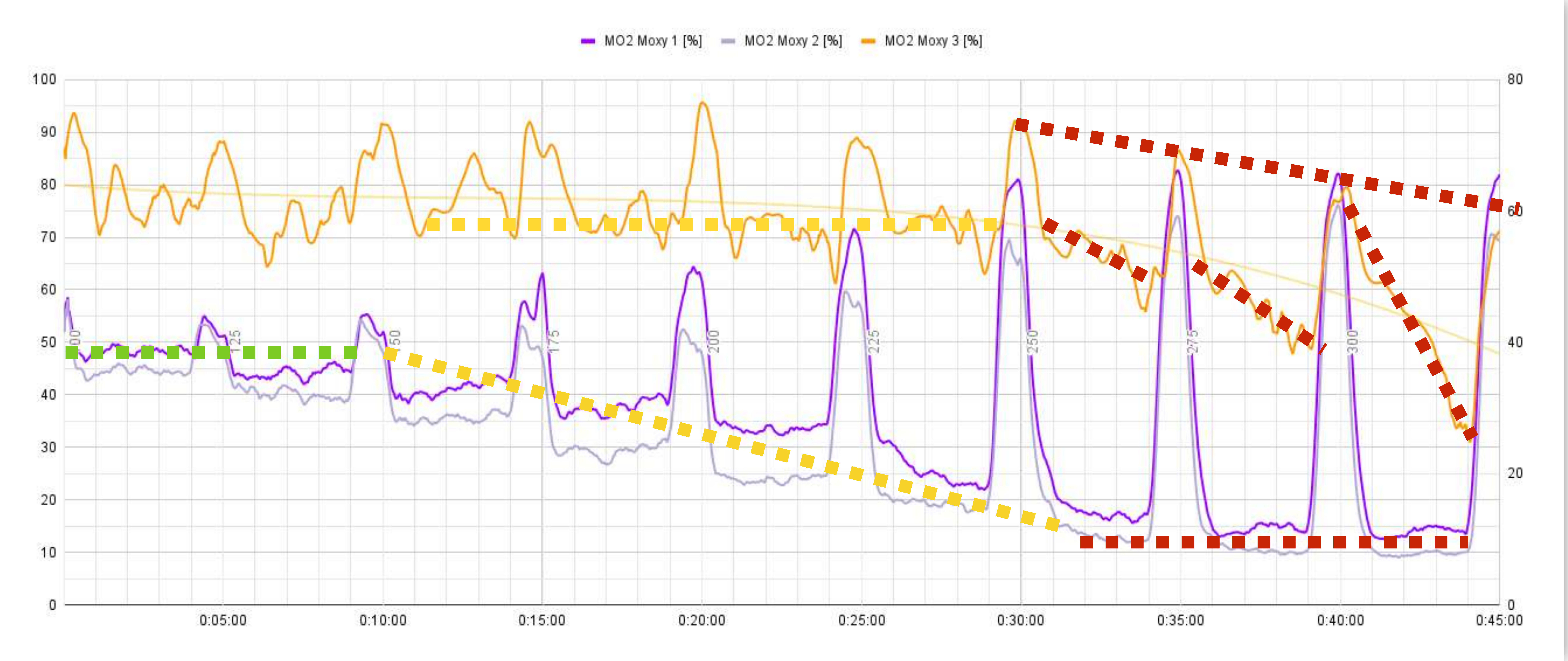


PCr & Oxygène



MO2 Moxy 1 [%]
MO2 Moxy 2 [%]
100
90
80
70
60
50
40
30
20
10
0
80
60
40
20
0
100
125
150
175
200
225
250
275
300
0:15:00
0:30:00
0:45:00

