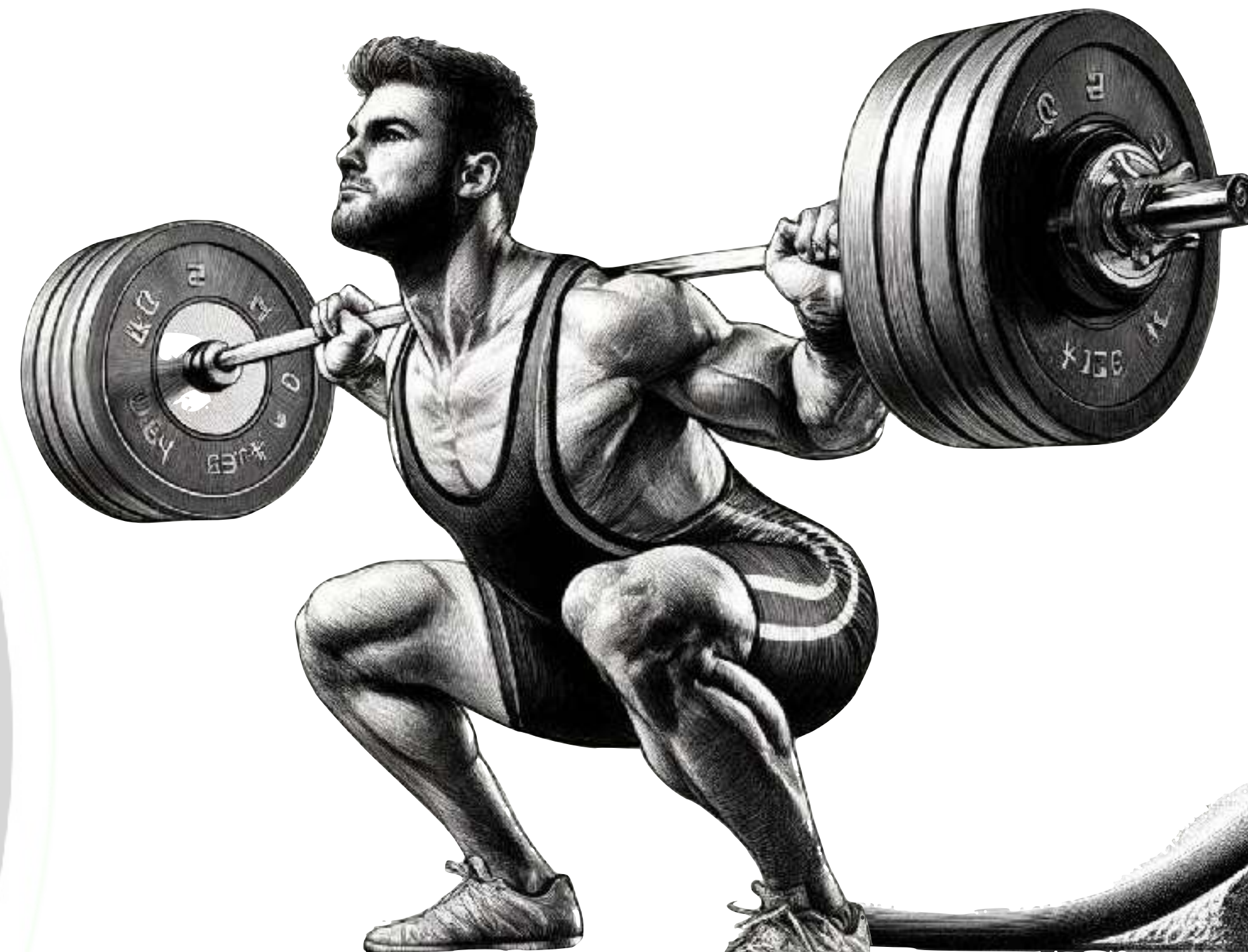


FORMATION

SPSL 2025

01-02 Avril 2025



Plan du Jour

Matin:

Rappel + Periodisation Sportive – Théorie & Pratique

Optimiser la Semaine d'Entraînement – T&P

Après Midi:

Programmation d'Entraînement – T&P

Entraînement Respiratoires – Fondations





Équilibre Métabolique

Seuil #2

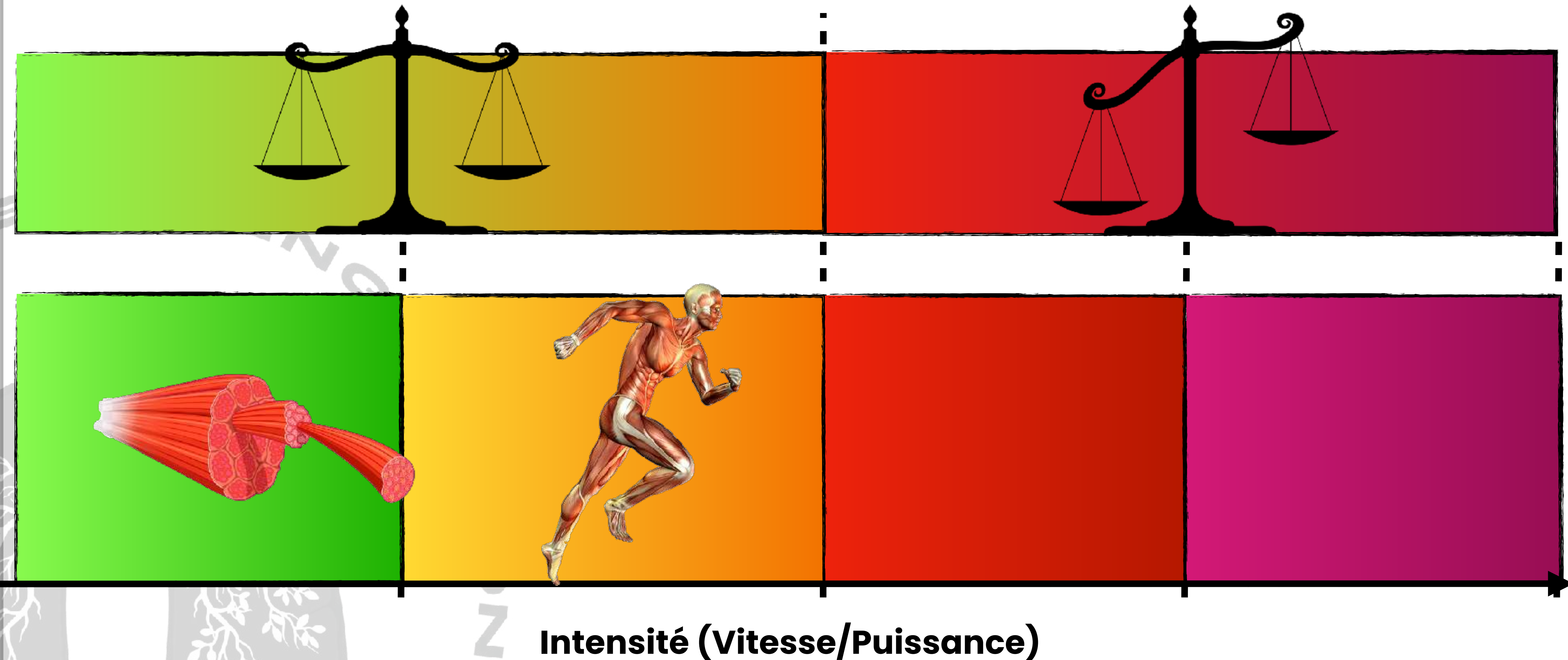
⋮



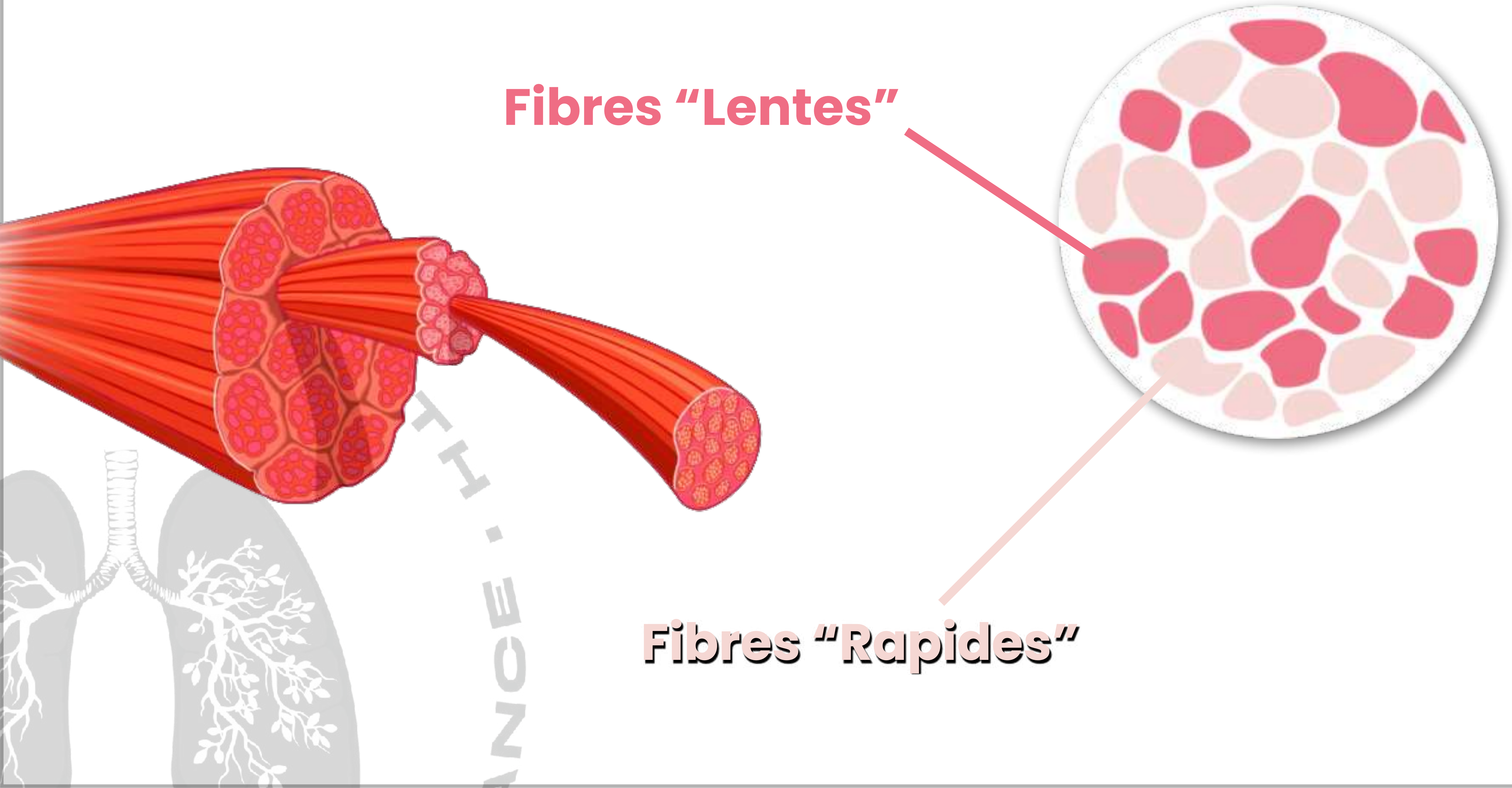
Intensité (Vitesse/Puissance)

Équilibre Métabolique

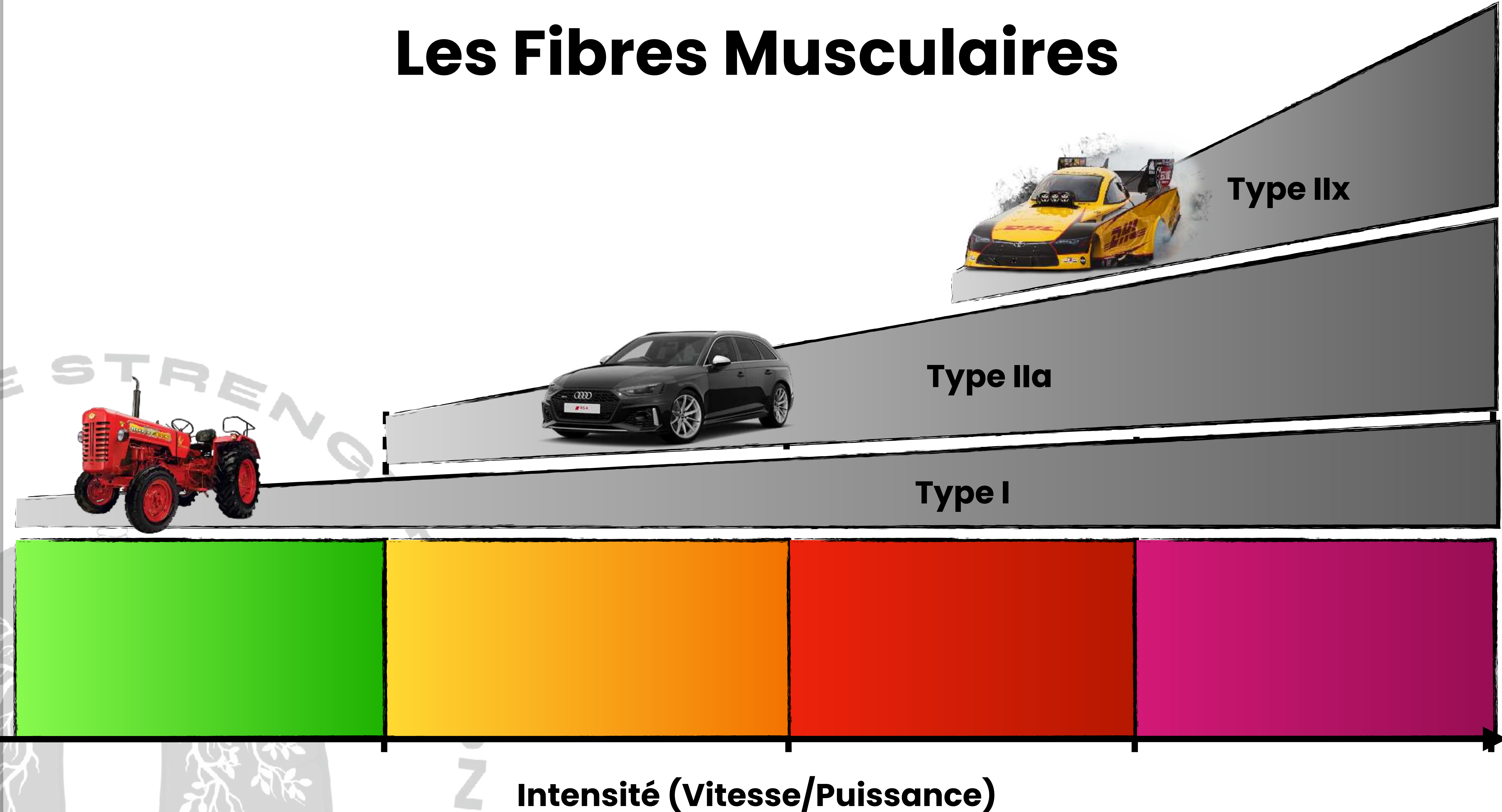
Seuil #2



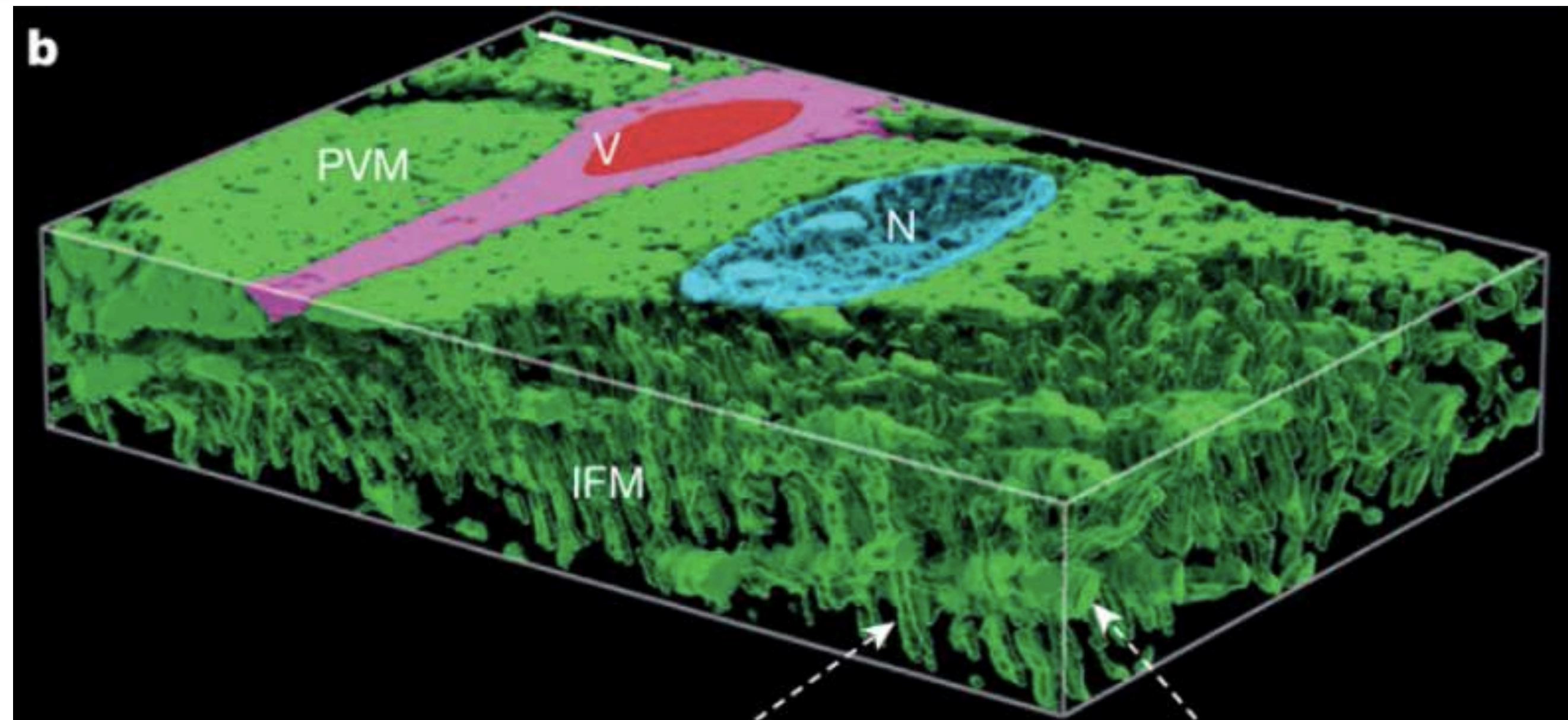
Les Fibres Musculaires



Les Fibres Musculaires



Reticulum Mitochondrial

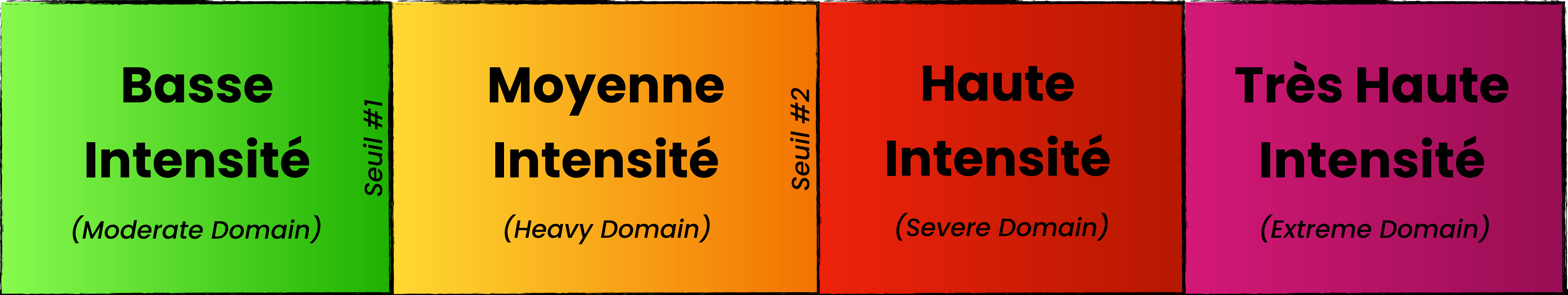
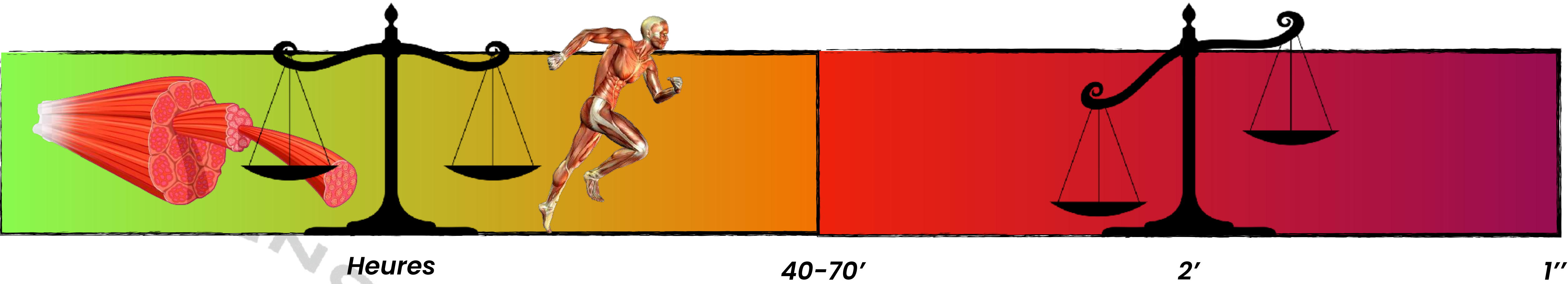


Glancy & al. (2015)

Les Filières Énergétiques

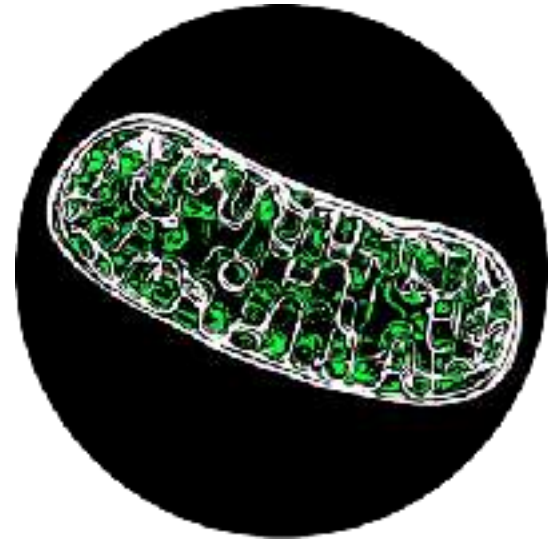


Les Seuils Physiologiques



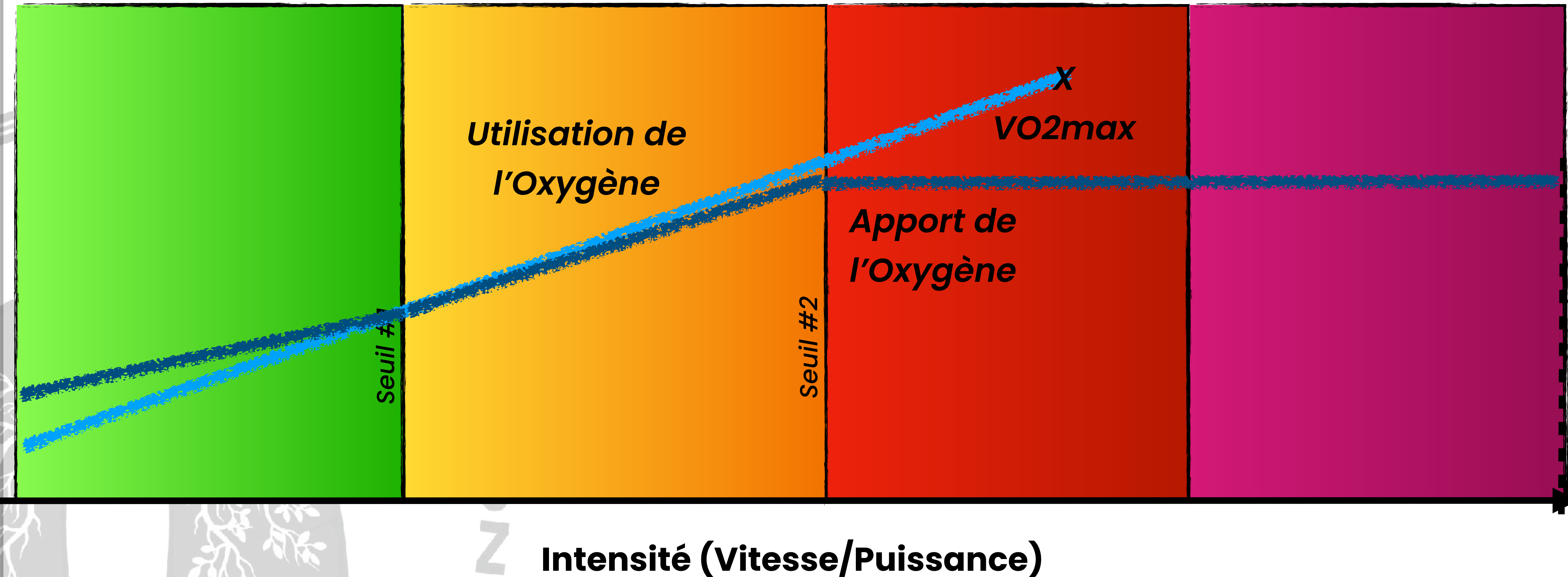
Intensité (Vitesse/Puissance)

Apport et Utilisation de l'O₂

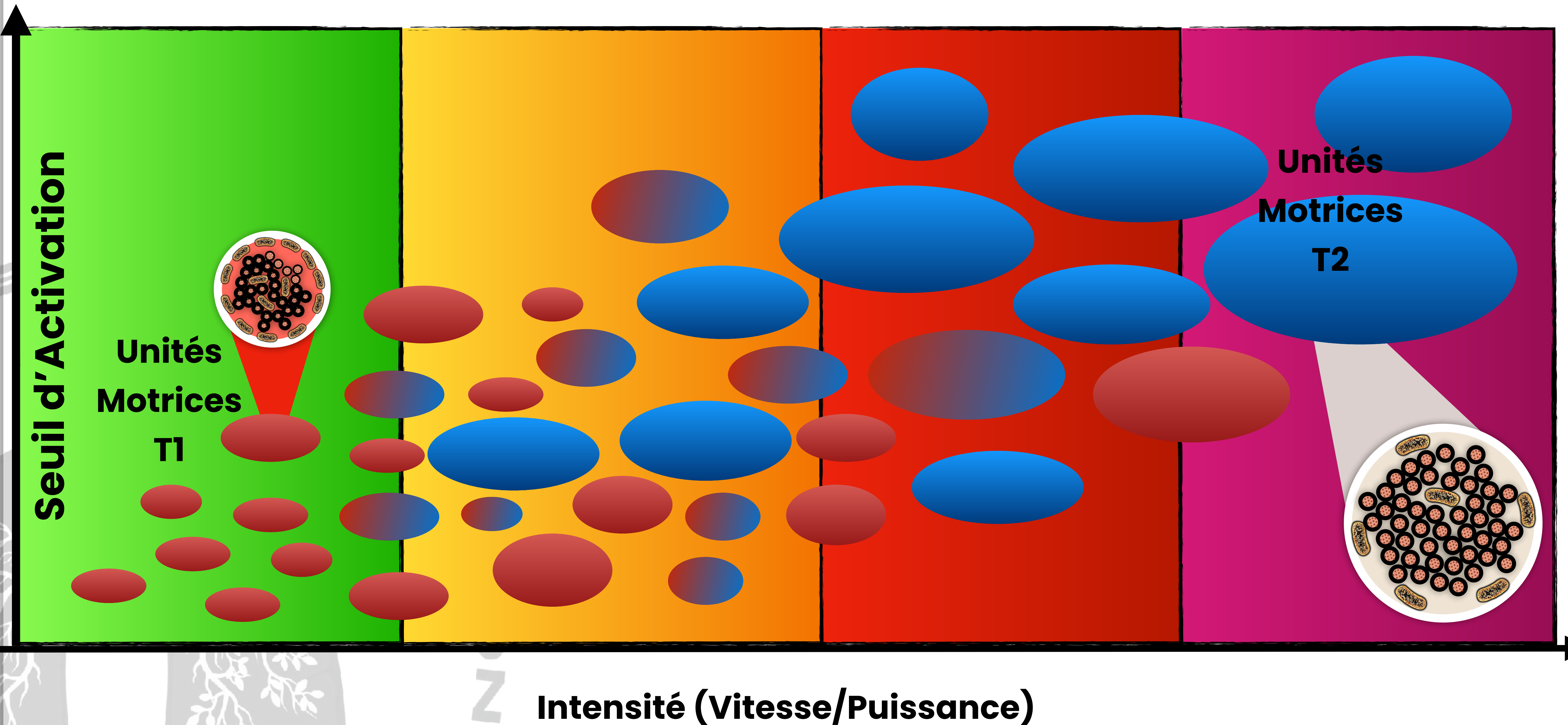


Système Métabolique

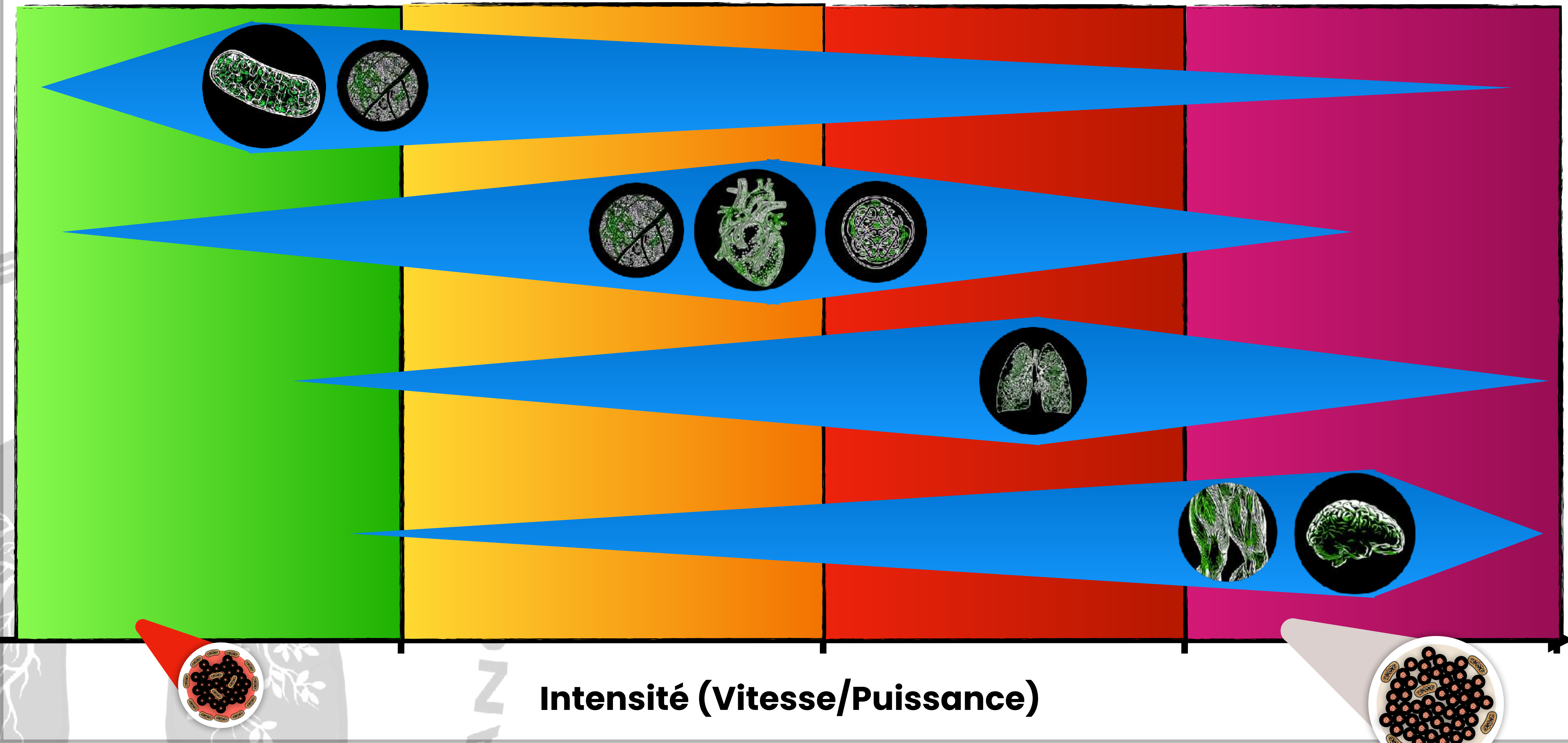
Utilisation de l'oxygène &
substrats, recyclage du
lactate & Pi & H⁺



Recrutement des Unités Motrices



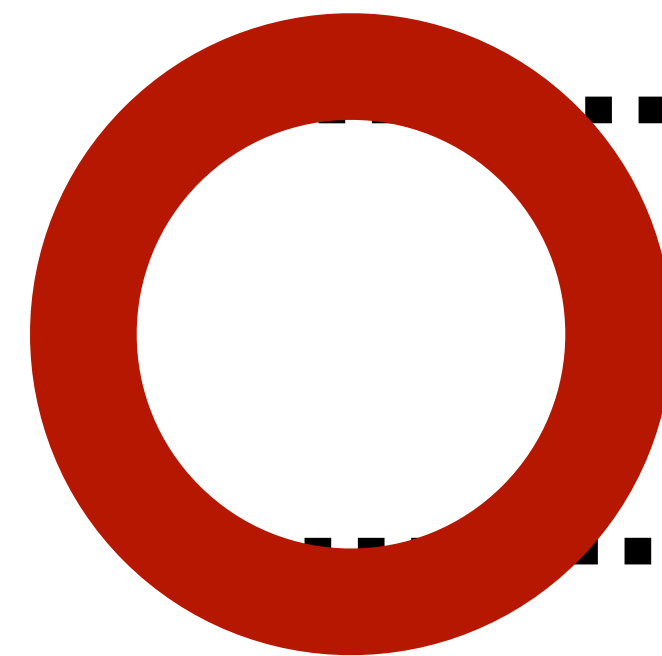
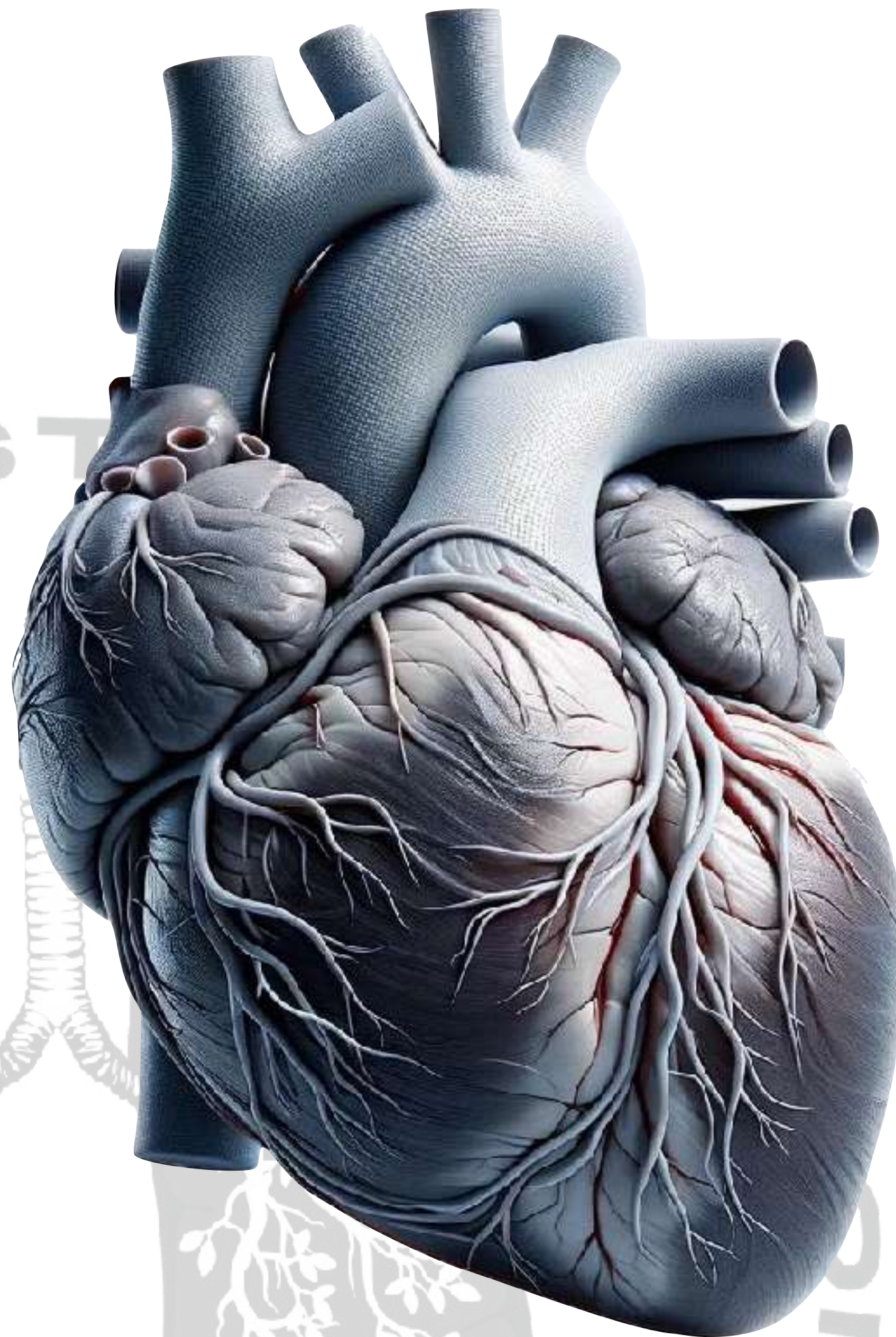
Adaptations



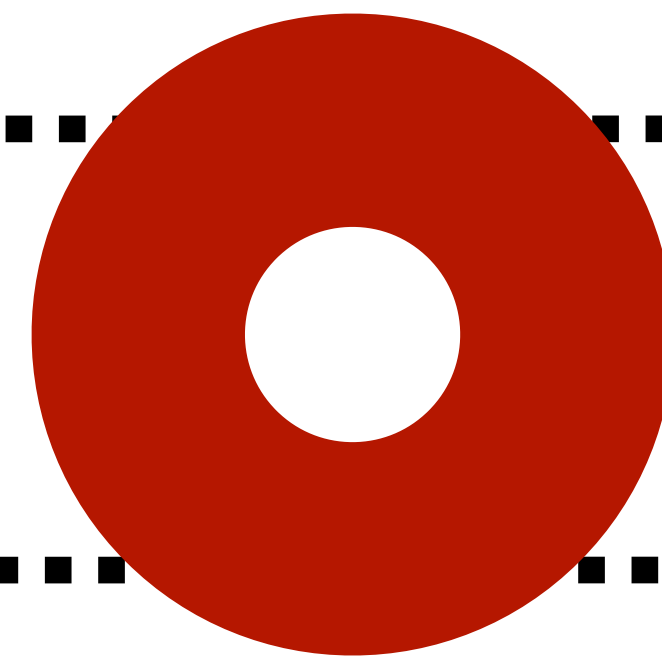
Coeur

➤ *Taille du Ventricule Gauche*

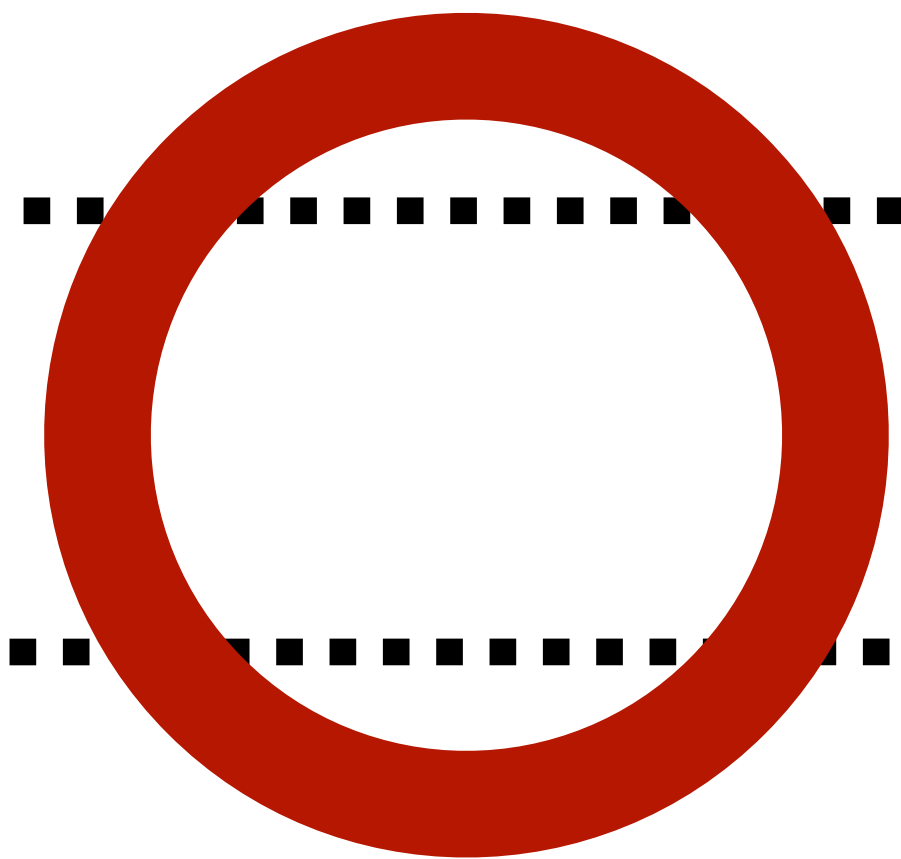
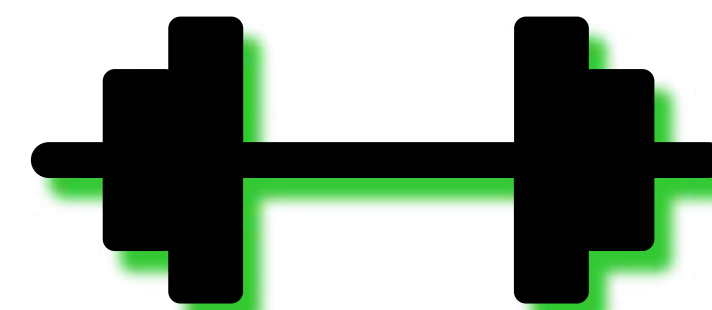
➤ *Contractilité*