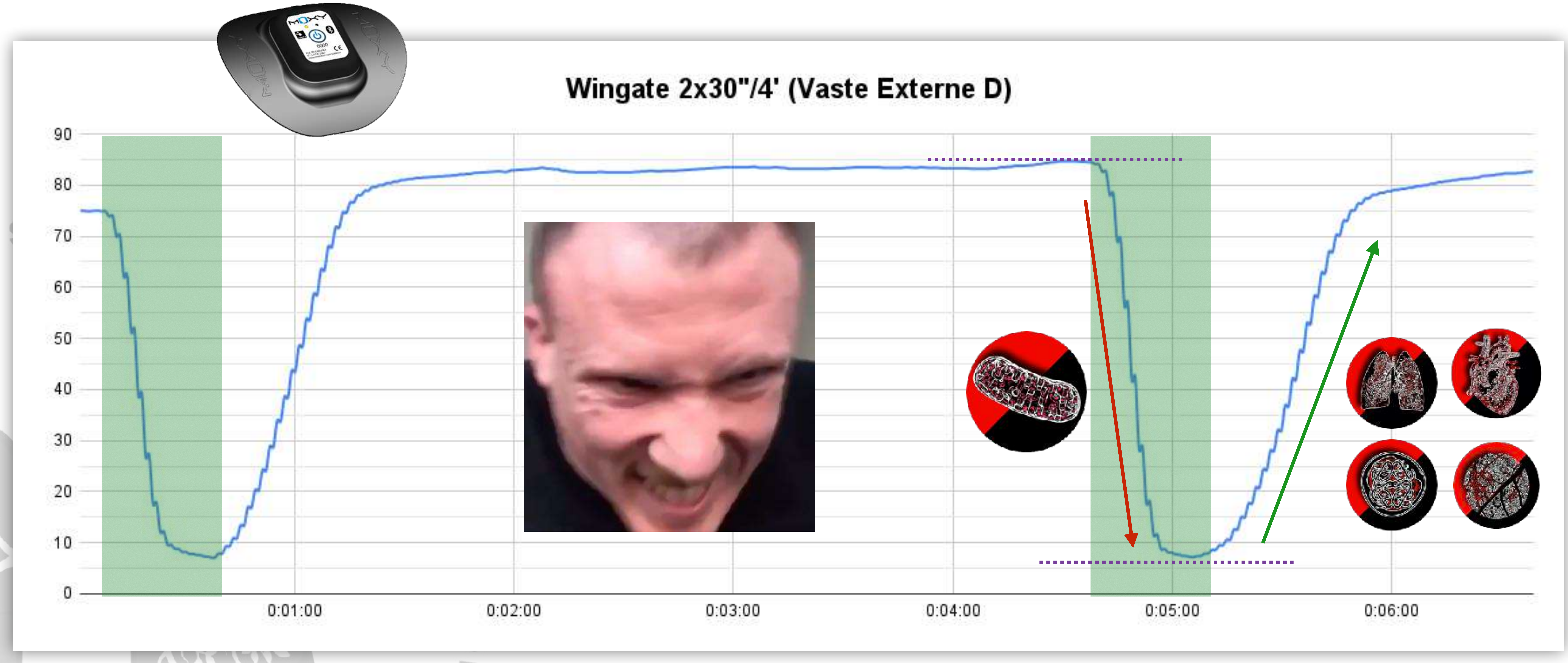
Interprétation



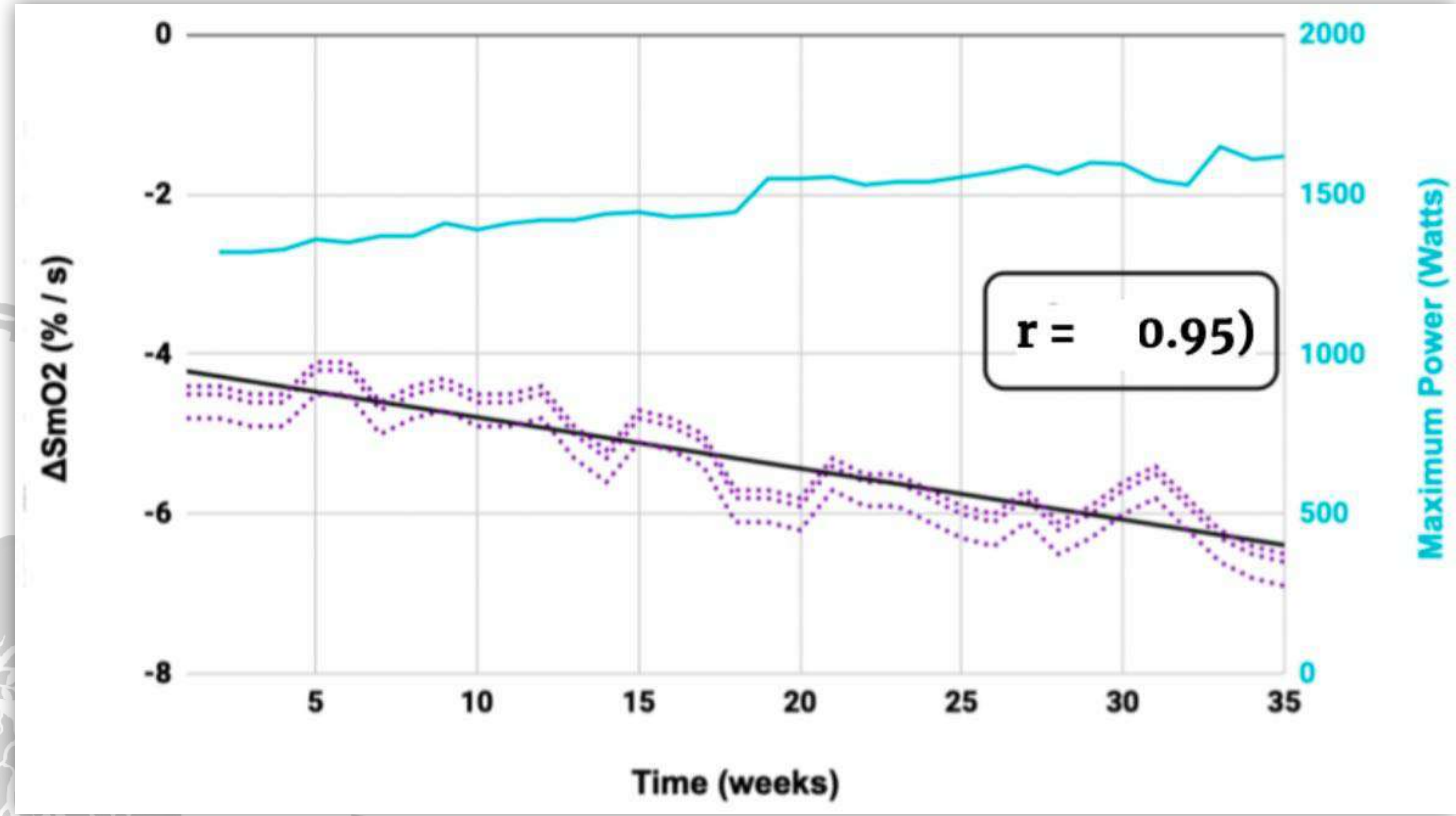
Interprétation

Interprétation

Cas d’Étude: Sprint

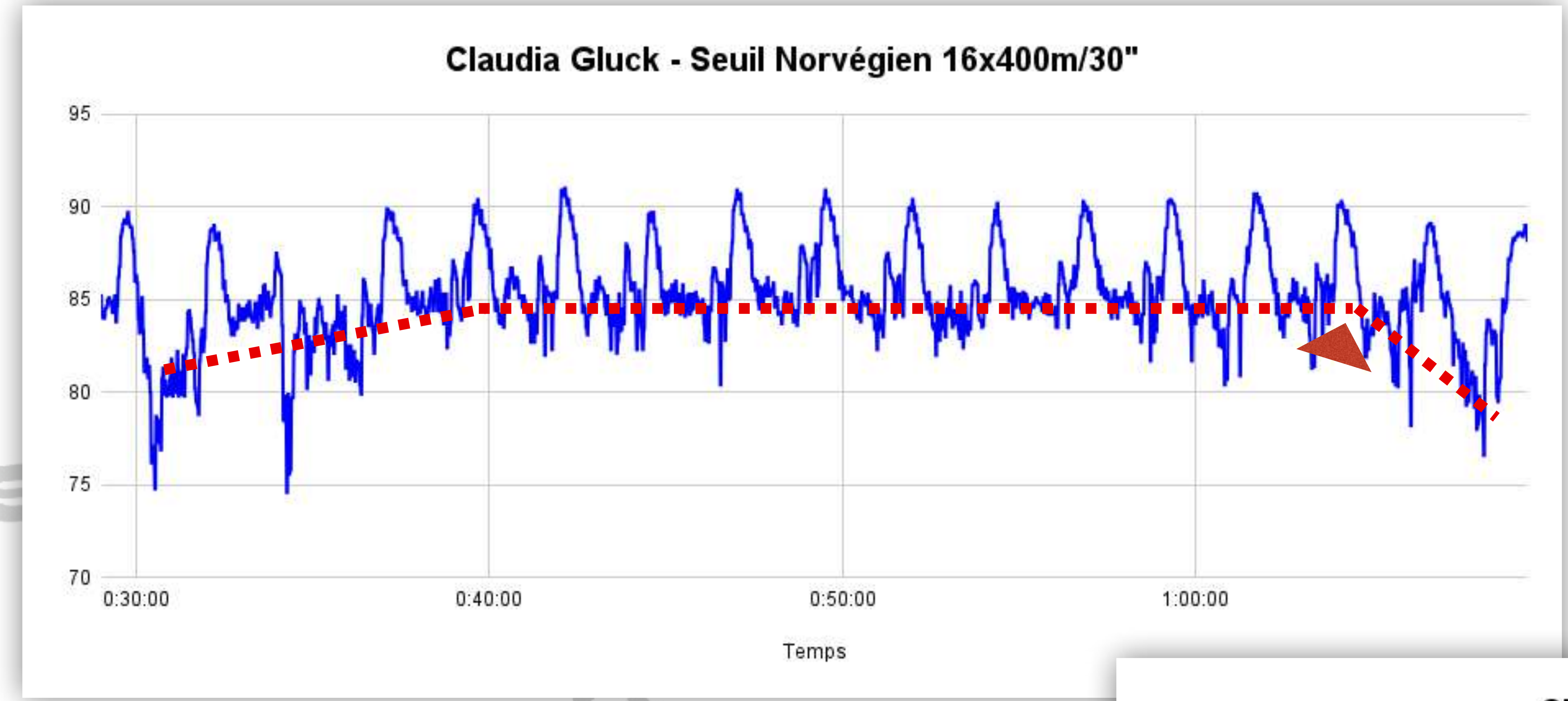


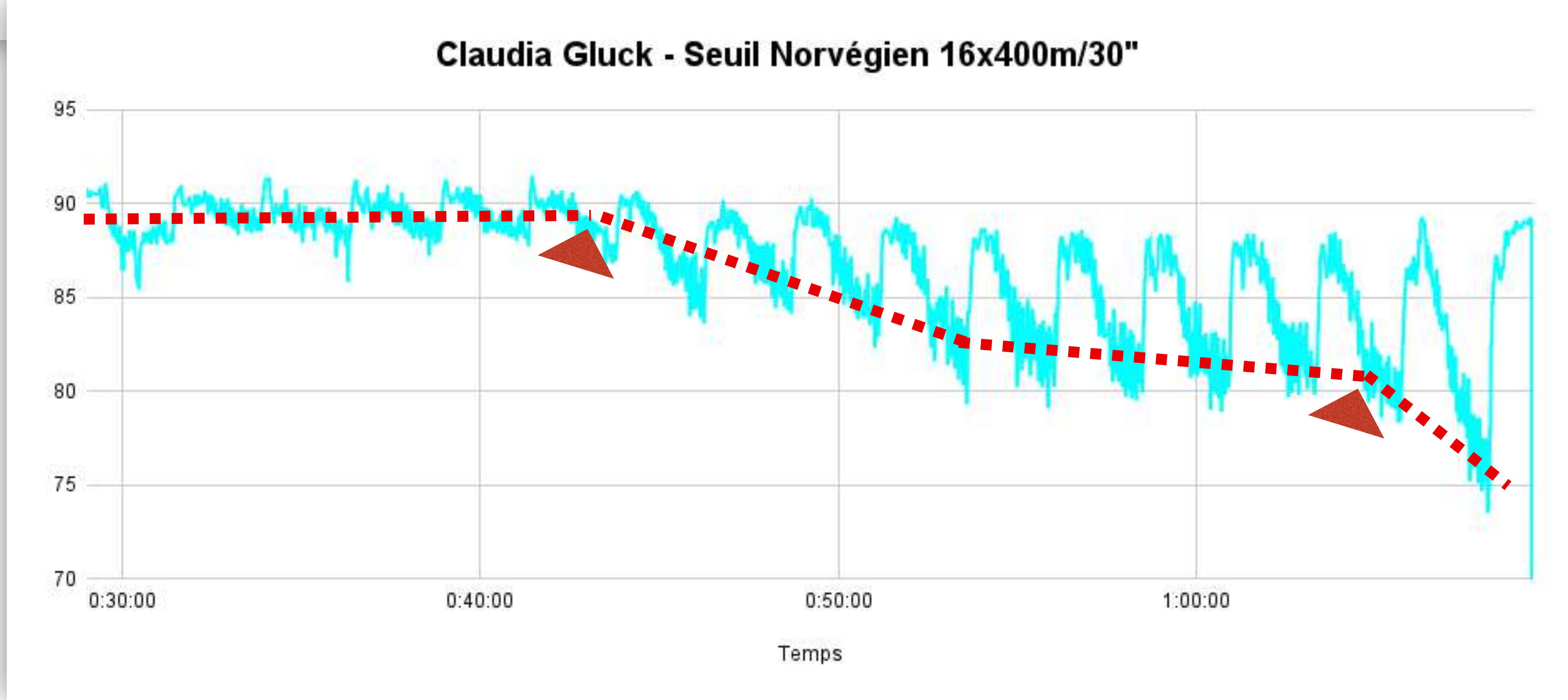
Cas d'Étude: Sprint



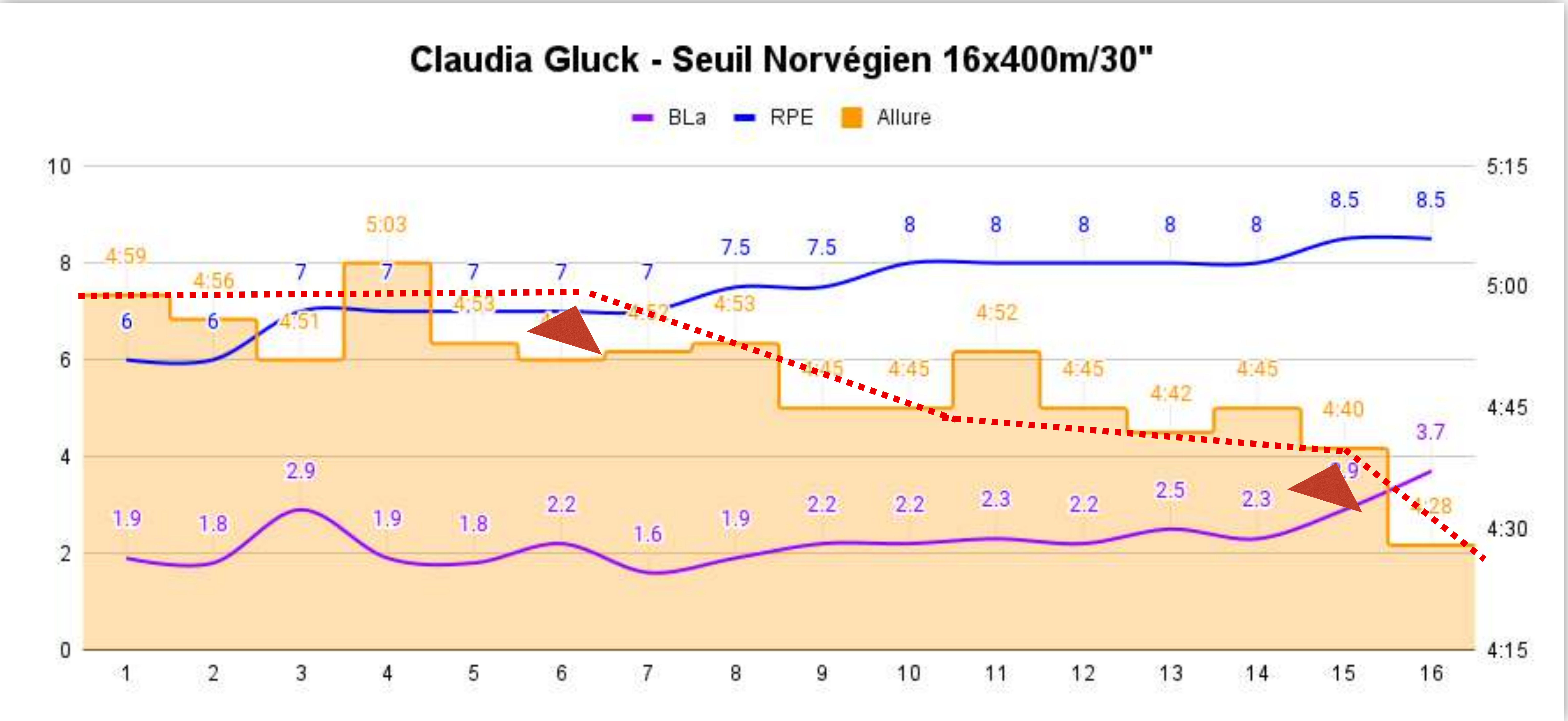
Source: Evan Peikon

Cas d'Étude: Seuil Norvégien





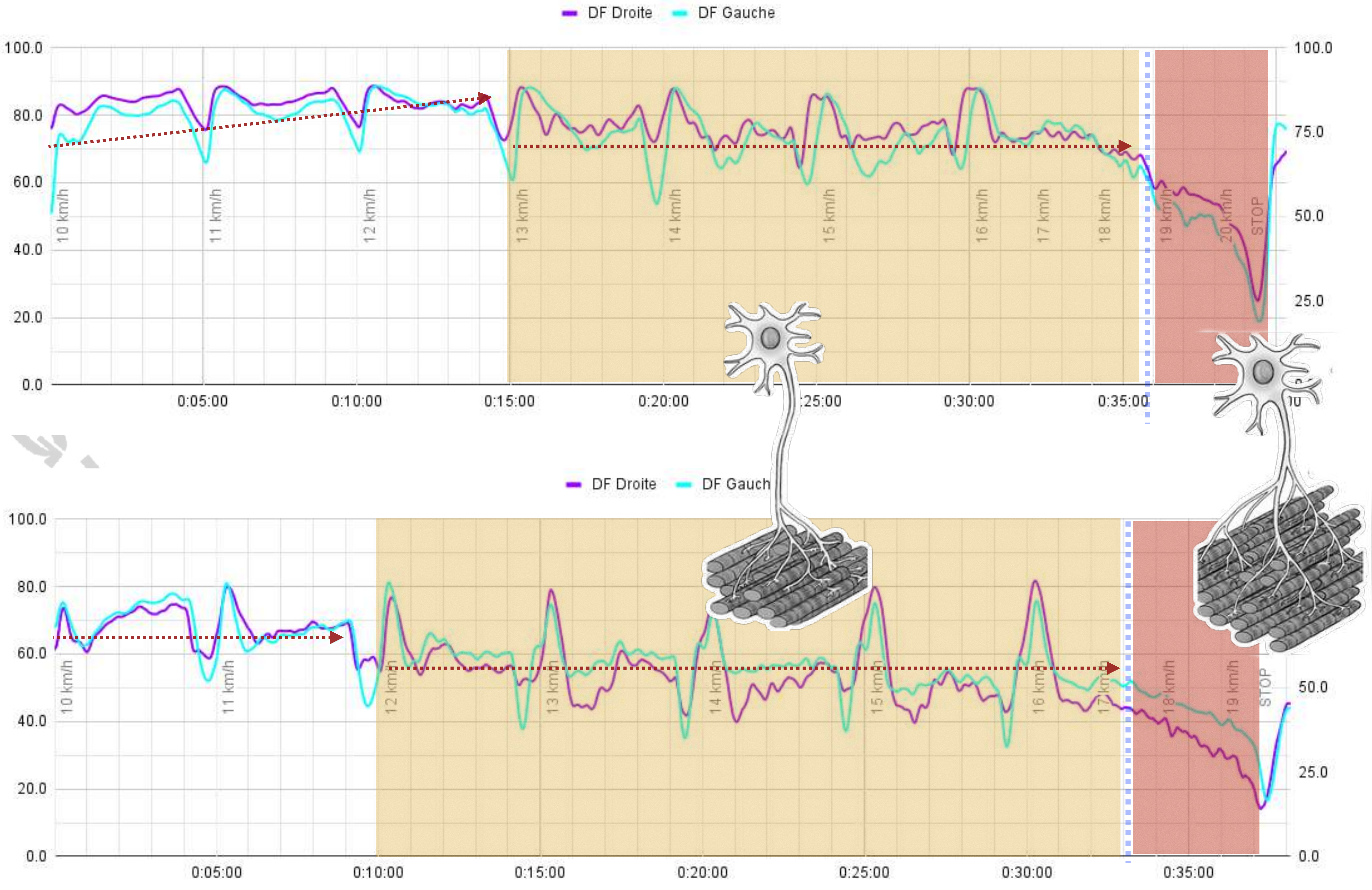
Cas d'Étude: Seuil Norvégien



Cas d'Étude: 2 Profils

3 – 5 km

400 - 800 m



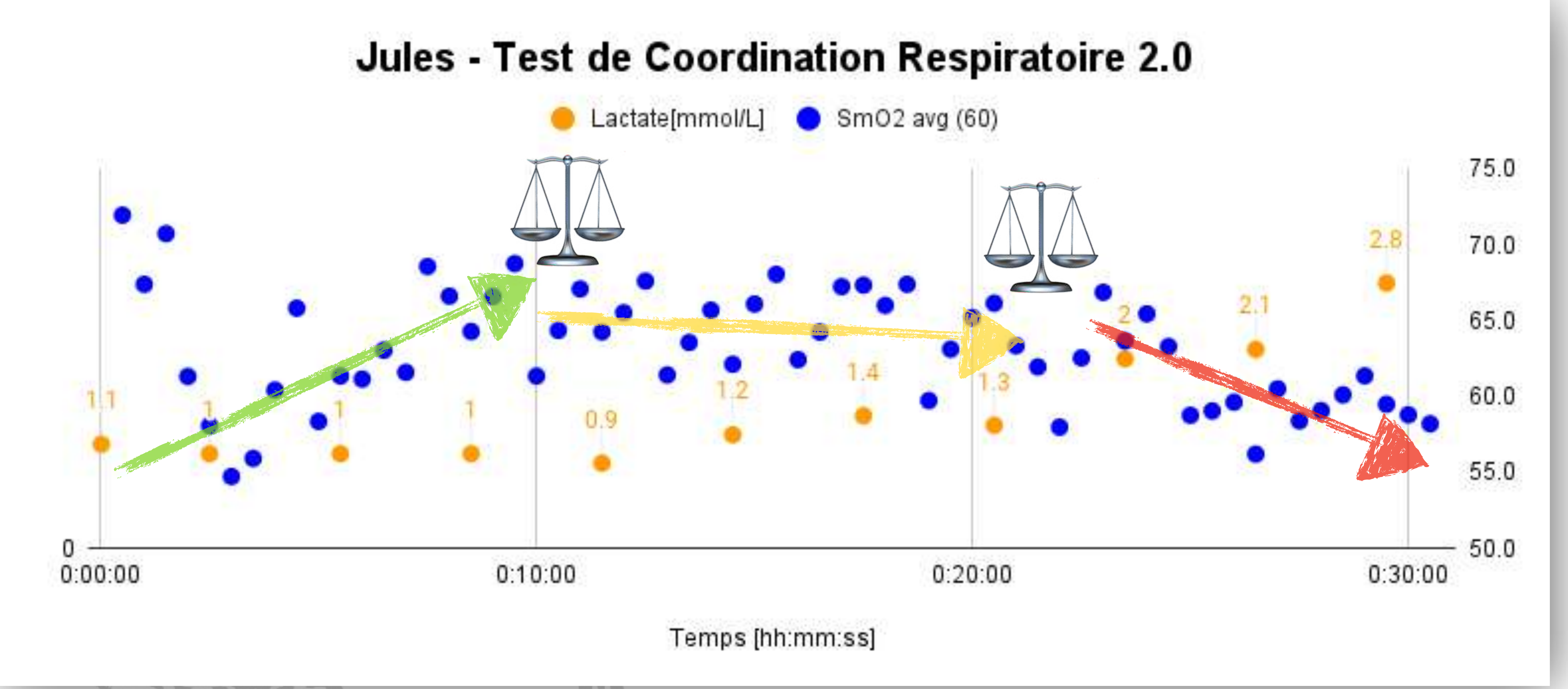
Prédispositions Génétiques

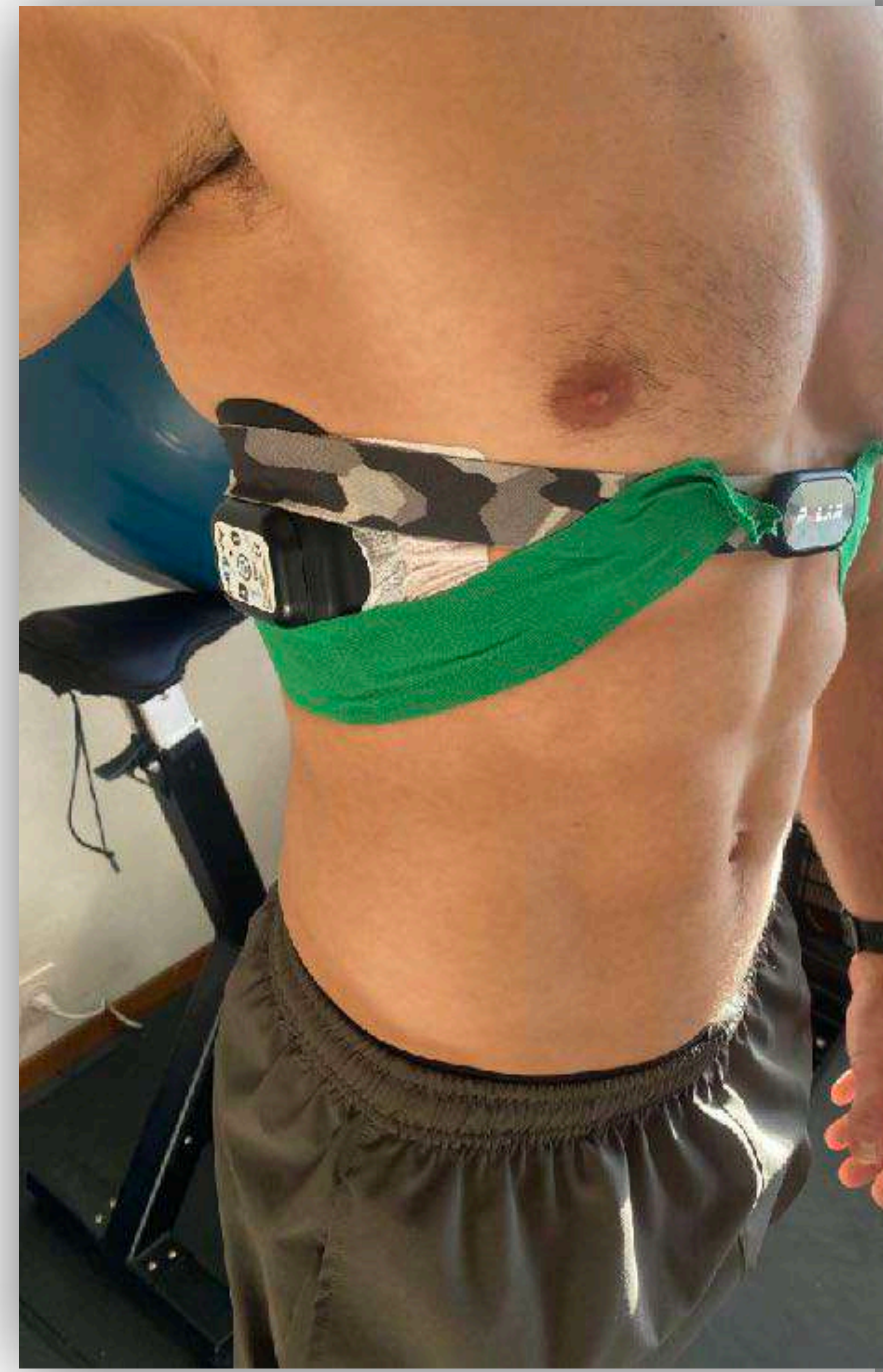
Puissant **Endurant**

Prédispositions Génétiques