Normal



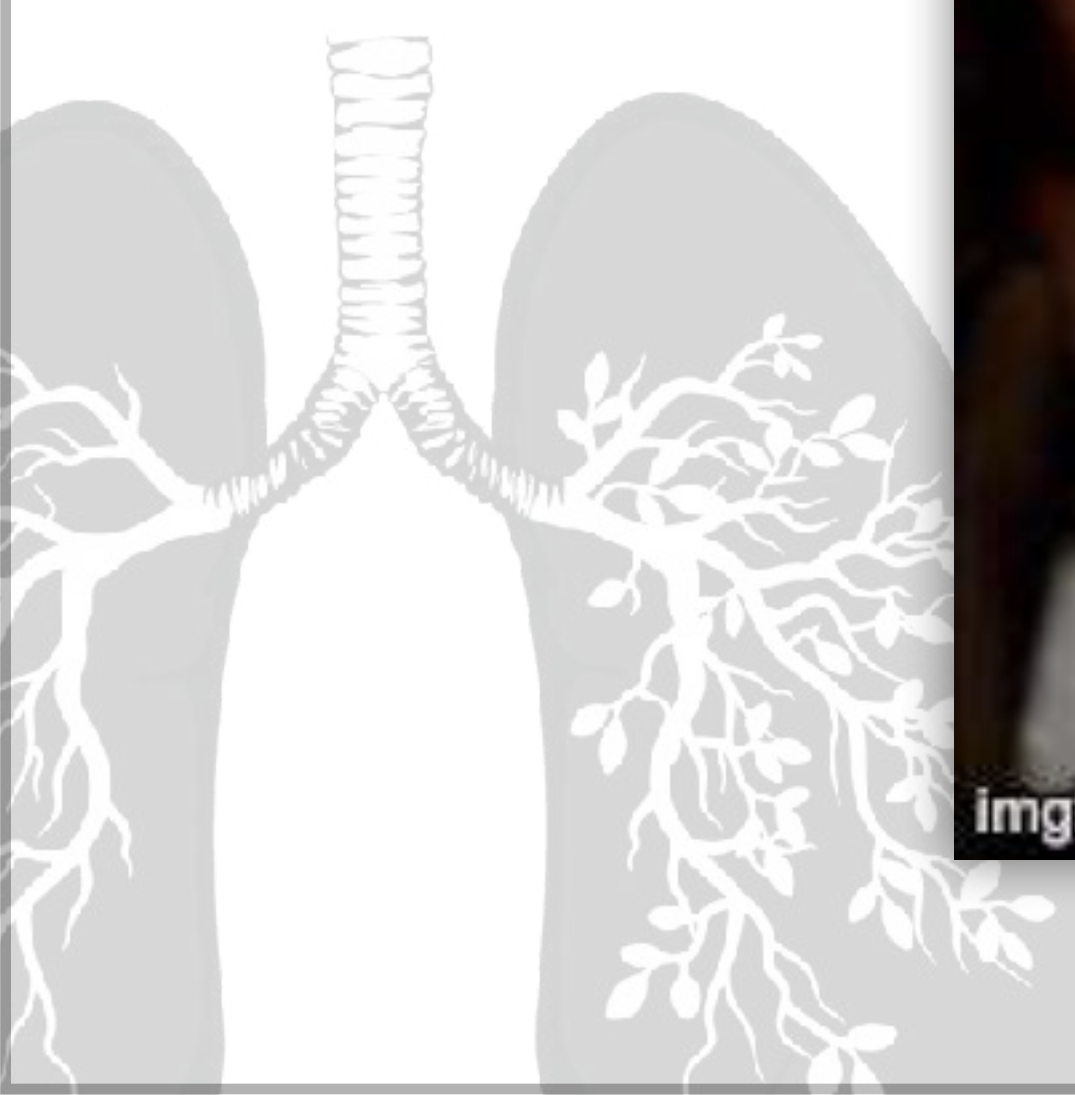
**Hypertrophie
Concentrique**



**Hypertrophie
Excentrique**



E STREET

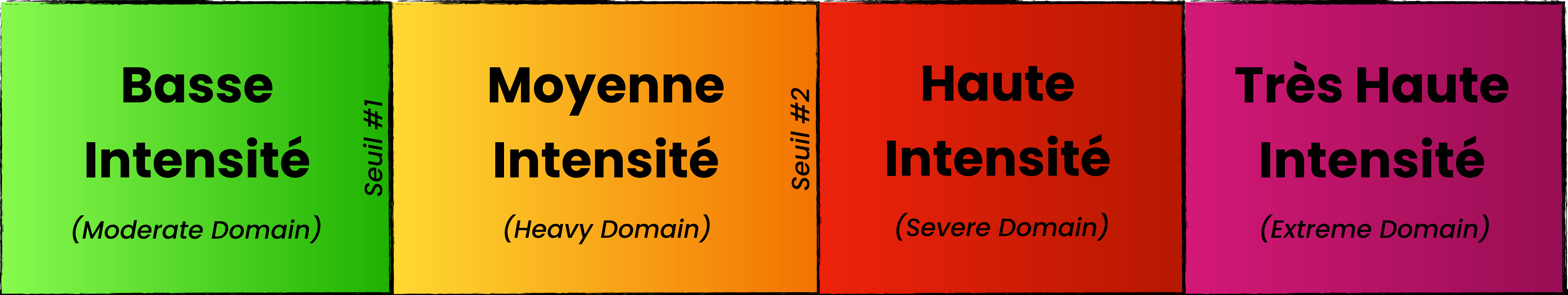
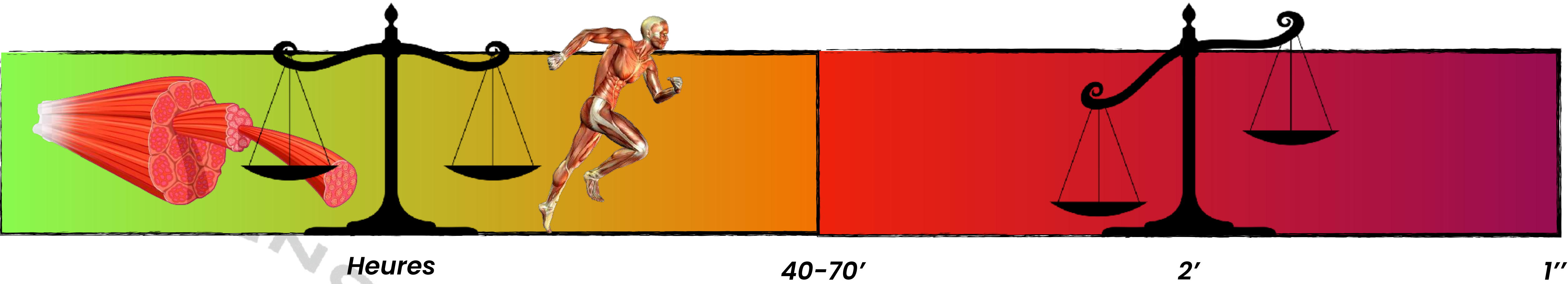


LE COÛT

DES ADAPTATIONS

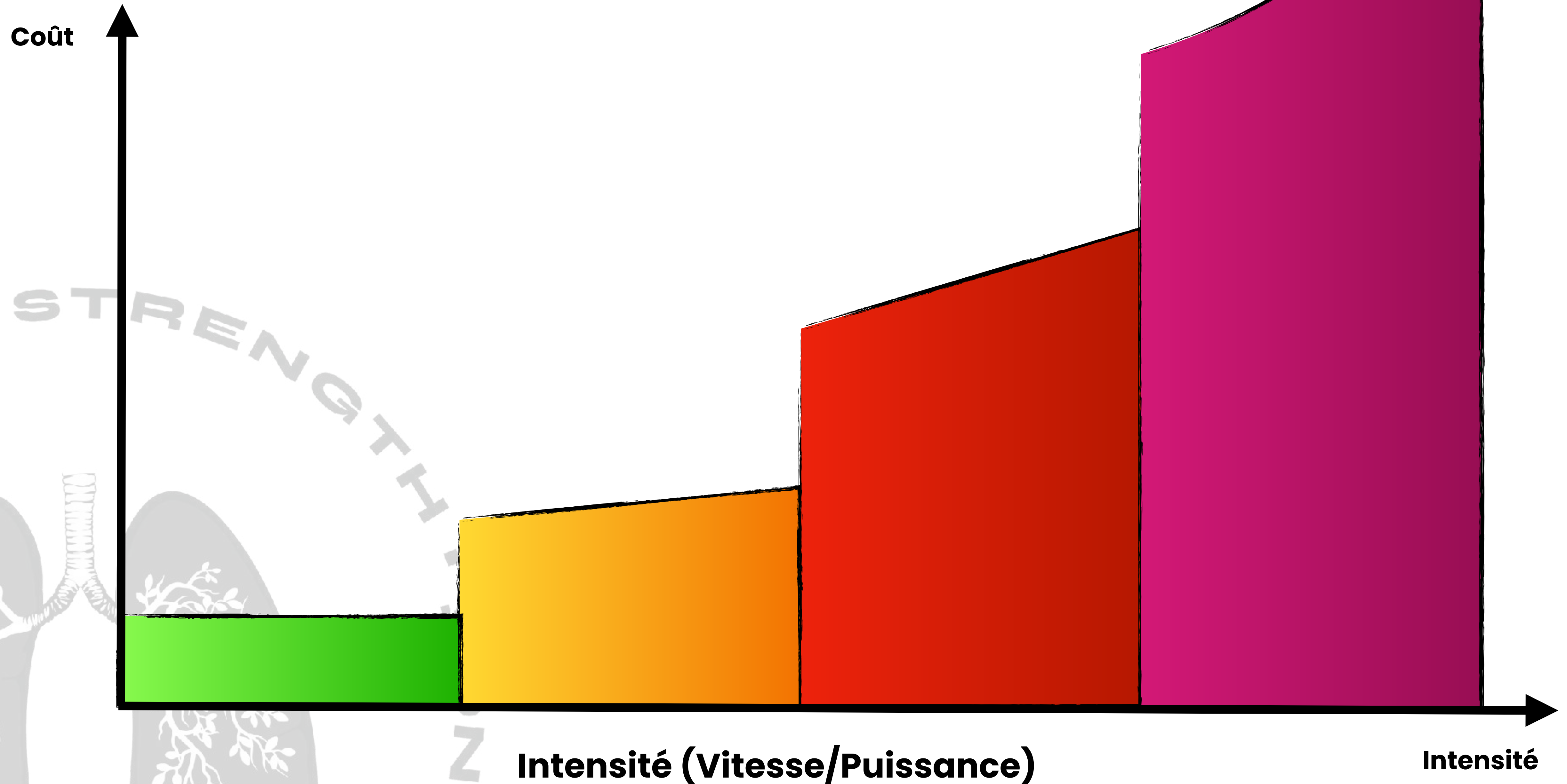
imgflip.com

Les Seuils Physiologiques

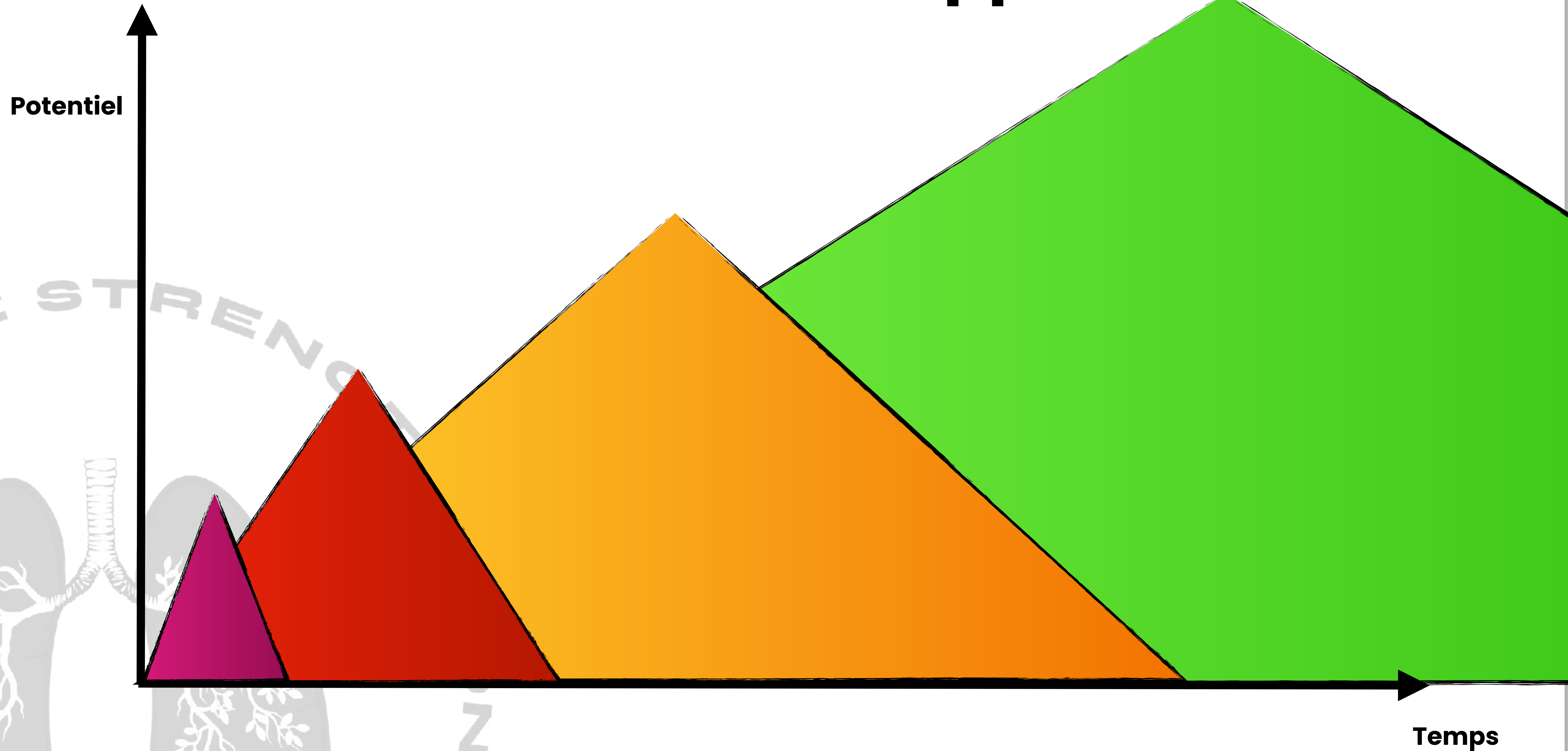


Intensité (Vitesse/Puissance)

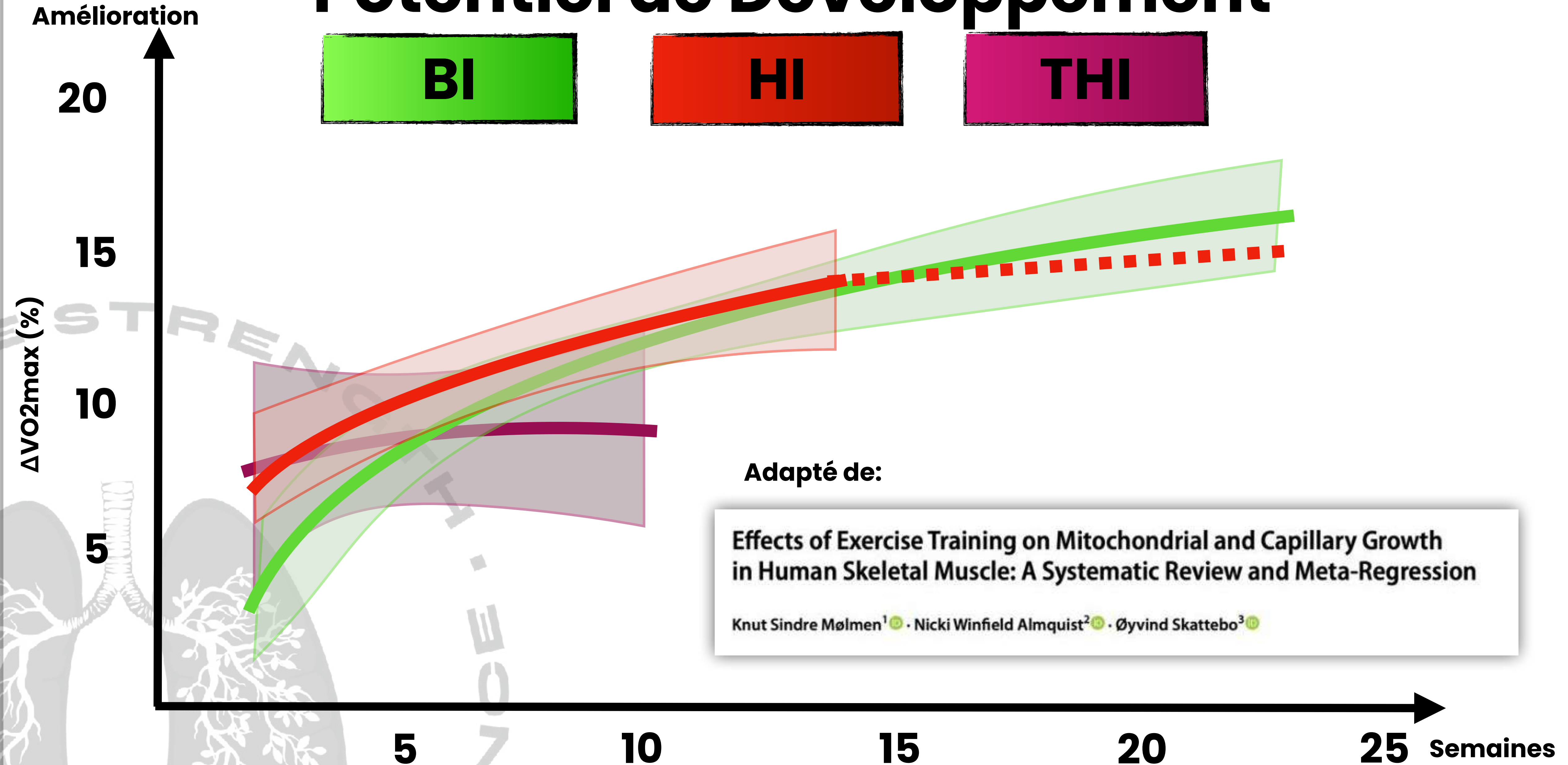
Coûts des Entraînements



Potentiel de Développement



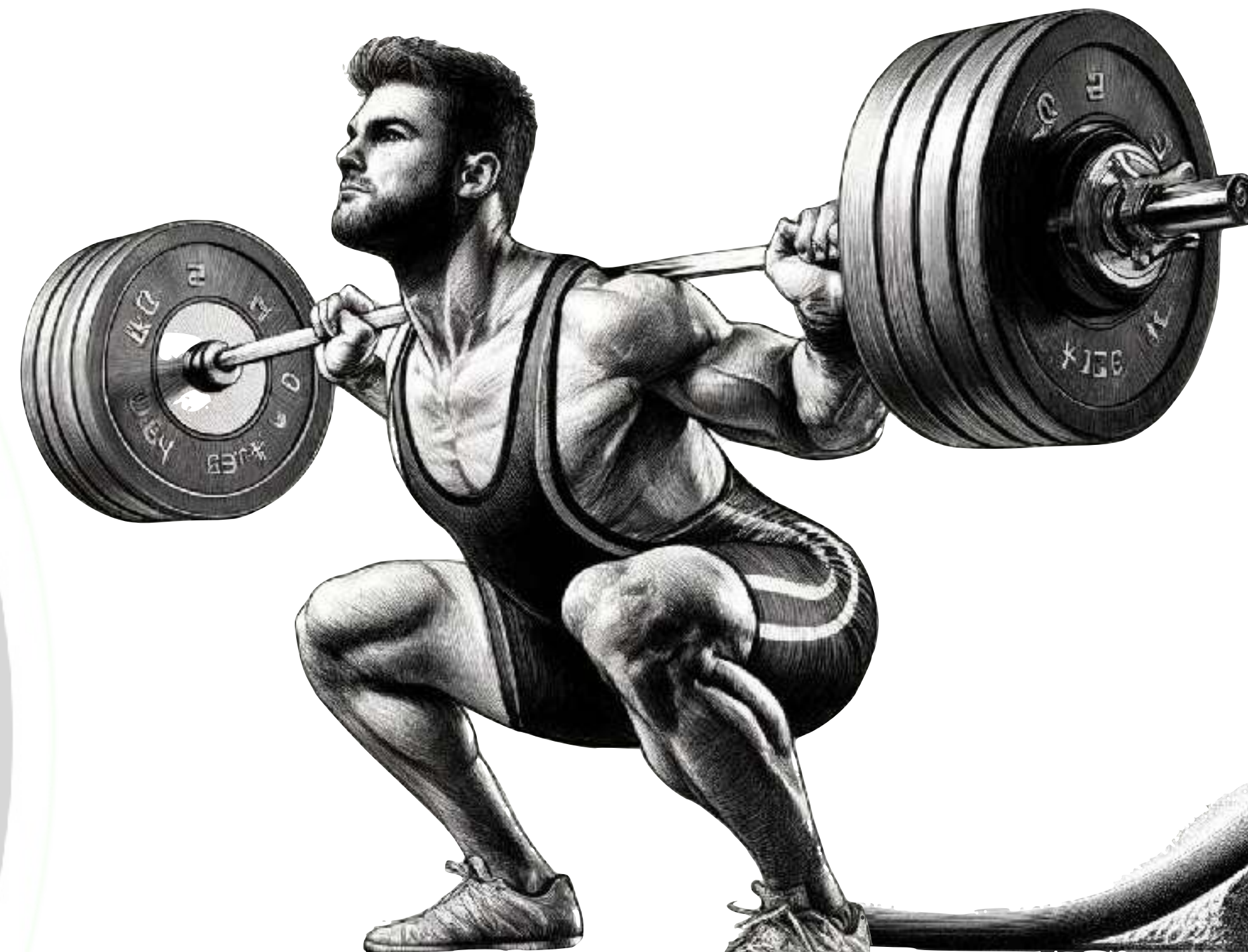
Potentiel de Développement



FORMATION

SPSL 2025

Principes de Programmation

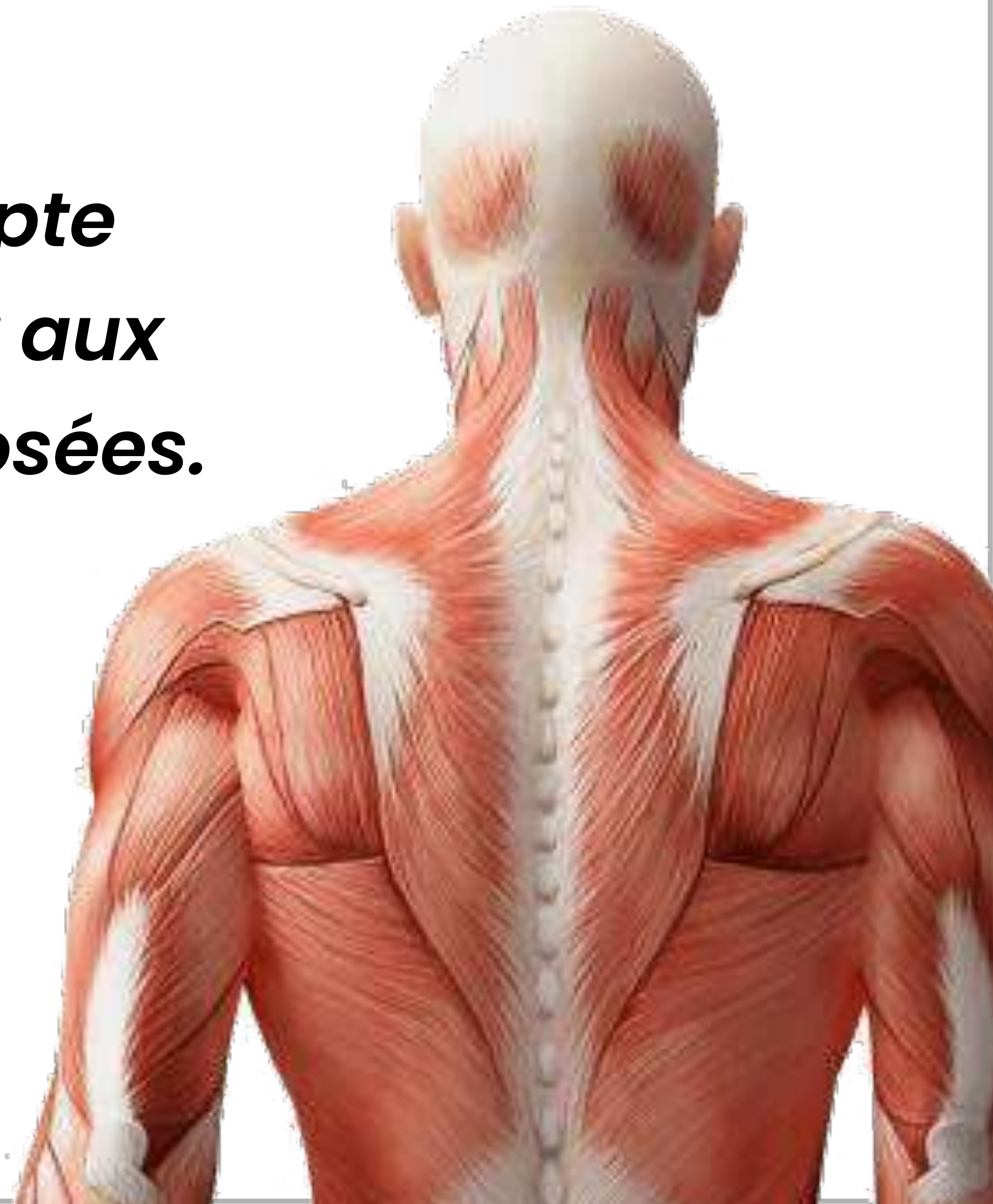
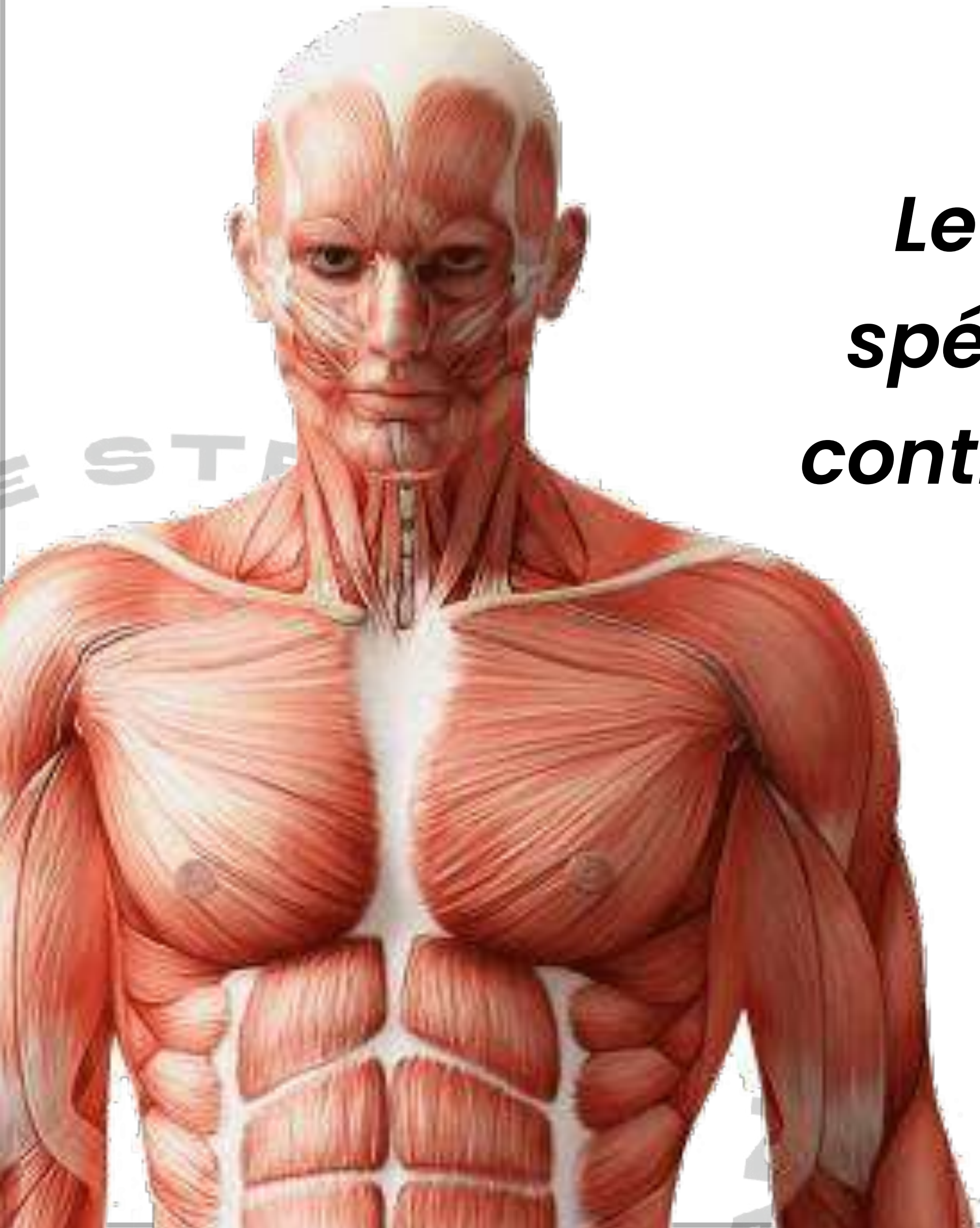


Spécificité



Spécificité

*Le corps s'adapte
spécifiquement aux
contraintes imposées.*



Spécifique ou Général ?



:

:

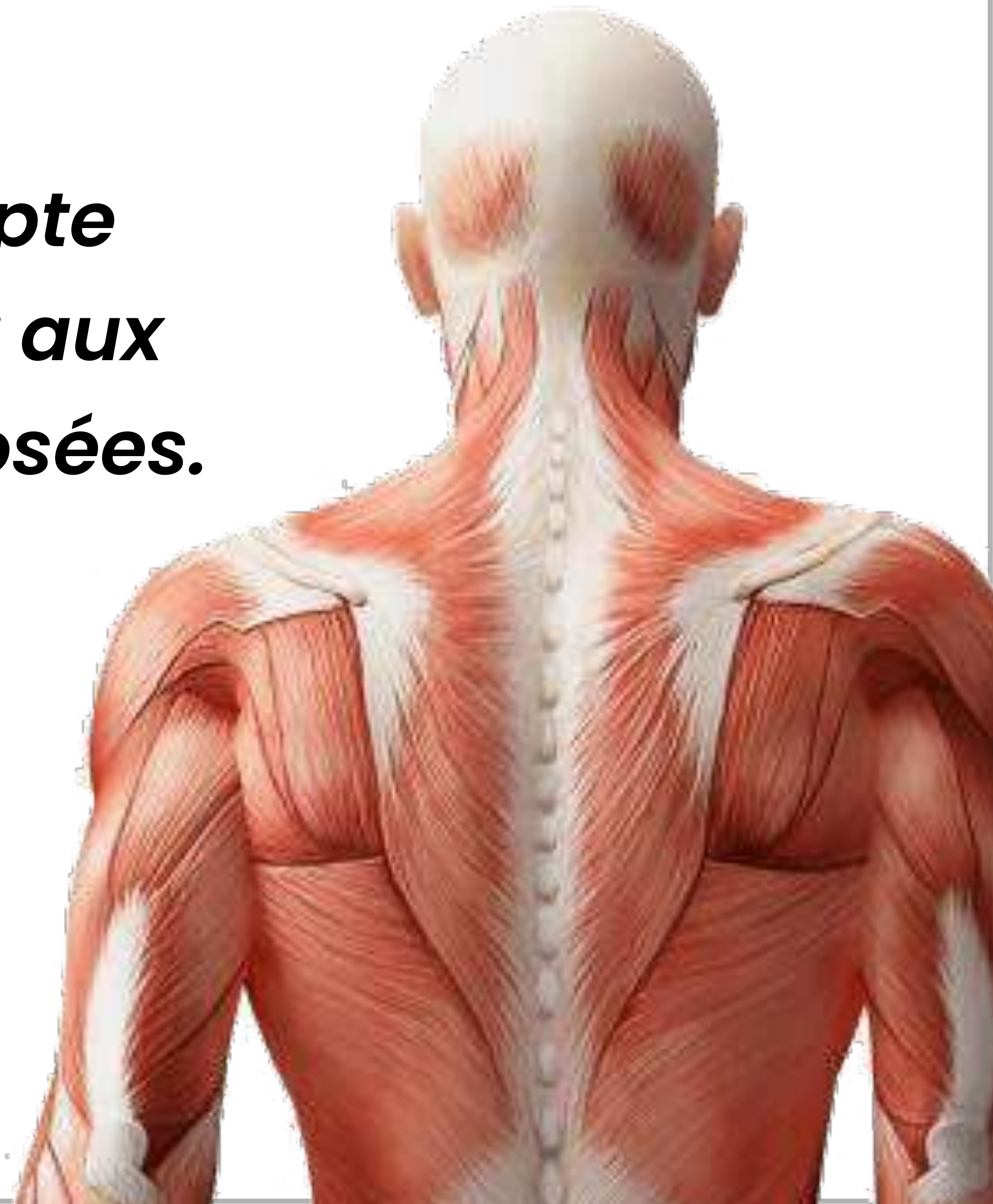
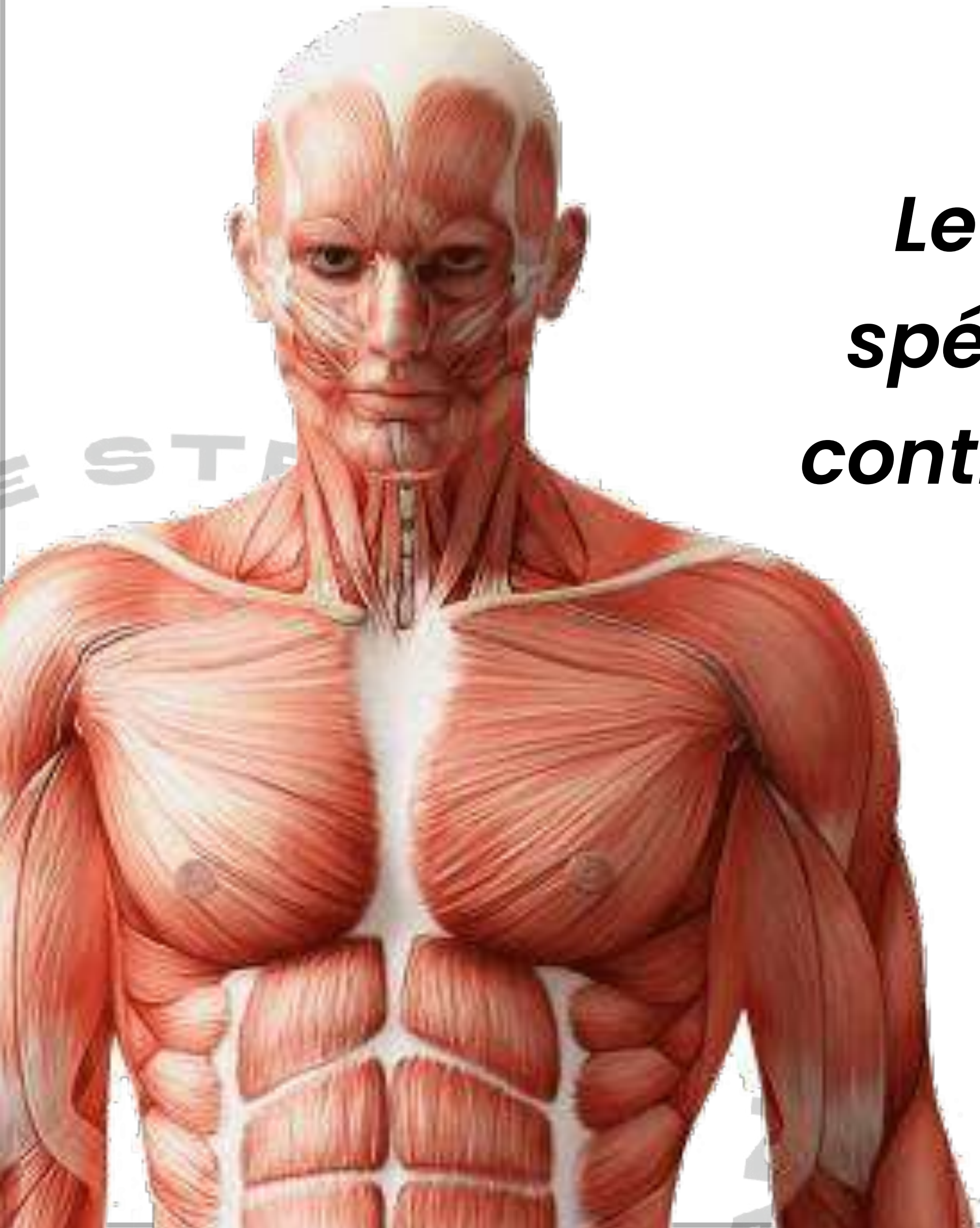
:

:

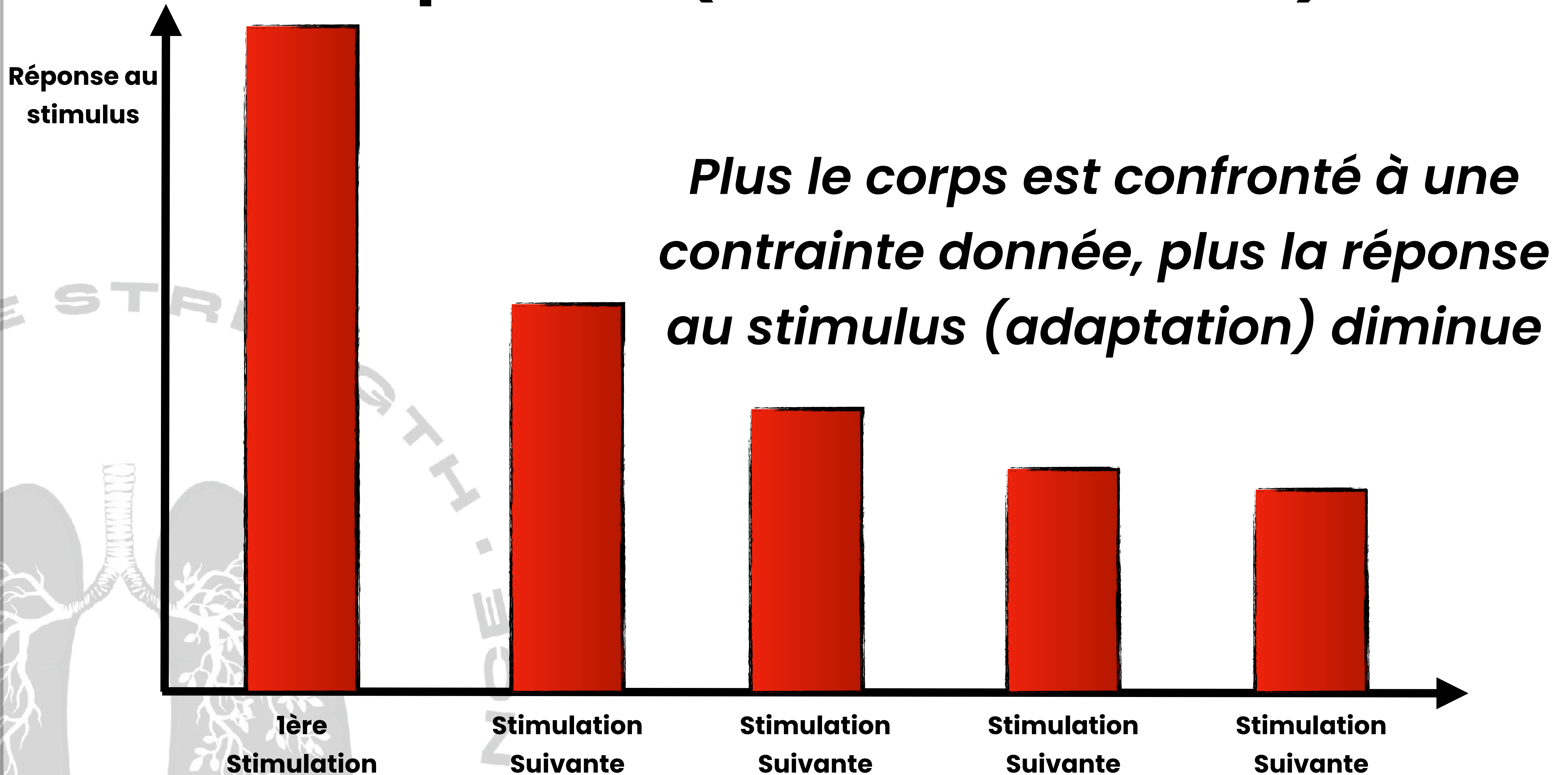
Intensité (Vitesse/Puissance)

Spécificité

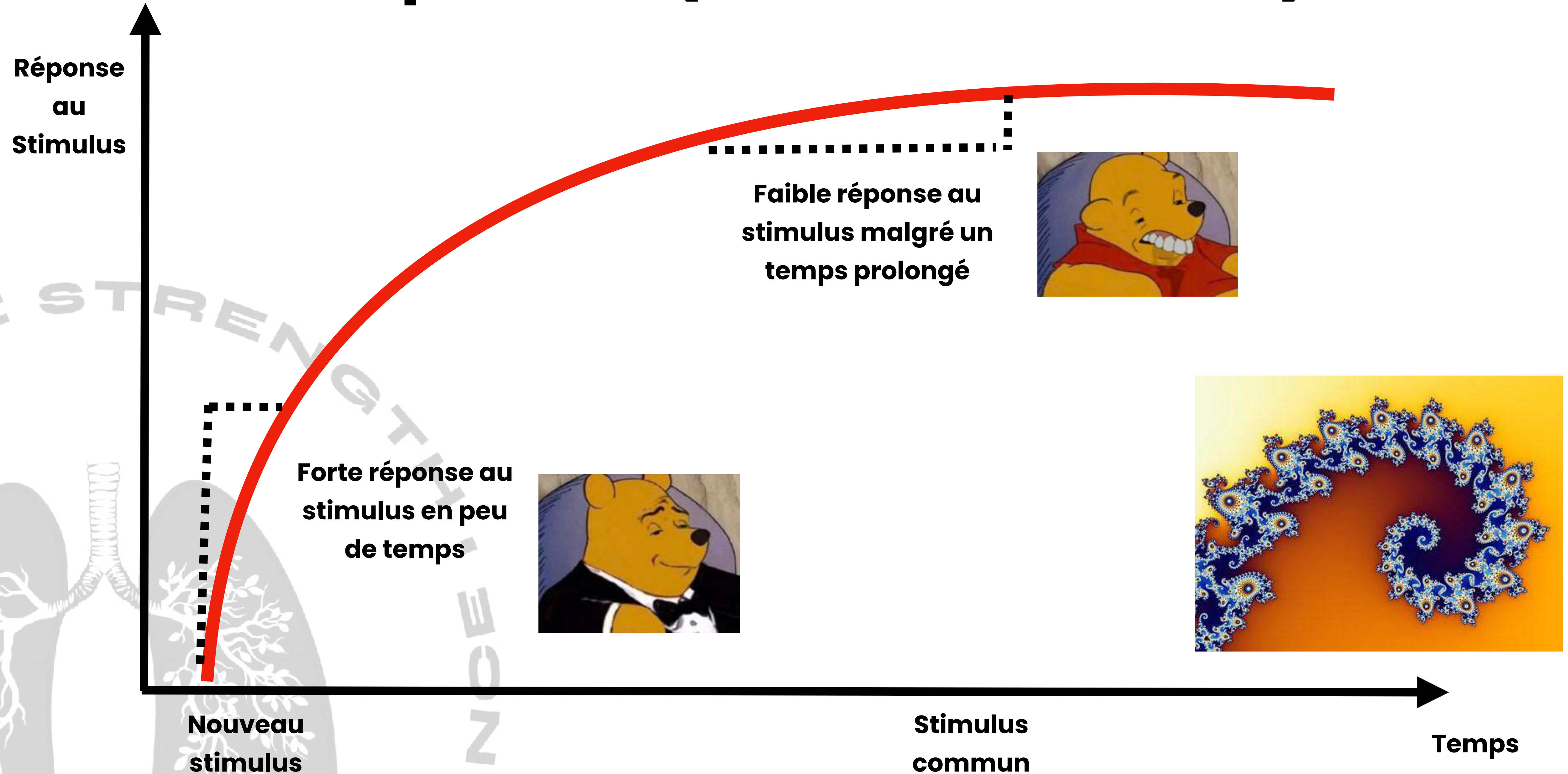
*Le corps s'adapte
spécifiquement aux
contraintes imposées.*