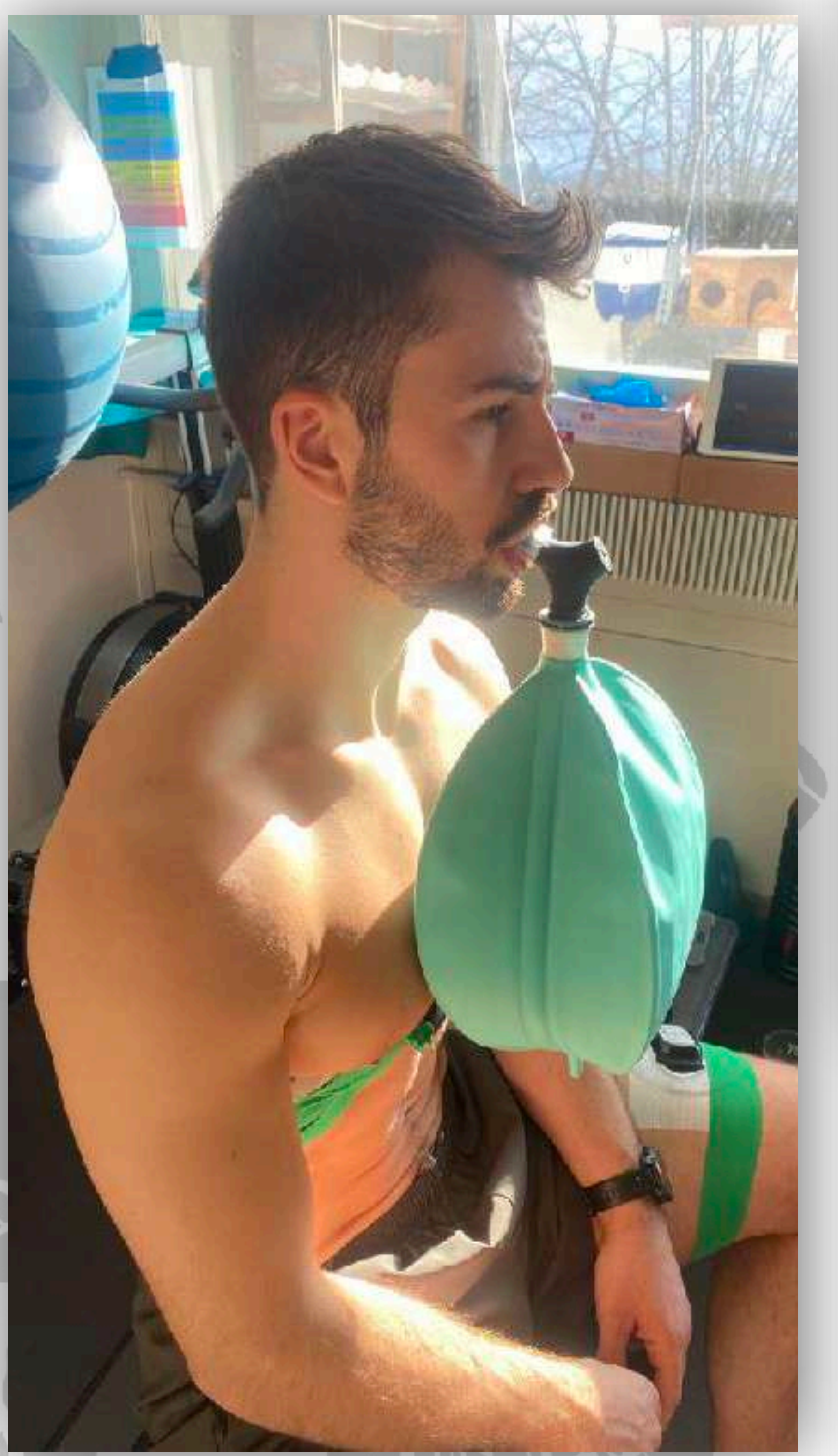
Profil Énergétique

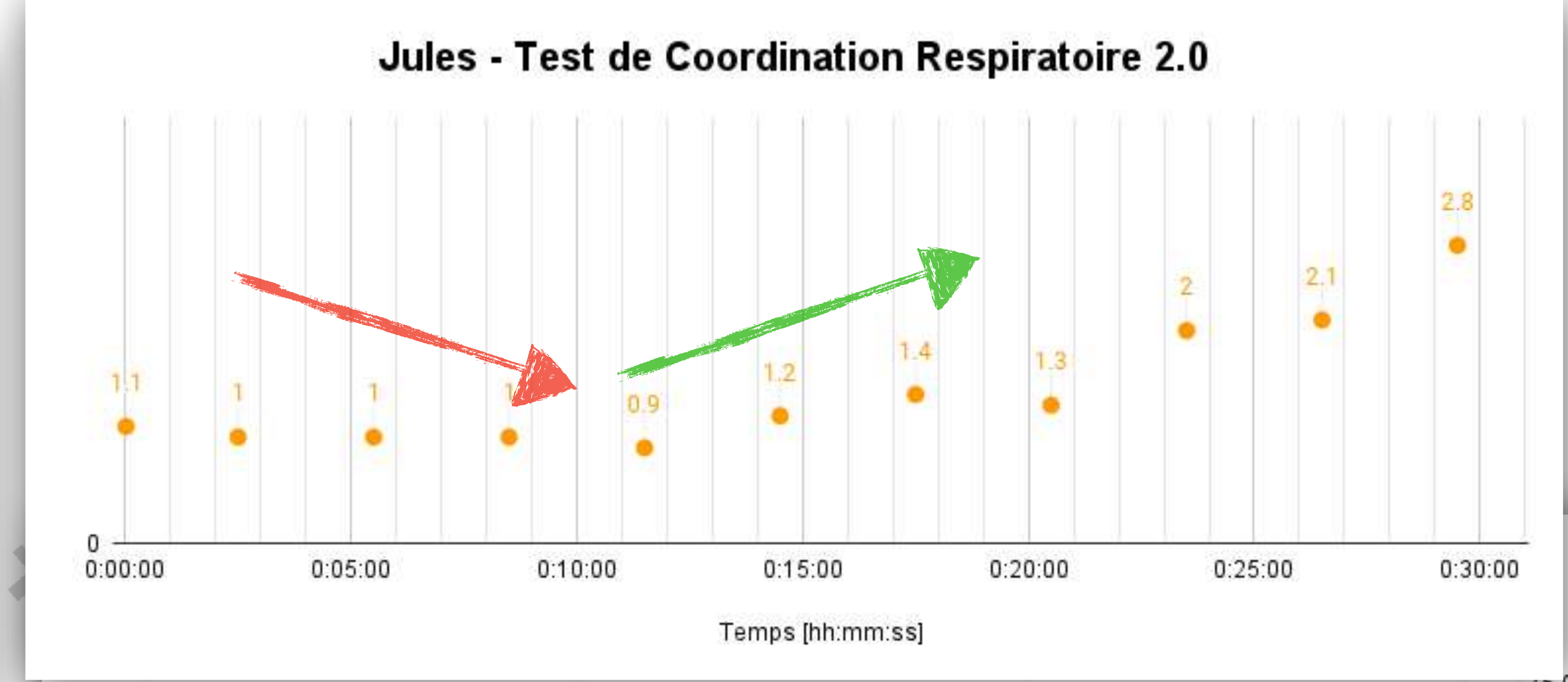
Cas D'Étude: Fréquence Respiratoire

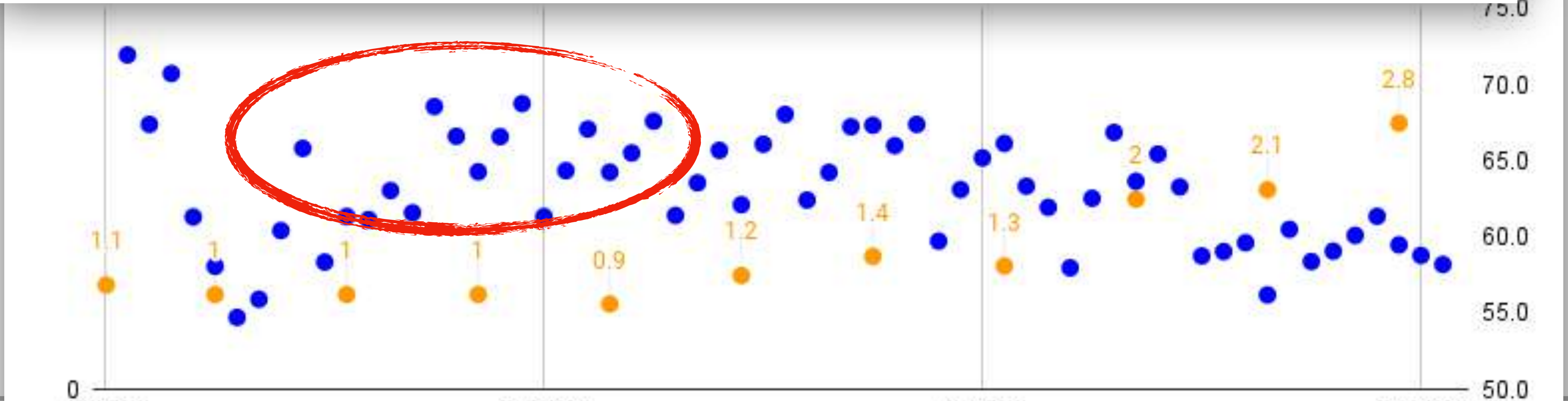




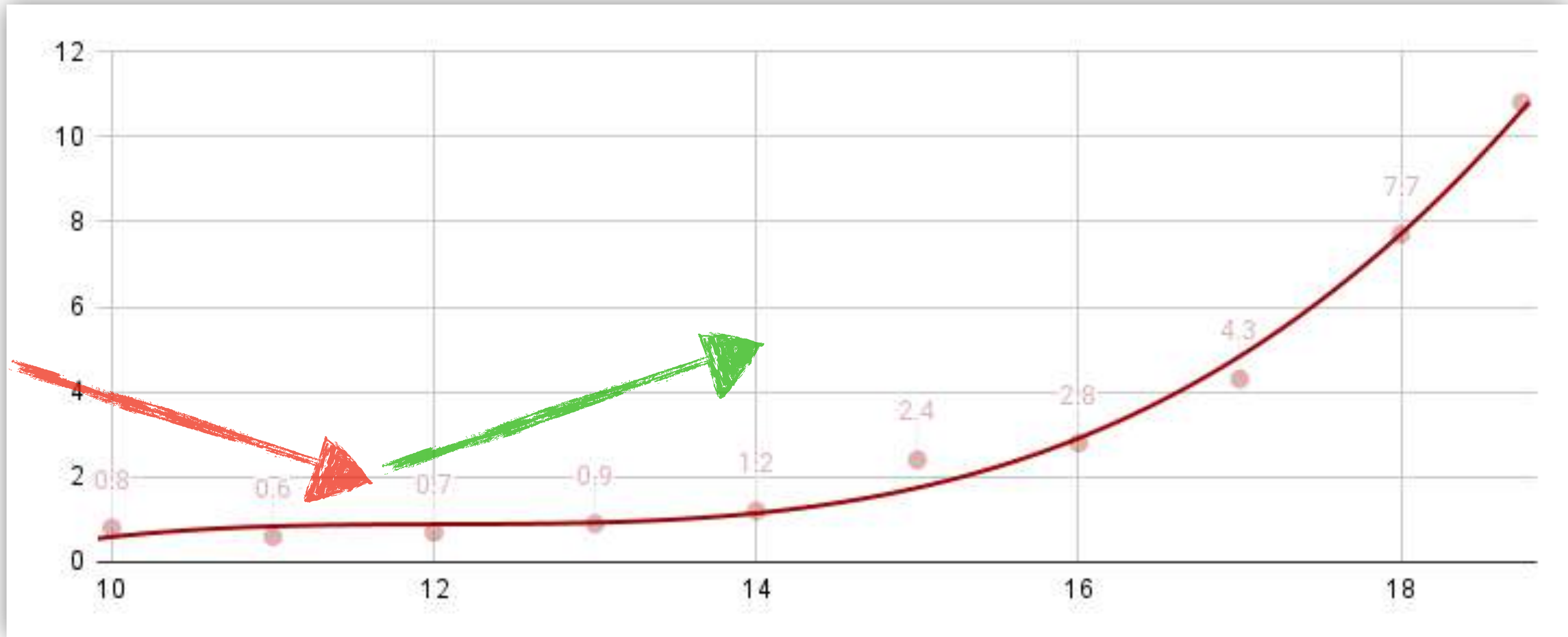
Cas D'Étude: Fréquence Respiratoire



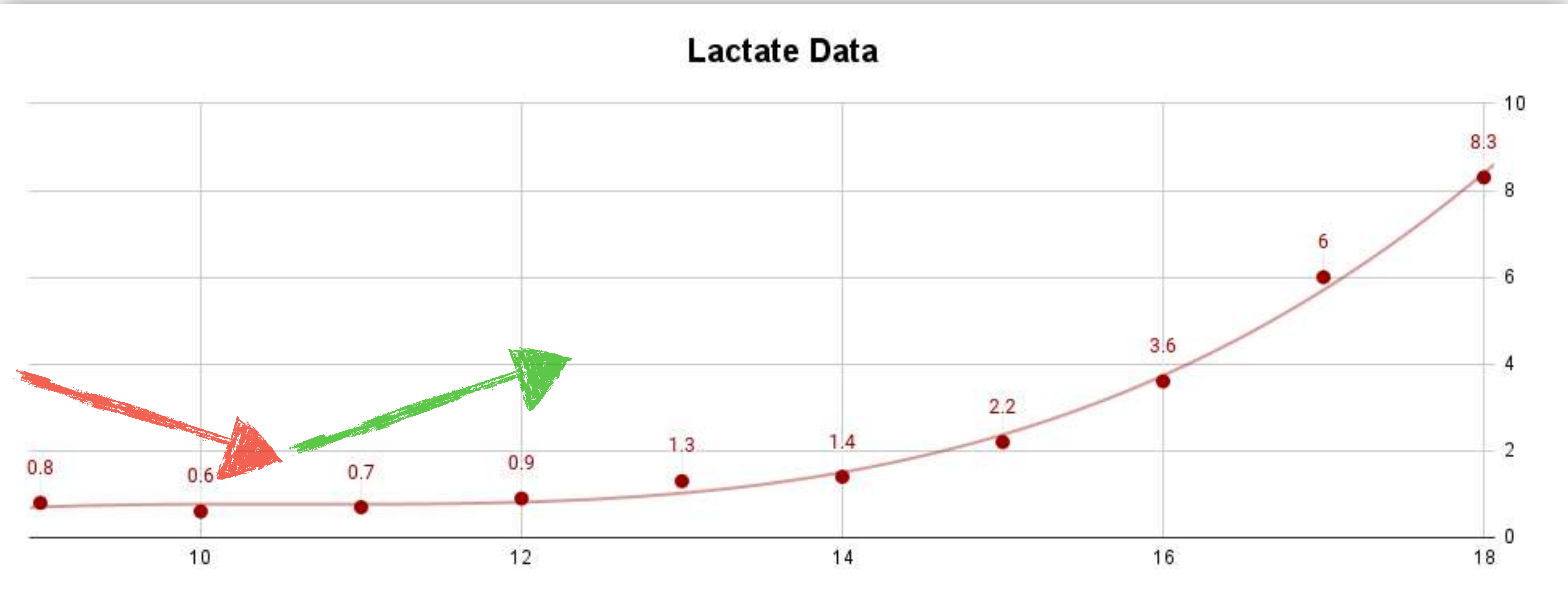


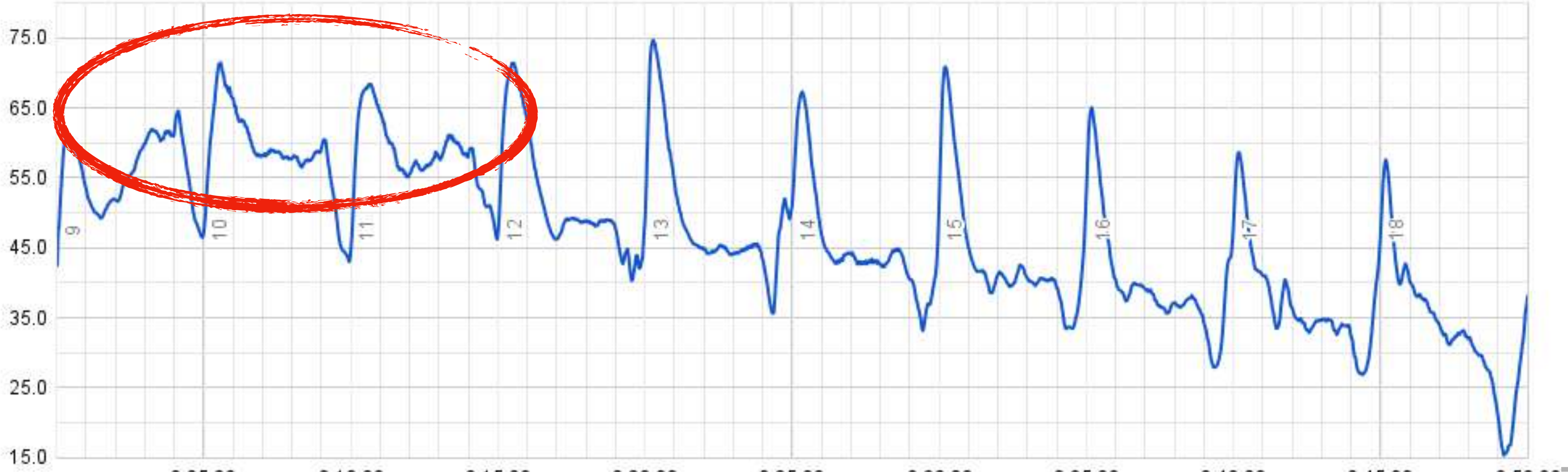


Cas D’Étude: Lactate + Moxy

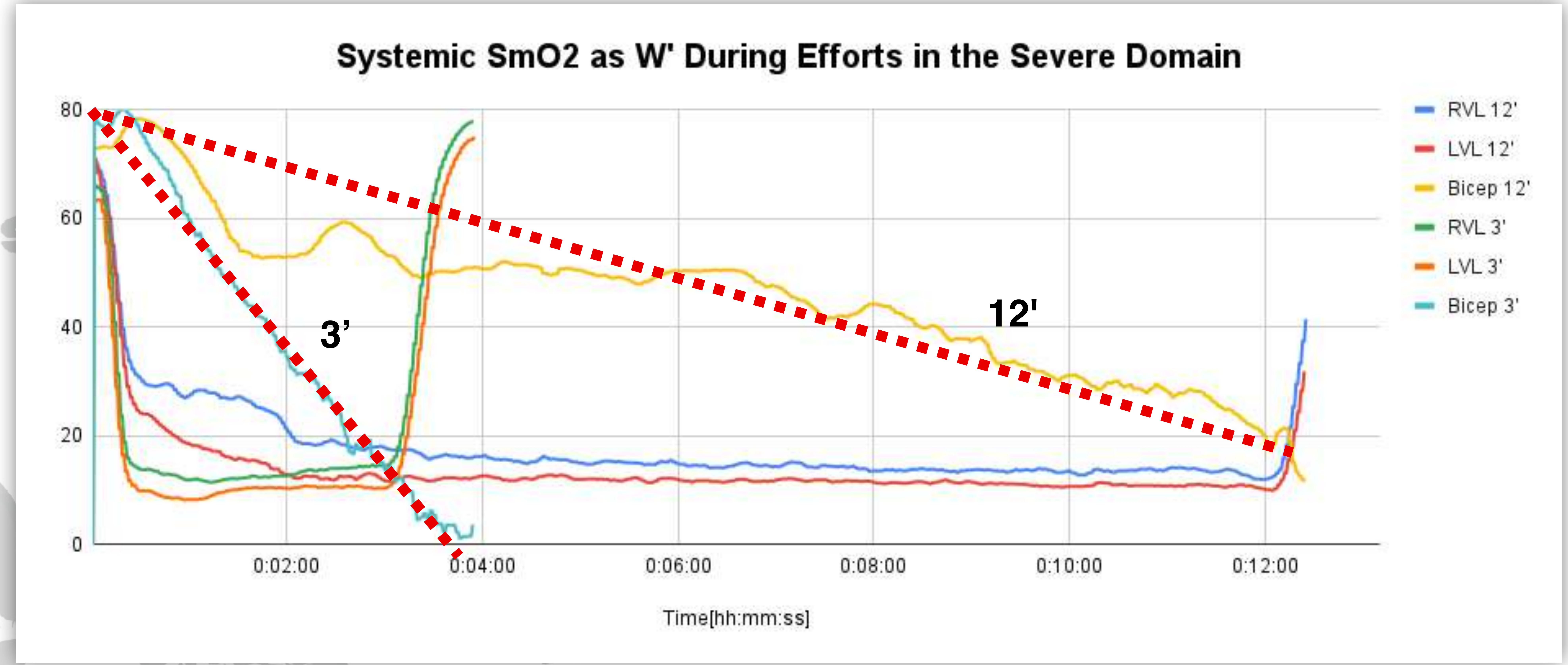


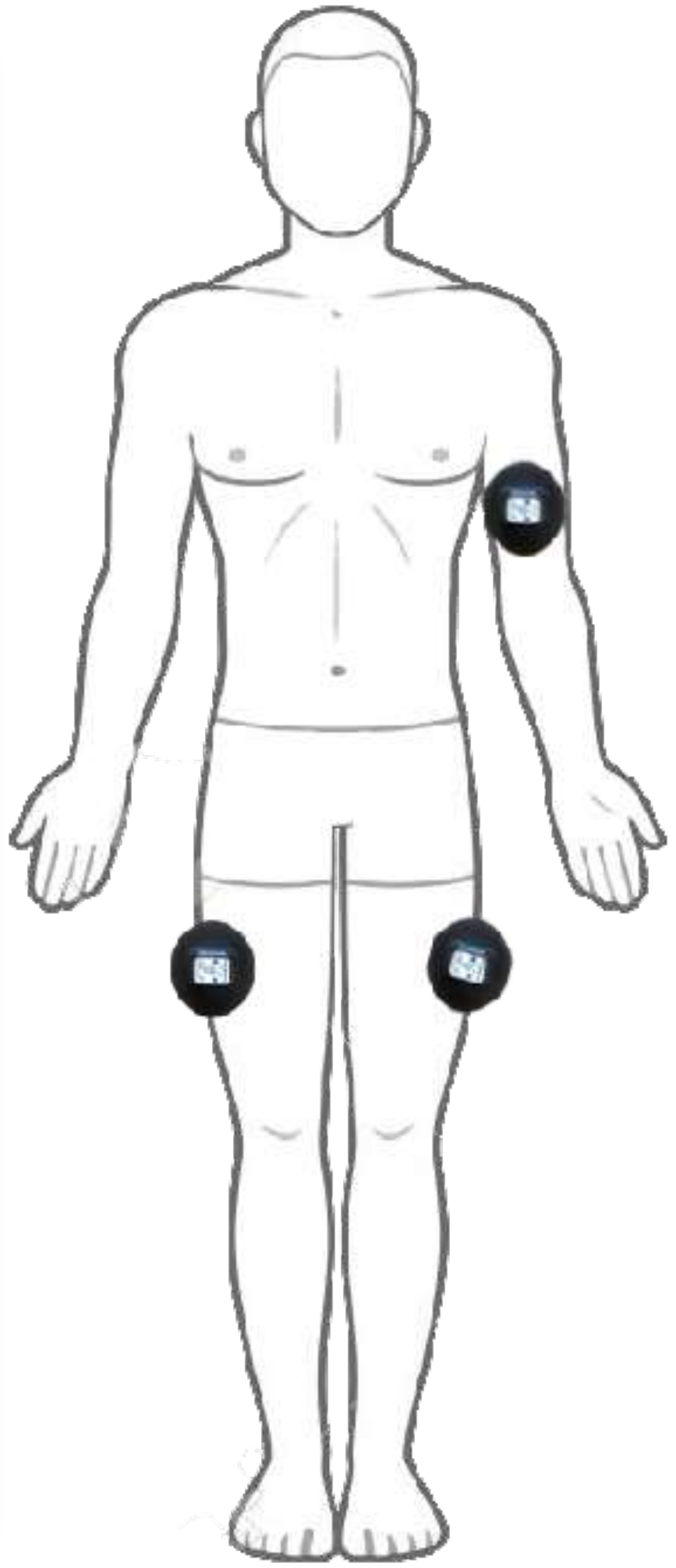
Cas D’Étude: Lactate + Moxy



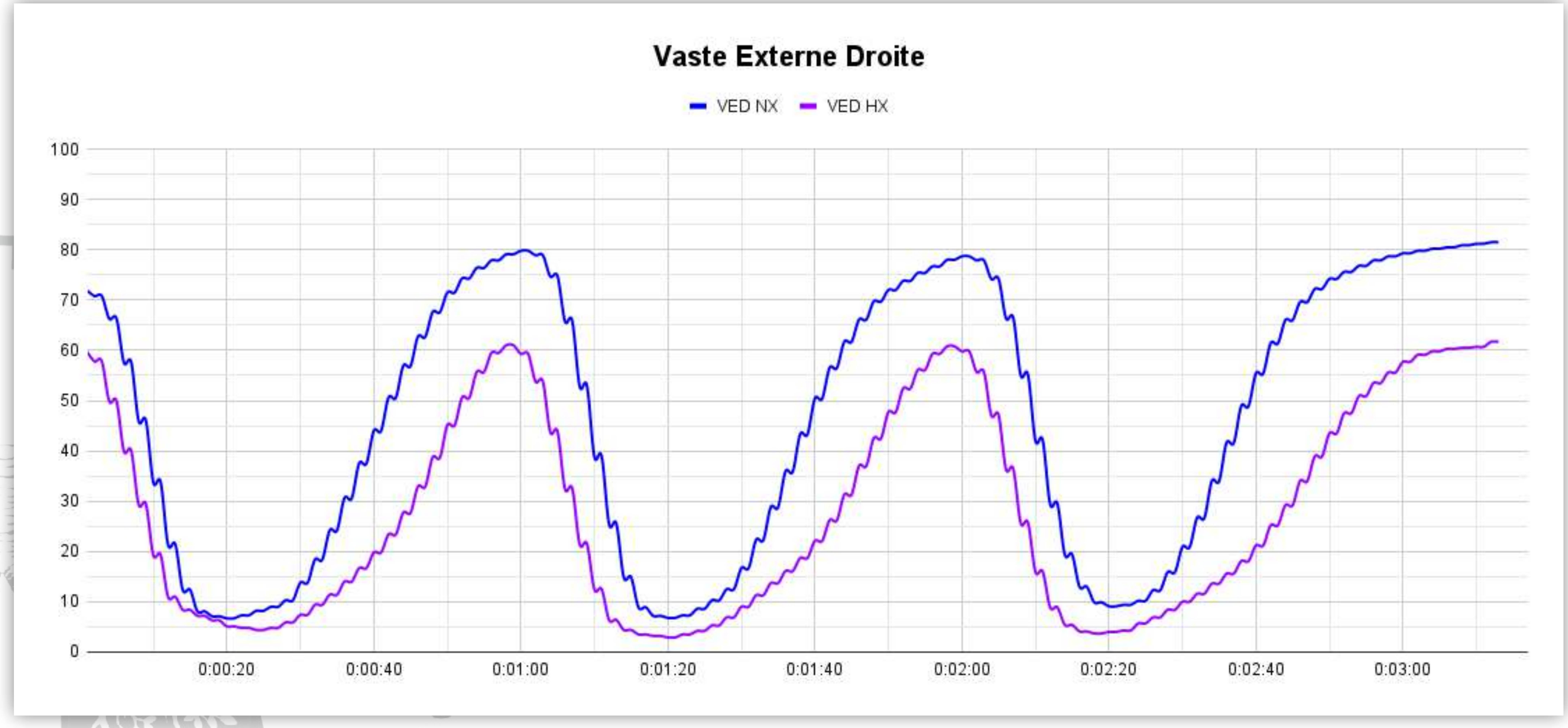


Cas D'Étude: Wprime





Cas D’Étude: Hypoxie

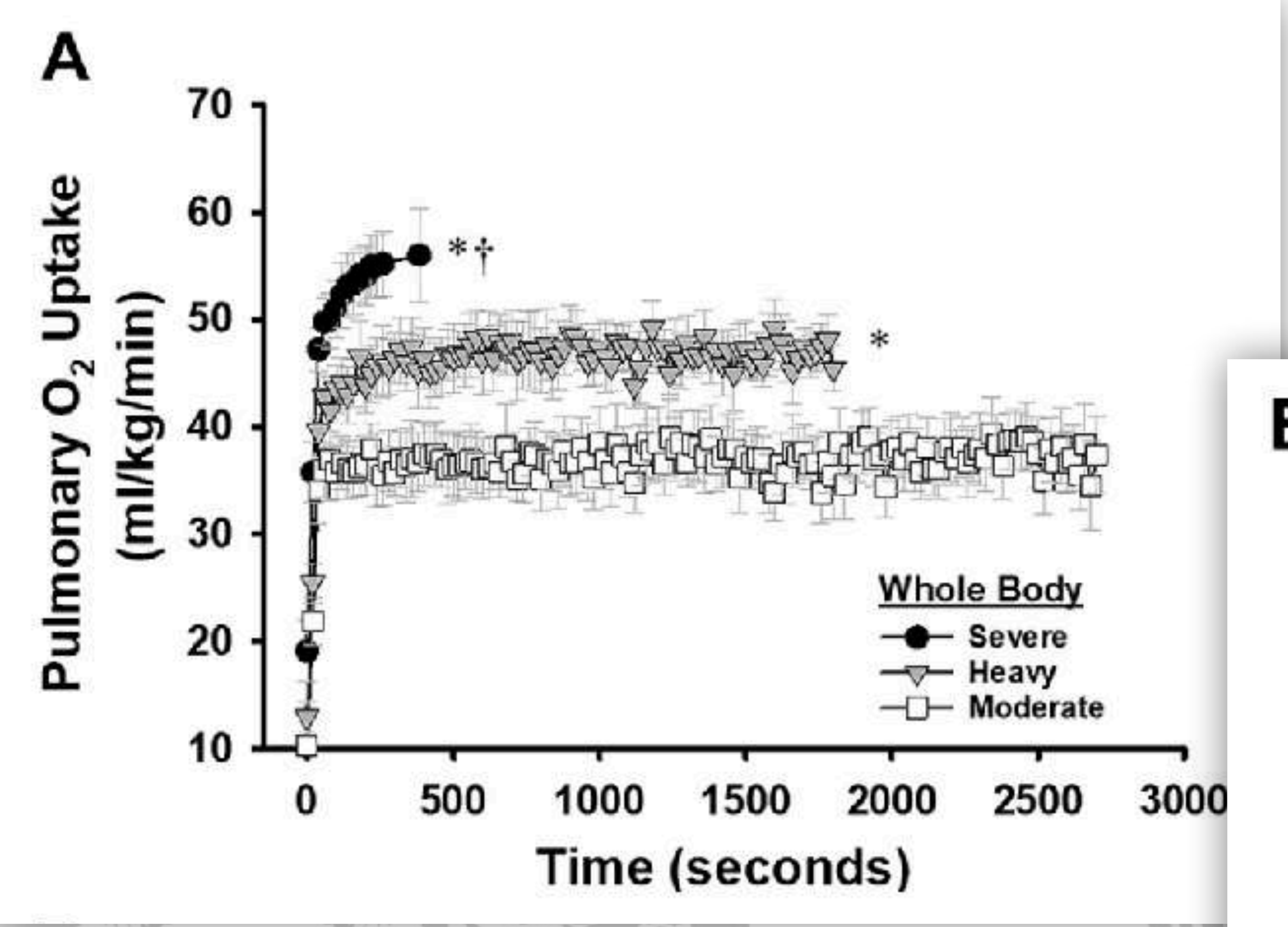