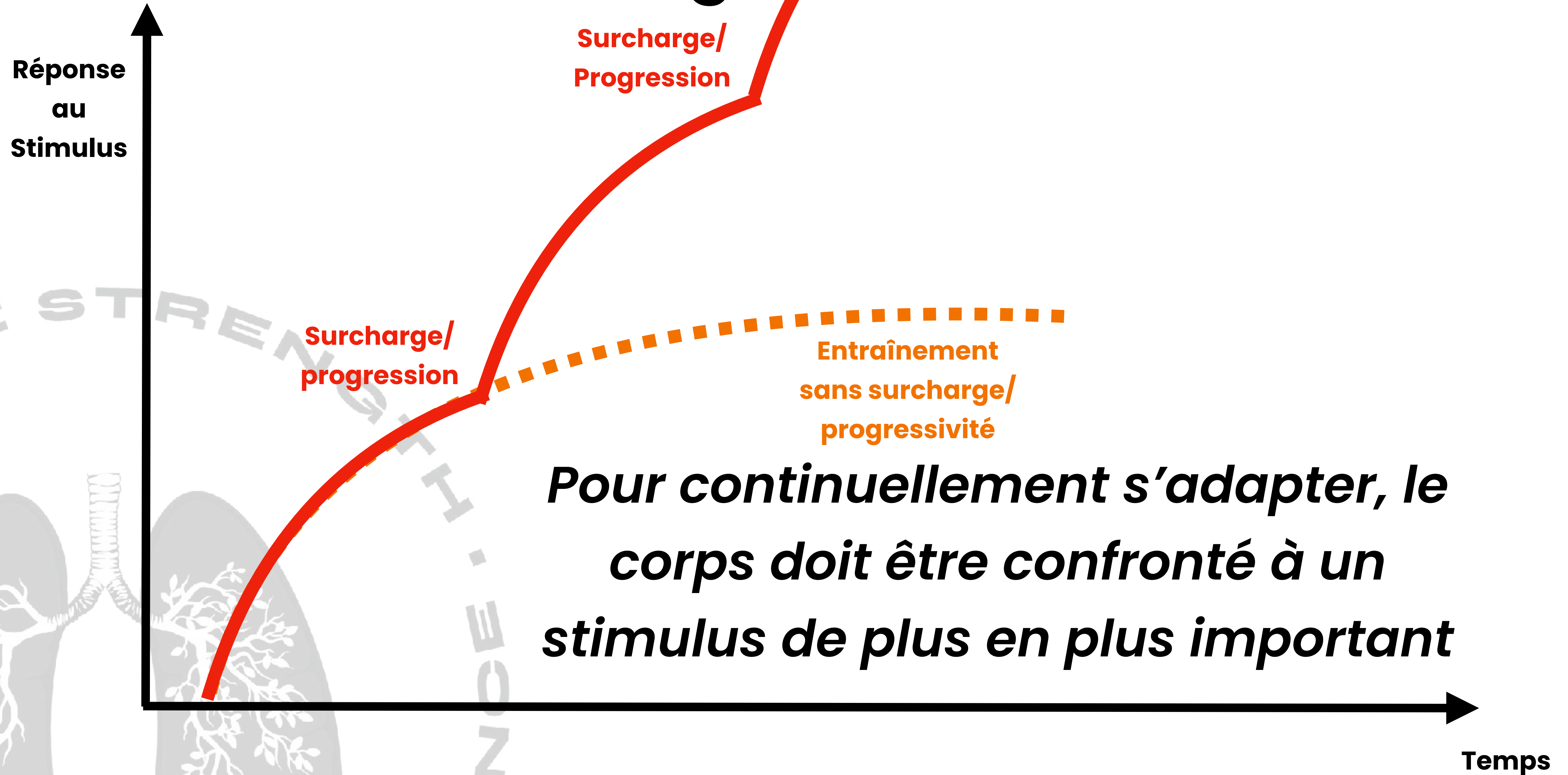
Adaptation (Accommodation)



Adaptation (Accommodation)

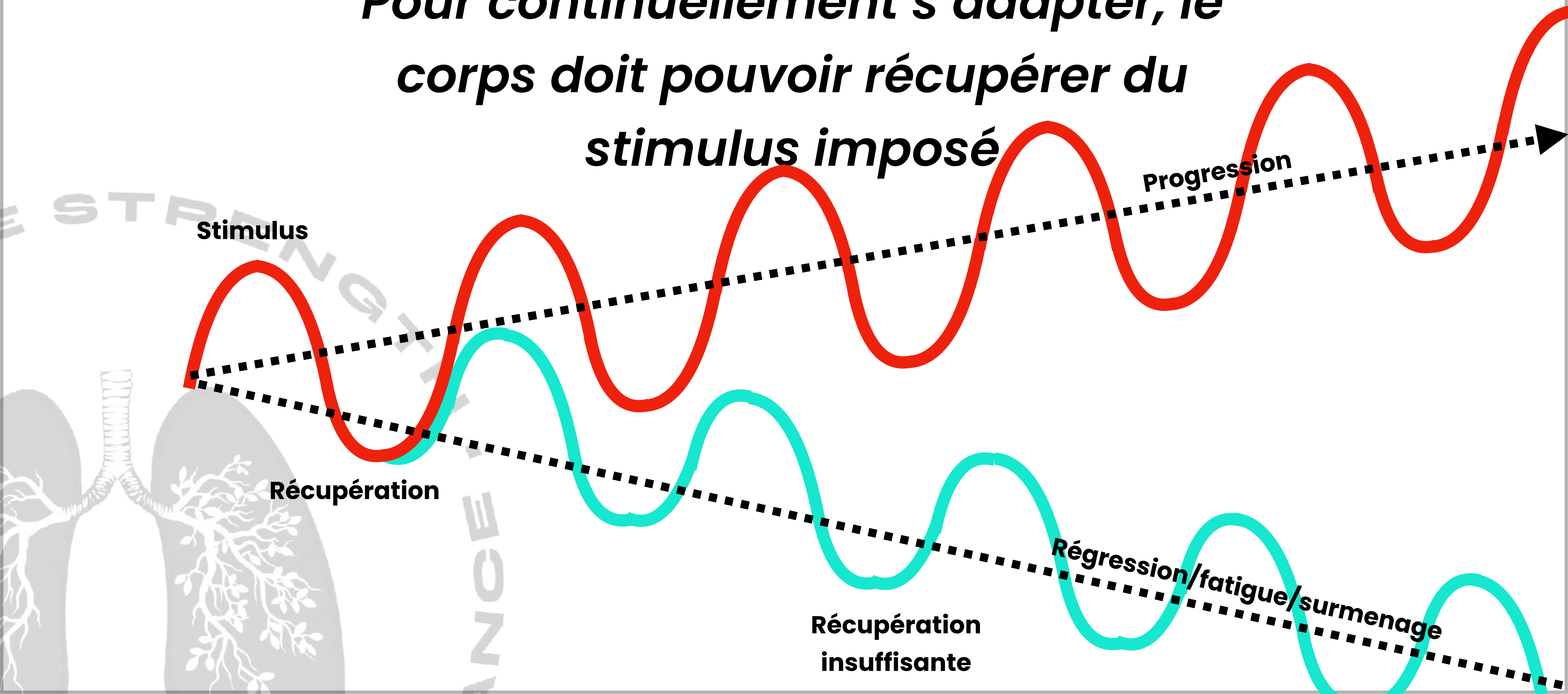


Progressivité



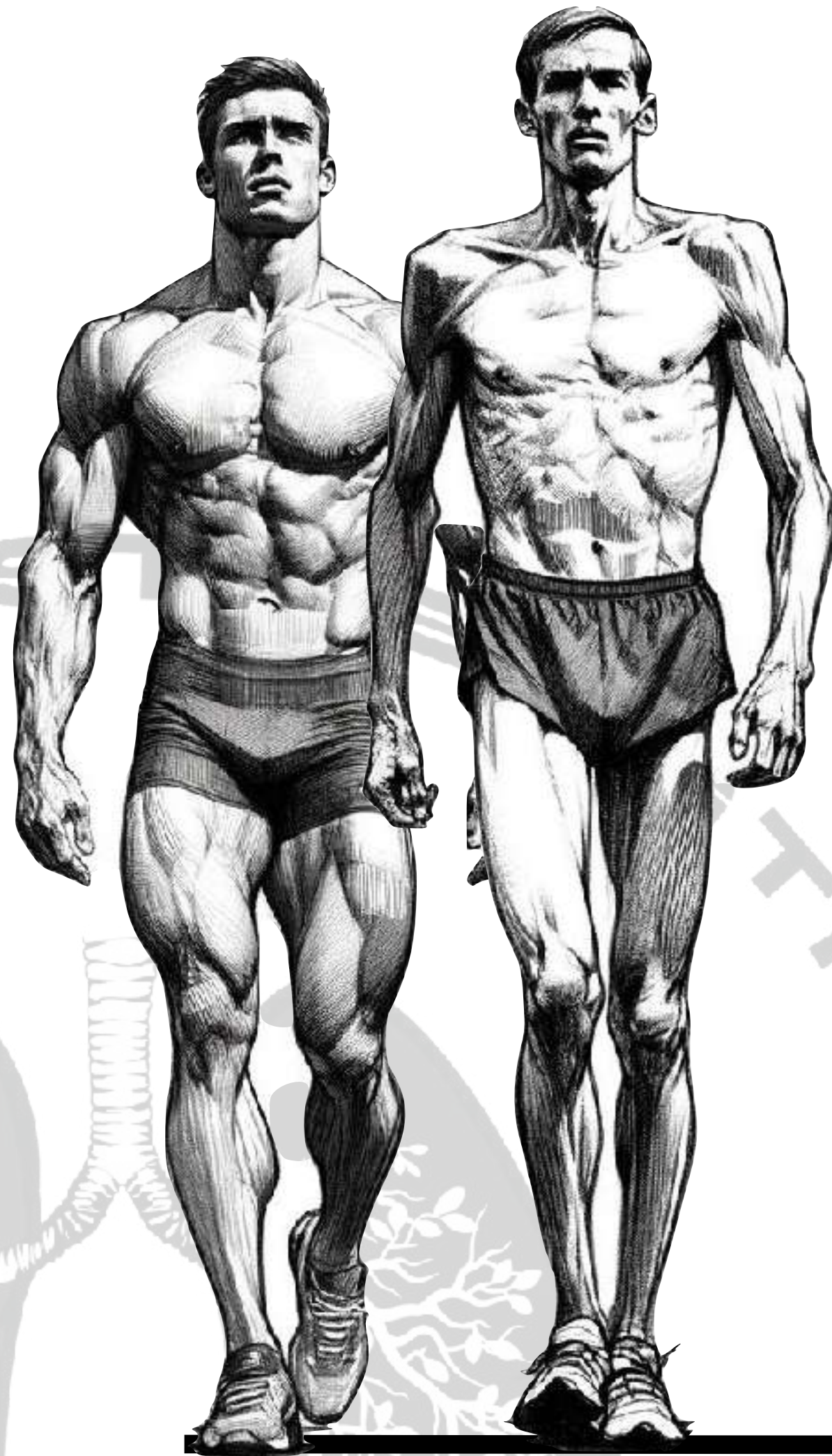
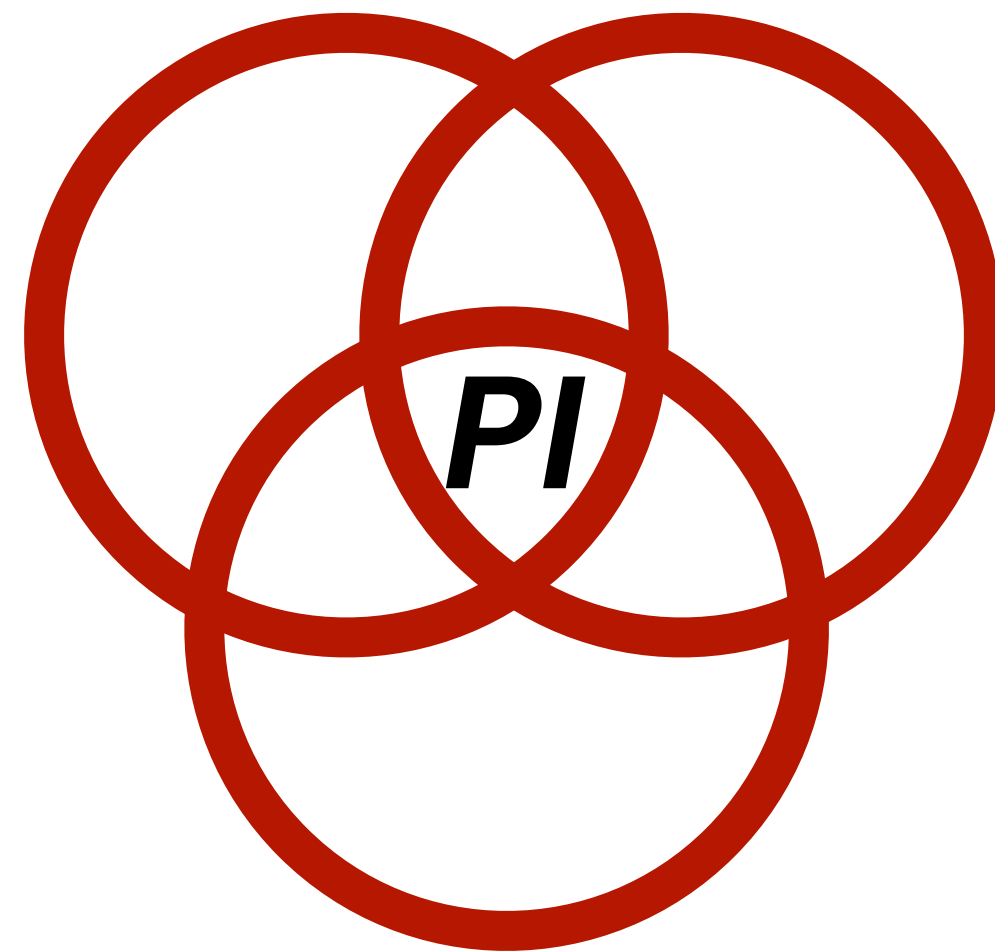
Récupération

Pour continuellement s'adapter, le corps doit pouvoir récupérer du stimulus imposé



Individualité

*L'entraînement doit être
prescrit en considérant le
profil individuel de
chaque sportif*



Profil Individuel

*Prédisposition
Génétique*

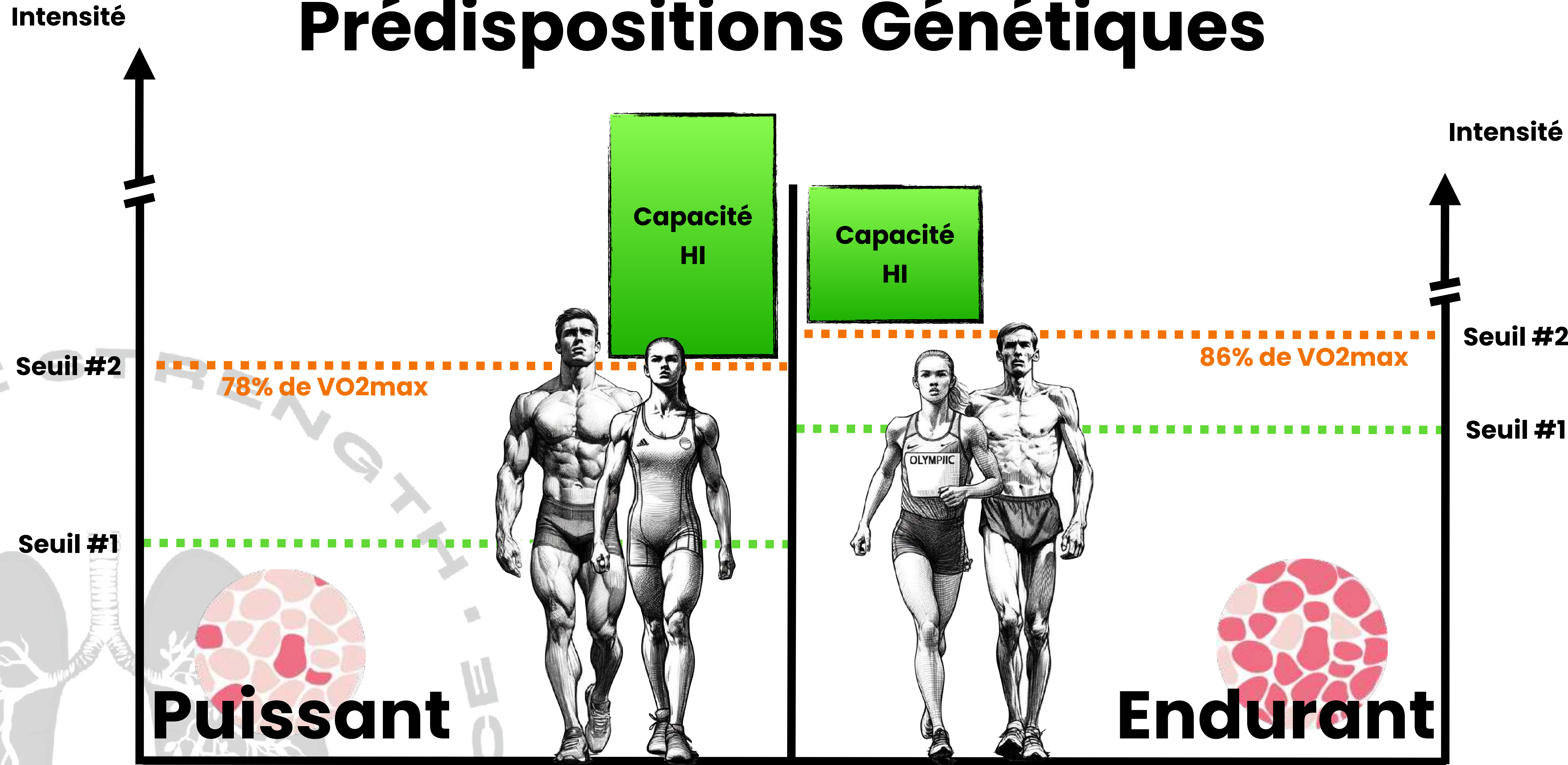
Passé Sportif

*Profil
Individuel*

*Pratique
Actuelle*

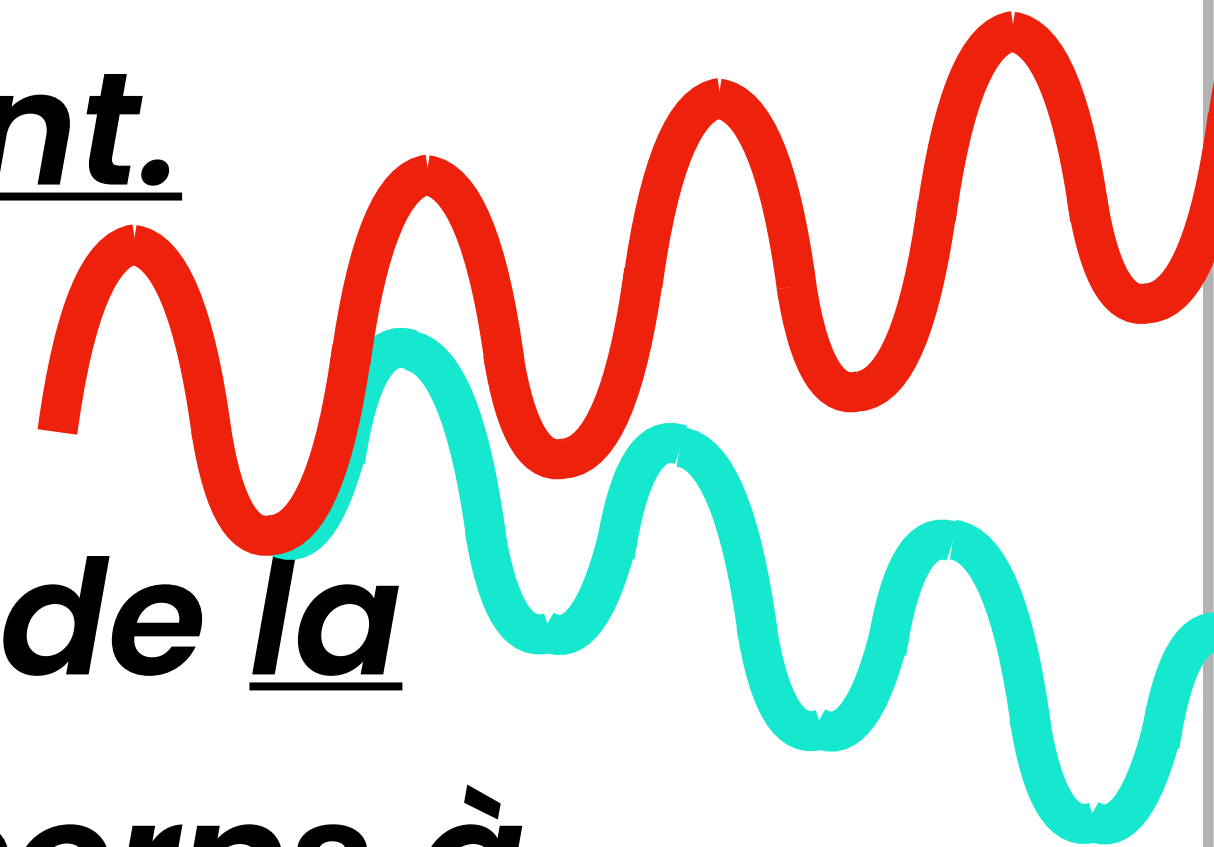
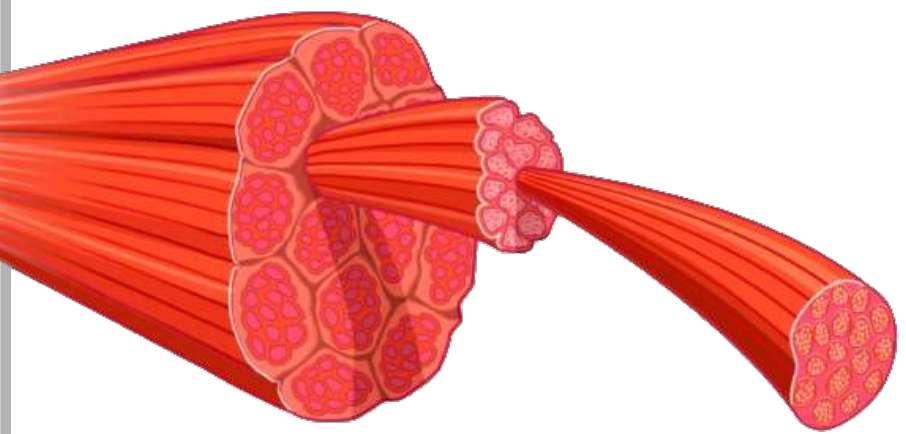


Prédispositions Génétiques



Vue d'Ensemble

Les principes régissent la manière dont l'organisme répond à l'entraînement.



Les adaptations sont la conséquence de la réponse physique & physiologique du corps à l'entraînement.



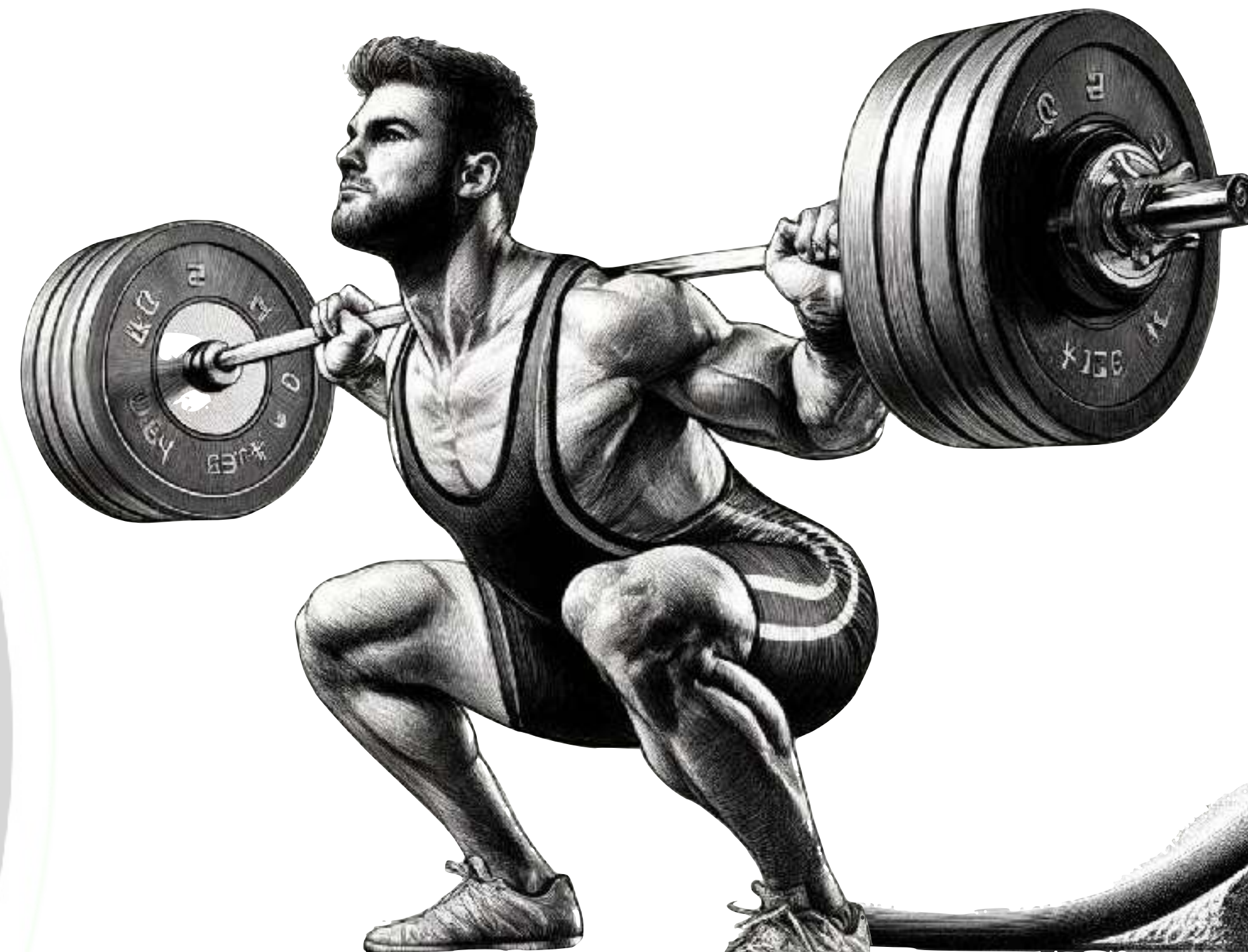
Le profil individuel définit le contexte précis dans lequel l'entraînement est appliqué.



FORMATION

SPSL 2025

Facteurs de Performance



Facteurs de Perf. en Endurance



**Cap. Mito.
(Seuil #1)**

Économie

**Apport d'Oxygène
(Seuil #2)**

%VO2 au S2

(VO2max)

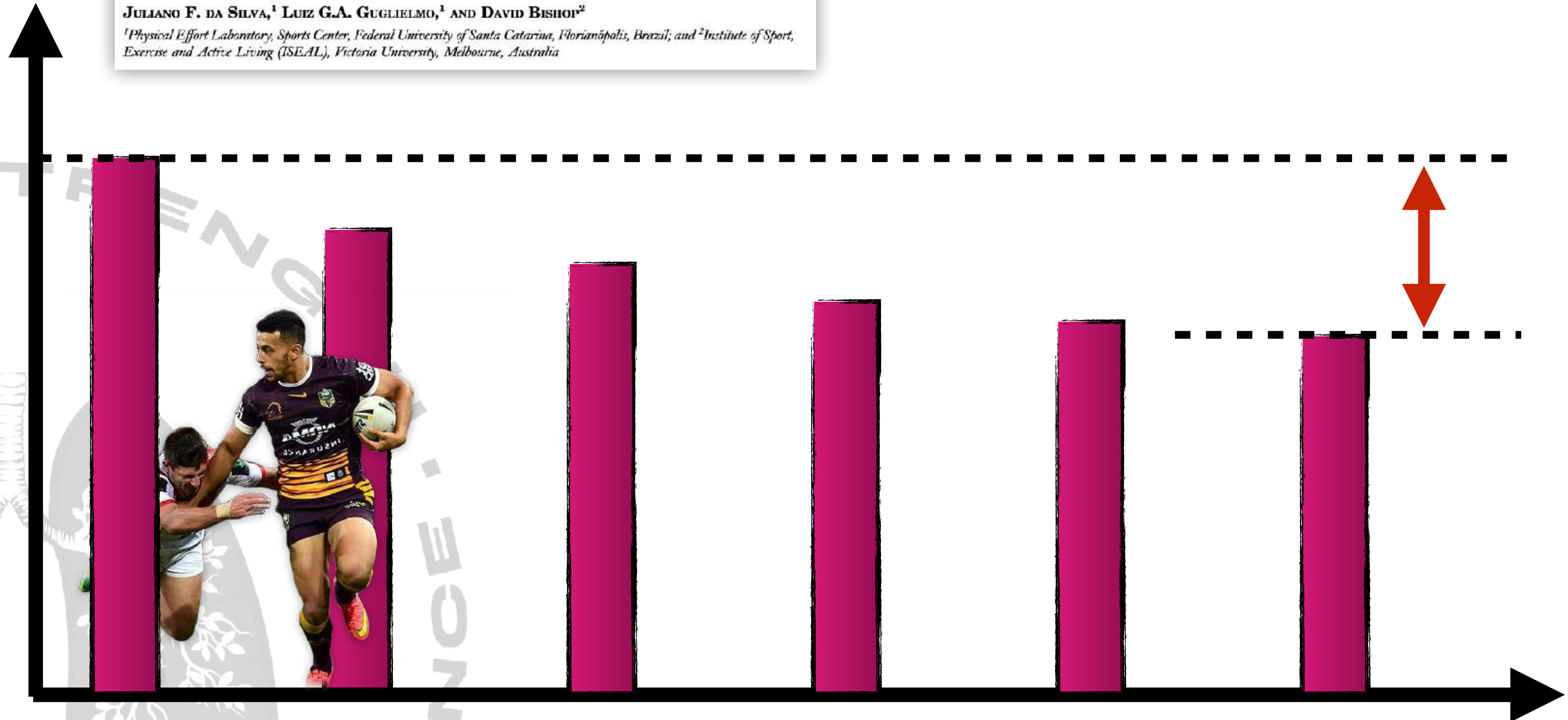
Intensité (Vitesse/Puissance)

Facteurs de Perf. en RSA

RELATIONSHIP BETWEEN DIFFERENT MEASURES OF AEROBIC FITNESS AND REPEATED-SPRINT ABILITY IN ELITE SOCCER PLAYERS

JULIANO F. DA SILVA,¹ LUIZ G.A. GUGLIELMO,¹ AND DAVID BISHOP²

¹Physical Effort Laboratory, Sports Center, Federal University of Santa Catarina, Florianópolis, Brazil; and ²Institute of Sport, Exercise and Active Living (ISEAL), Victoria University, Melbourne, Australia



Facteurs de Perf. en RSA

RELATIONSHIP BETWEEN DIFFERENT MEASURES OF AEROBIC FITNESS AND REPEATED-SPRINT ABILITY IN ELITE SOCCER PLAYERS

JULIANO F. DA SILVA,¹ LUIZ G.A. GUGLIELMO,¹ AND DAVID BISHOP²

¹Physical Effort Laboratory, Sports Center, Federal University of Santa Catarina, Florianópolis, Brazil; and ²Institute of Sport, Exercise and Active Living (ISEAL), Victoria University, Melbourne, Australia

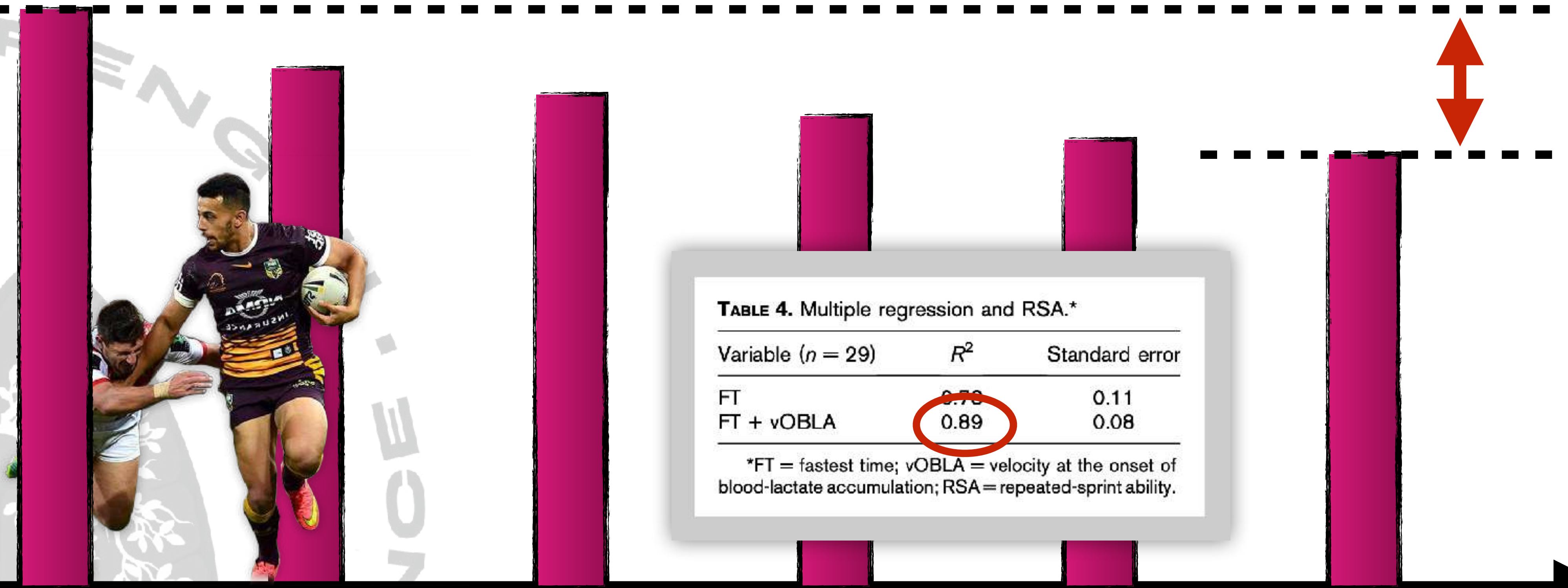


TABLE 4. Multiple regression and RSA.*

Variable (n = 29)	R ²	Standard error
FT	0.78	0.11
FT + vOBLA	0.89	0.08

*FT = fastest time; vOBLA = velocity at the onset of blood-lactate accumulation; RSA = repeated-sprint ability.

Facteurs de Perf. en RSA



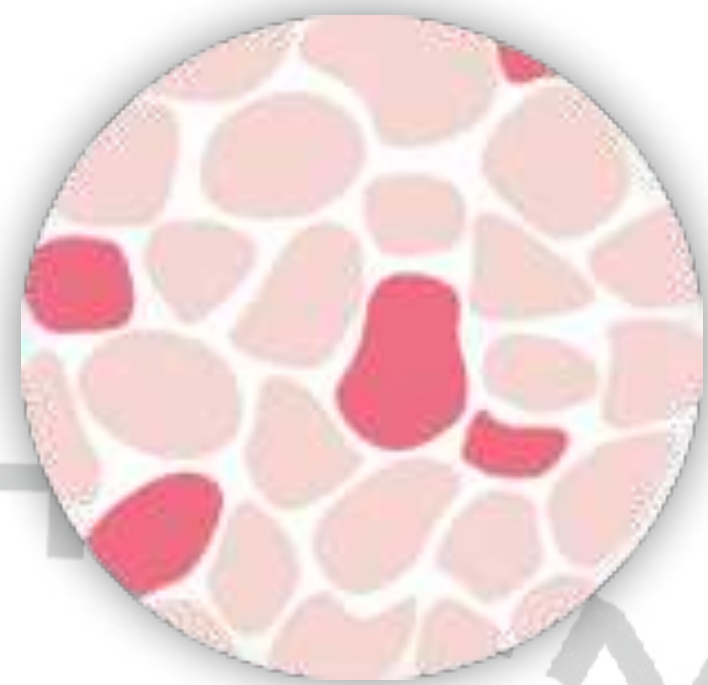
**Apport d'Oxygène
(Seuil #2)**

v/Pmax

Intensité (Vitesse/Puissance)

Facteurs de Perf. en Sprint

Proportion de
Fibres T2



Capacité
Glycolytique

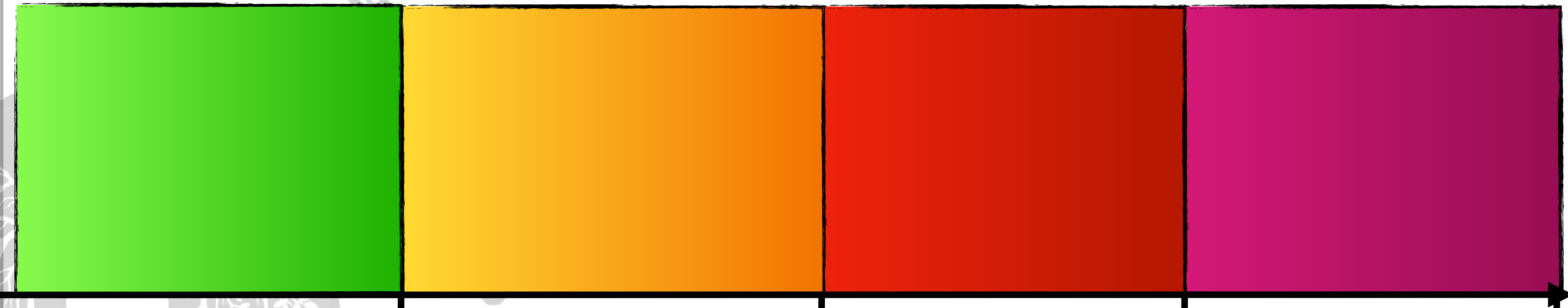
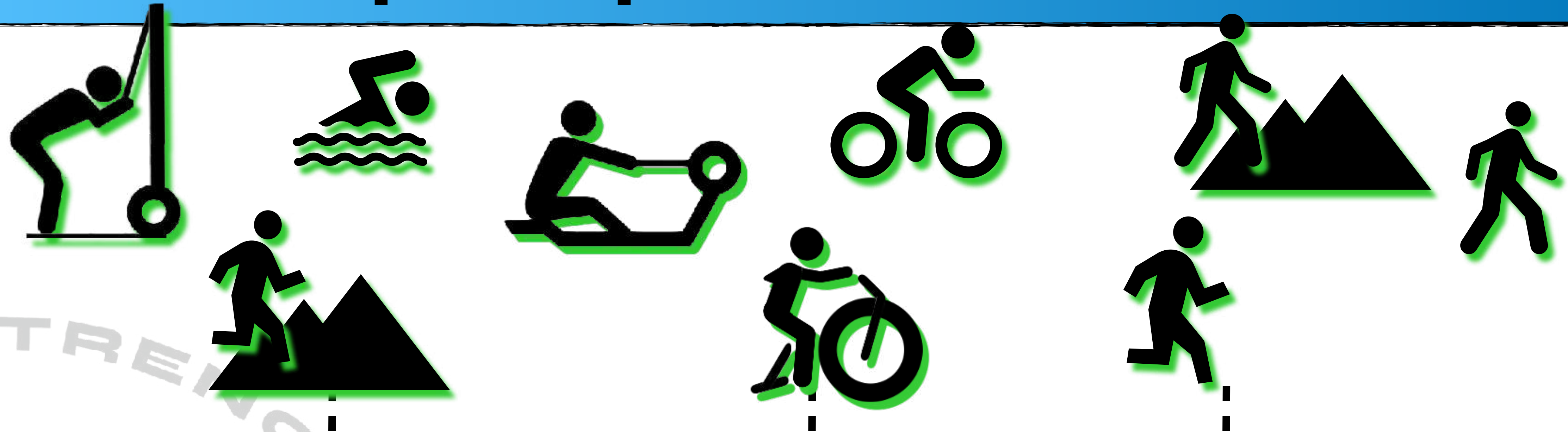


Volume
Musculaire



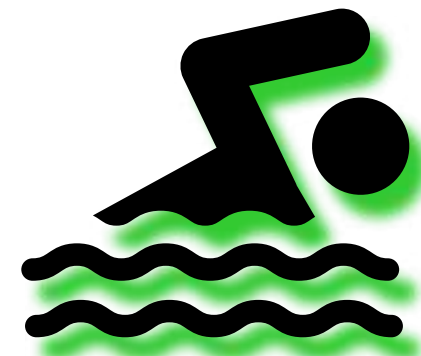
Intensité (Vitesse/Puissance)

Spécifique ou Général ?



Intensité (Vitesse/Puissance)

Choisir la/les Modalité(s)



Lien à l'Activité Principale (S/G)



Logistique / Disponibilité

Objectif d'Entraînement



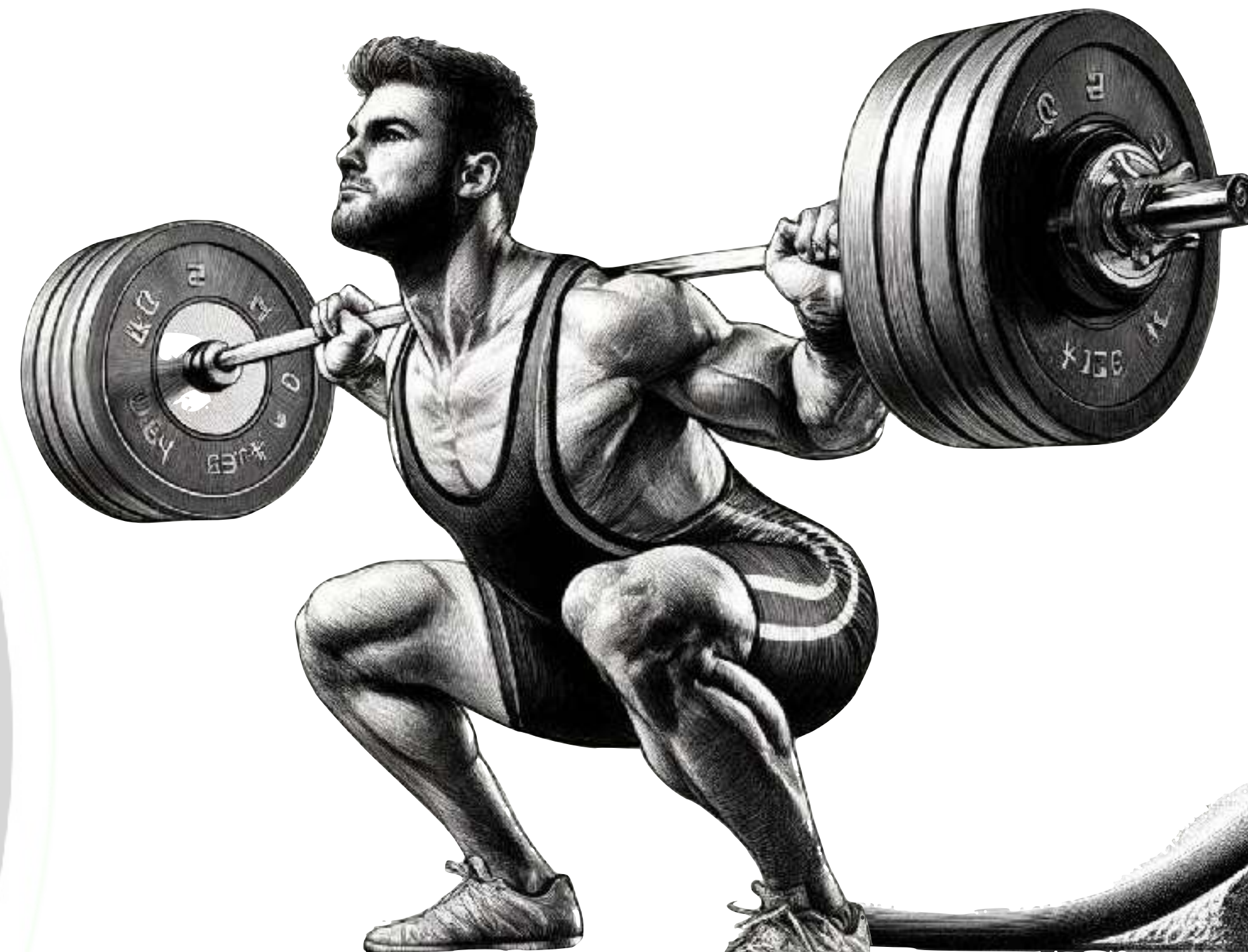
Préférence Personnelle



FORMATION

SPSL 2025

La Periodisation



Dwight D. Eisenhower



“Quand je prépare une bataille, j’ai toujours constaté que les plans sont inutiles, mais que la planification est indispensable.”