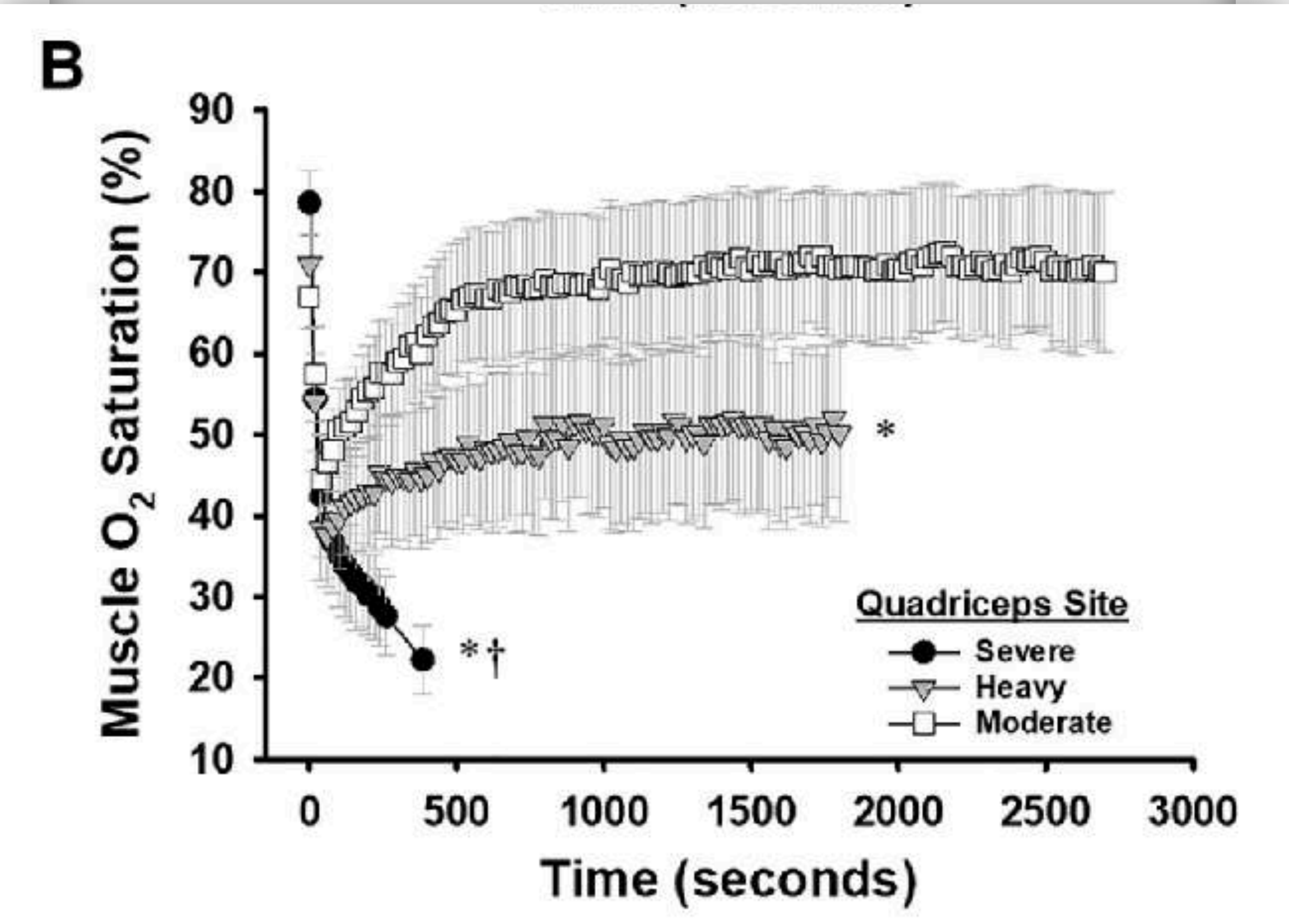
Étude en CAP

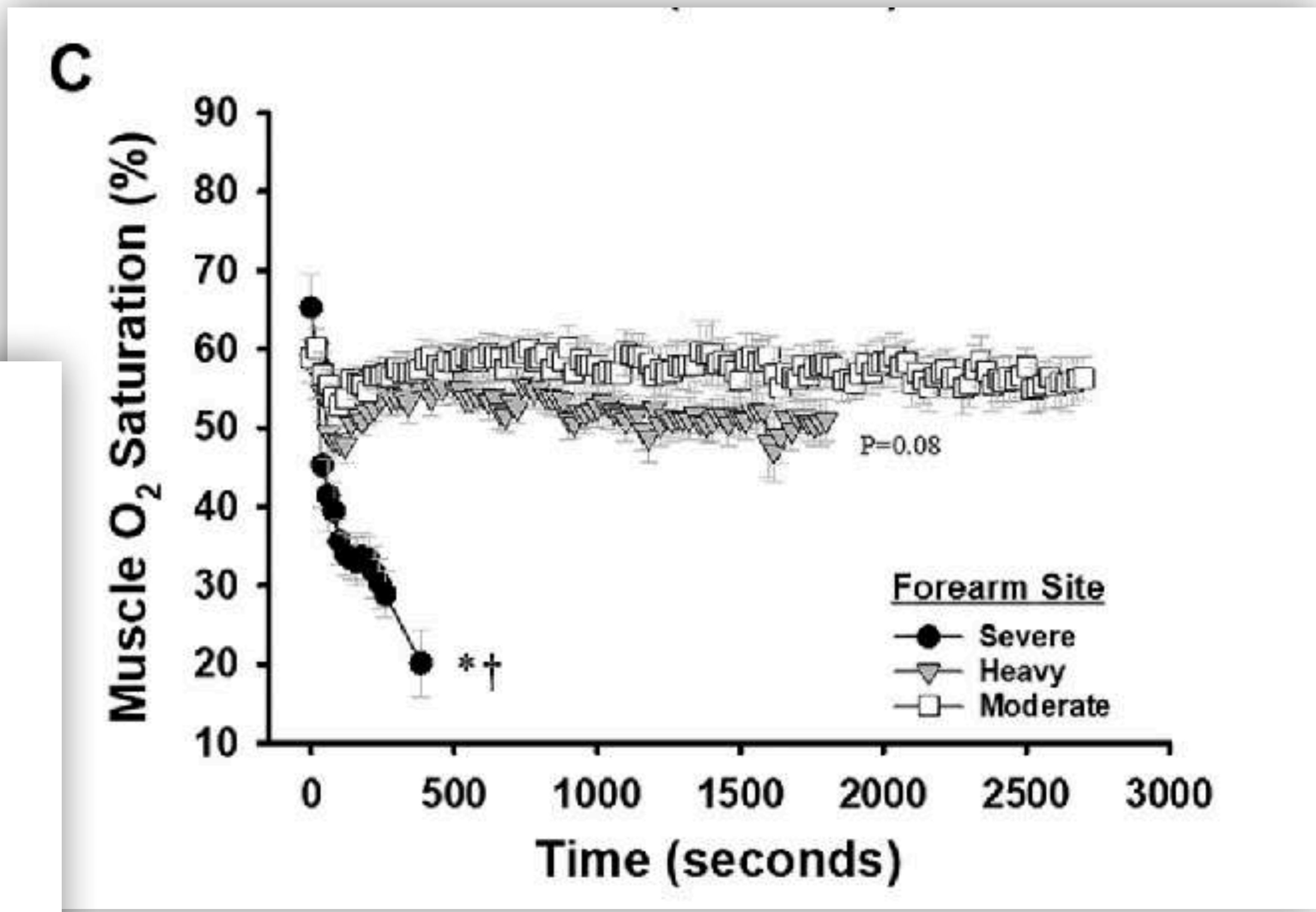
The balance of muscle oxygen supply and demand reveals critical metabolic rate and predicts time to exhaustion

Brett S. Kirby,[1] David A. Clark,[1] Eric M. Bradley,[1] and Brad W. Wilkins[2]

[1]Nike Sport Research Lab, Nike Inc., Beaverton, Oregon and [2]Department of Human Physiology, Gonzaga University, Spokane, Washington



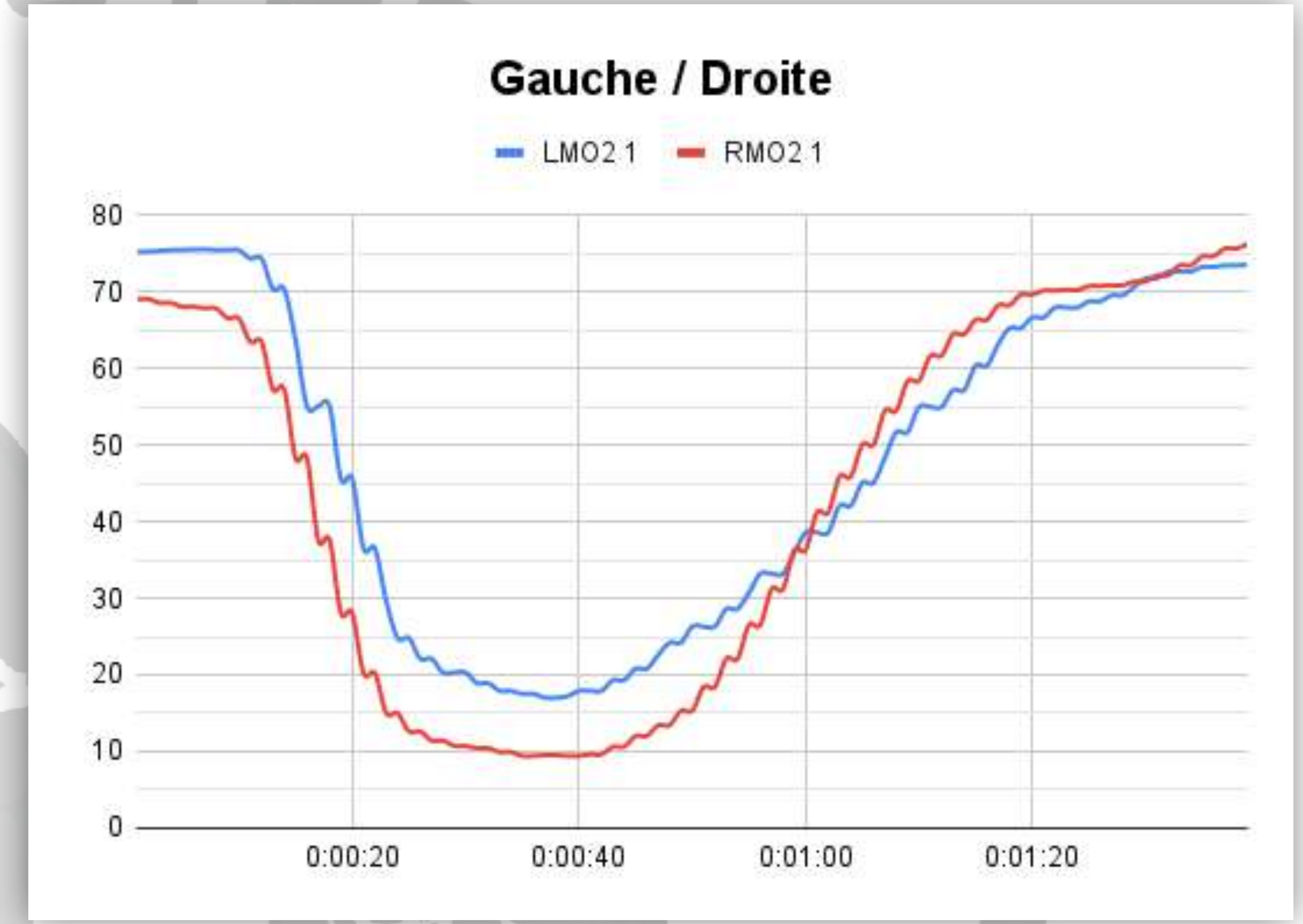


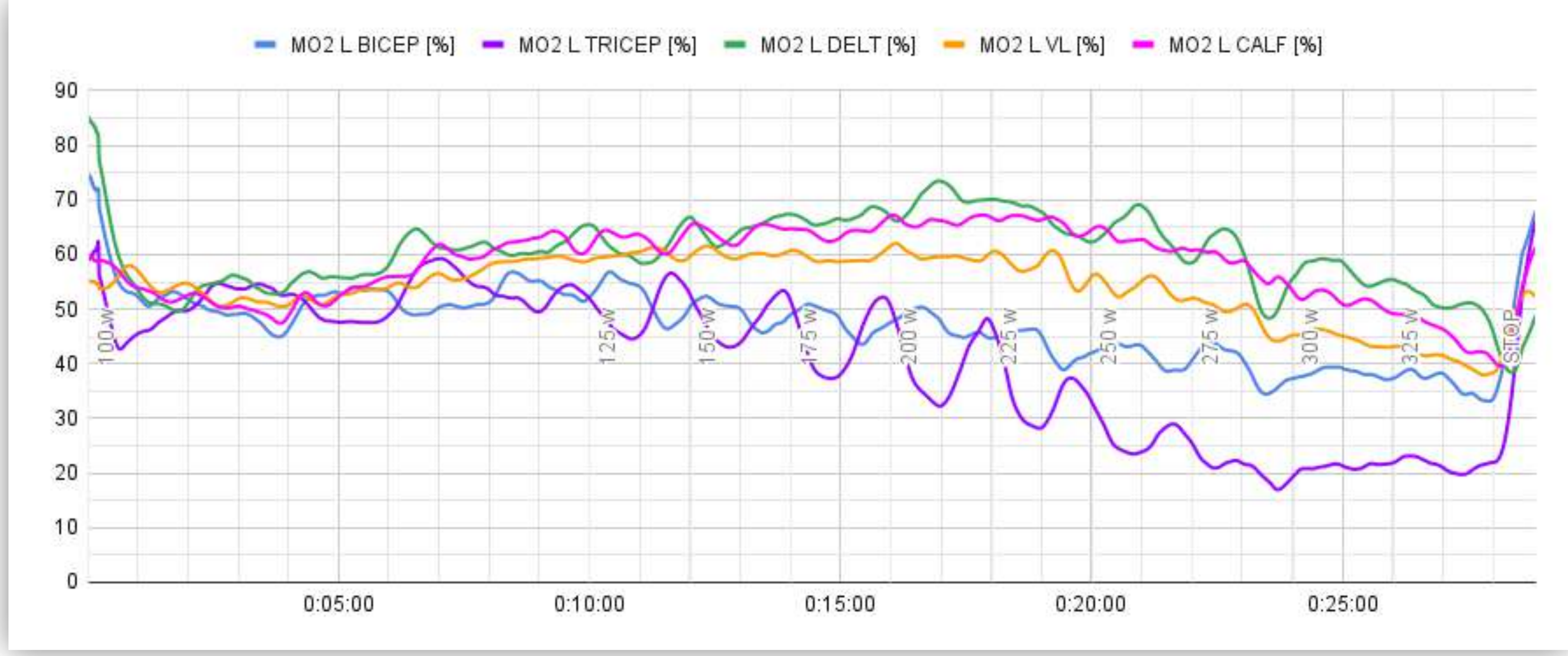


Applications Pratiques

Monitoring Muscle Oxygen Asymmetry as a Strategy to Prevent Injuries in Footballers