La Periodisation

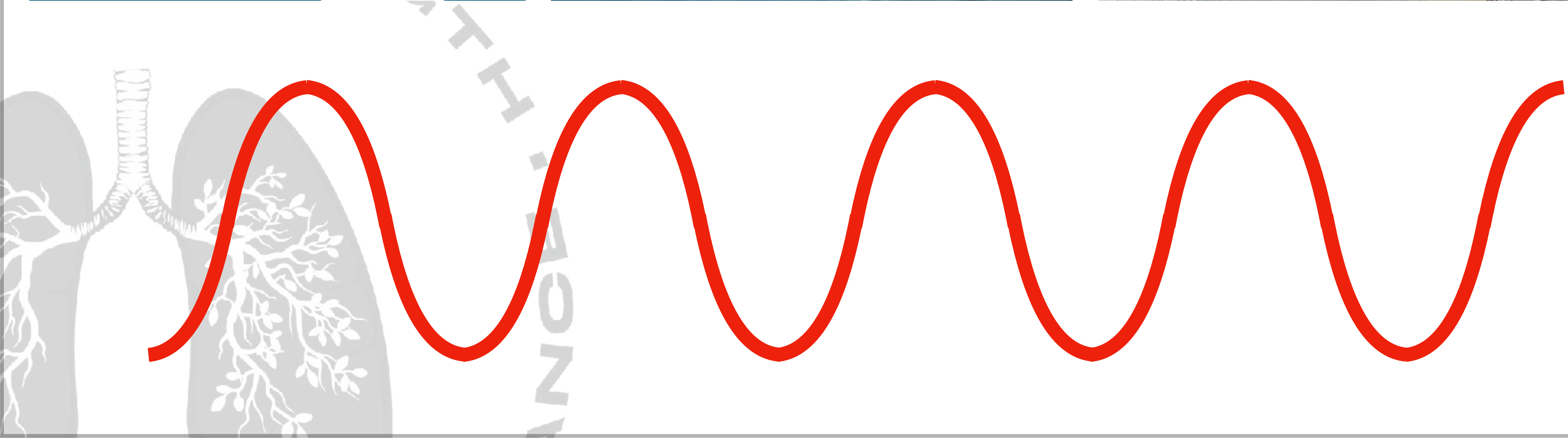
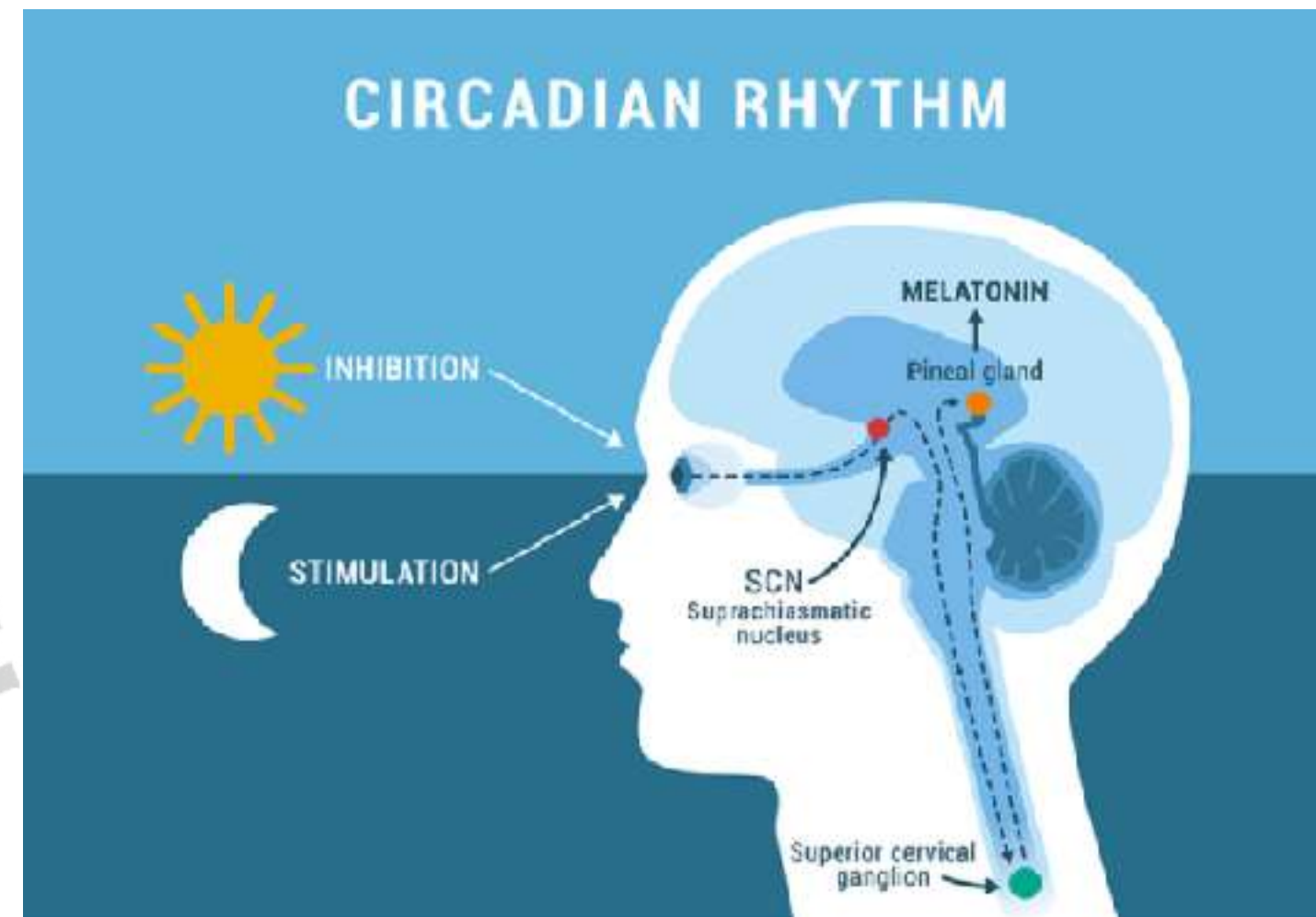
Compétition

Préparation Spécifique

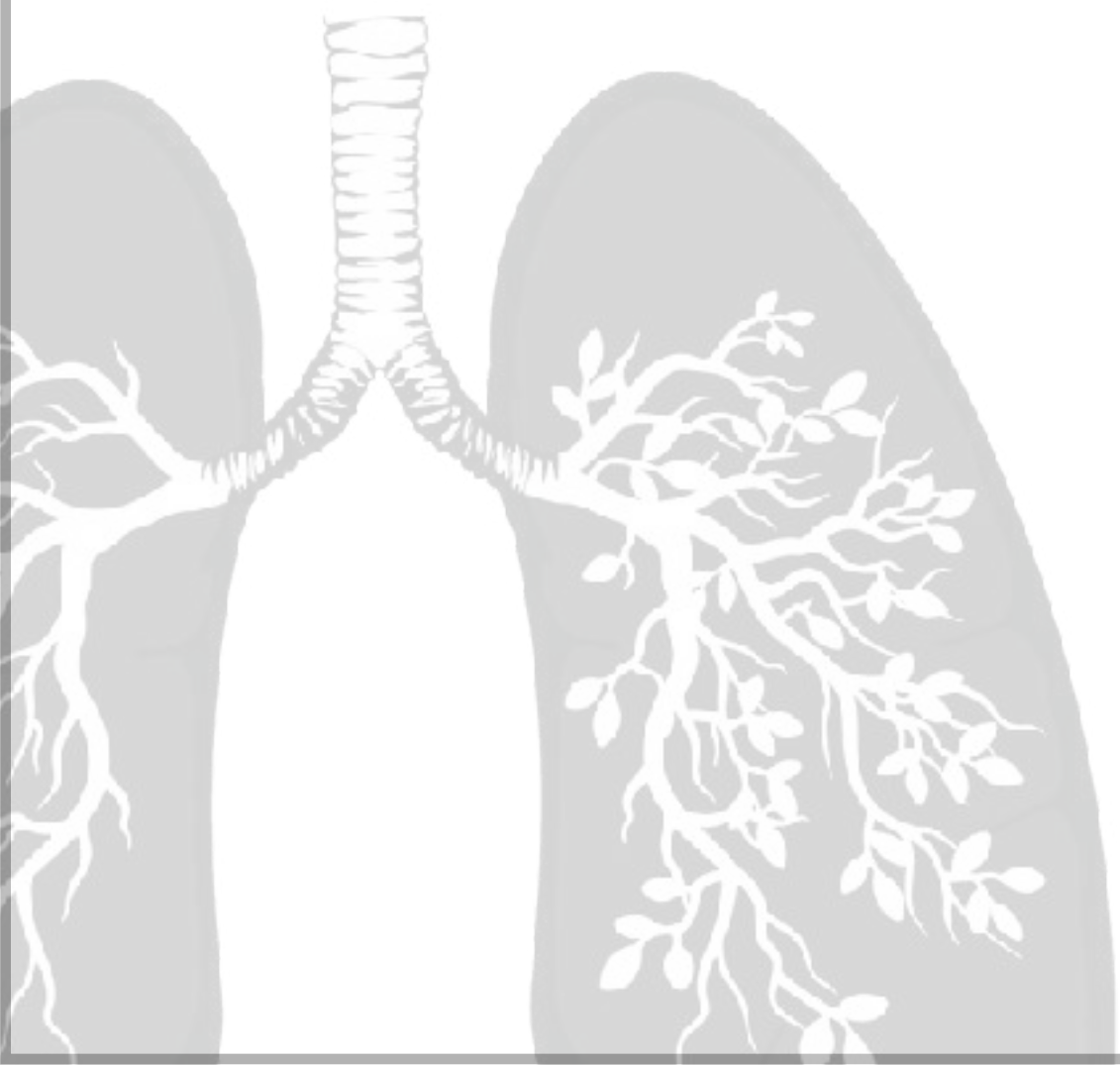
Préparation Générale

Performance

Les Cycles Naturels



*Quelles sont les phases/cycles
dans la periodisation?*



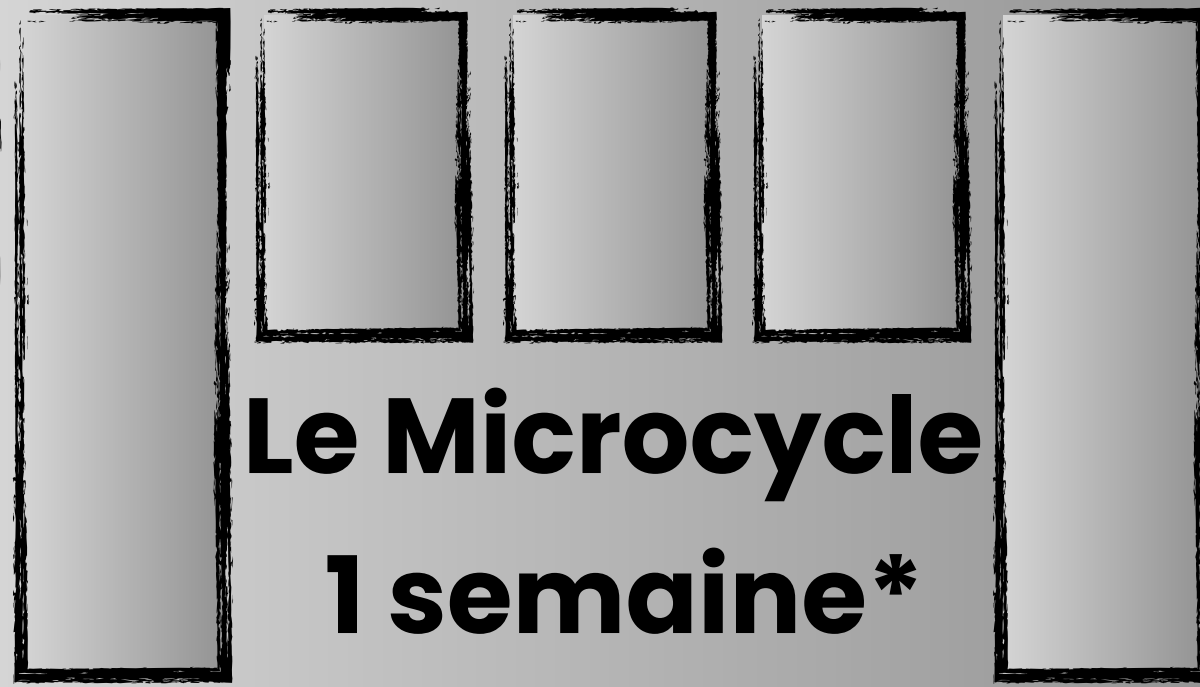
STRENGTH
ANCE

Le Plan Annuel

Le Macrocycle
1an - Cycle complet

Le Mesocycle
3-6 semaines

Le Microcycle
1 semaine*



Durée du Mesocycle

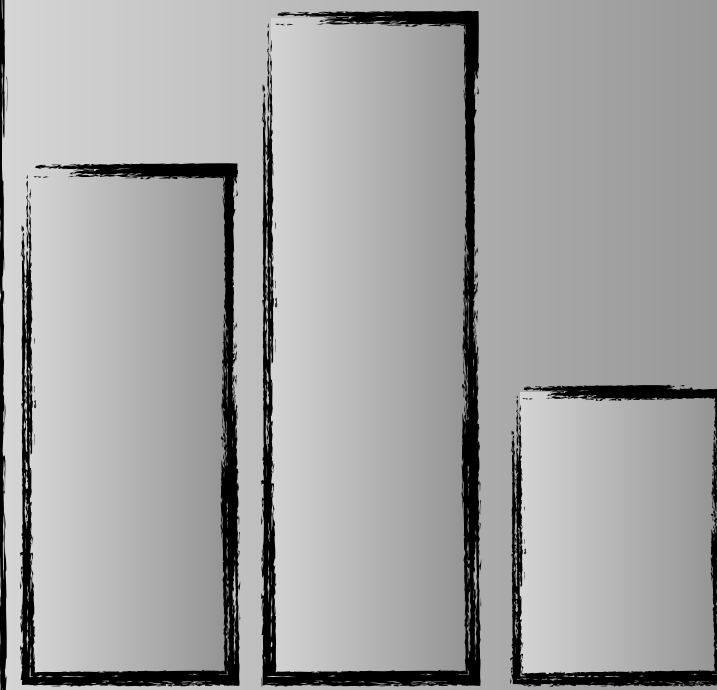


Moins commun

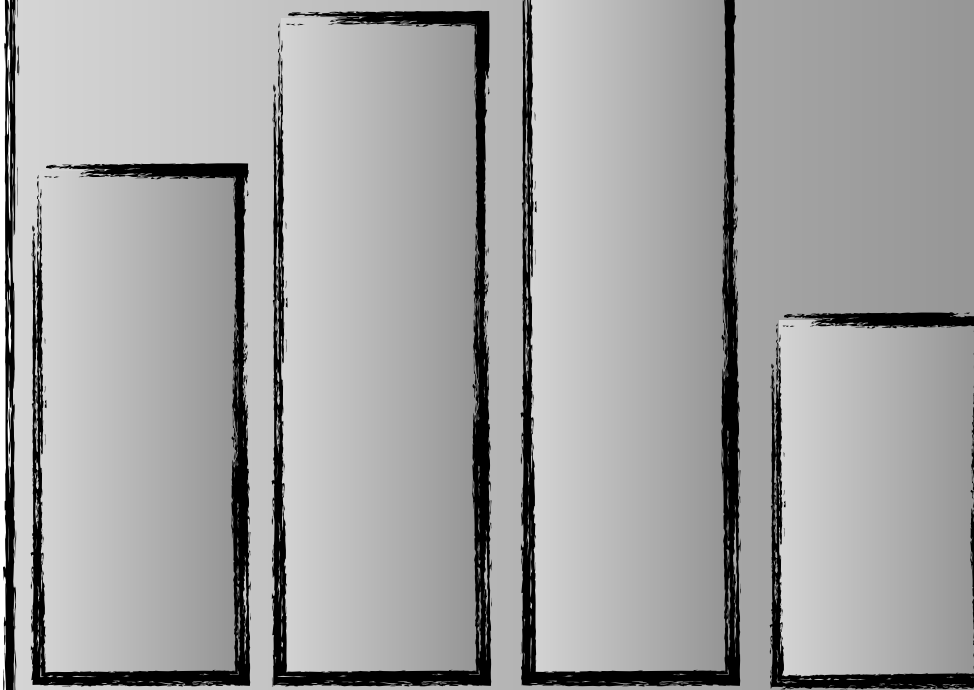
Plus commun

Moins commun

**Le Mesocycle
3 semaines**



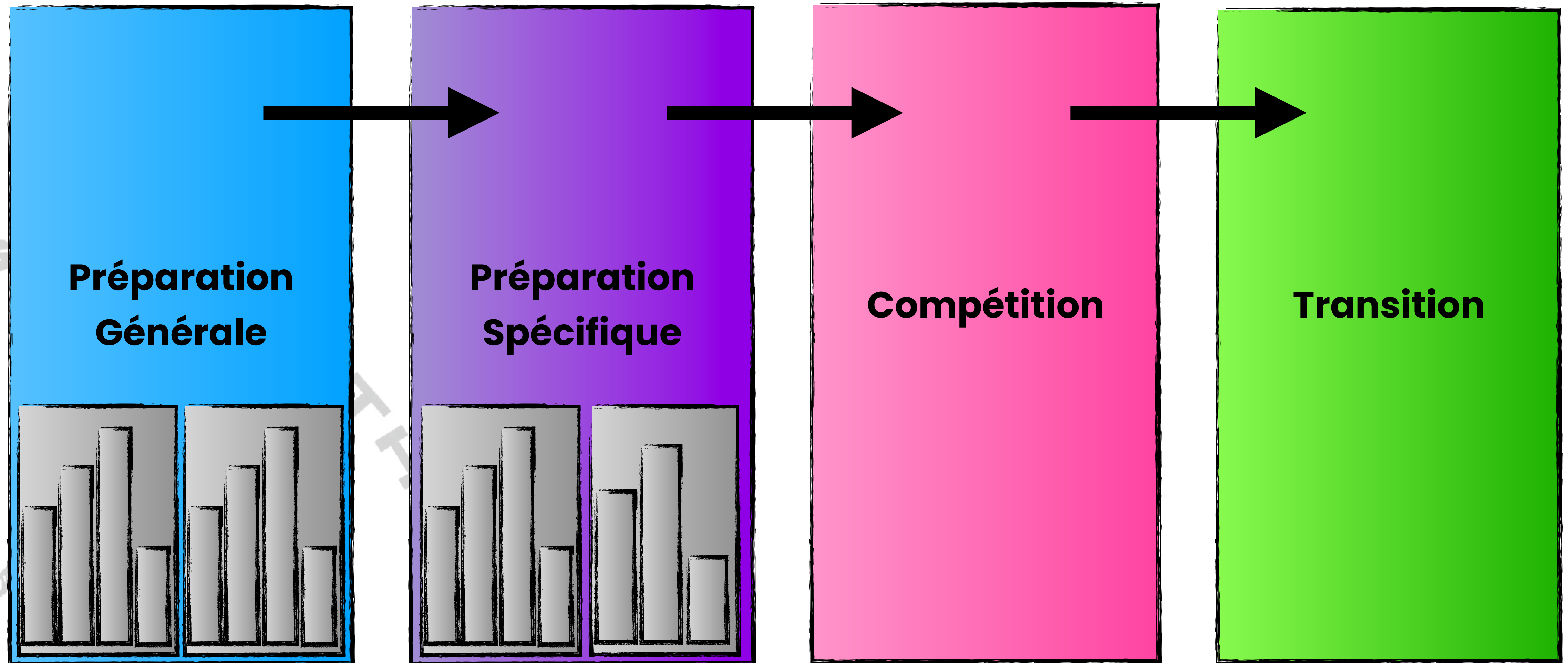
**Le Mesocycle
4 semaines**



**Le Mesocycle
5 semaines**



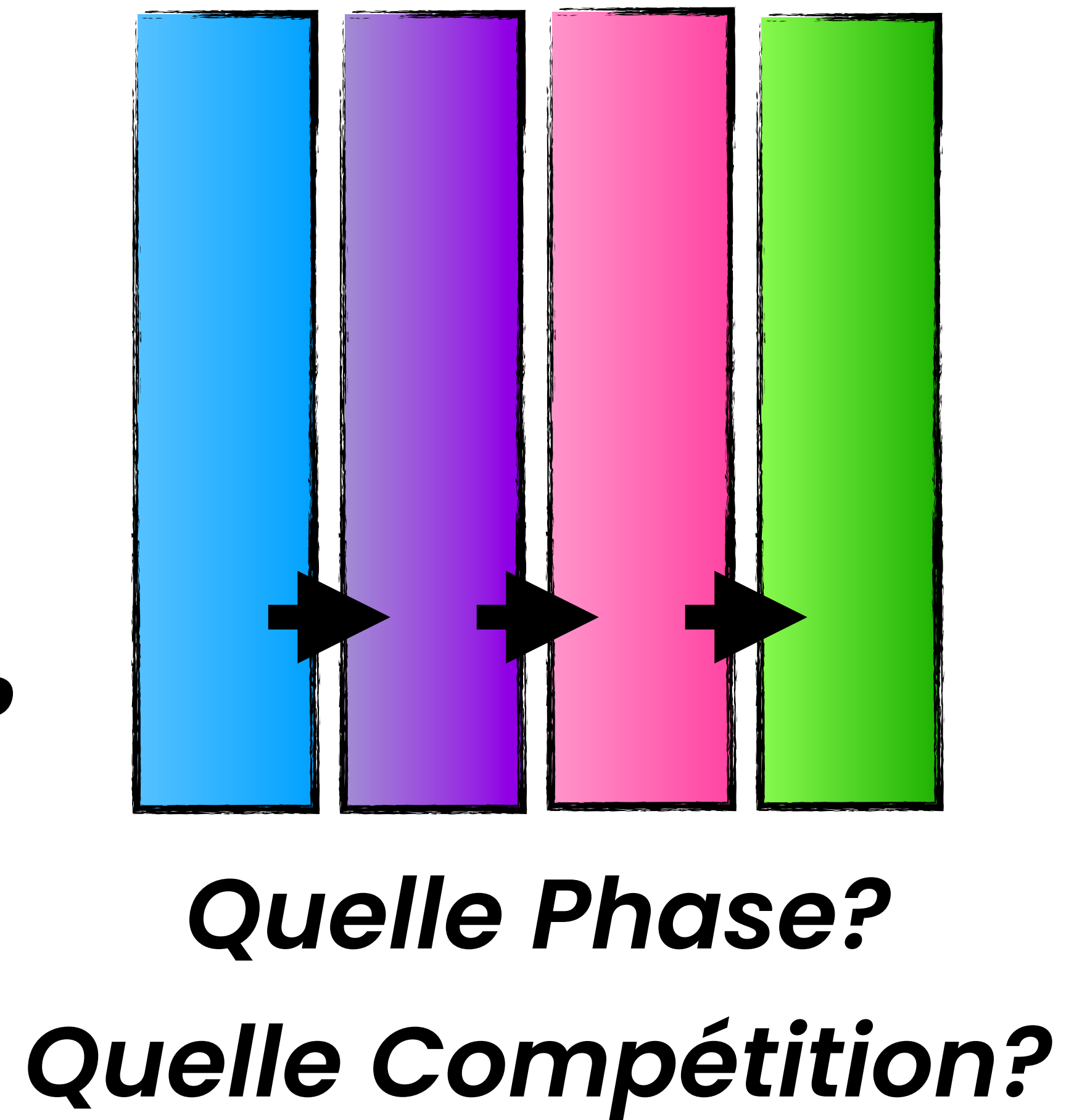
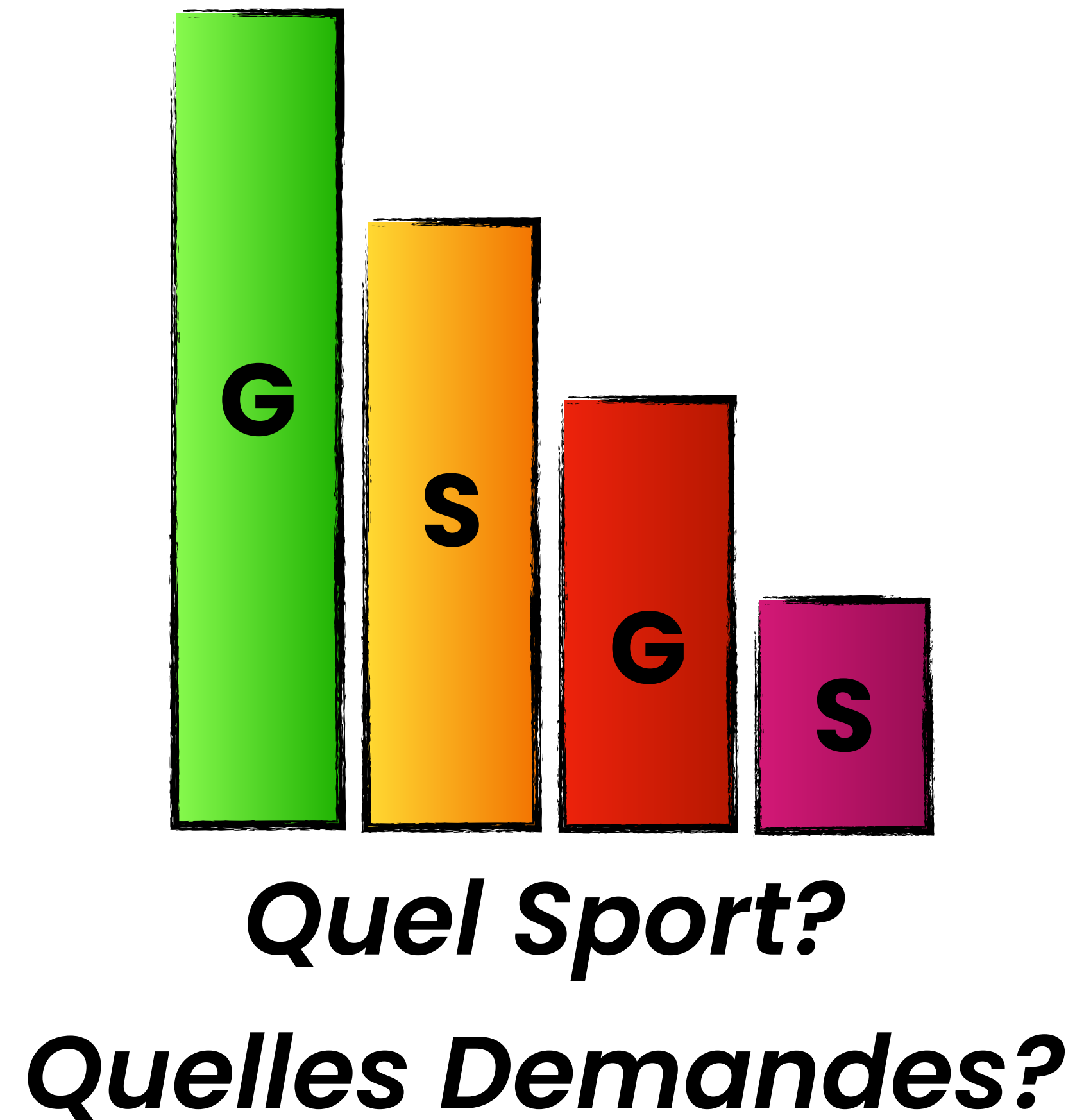
La Periodisation Sportive



La Planification en Endurance



Quel Profil?
Quels Besoins?



Besoins Individuels



Préparation Générale

(Force Max)

Course à Pied (Seuil)

Basse/Moyenne IT

Préparation Spécifique

CrossFit®

Course à Pied (VO2)

Haute Intensité



Demandes Sportives (Triathlon)

← **Moins Important** **Plus Important** →

Sprint

Durabilité

Seuil

VO2max

70.3

VO2max

Durabilité

Seuil

Ironman

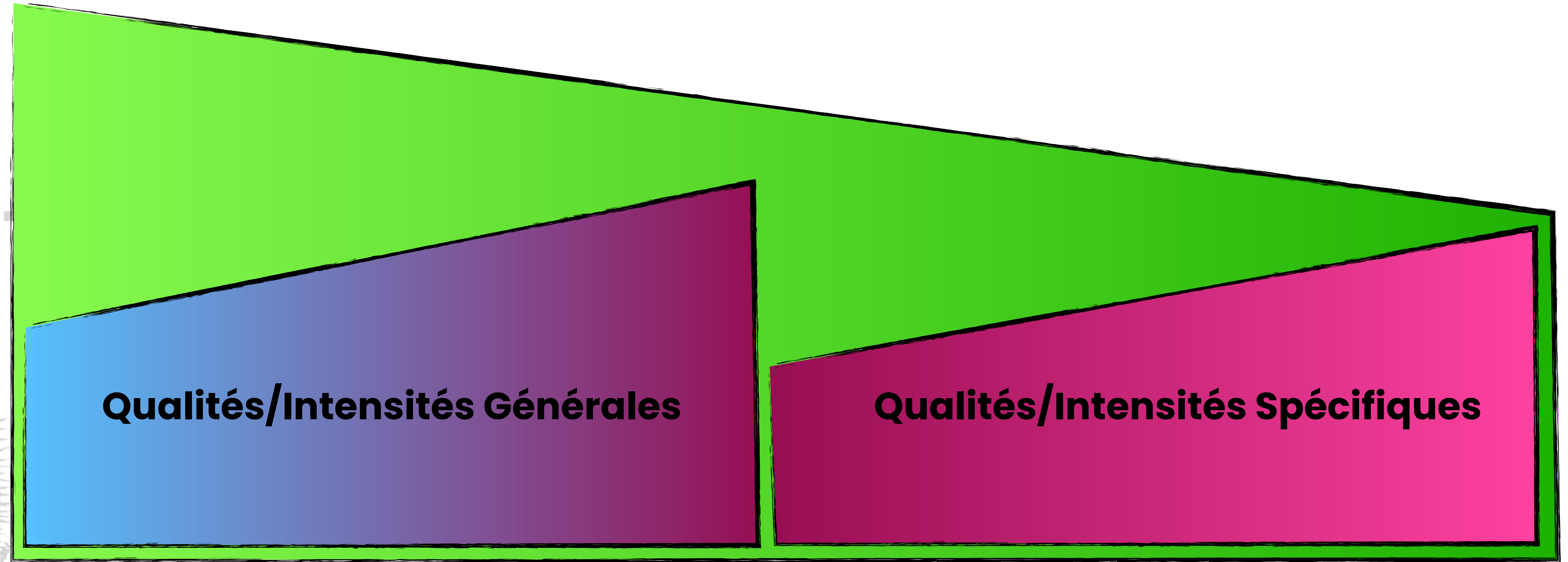
VO2max

Seuil

Durabilité

→ **Progression dans le macrocycle**

Phase d'Entraînement



Qualités/Intensités Générales

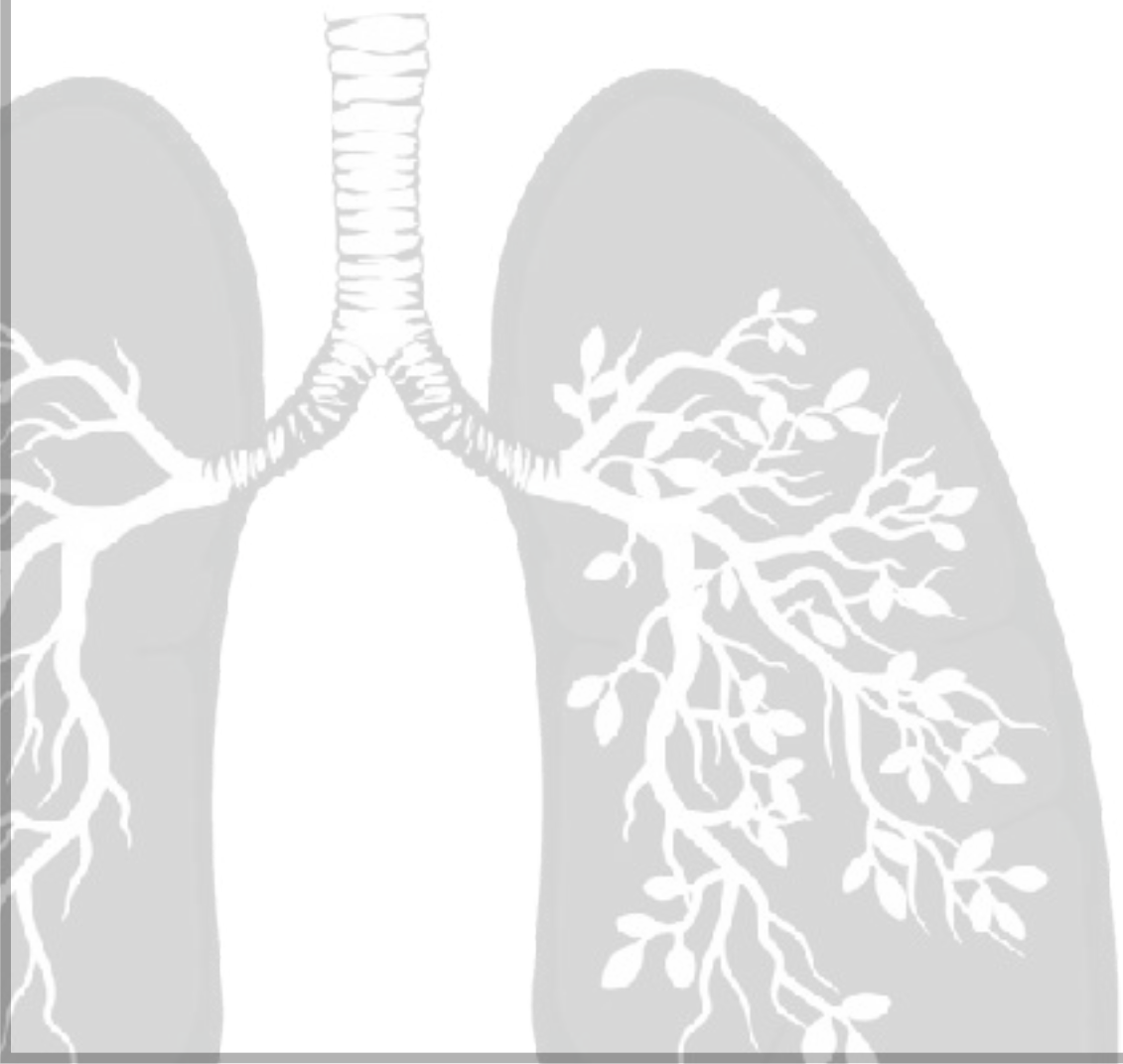
Qualités/Intensités Spécifiques

Loin de la Compétition

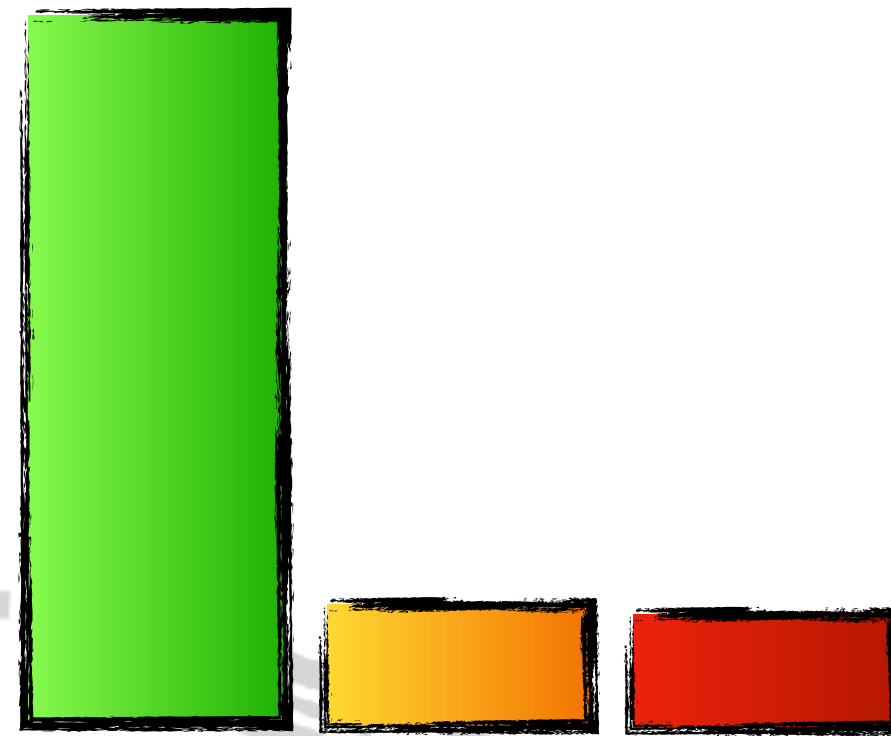
Proche de la Compétition

Distribution d'Intensité

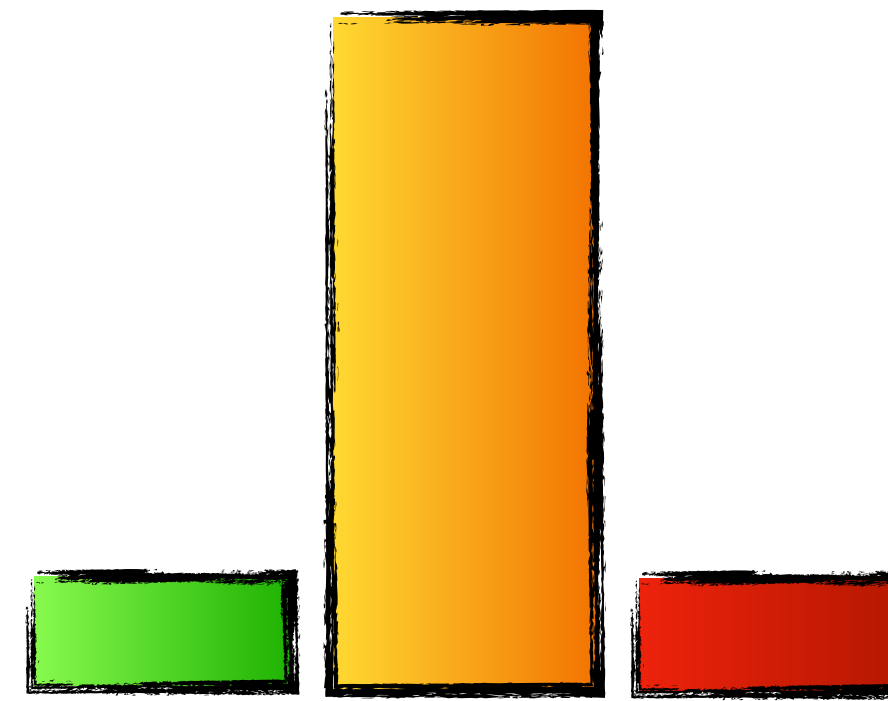
*La répartition des intensités (basse/moyenne/
haute) dans une semaine, un cycle ou une
phase d'entraînement*