Aldo A. Vasquez-Bonilla, Javier Brazo-Sayavera, Rafael Timón & Guillermo Olcina

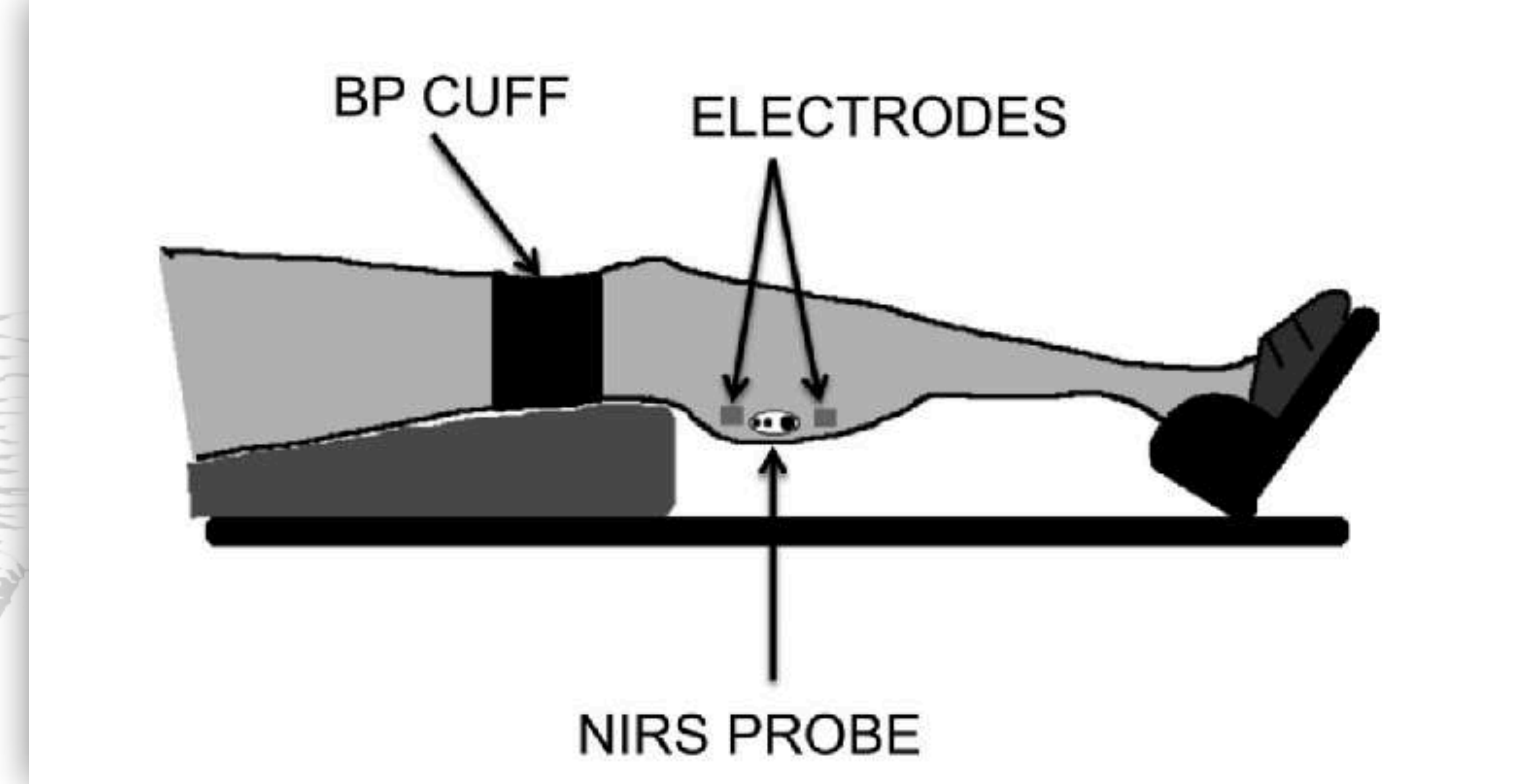


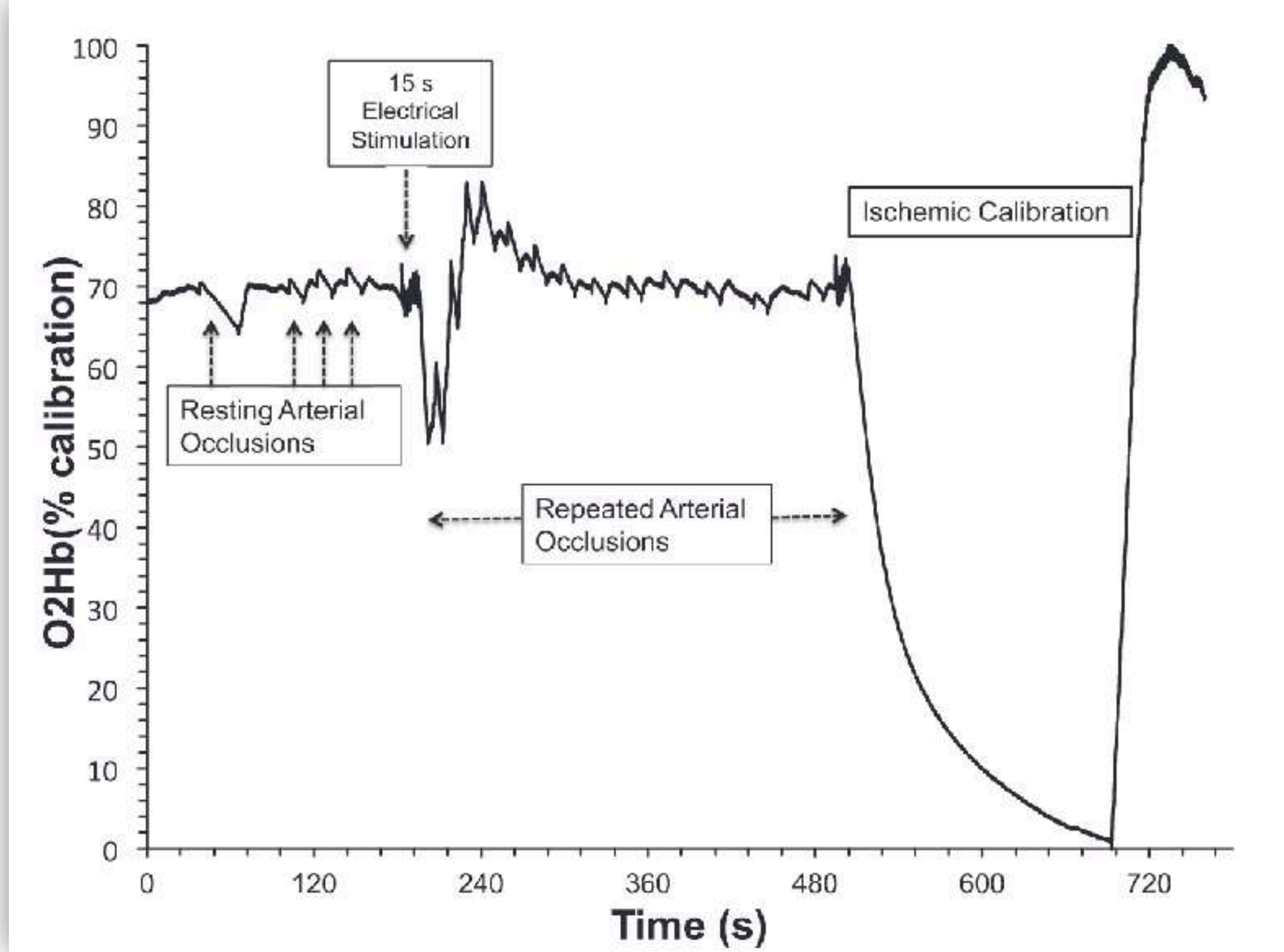


Applications Pratiques

Noninvasive evaluation of skeletal muscle mitochondrial capacity with near-infrared spectroscopy: correcting for blood volume changes

Terence E. Ryan, Melissa L. Erickson, Jared T. Brizendine, Hui-Ju Young, and Kevin K. McCully
Department of Kinesiology, University of Georgia, Athens, Georgia





Théorie 2

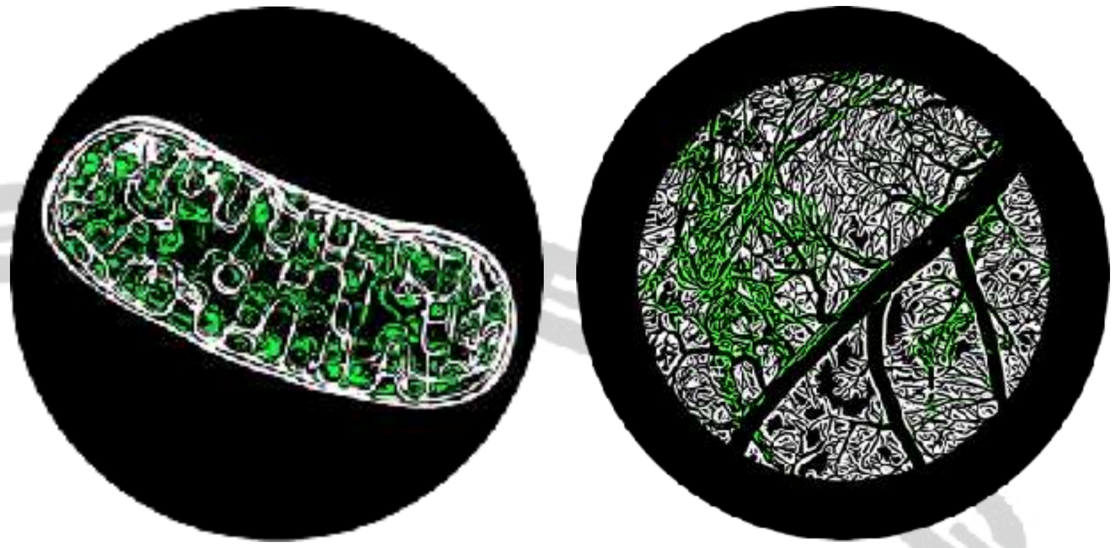
Interprétation & Cas D'Études

Discussion & Questions

Gestion du Flux Sanguin

Système Métabolique & Vasculaire

Vasodilatation métabolique en réponse à l'utilisation de l'oxygène

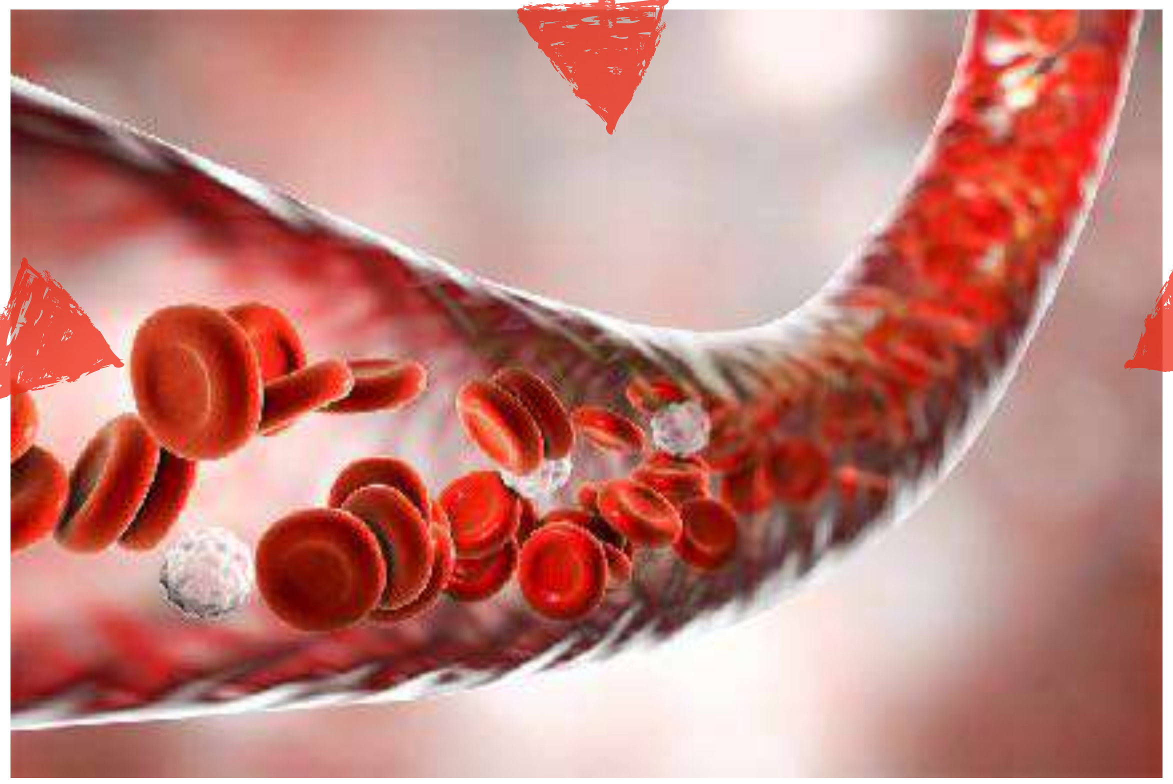


Système Nerveux

Vasoconstriction sympathique pour distribuer le sang au bon endroit (selon les besoins)

Système Musculaire

Obstruction du flux sanguin par compression mécanique



Flux Sanguin