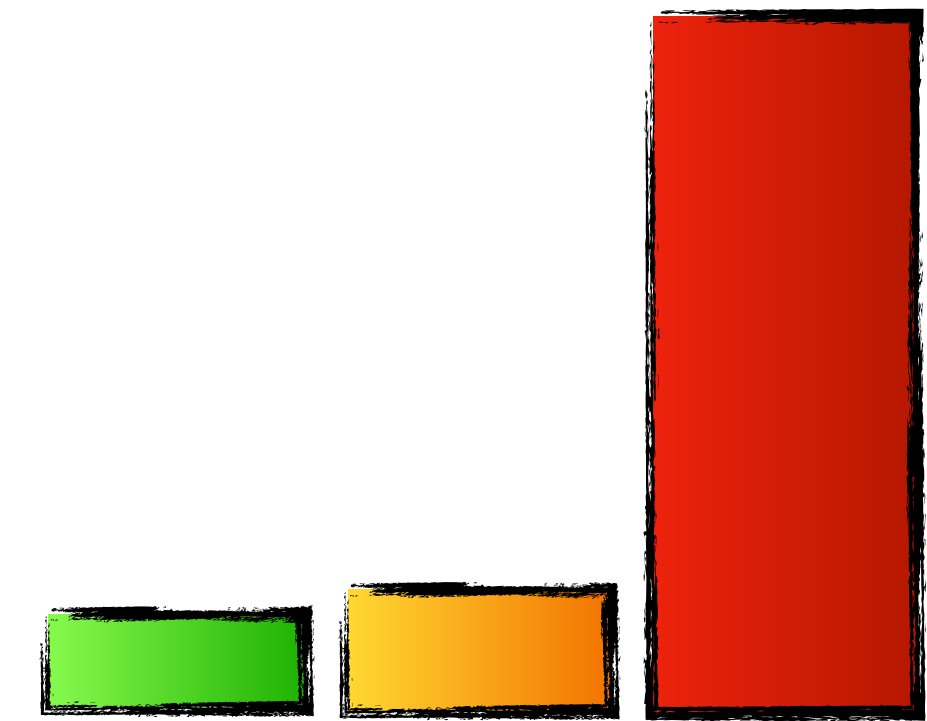
Modèles de Distribution



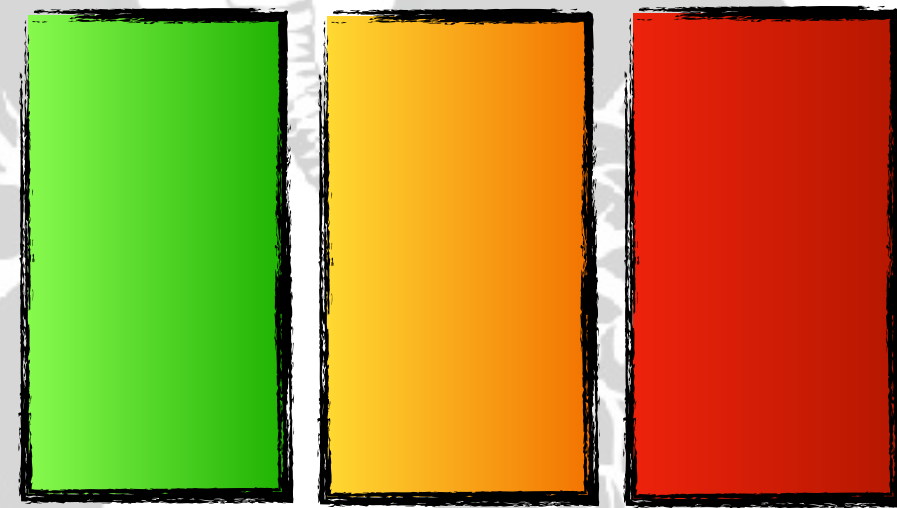
Basse Intensité



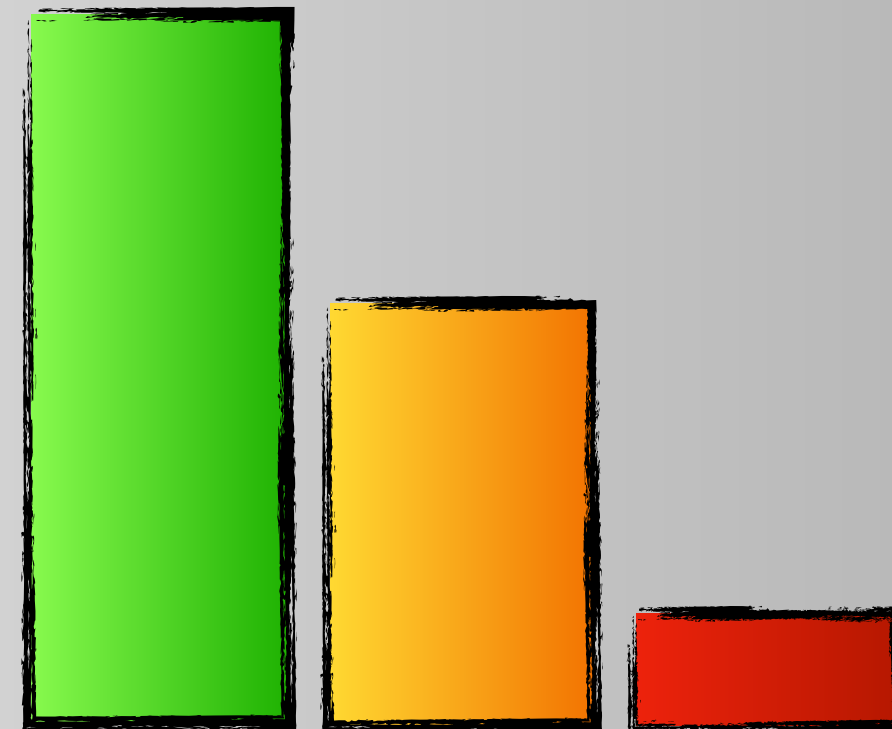
Seuil



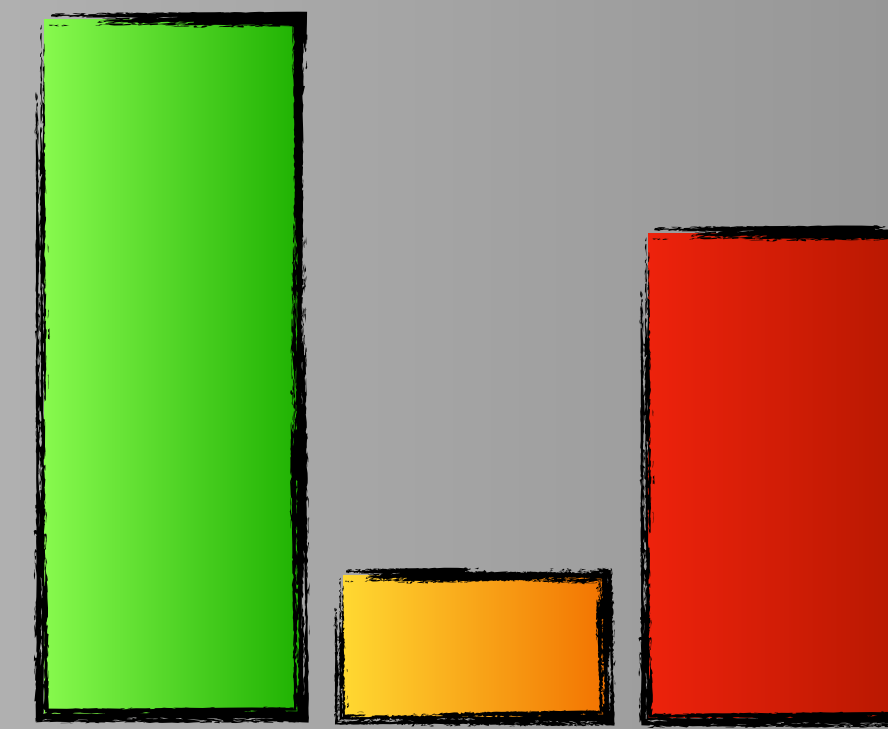
Haute Intensité



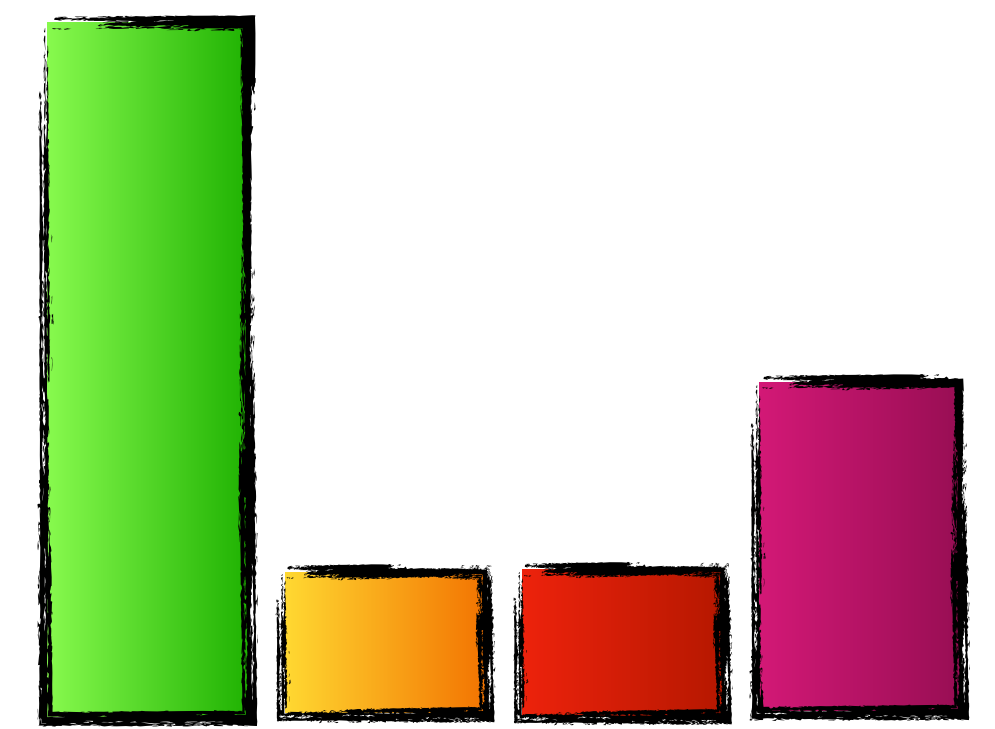
Uniforme



Pyramidal

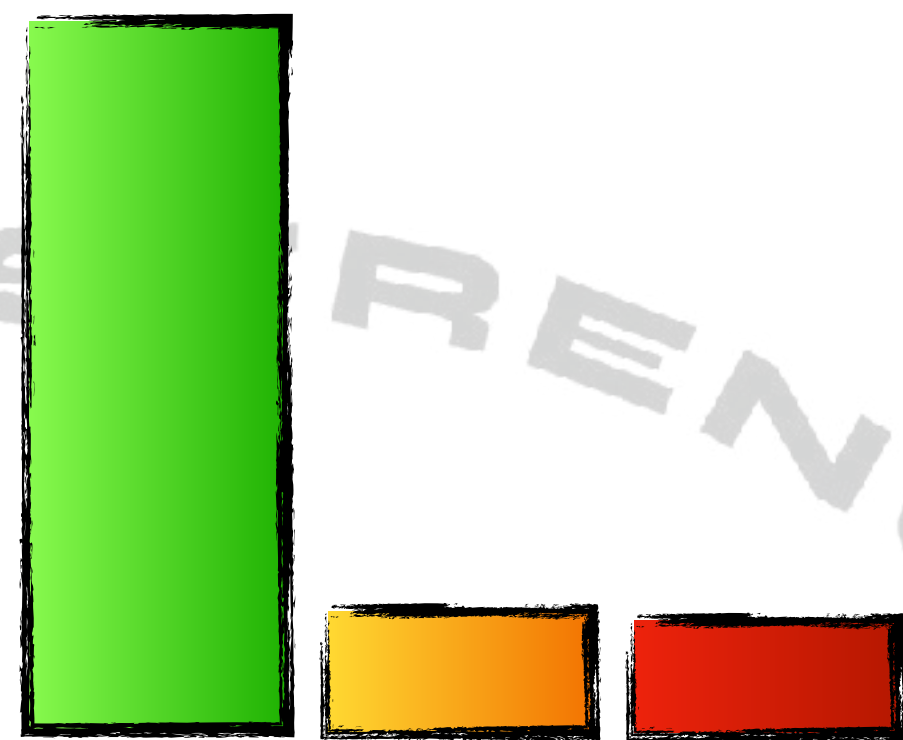


Polarisé



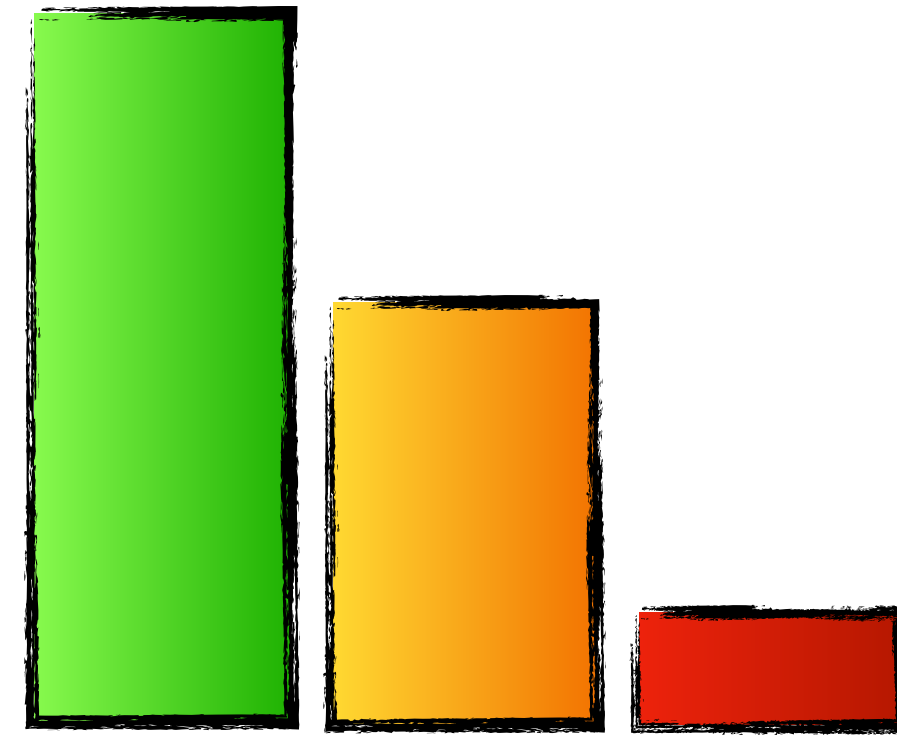
Sprint

Durée de Développement



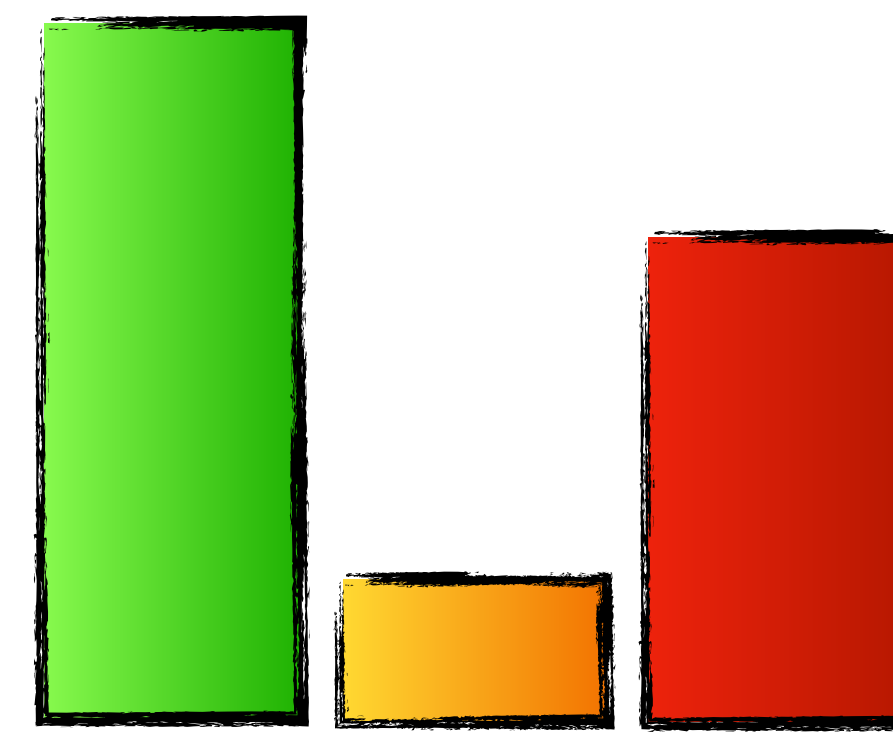
Basse Intensité

**2 semaine à
12 mois**



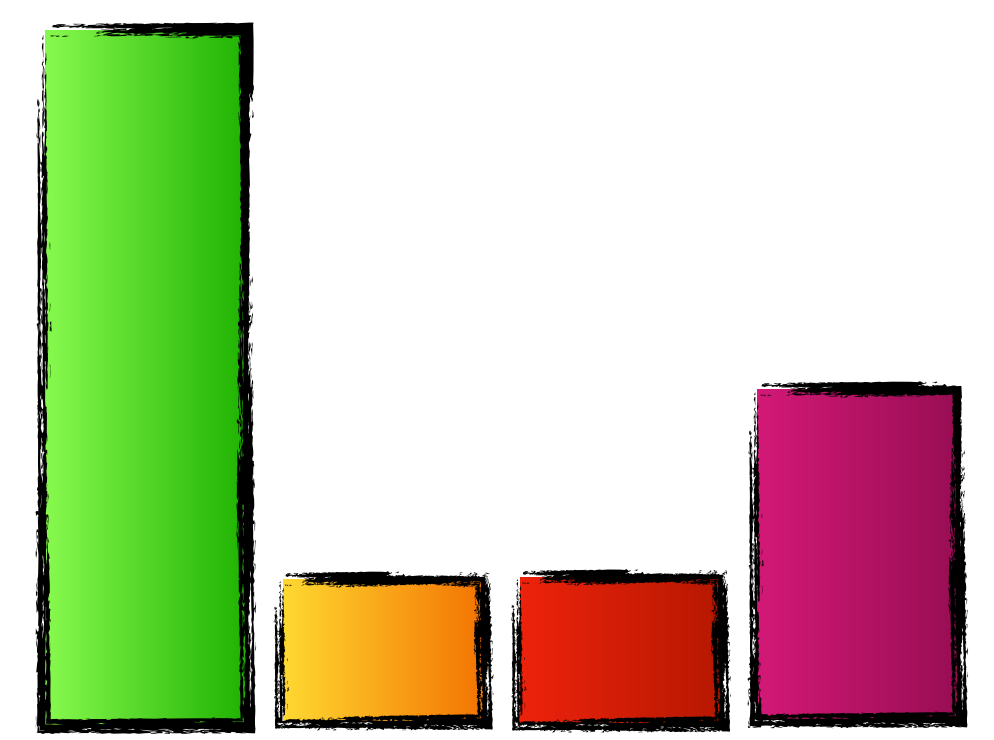
Pyramidal

**3 semaines à
4 mois**



Polarisé

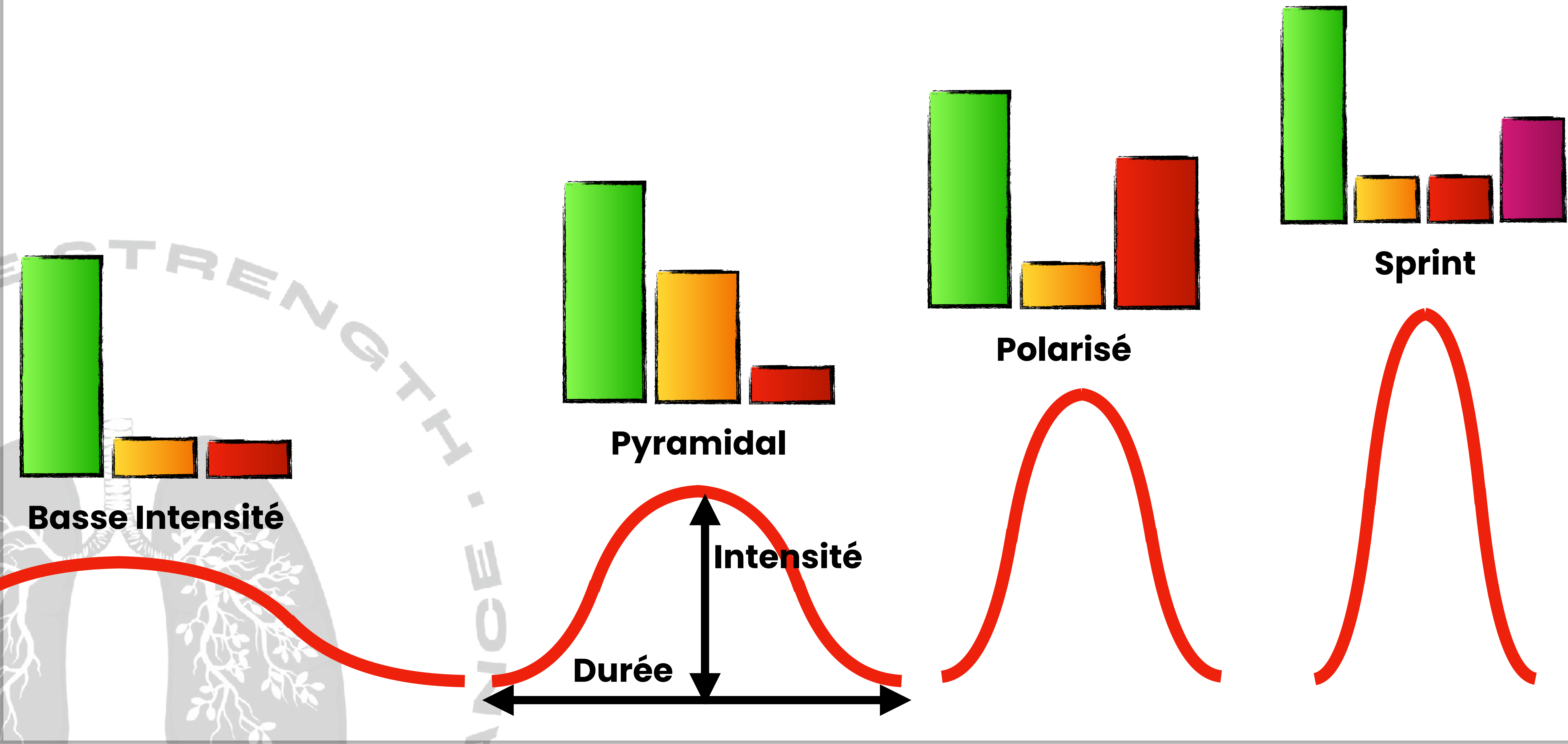
**2 semaines à
3 mois**



Sprint

**1 à 4
semaines**

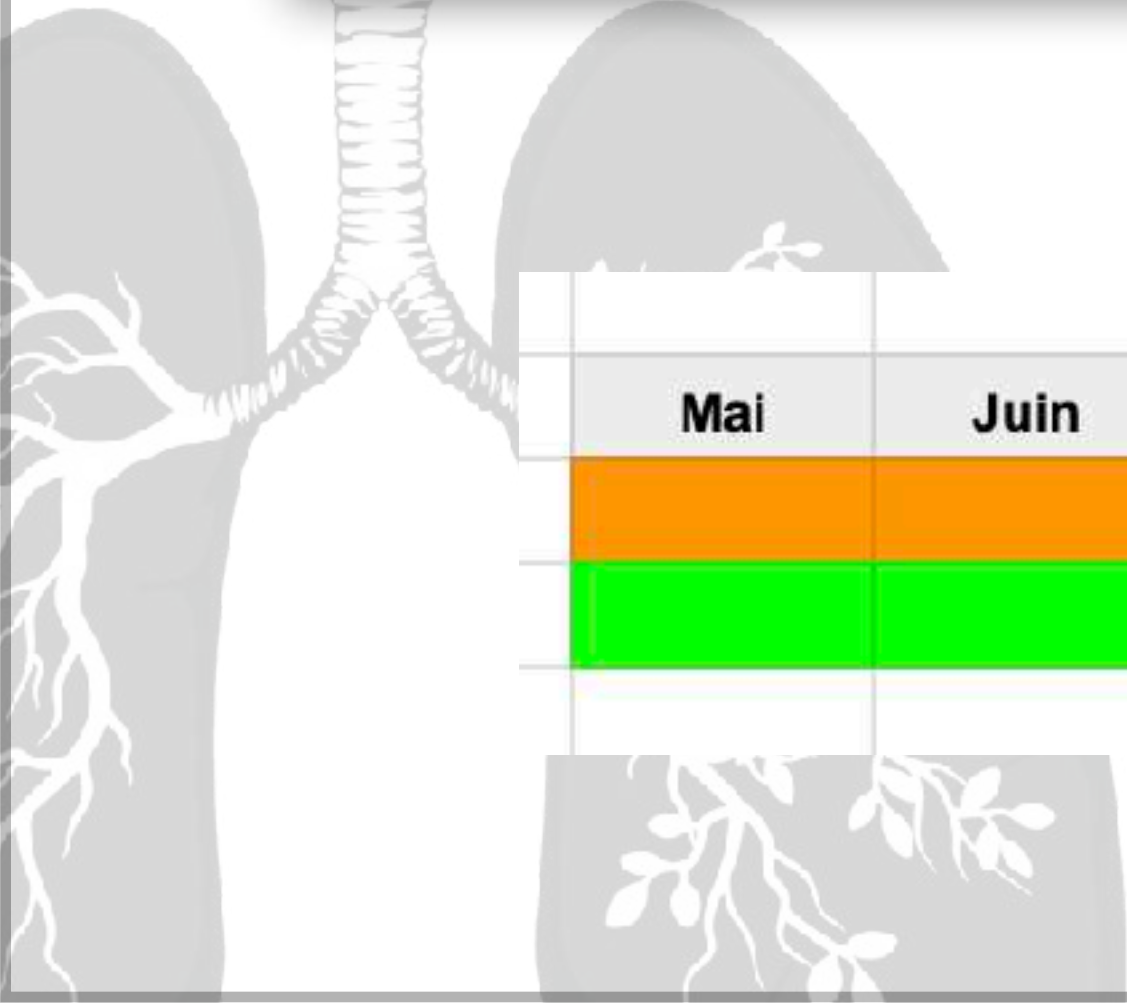
Durée de Développement



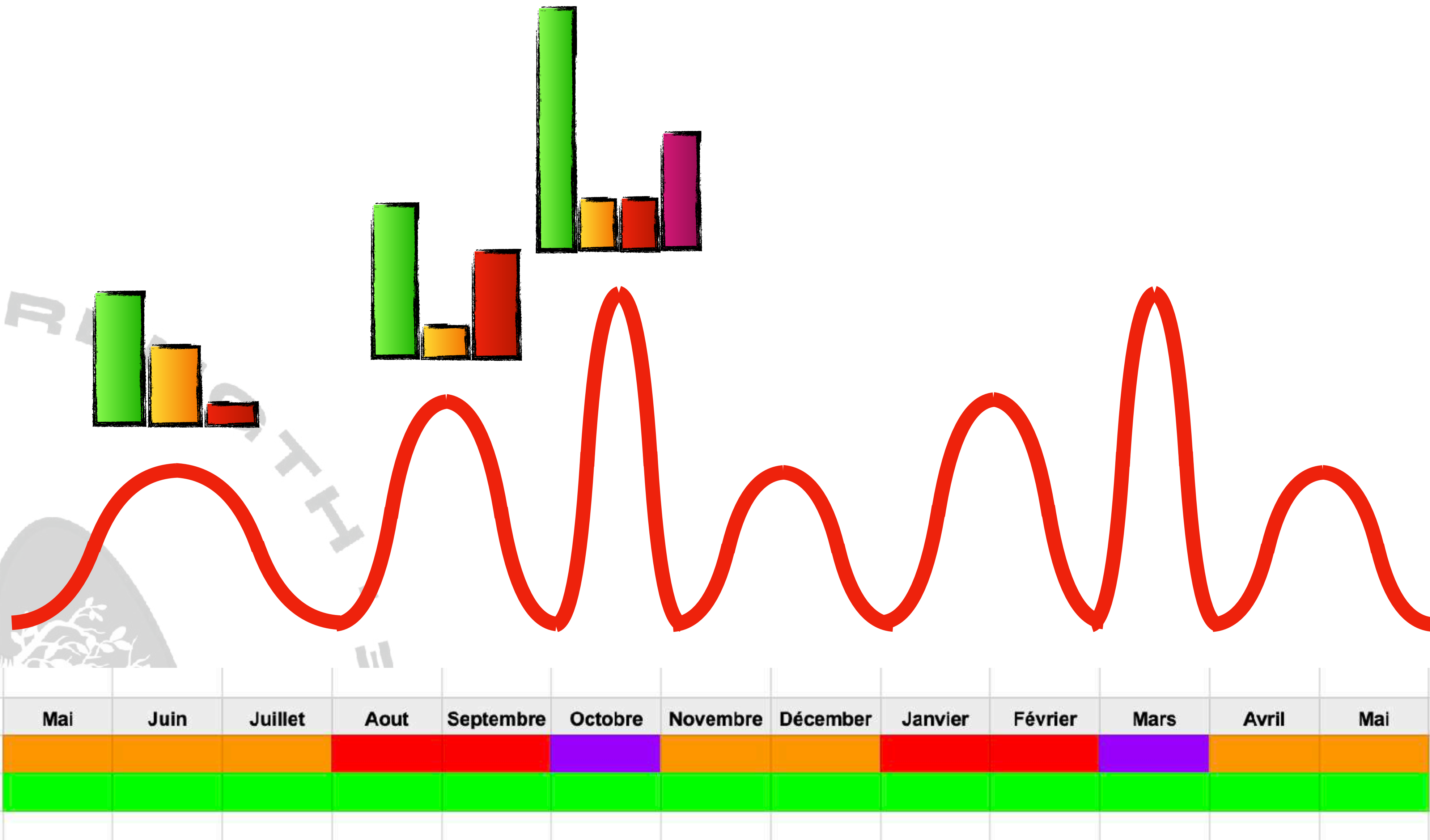
Exemples Pratiques



41

[illegible]

Développement Général



Combatant en MMA

Profil Puissant – Manque d’endurance

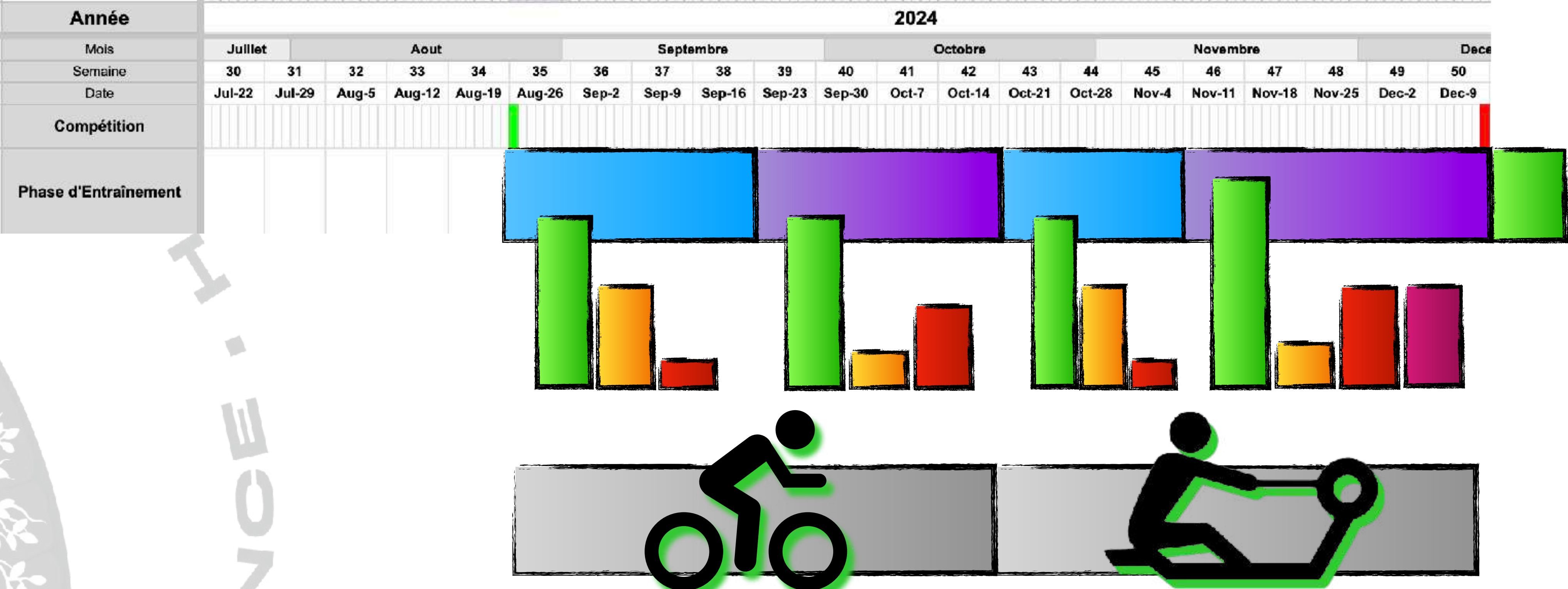
12 semaines jusqu’à la compétition (3x3’)



Remise en Forme

Profil Endurant – Manque de puissance

16 semaines de programmation



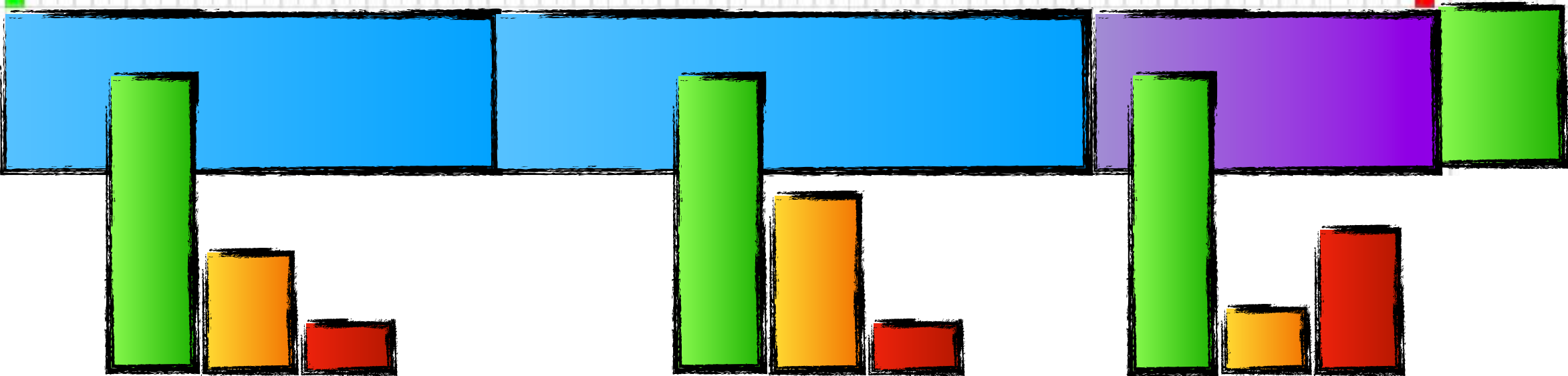
Course à Pied

Profil Puissant – Manque de pratique en CAP

Premier 5km dans 12 semaines



Année	2024																	
Mois	Juillet		Aout				Septembre				Octobre				Novembre			
Semaine	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
Date	Jul-22	Jul-29	Aug-5	Aug-12	Aug-19	Aug-26	Sep-2	Sep-9	Sep-16	Sep-23	Sep-30	Oct-7	Oct-14	Oct-21	Oct-28	Nov-4	Nov-11	Nov-18
Compétition																		
Phase d'Entraînement																		



Triathlon Long

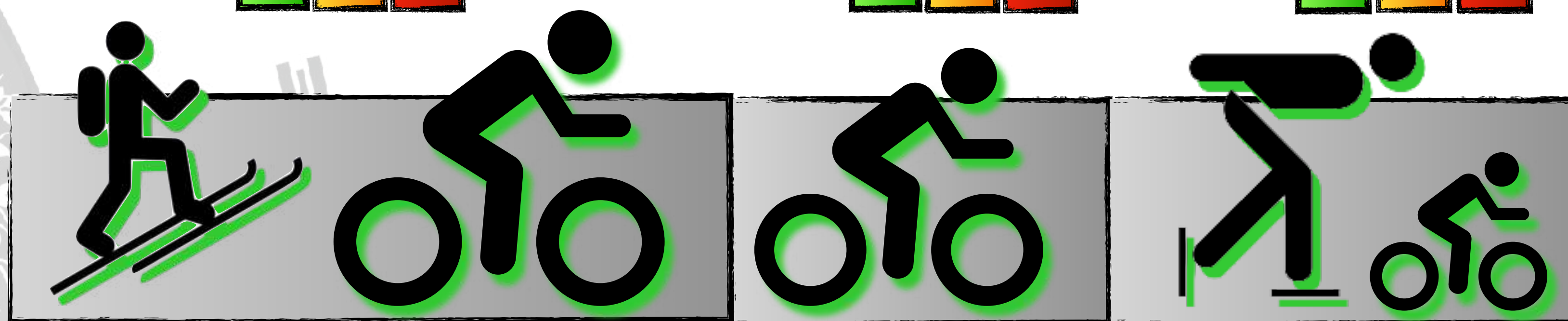
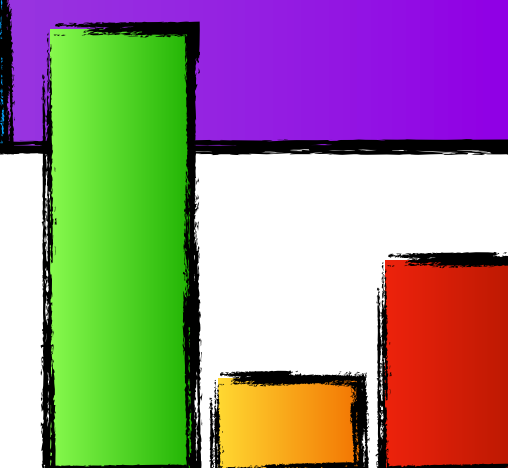
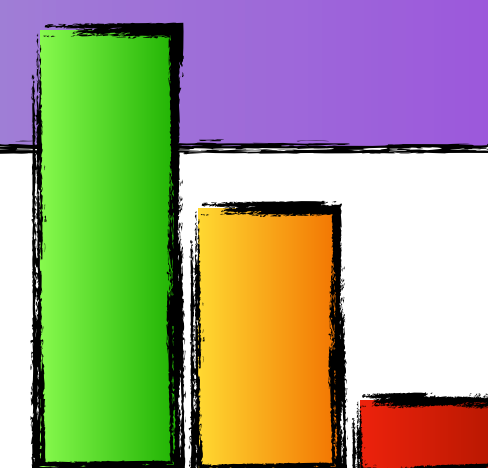
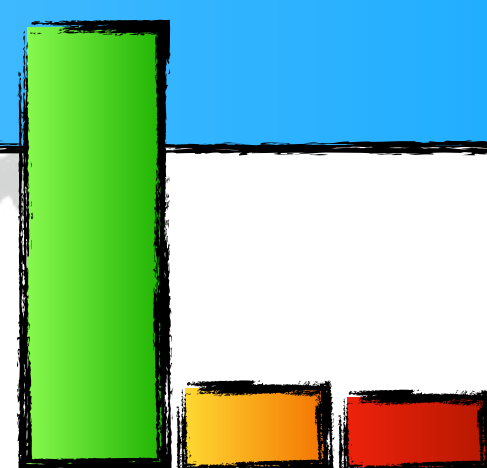
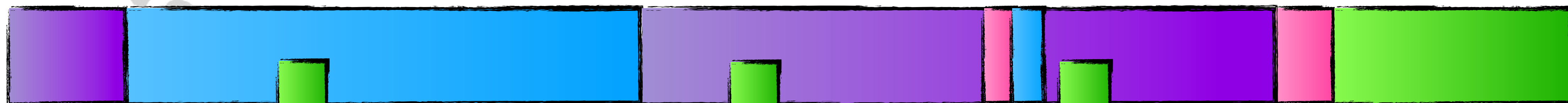
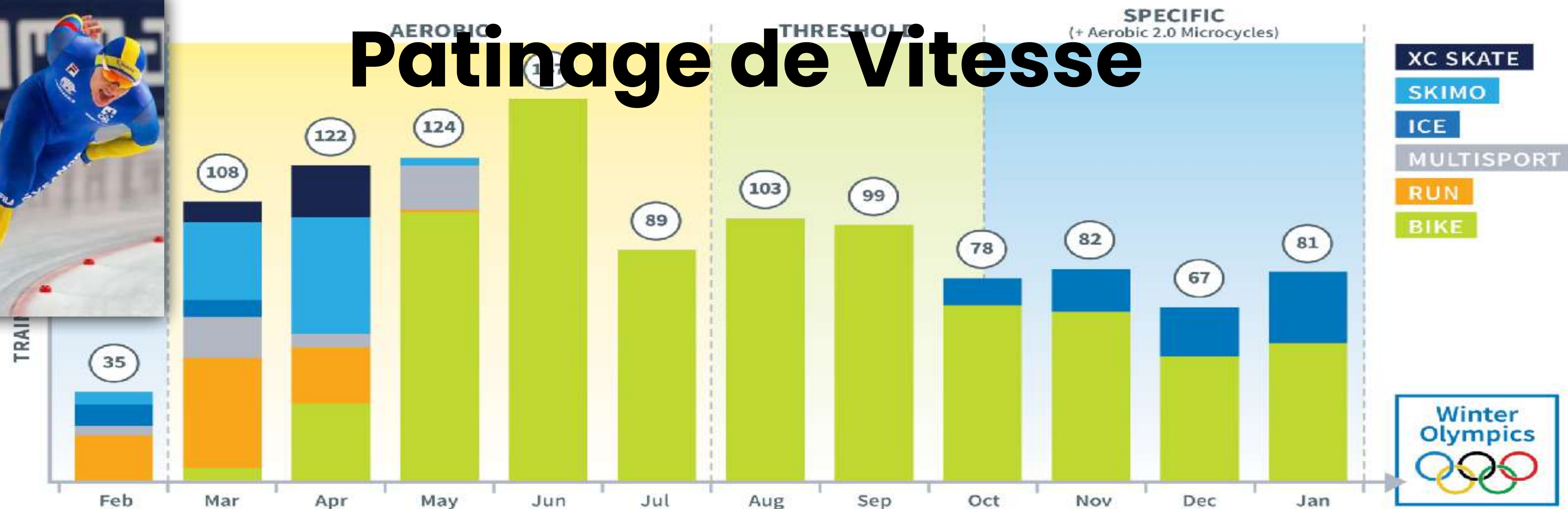
Profil Endurant – Manque de VO2max & Vélo

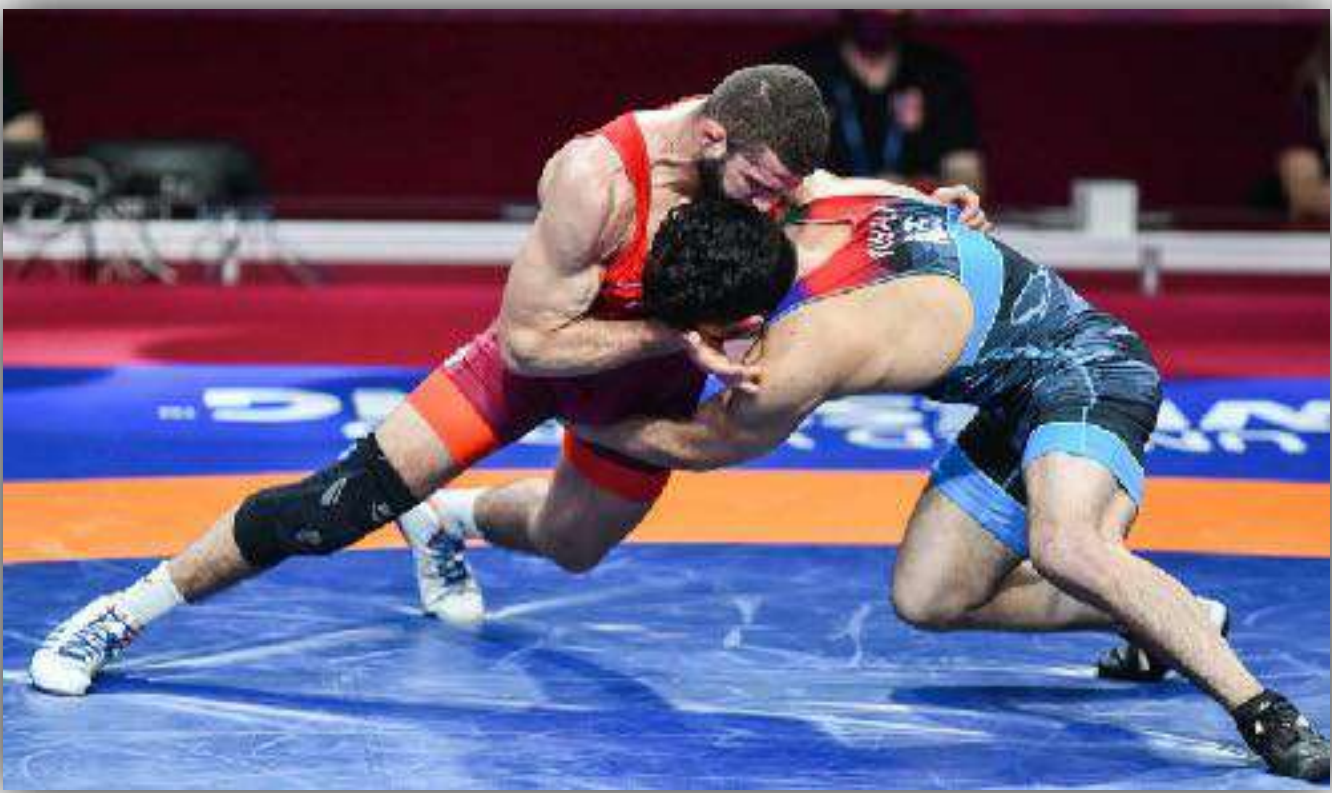
16 semaines d'entraînement





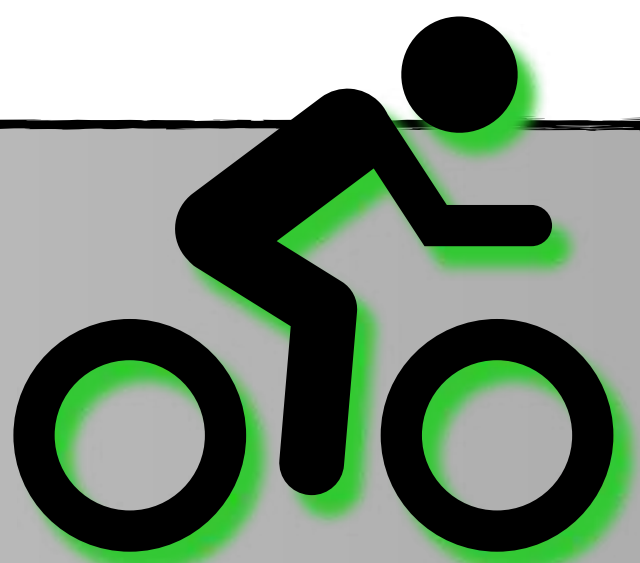
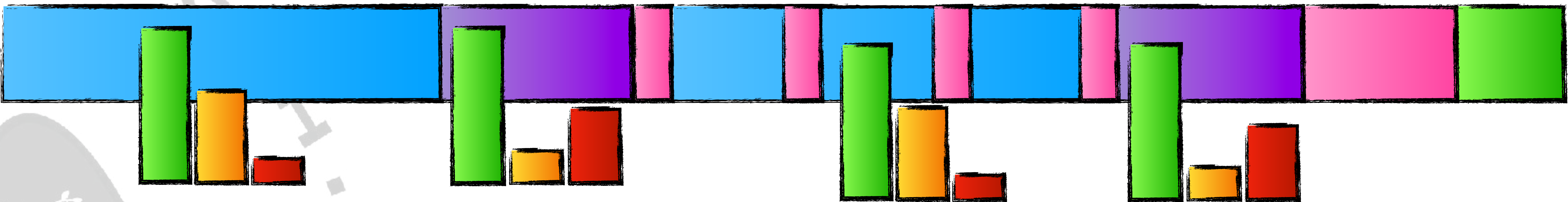
Patinage de Vitesse



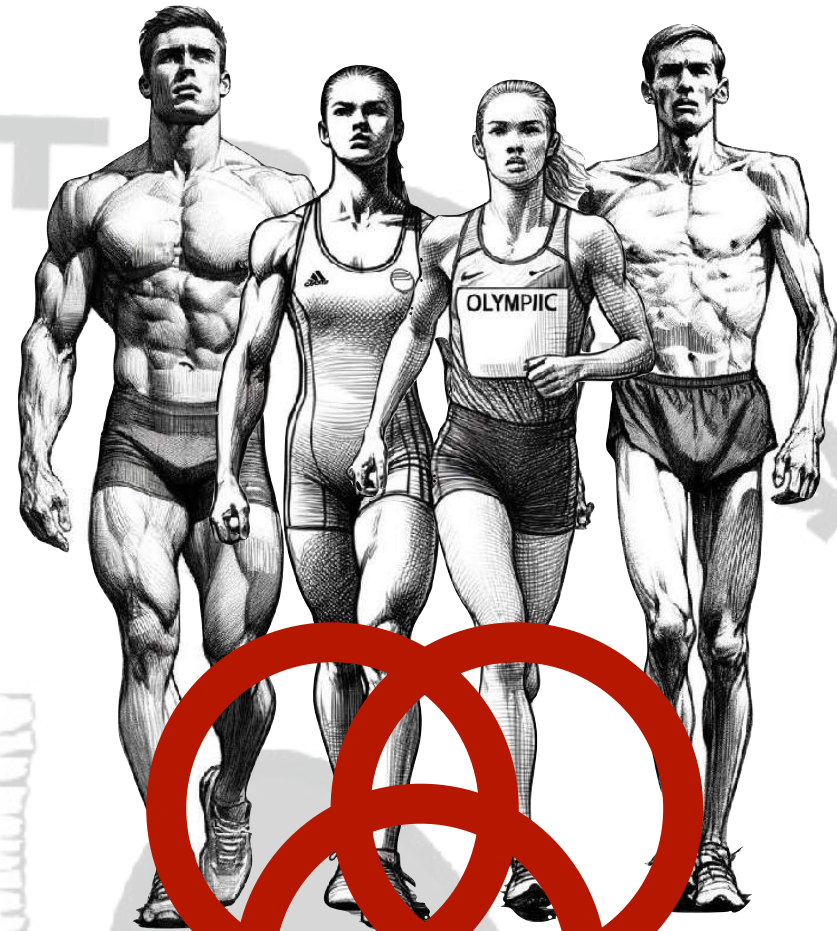


Endurance (lutte)

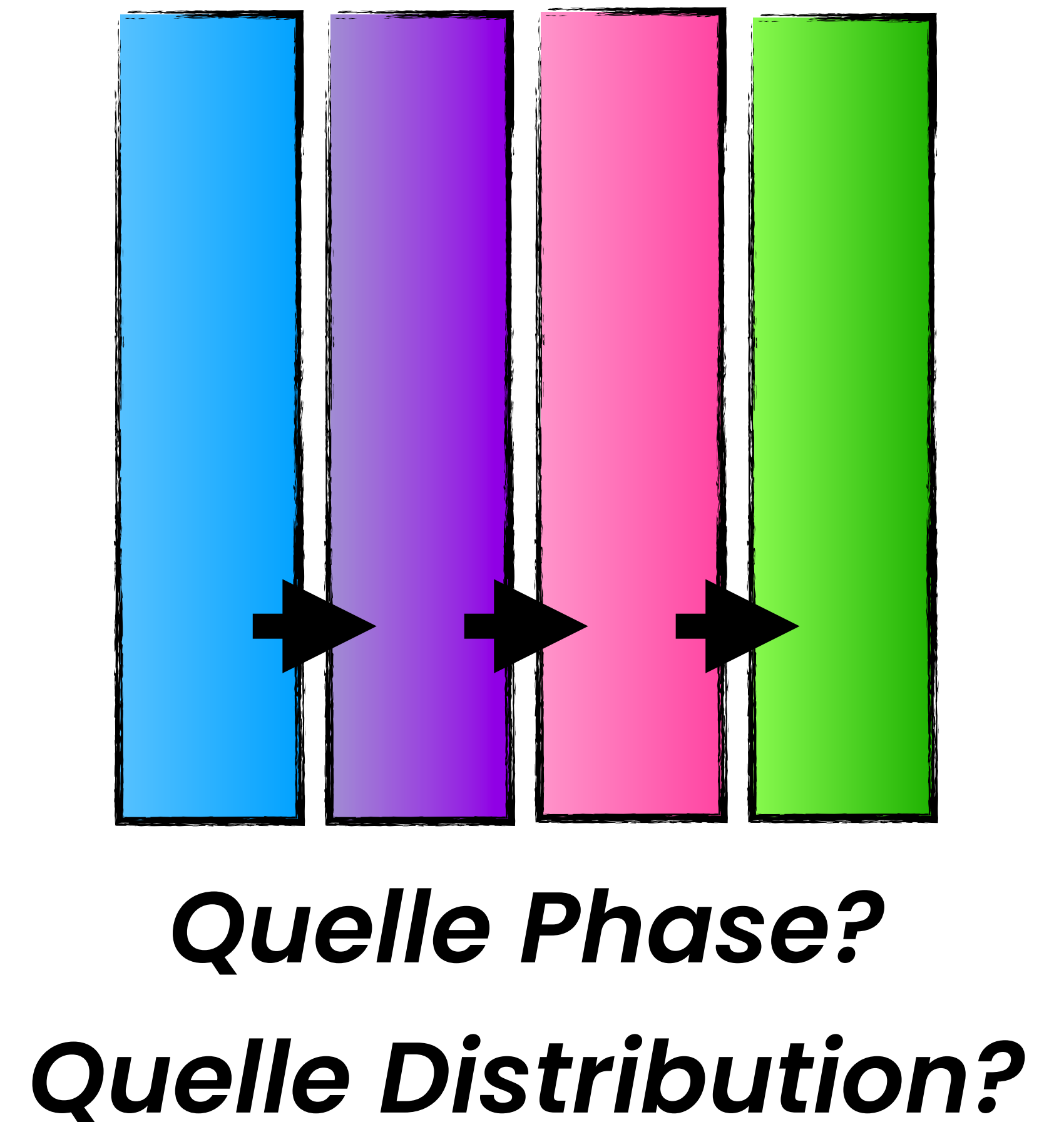
	Pre Season													In Season																
Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Session 1	Green	Yellow	Green	Yellow	Green	Orange	Green	Orange	Green	Green	Red	Red	Green	Green	Green	Green	Green	Green	Green	Green	Orange	Green	Green	Red	Red	Green	Green	Green	Green	Green
Session 2	Yellow	Green	Yellow	Green	Orange	Green	Orange	Green	Orange	Red	Green	Green	Red	Red	Yellow	Green	Yellow	Green	Yellow	Green	Orange	Green	Orange	Red	Green	Green	Red	Green	Green	Green
Session 3	Green	Yellow	Green	Yellow	X	Orange	Green	Red	X	Green	Red	Purple	X	X	X	X	X	X	X	X	Green	Orange	X	Green	Red	Purple	X	X	X	X



La Planification en Endurance



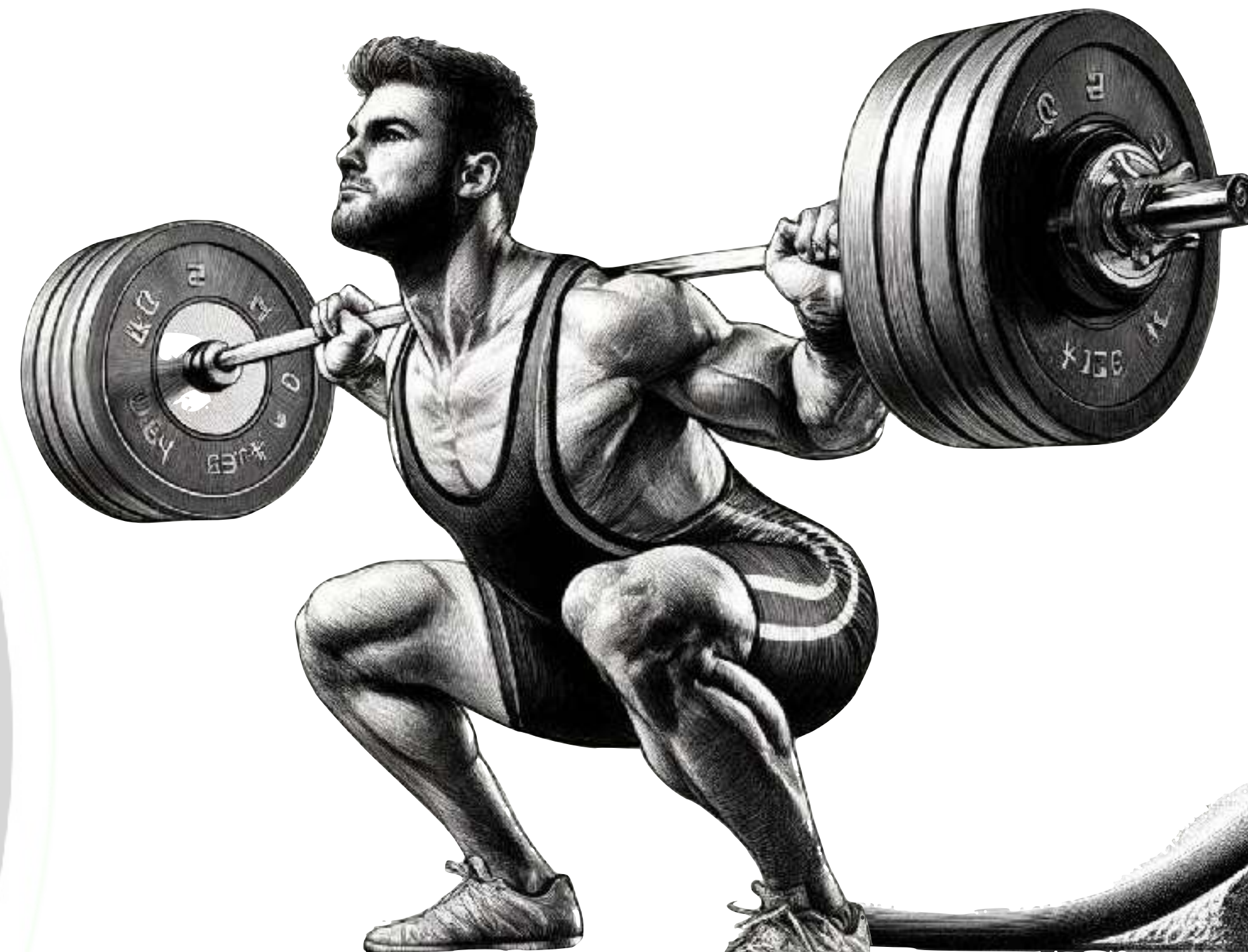
Quel Profil?
Quels Besoins?



FORMATION

SPSL 2025

La Semaine d'Entraînement



Michael J. Silverstein



***“Toutes les entreprises
ont de nombreuses
opportunités. La
stratégie consiste à
répartir les ressources
et les priorités de
manière optimale.”***



imgflip.com

JAKE-CLARK.TUMBLR





LE COACH



**QUI VEUT
PROGRAMMER**

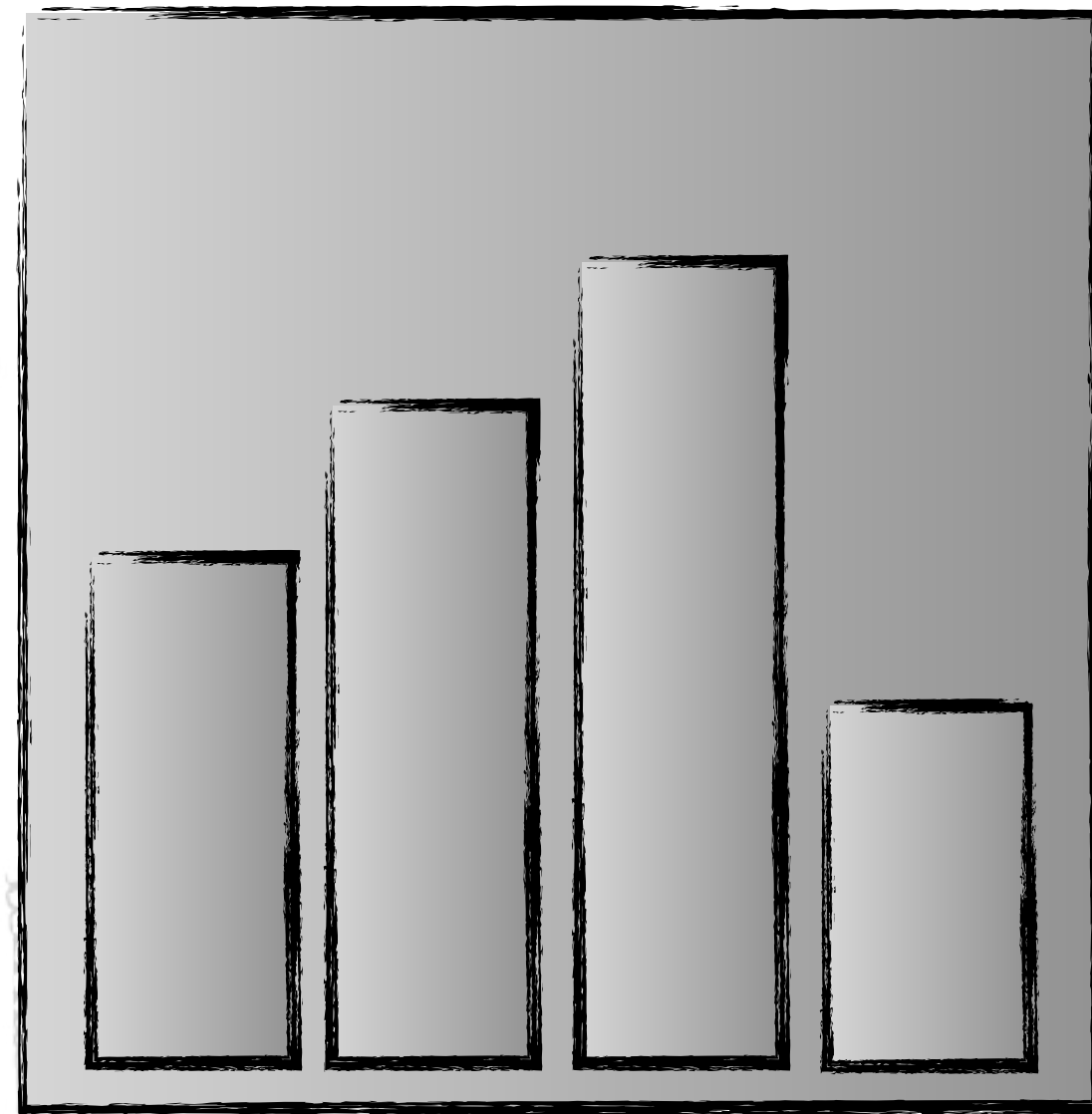
imgflip.com



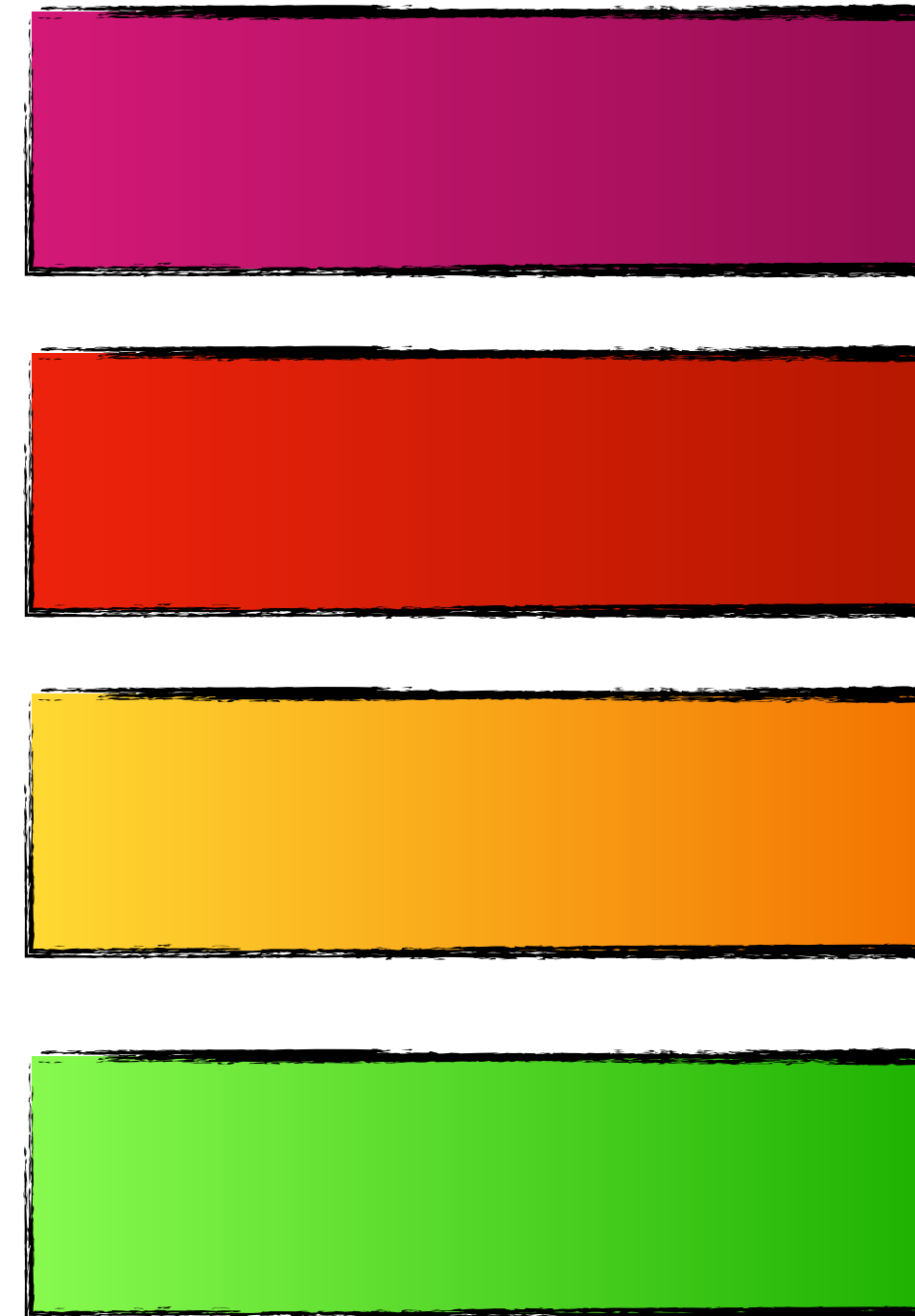
SANS INTERFÉRENCES



Le plan du jour



***Comprendre le
Mesocycle***



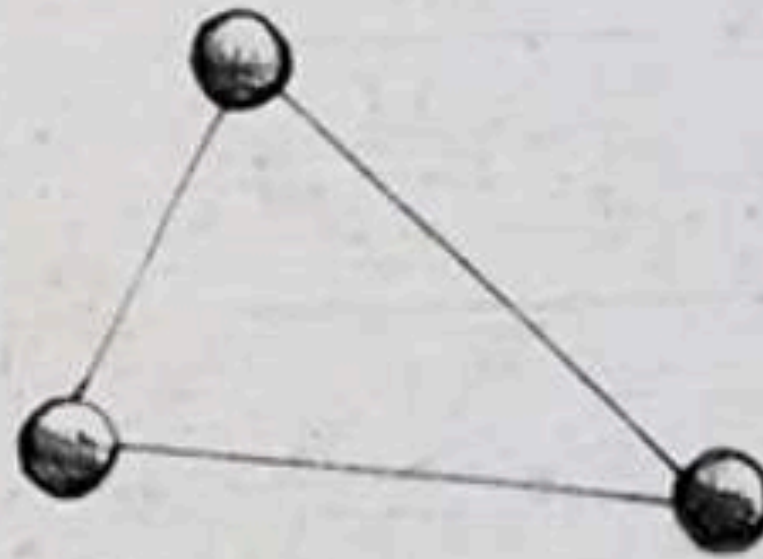
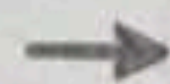
***Choisir les
Séances***



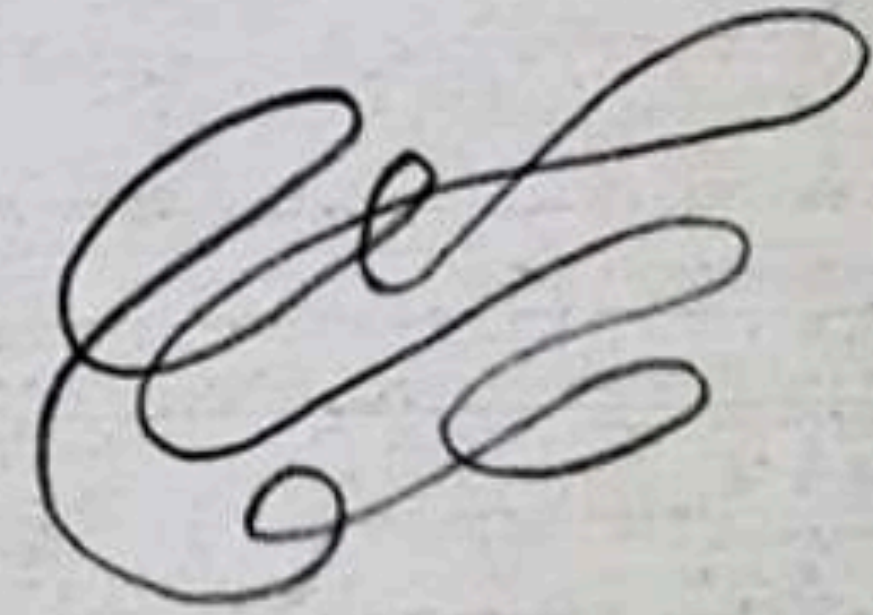
***Choisir la
Répartition***



Isolation

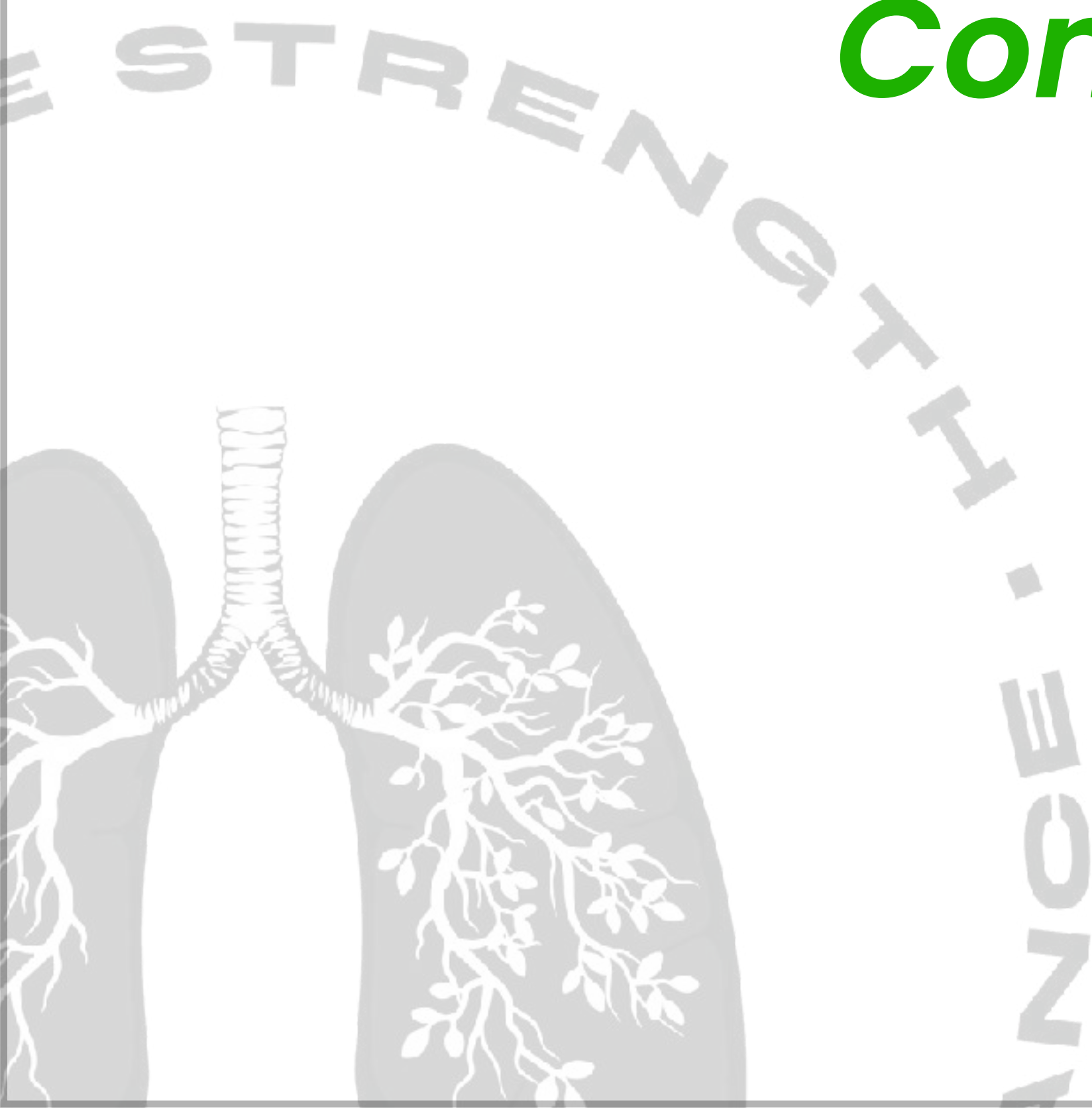


Integration



Improvisation

Comment Organiser les Mesocycles?

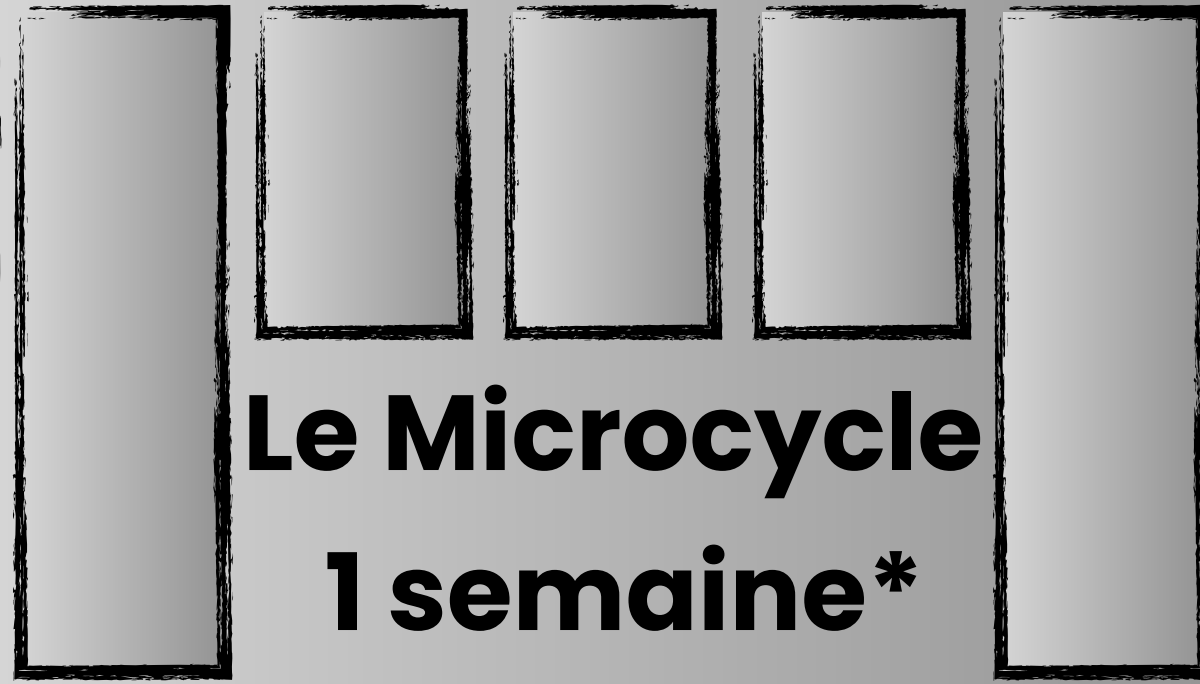


Le Plan Annuel

Le Macrocycle
1an - Cycle complet

Le Mesocycle
3-6 semaines

Le Microcycle
1 semaine*



Progression des Microcycles

Le Mesocycle - 4 semaines

Semaine 1

Introduction

Semaine 2

Accumulation

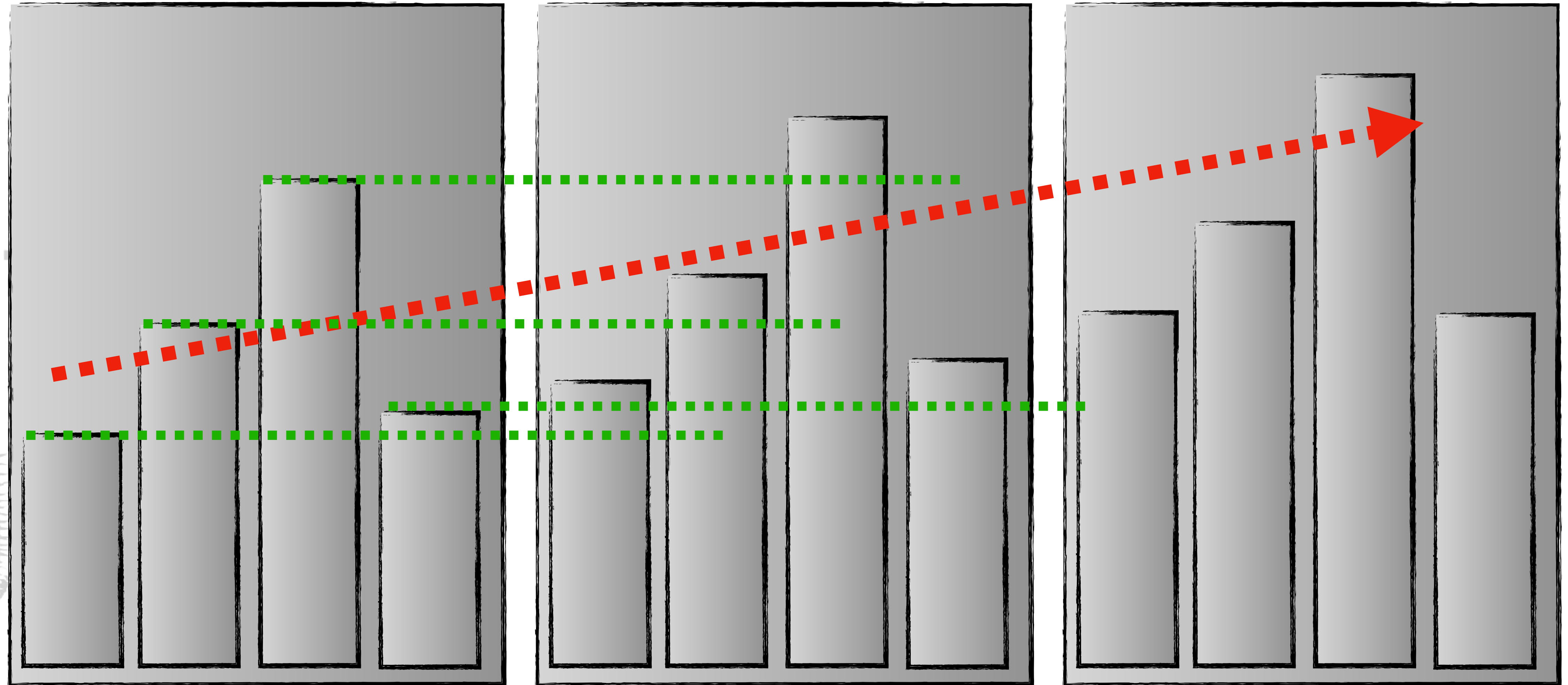
Semaine 3

Charge max

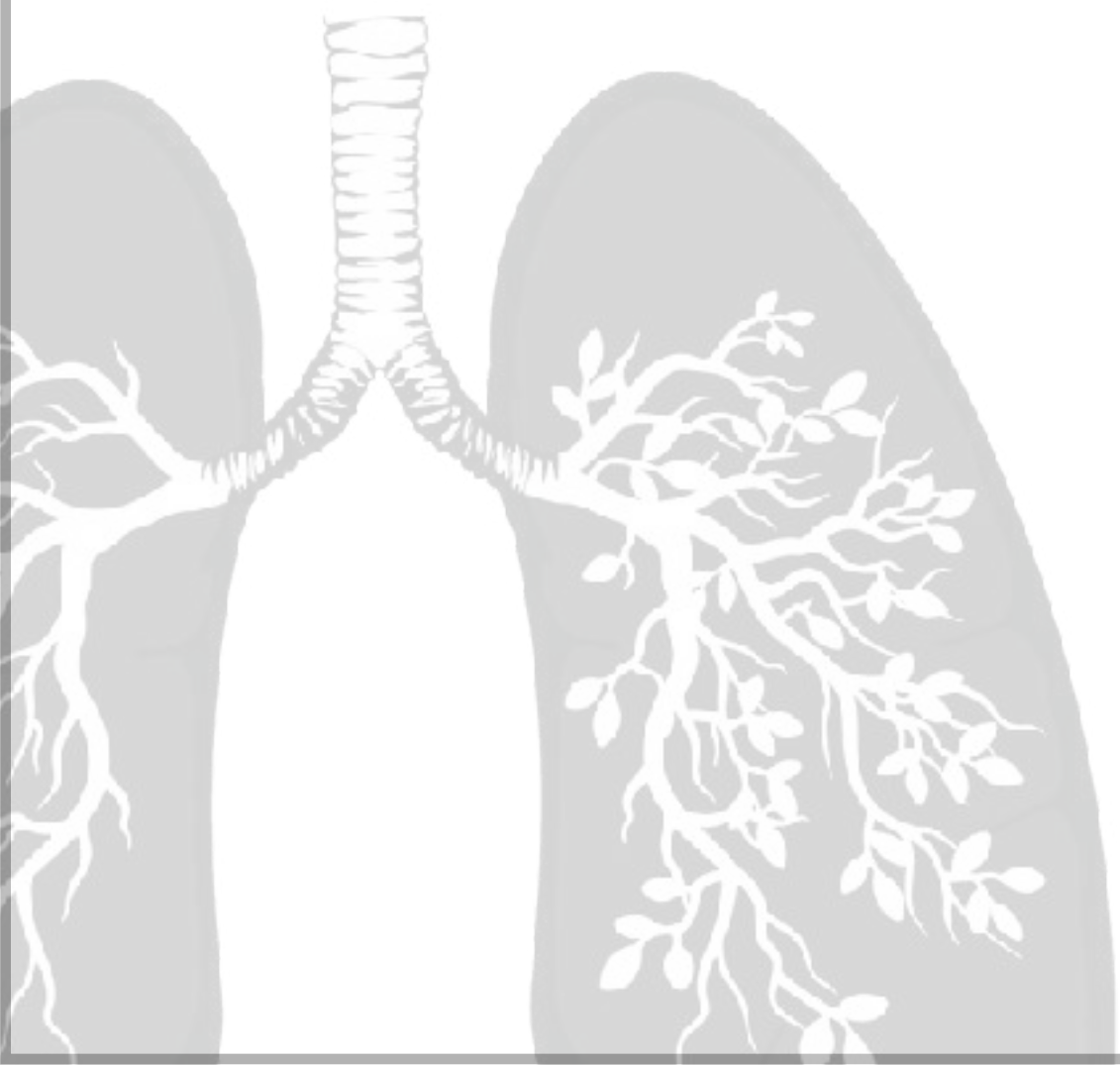
Semaine 4

Deload

Progression des Mesocycles



Comment choisir les séances d'endurance du Microcycle?

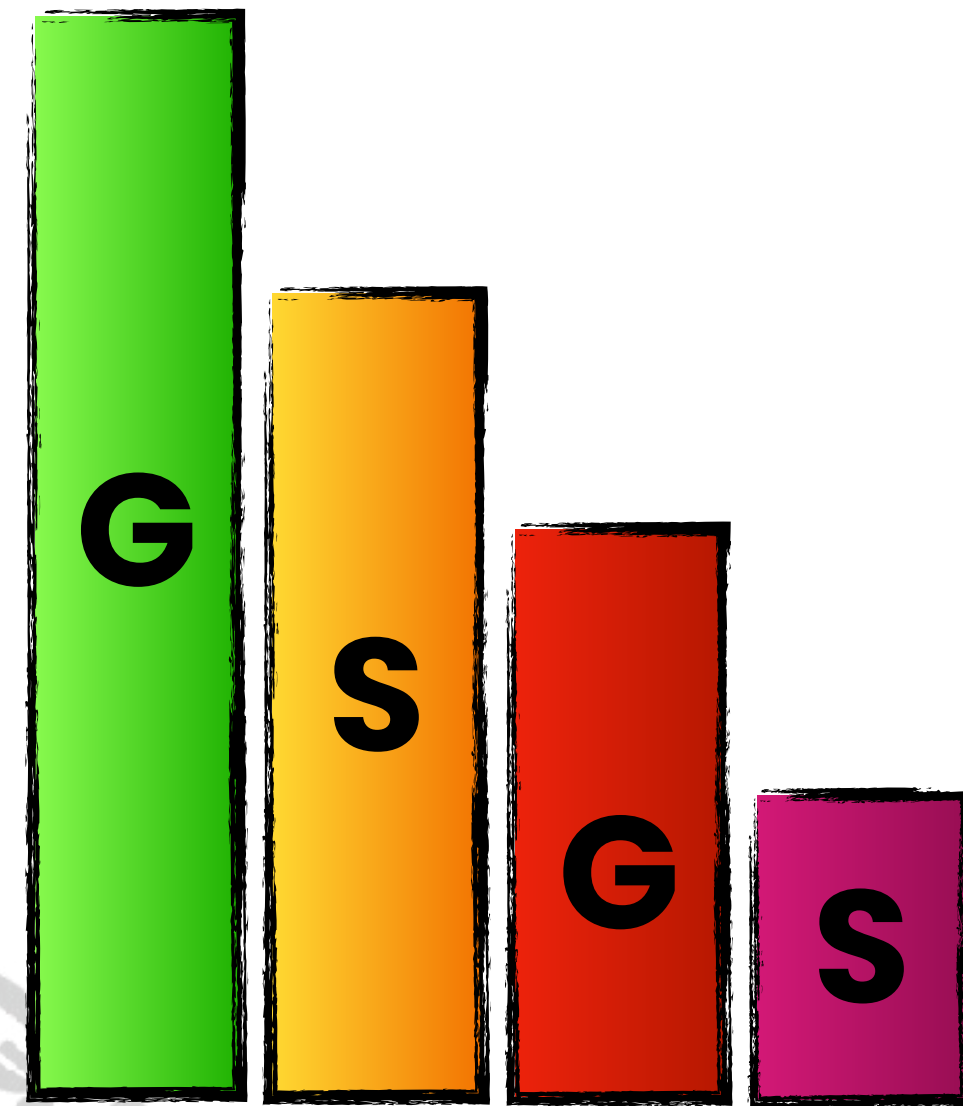


E STRENGTH
ANCE

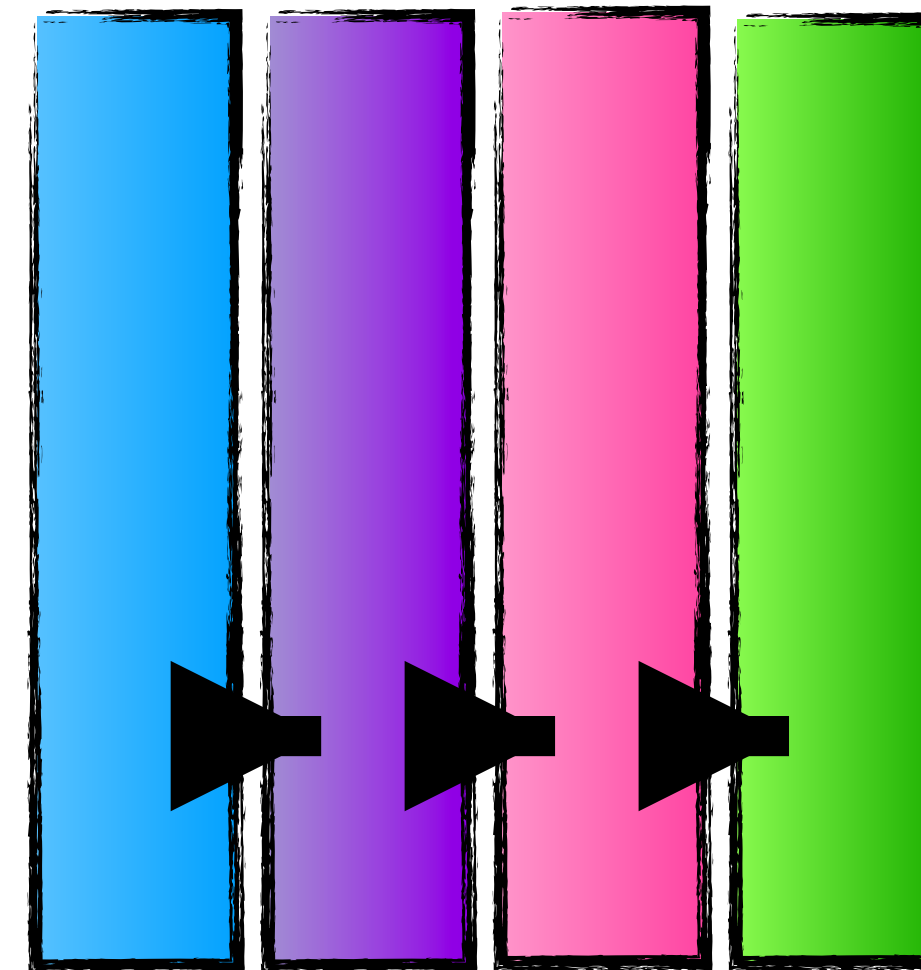
Les Questions à Poser



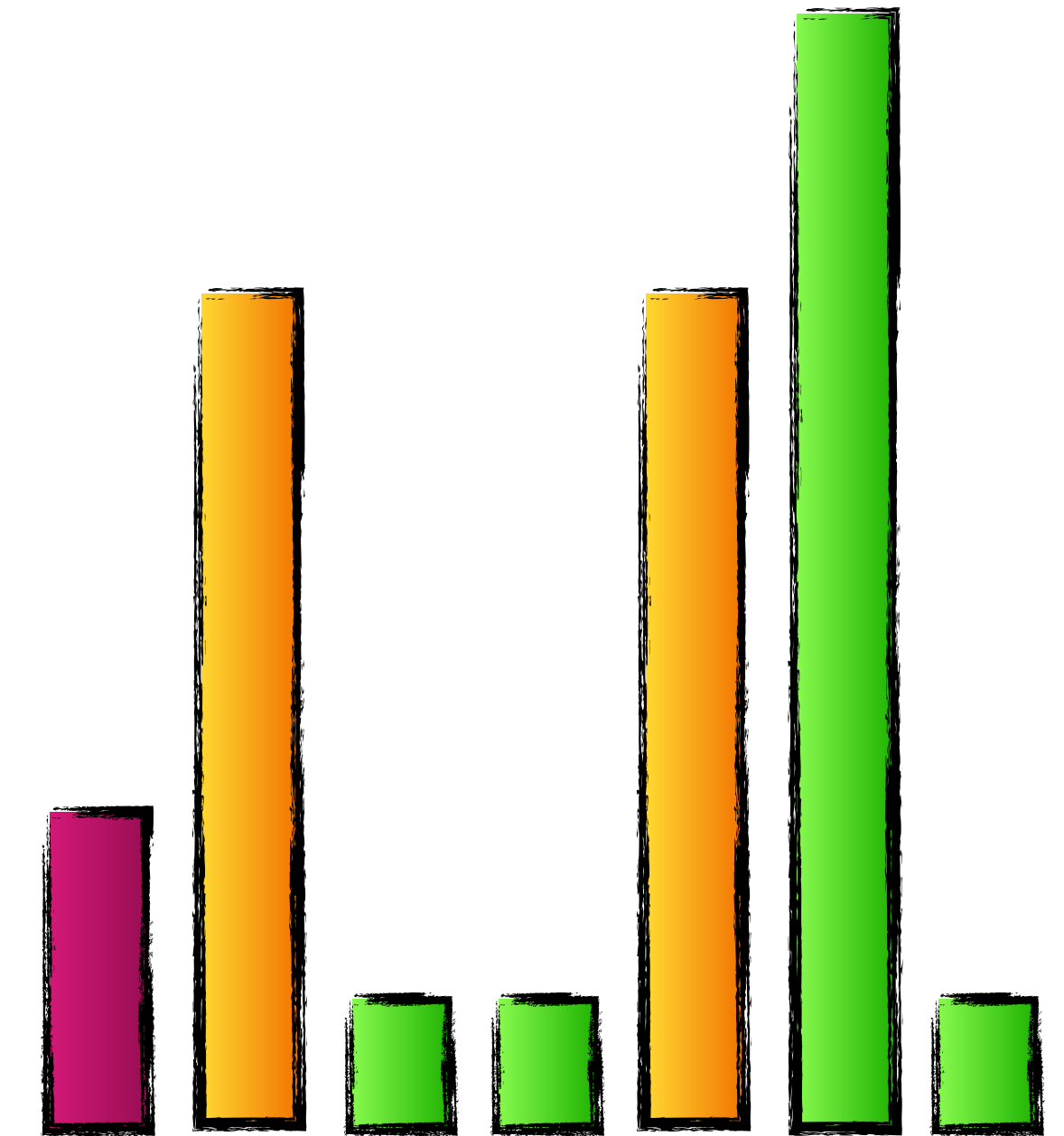
Quel Profil?
Quels Besoins?



Quel Sport?
Quelles Demandes?

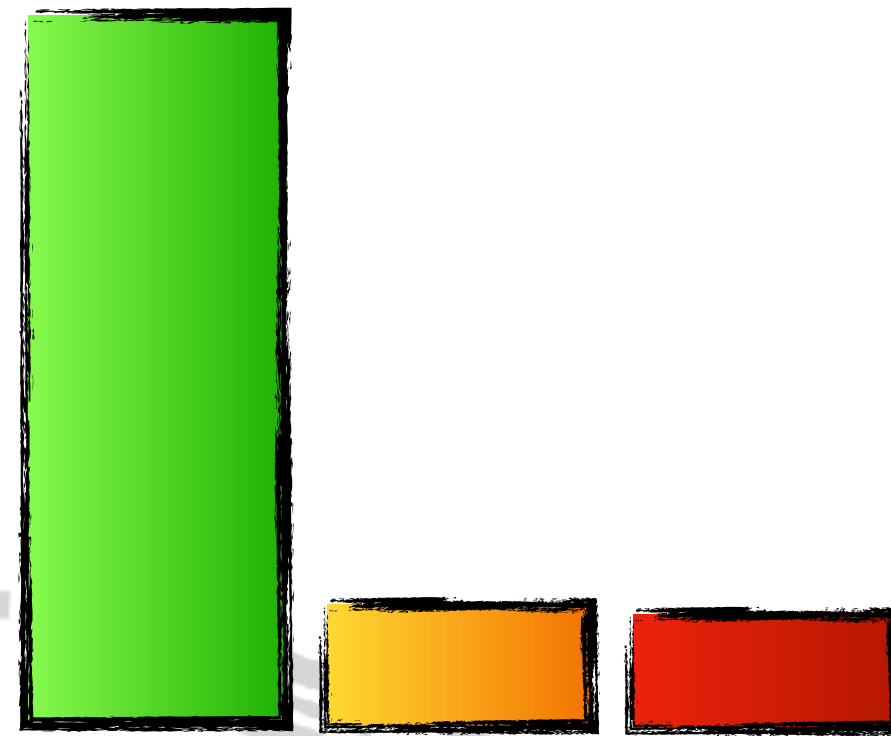


Quelle Phase?
Quelle Distribution?

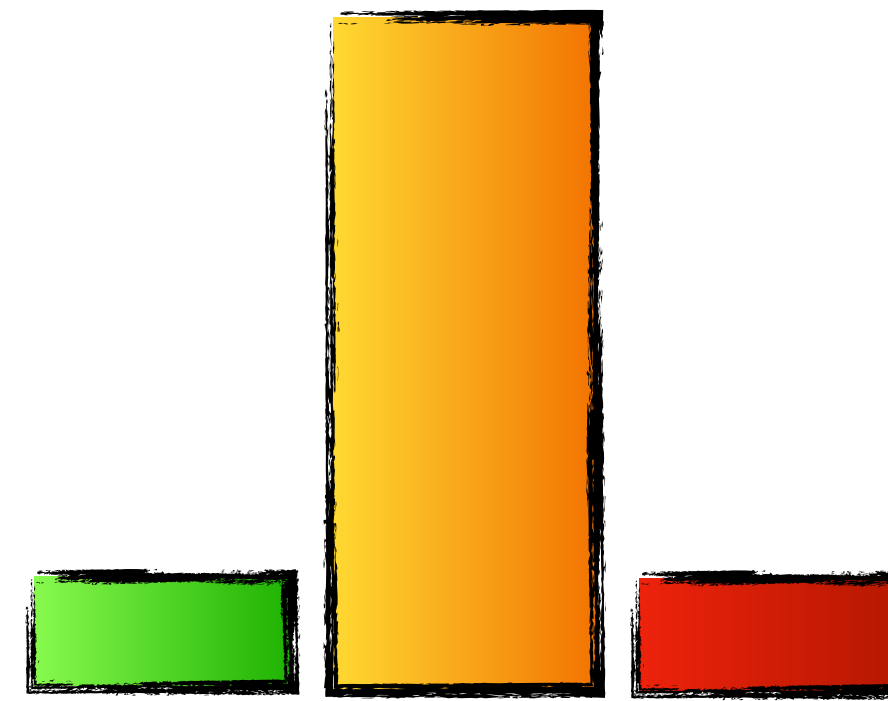


Quelles Séances?
Quelle Répartition?

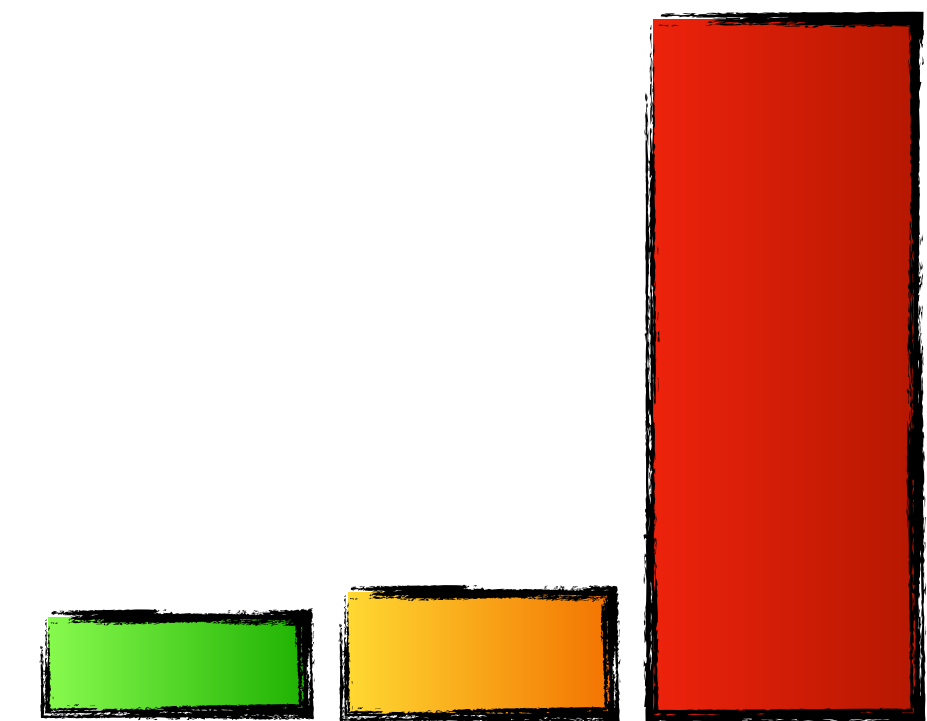
Modèles de Distribution



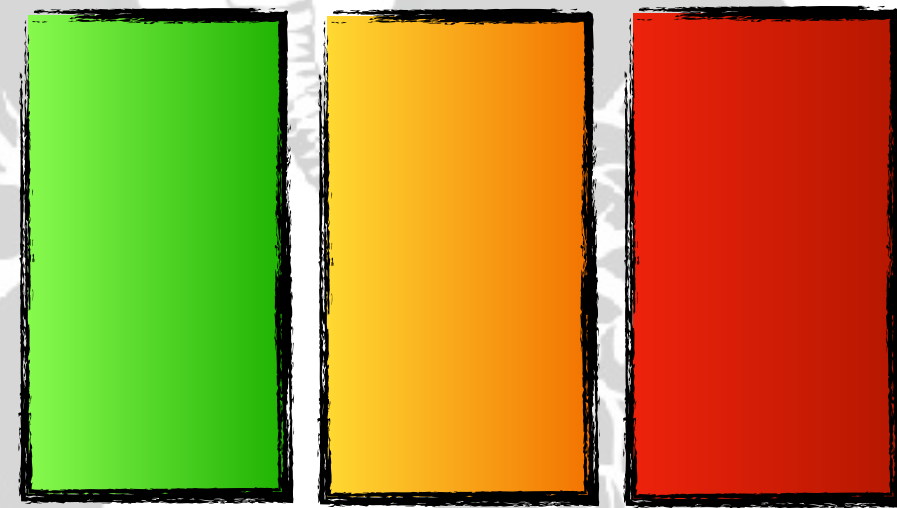
Basse Intensité



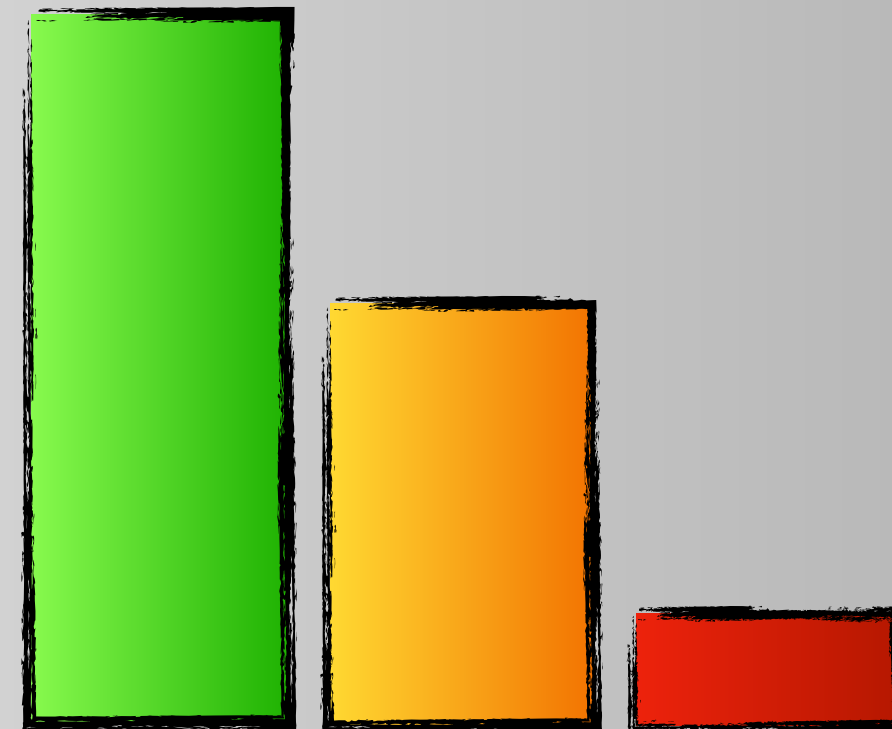
Seuil



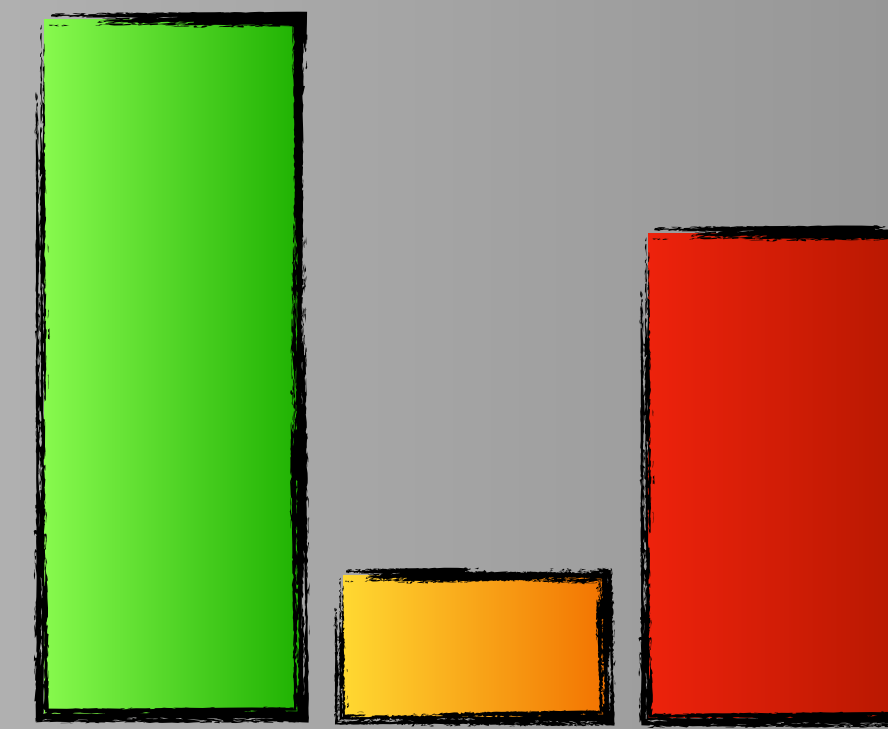
Haute Intensité



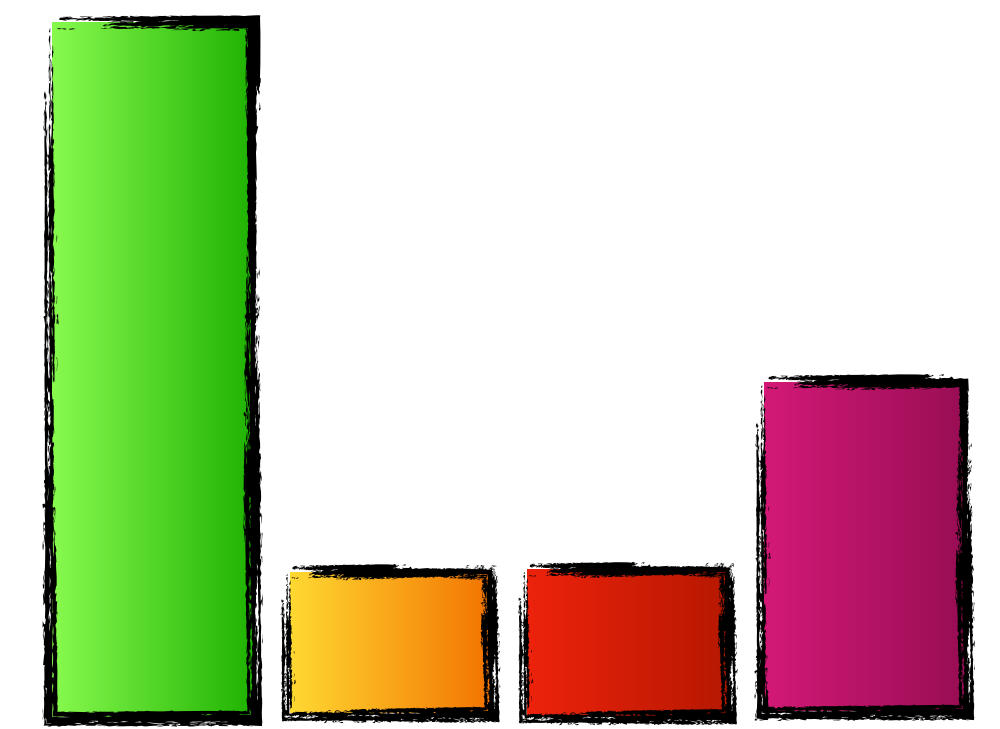
Uniforme



Pyramidal

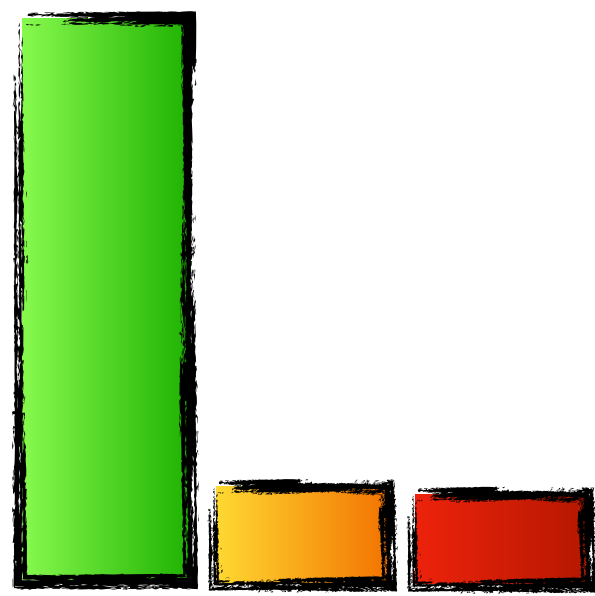


Polarisé



Sprint

Exemples – Distribution



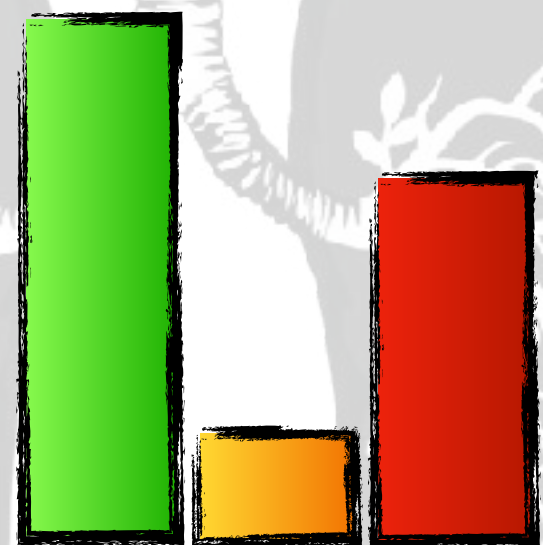
BI

Application: Introduction CAP pour un débutant, début de macrocycle pour un sport d'endurance moyen-long



PYR

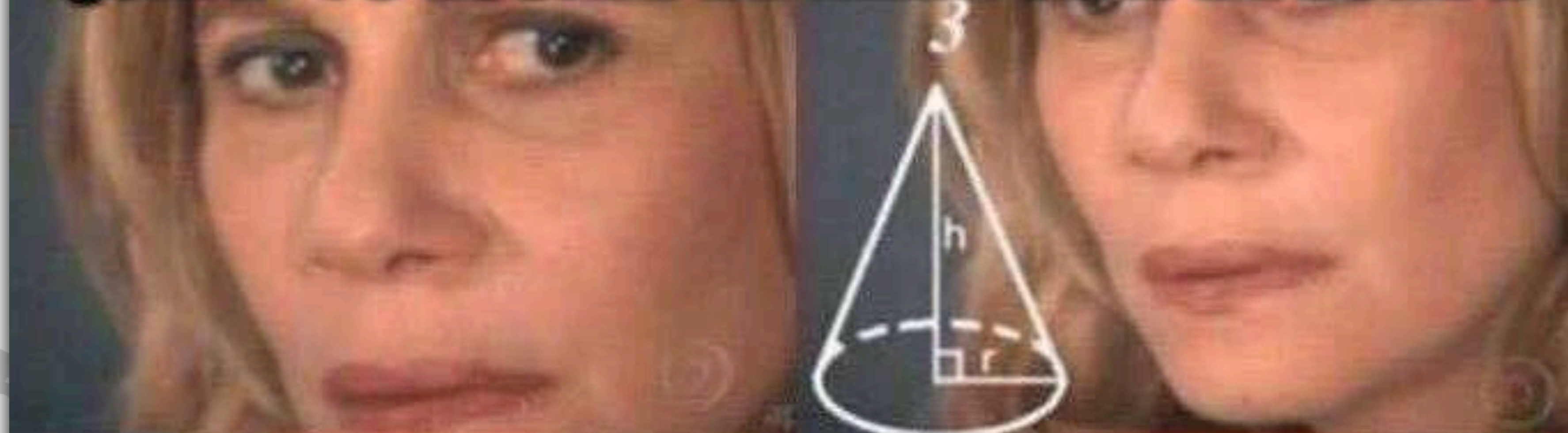
Application: Phase d'endurance générale pour un sport de haute intensité (CrossFit, Sport Collectif, MMA, etc...), phase d'endurance spécifique pour un sport de moyenne intensité (Semi-marathon, Cycloportive, Trail)



POL

Application: Phase d'endurance générale pour un sport de moyenne intensité (Triathlon Olympique, Ski de Fond, etc...), phase d'endurance spécifique pour un sport de haute intensité (5km Run, Rameur 2000m, etc...)

QUAND TU ESSAYE DE FAIRE 80% DE ZONE 2



AVEC 3 ENTRAÎNEMENTS DANS LA SEMAINE

imgflip.com

Intensités par Semaine

0

Intensités

1

Intensités

2

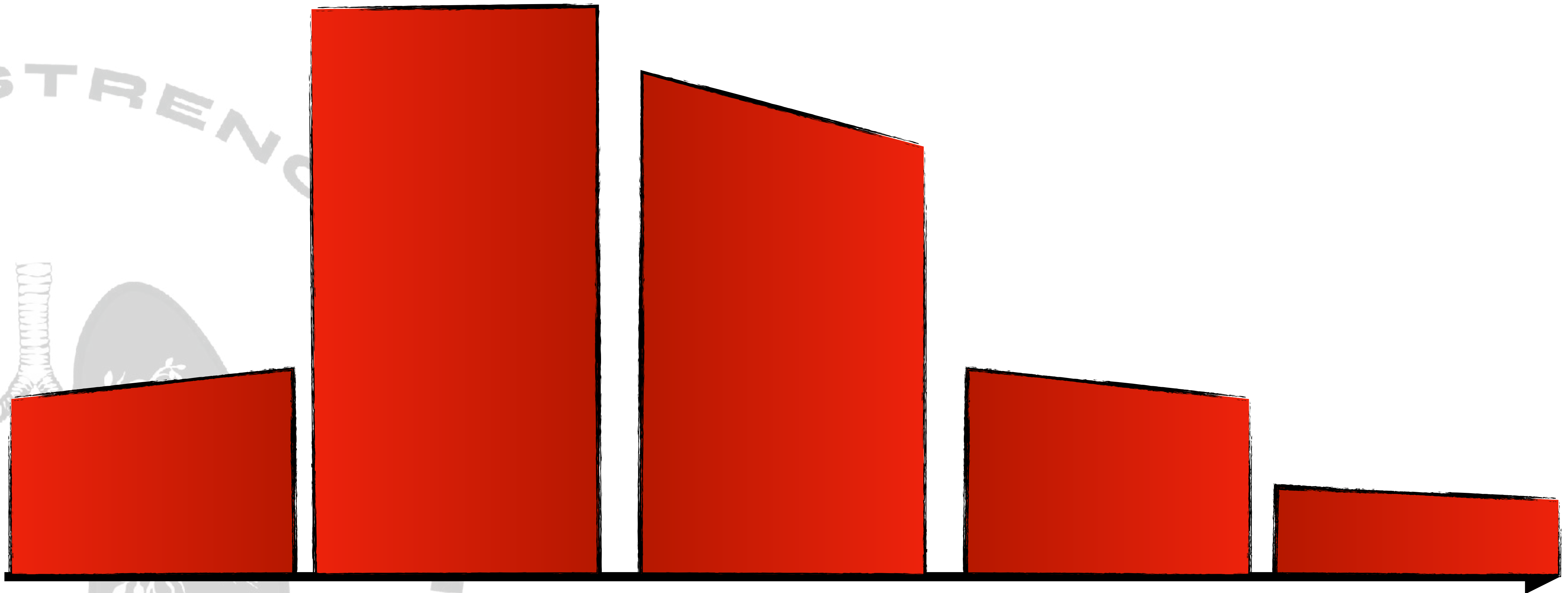
Intensités

3

Intensités

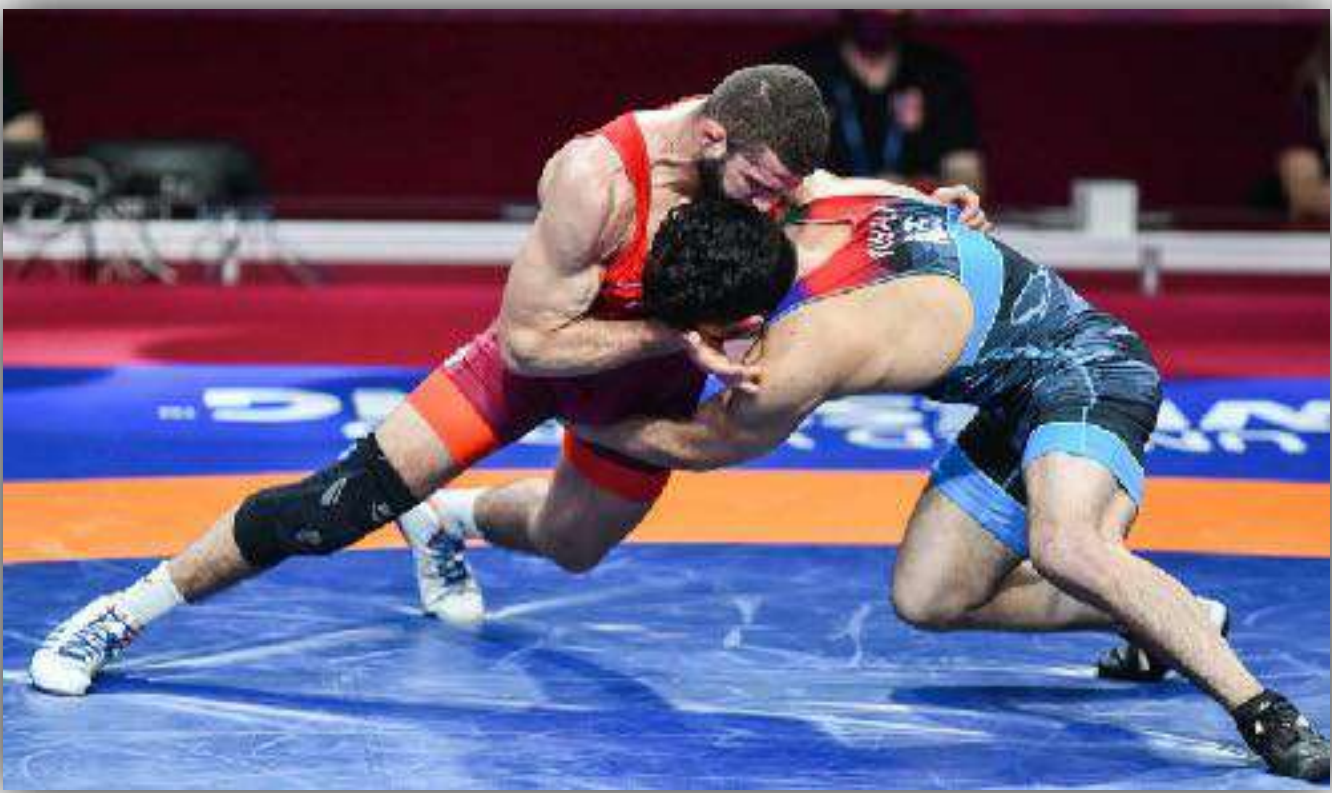
4

Intensités



Exemple Pratiques



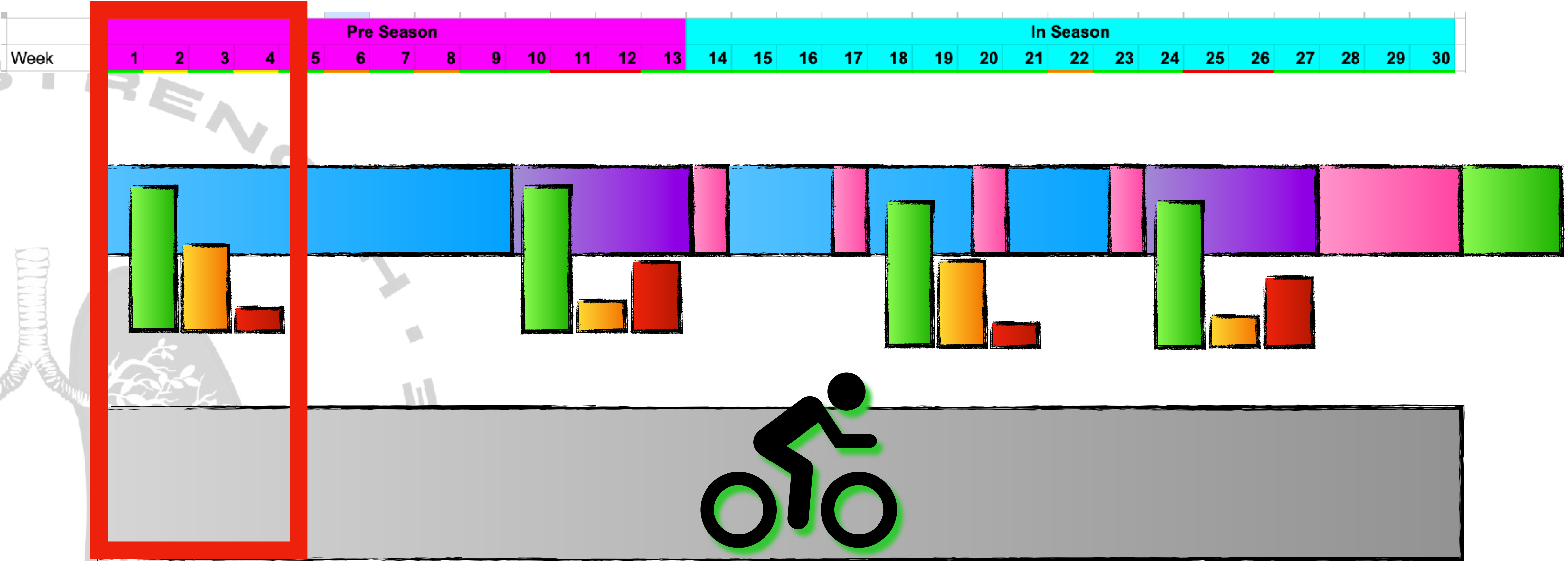


Endurance (lutte)

de Séances Endurance: 3

Phase/distribution: Générale/Pyramidale

Priorités: Moyenne, Basse, Très Haute






Choisir les Séances

Phase/distribution: Générale/Pyramidale

Priorités: Moyenne, Basse, Très Haute

S1

**Moyenne Intensité**

**Basse Intensité**

**Moyenne Intensité**

S2

**Basse Intensité**

**Moyenne Intensité**

**Basse Intensité**


S3

**Moyenne Intensité**

**Basse Intensité**

**Moyenne Intensité**

S4

**Basse Intensité**

**Moyenne Intensité**

Deload

Progression des Microcycles

Le Mesocycle - 4 semaines

Semaine 1

Introduction

Semaine 2

Accumulation

Semaine 3

Charge max

Semaine 4

Deload




Choisir les Séances

Phase/distribution: Générale/Pyramidale

Priorités: Moyenne, Basse, Très Haute

S1

**Moyenne Intensité**

**Basse Intensité**

**Moyenne Intensité**

S2

**Basse Intensité**

**Moyenne Intensité**

**Basse Intensité**


S3

**Moyenne Intensité**

**Basse Intensité**

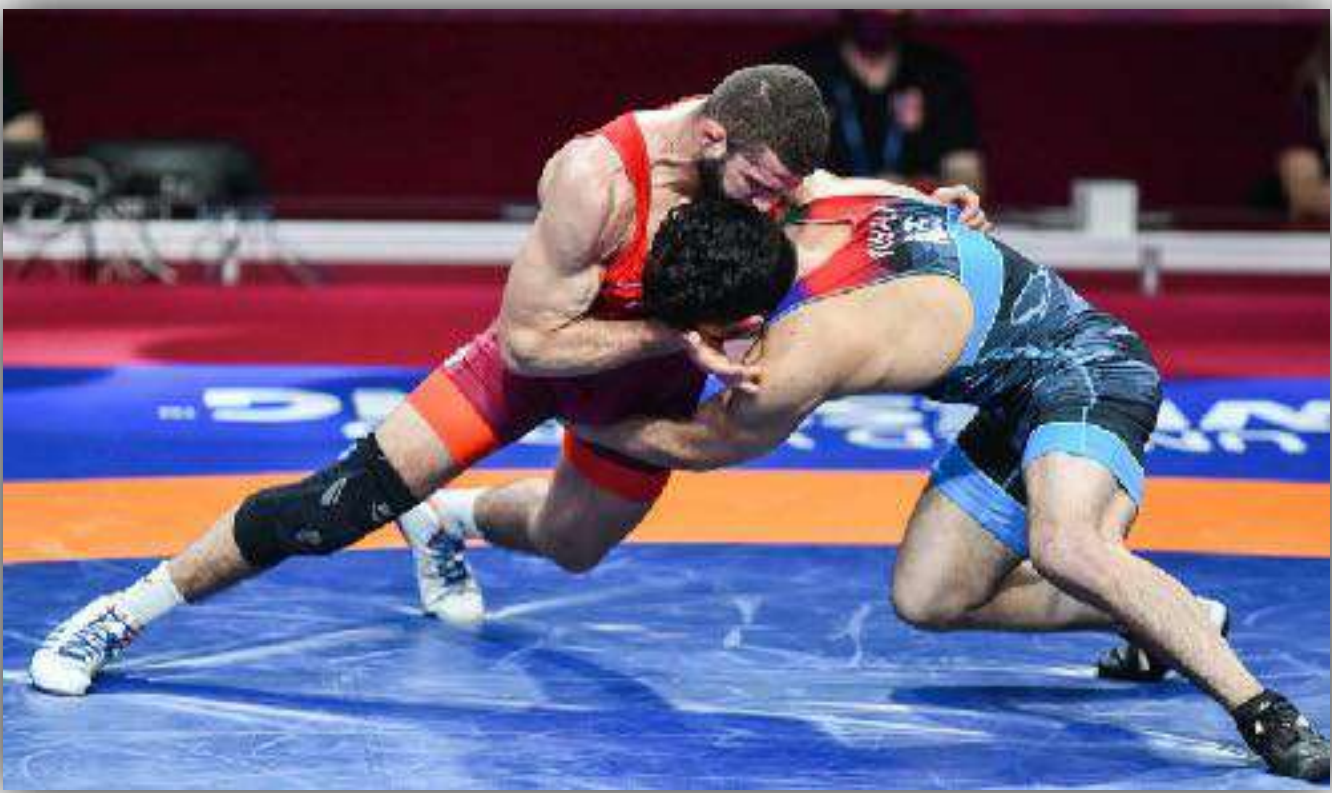
**Moyenne Intensité**

S4

**Basse Intensité**

**Moyenne Intensité**

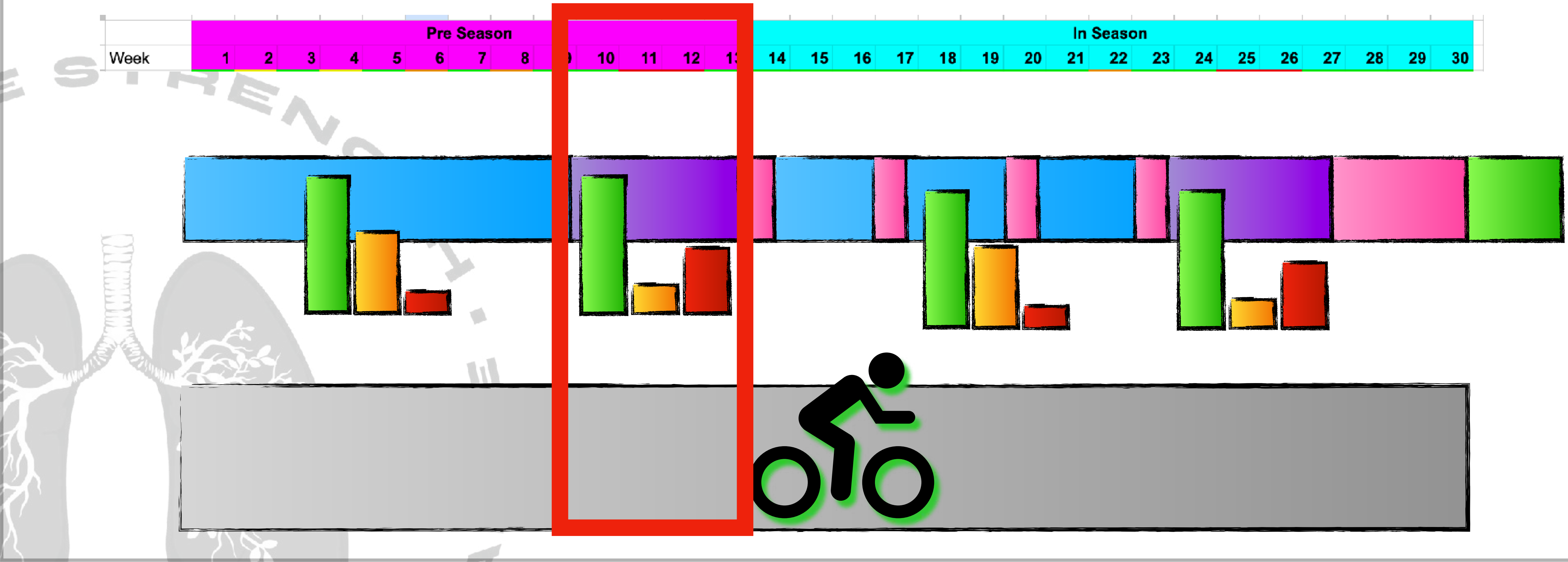
Deload

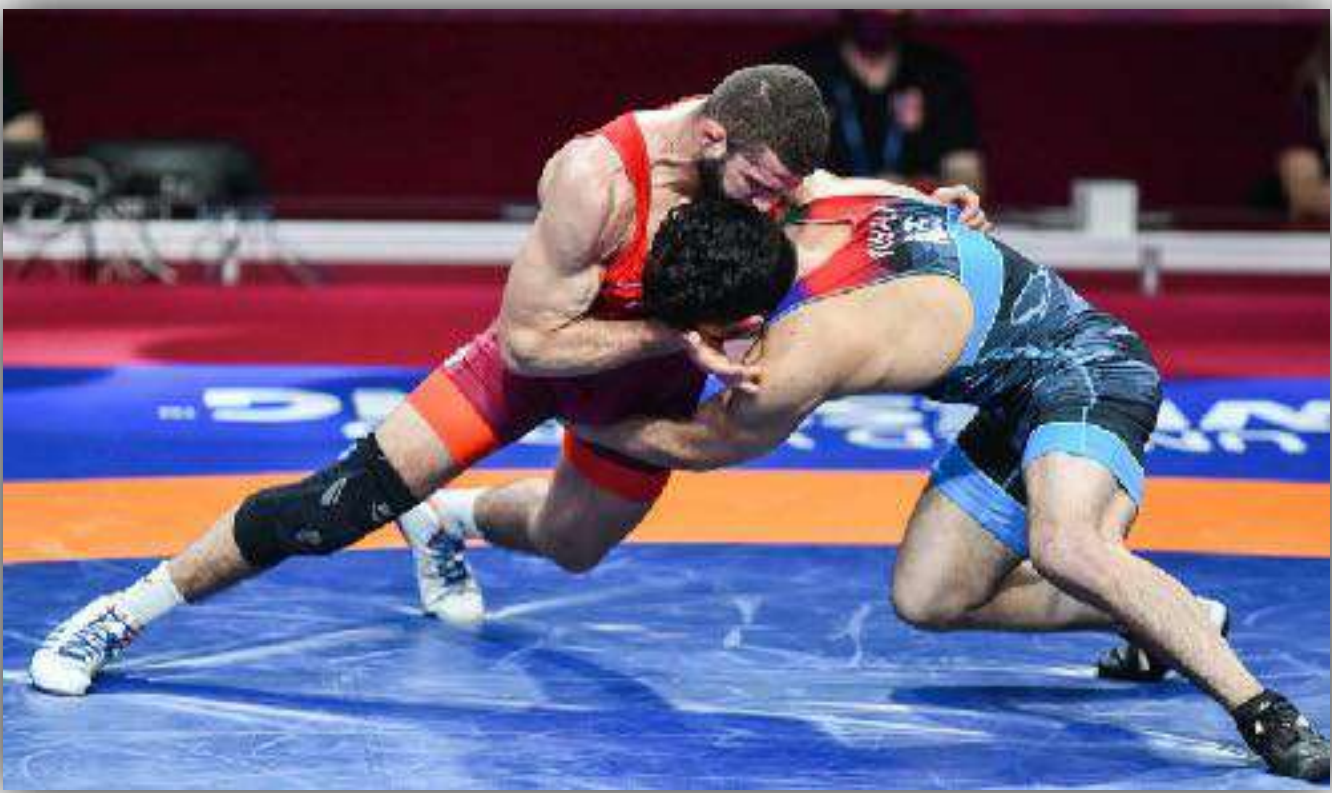


Endurance (lutte)

Phase/distribution: Spécifique/Polarisée

Priorités: Haute, Très Haute, Basse





Choisir les Séances

Phase/distribution: Spécifique/Polarisée

Priorités: Haute, Très Haute, Basse

S1

Basse Intensité


Haute Intensité

Basse Intensité

S2


Haute Intensité

Basse Intensité

Haute Intensité

S3

Très Haute Intensité

Basse Intensité

Haute Intensité

S4

Haute Intensité

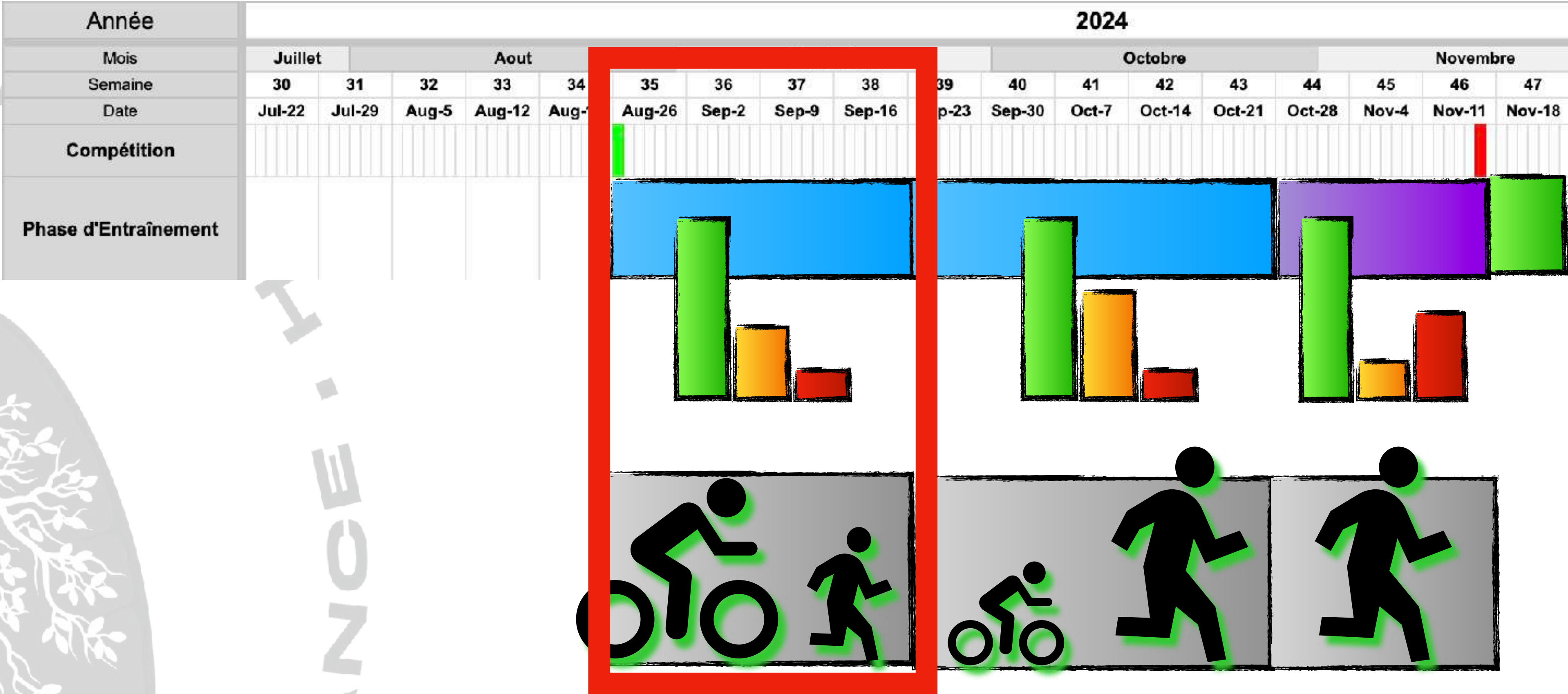
Basse Intensité

Deload

Course à Pied

Profil Puissant – Manque de pratique en CAP

Premier 5km dans 12 semaines



CAP ↗


















Choisir les Séances

de Séances Endurance: 4

Phase/distribution: Générale/Pyramidale

Priorités: Moyenne, Basse

S1	 BI	 MI	 BI	 BI
S2	 BI	 MI	 BI	 HI
S3	 BI	 MI	 BI	 MI
S4	 BI	 MI	 BI	DL

Course à Pied

Profil Puissant – Manque de pratique en CAP

Premier 5km dans 12 semaines



Année

Mois

Semaine

Date

Compétition

Phase d'Entraînement

2024

Juillet

Aout

Septembre

Octobre

Novembre

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

Jul-22

Jul-29

Aug-5

Aug-12

Aug-19

Aug-26

Sep-2

Sep-9

Sep-16

Sep-23

Sep-30

Oct-7

Oct-14

Oct-21

Oct-28

Nov-4

Nov-11

Nov-18


















Choisir les Séances

CAP ↗

de Séances Endurance: 4

Phase/distribution: Générale/Pyramidale

Priorités: Moyenne, Basse

S1	 BI	 MI	 BI	 BI
S2	 BI	 MI	 BI	 MI
S3	 BI	 MI	 BI	 HI
S4	 BI	 MI	 BI	DL

Course à Pied

Profil Puissant – Manque de pratique en CAP

Premier 5km dans 12 semaines



Année

Mois

Semaine

Date

Compétition

Phase d'Entraînement

2024

Juillet

Aout

Septembre

Octobre

Novembre

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

Jul-22

Jul-29

Aug-5

Aug-12

Aug-19

Aug-26

Sep-2

Sep-9

Sep-16

Sep-23

Sep-30

Oct-7

Oct-14

Oct-21

Oct-28

Nov-4

Nov-11

Nov-18














Choisir les Séances

CAP ↗

de Séances Endurance: 4

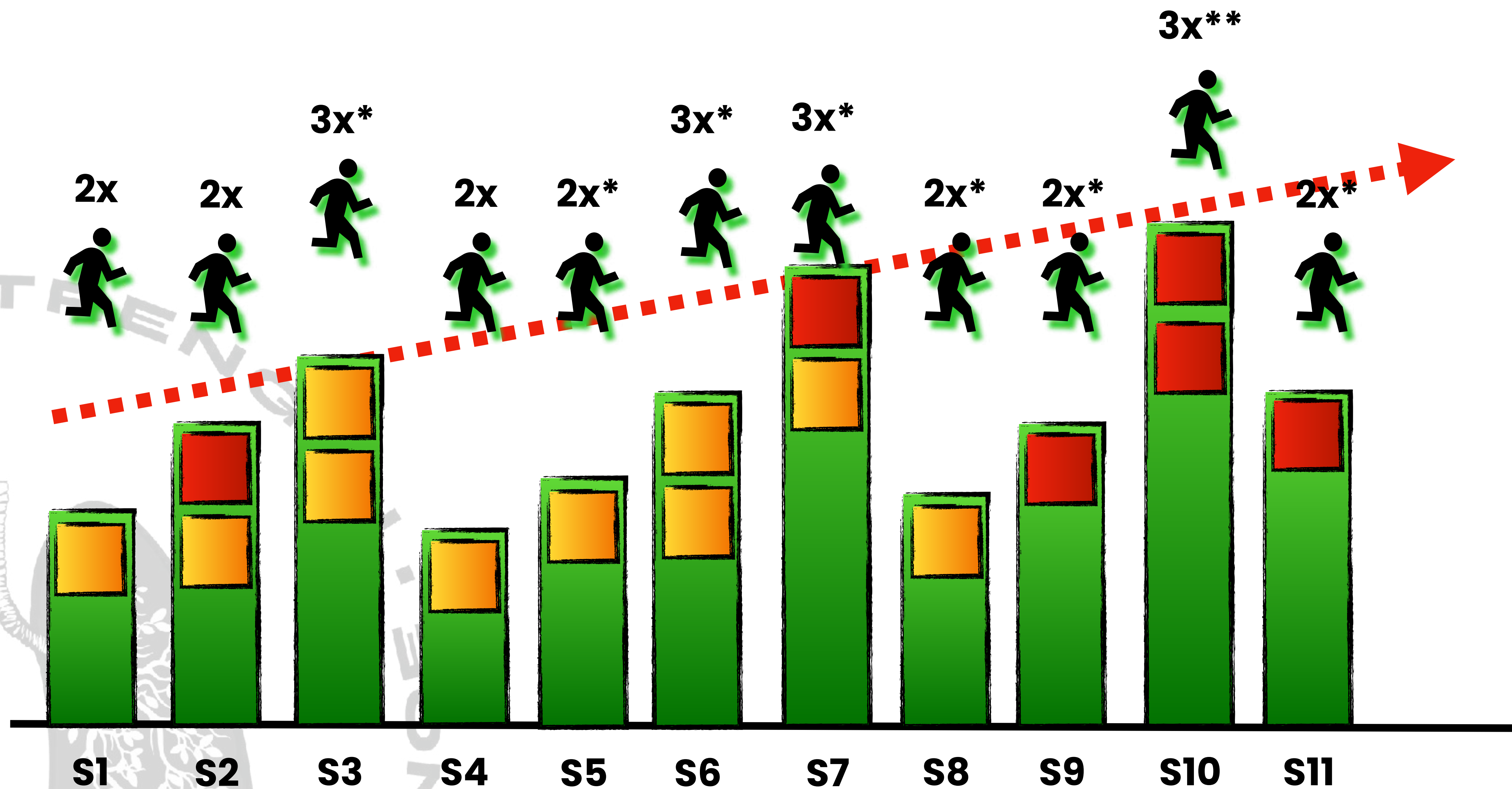
Phase/distribution: Spécifique/Polarisée

Priorités: Haute, Basse

S1	 BI	 HI	 BI	 BI
S2	 BI	 HI	 BI	 HI
S3	 BI	 HI	 BI	OFF



Progression sur 12 semaines



Combatant en MMA

Profil Puissant – Manque d’endurance

12 semaines jusqu’à la compétition (3x3’)



Endurance

















Choisir les Séances

de Séances Endurance: 3-4

Phase/distribution: Générale/Pyramidale

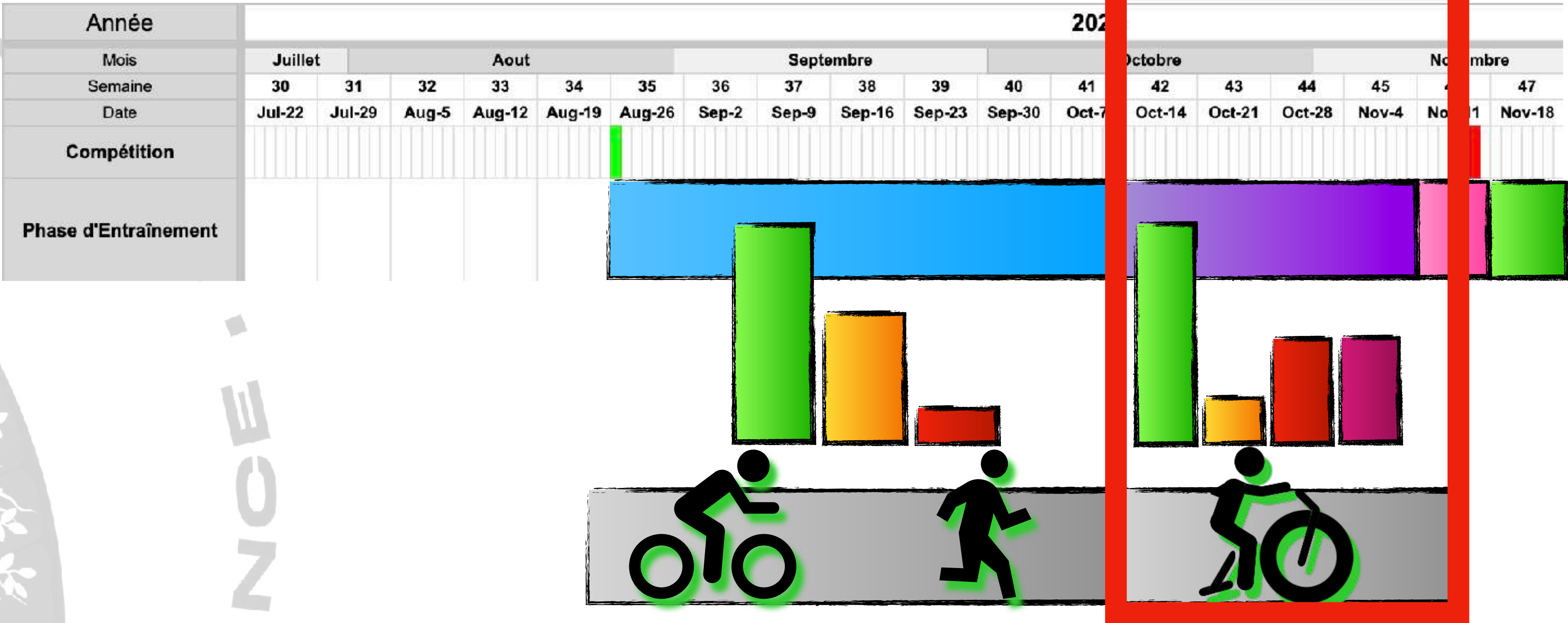
Priorités: Moyenne, Basse

S1	 BI	 MI	 BI	 BI
S2	 BI	 MI	 BI	OFF
S3	 BI	 MI	 BI	 HI
S4	 BI	 MI	 BI	DL

Combatant en MMA

Profil Puissant – Manque d’endurance

12 semaines jusqu’à la compétition (3x3’)





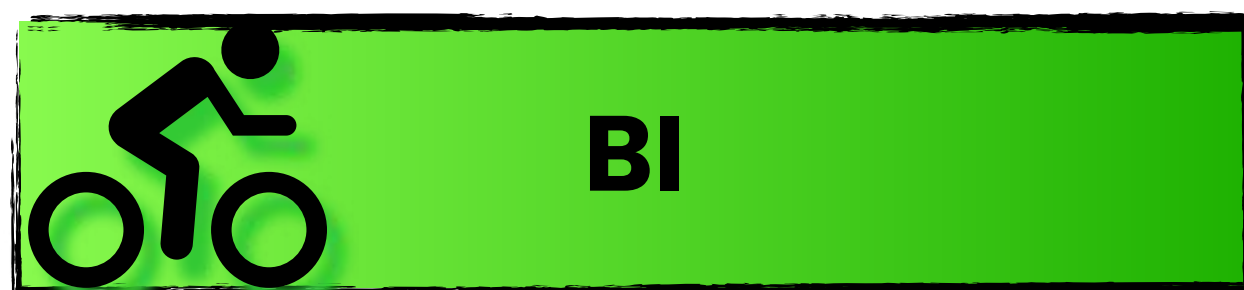
Choisir les Séances

Endurance

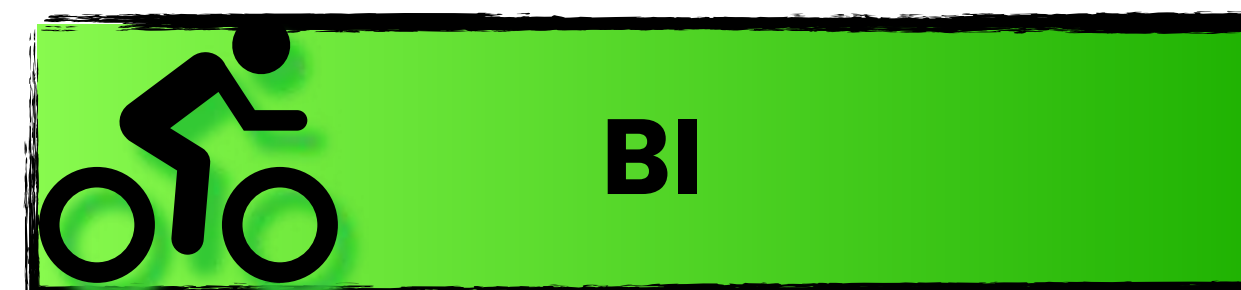
Phase/distribution: Spécifique/Polarisée

Priorités: Haute, Très Haute, Basse

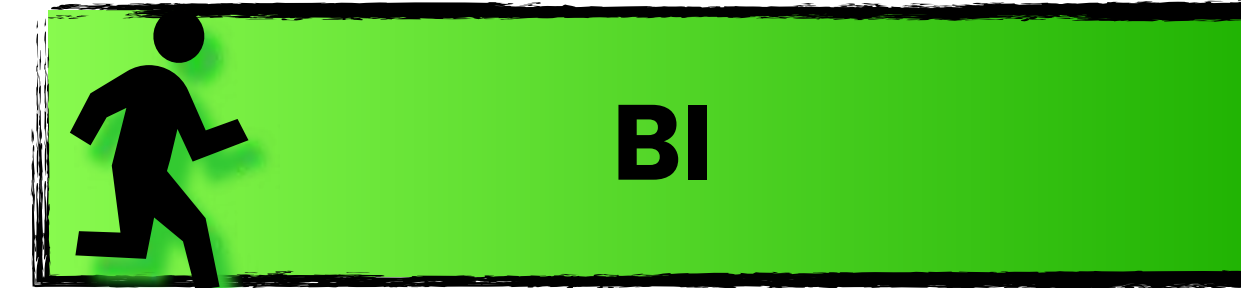
S1



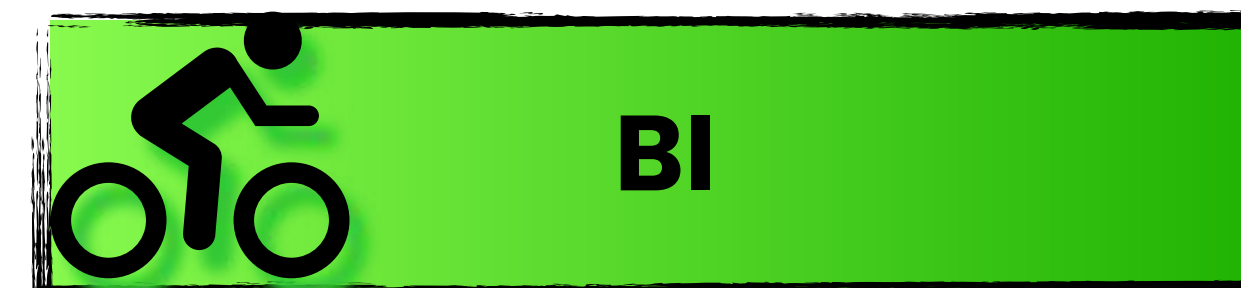
S2



S3



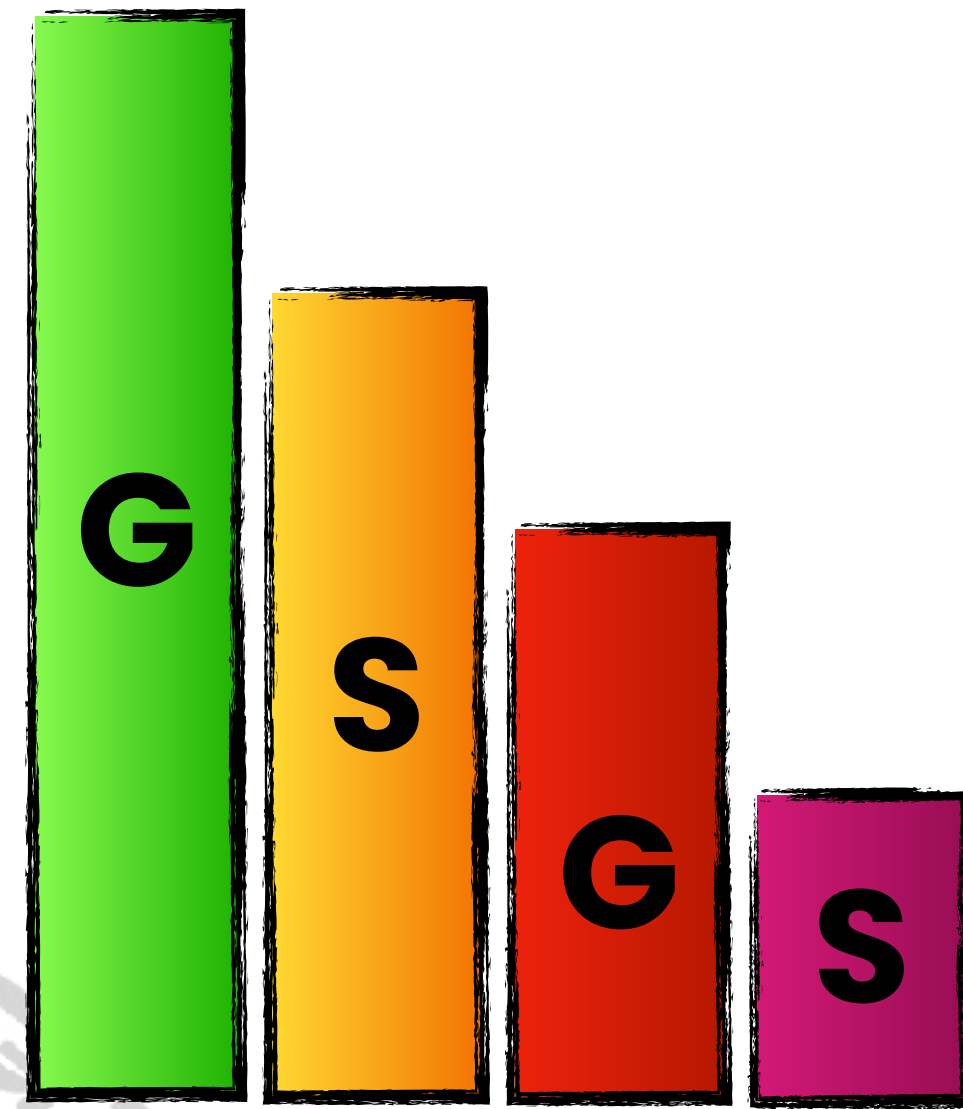
S4



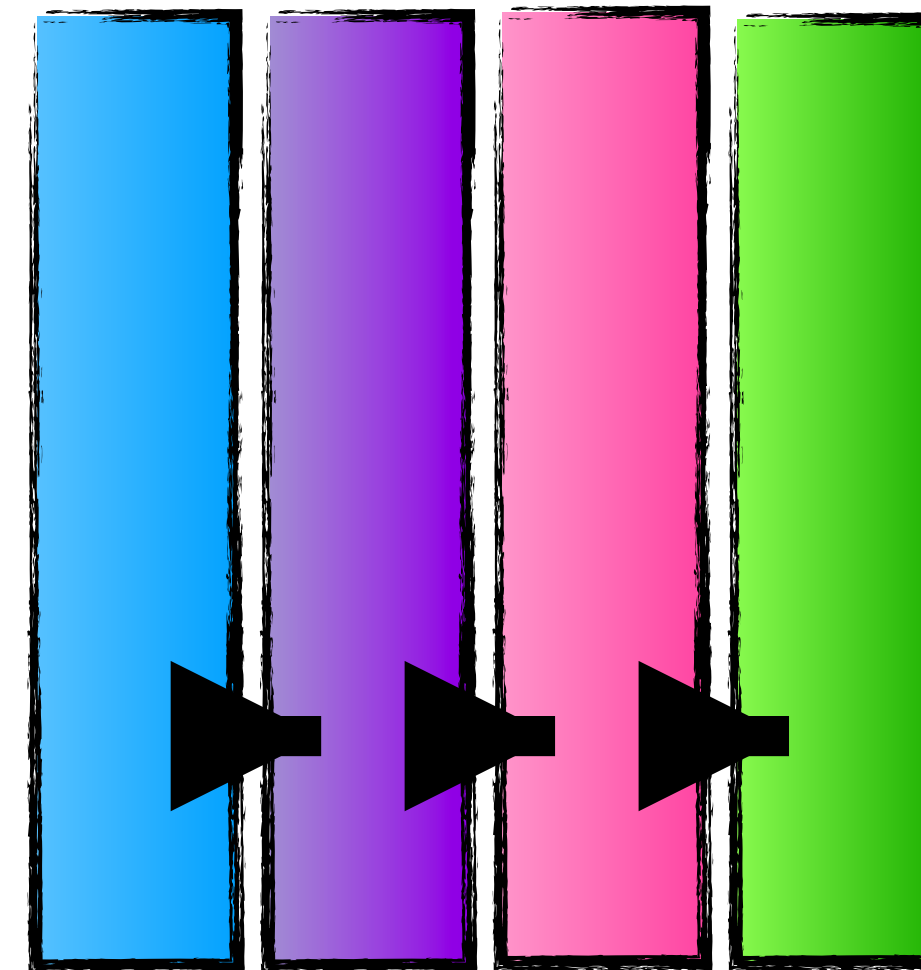
Les Questions à Poser



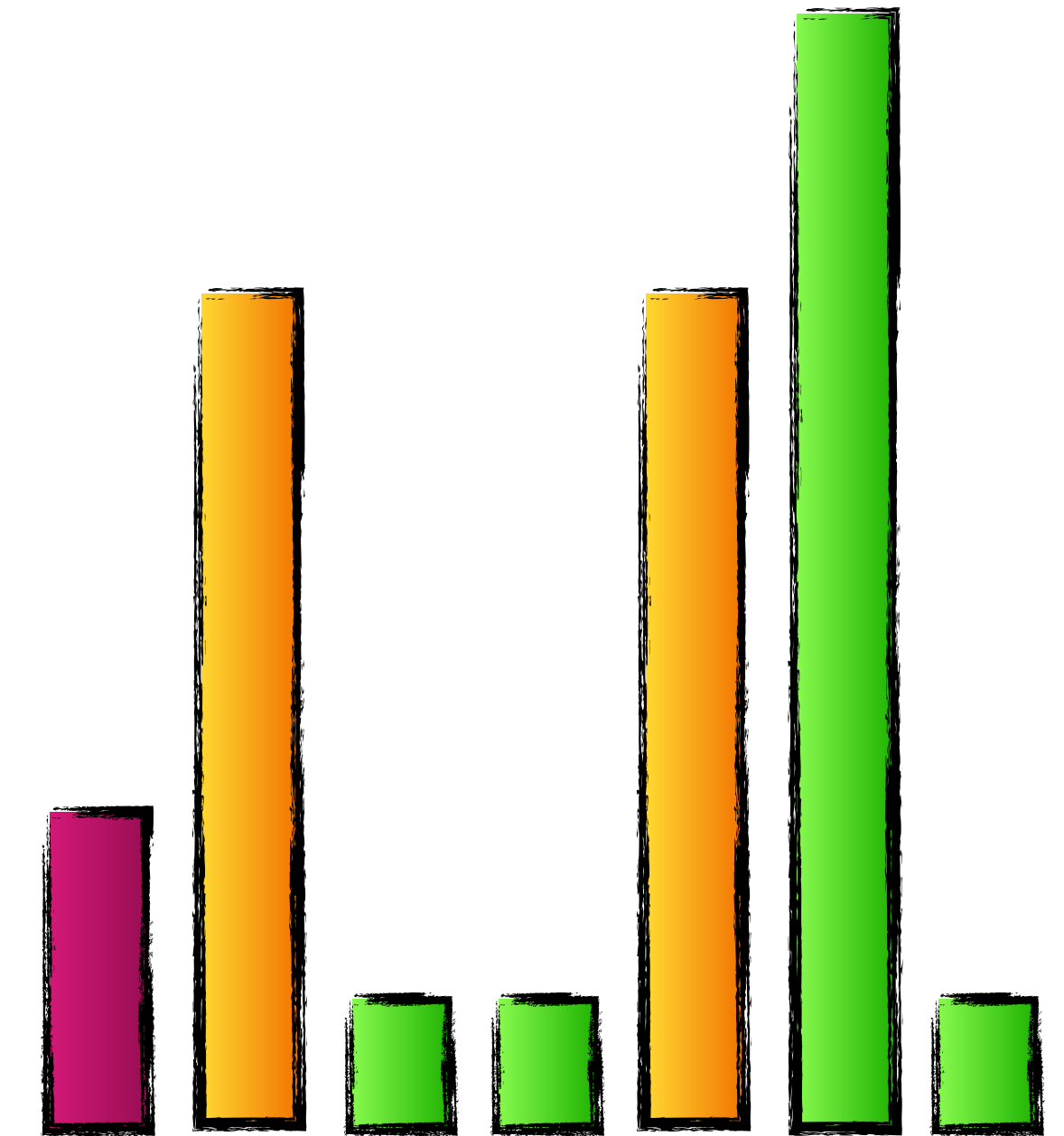
Quel Profil?
Quels Besoins?



Quel Sport?
Quelles Demandes?

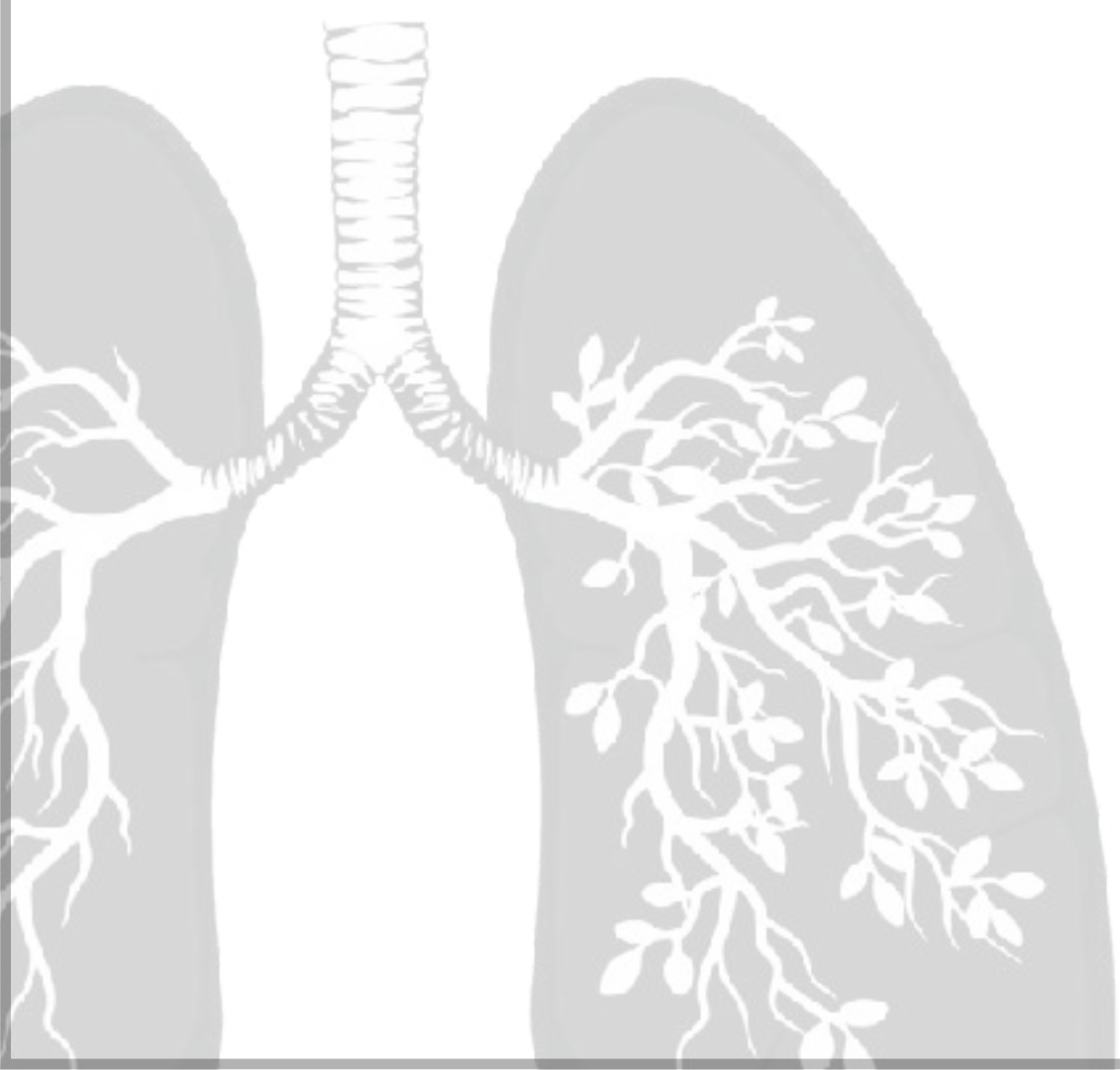


Quelle Phase?
Quelle Distribution?



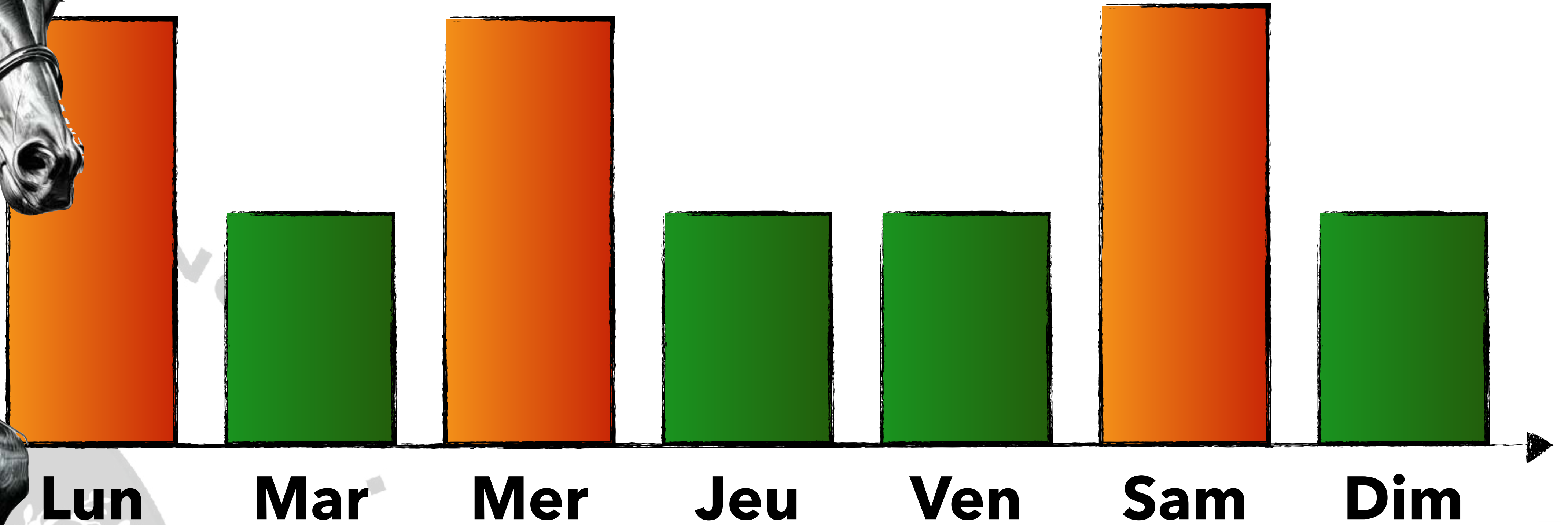
Quelles Séances?
Quelle Répartition?

Comment répartir les séances dans la semaine?

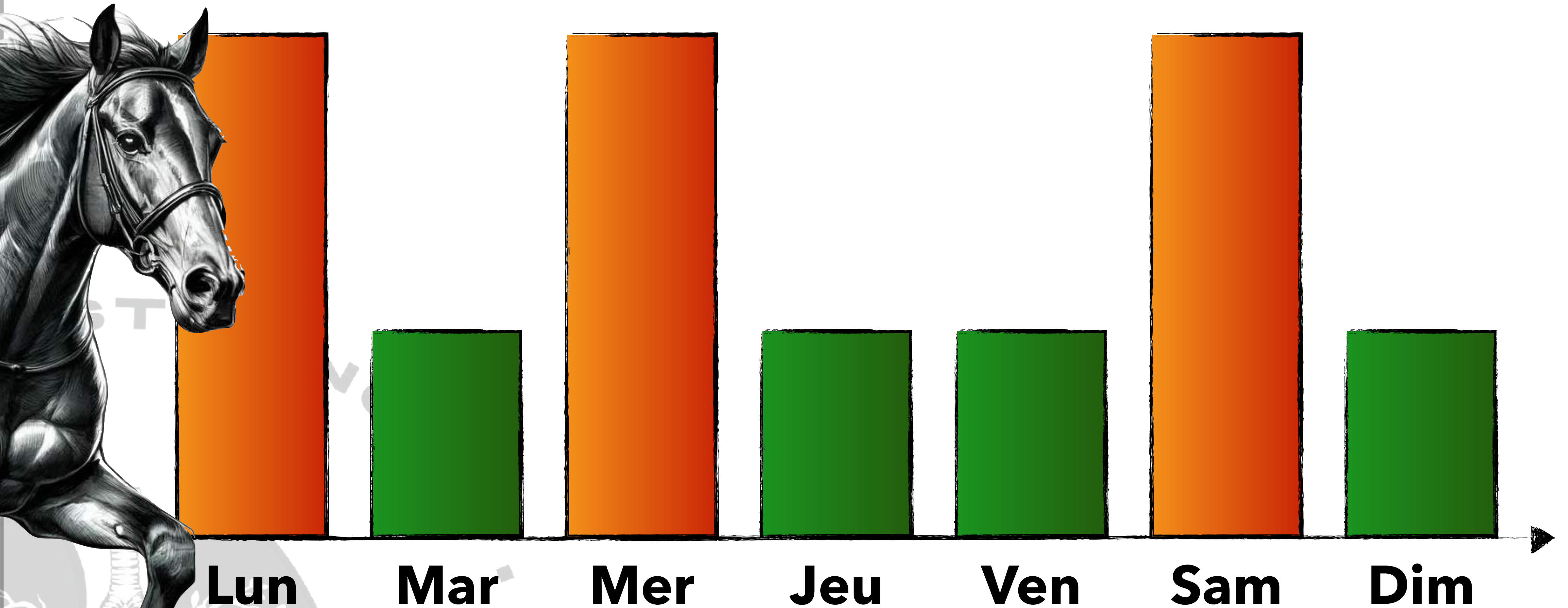


E STRENGTH
ANCE .

Monotonie & Performance



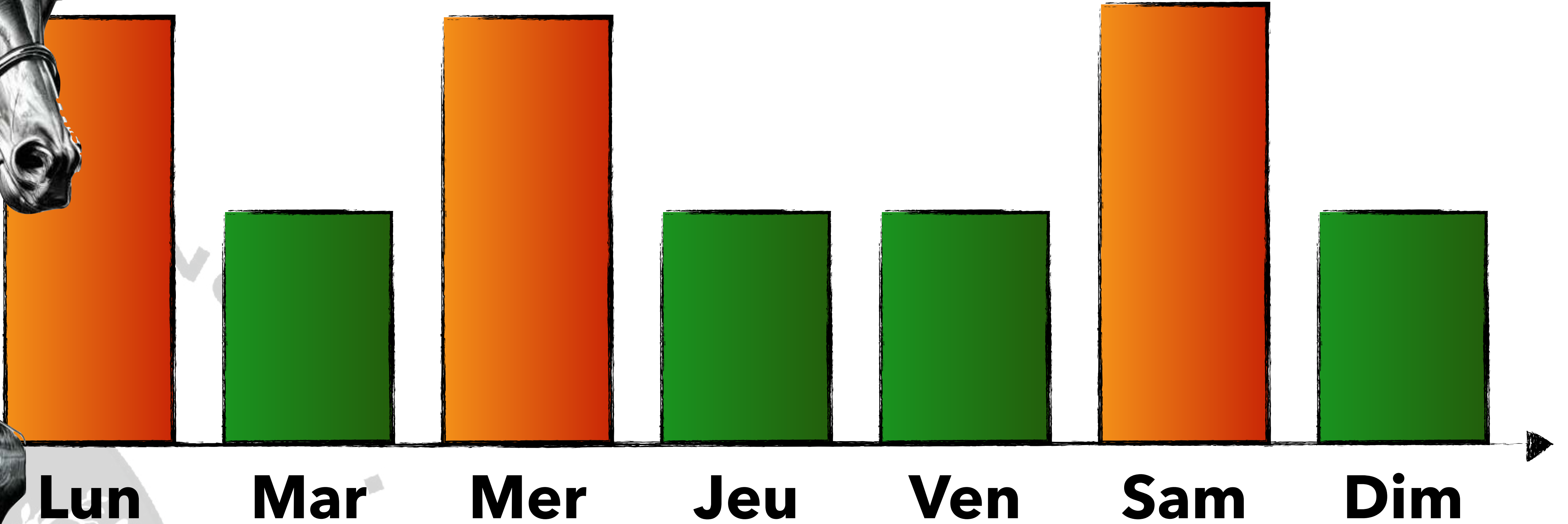
Monotonie & Performance



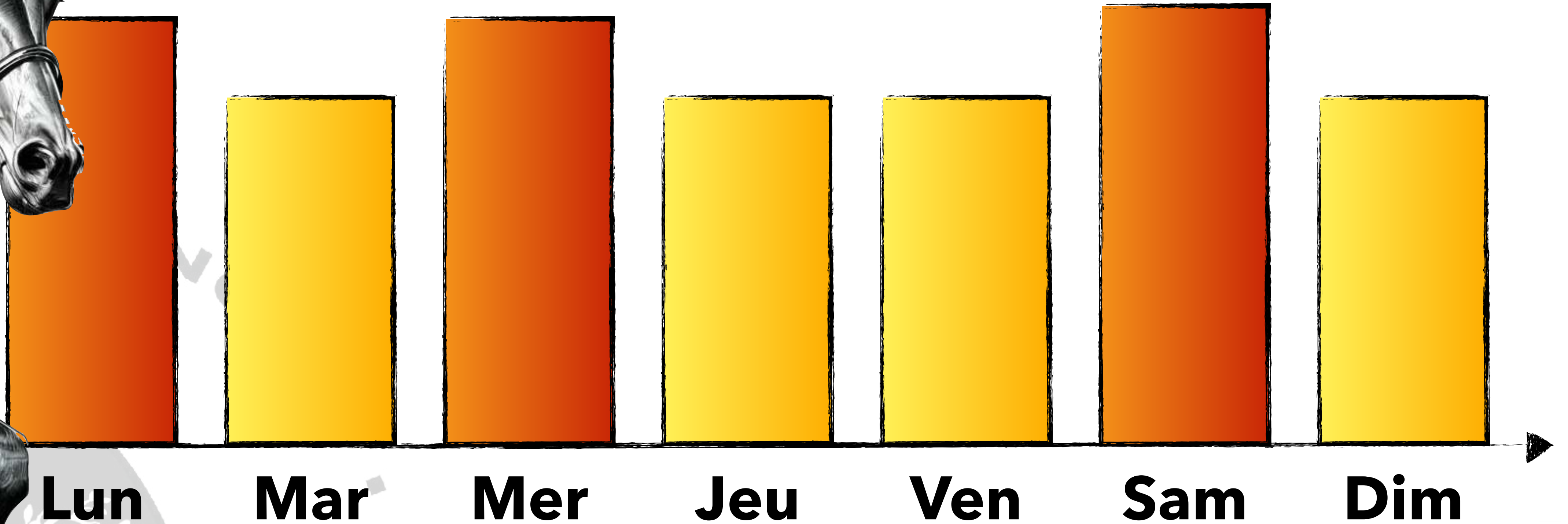
↗ Charge HI = ↗ Performance



Monotonie & Performance



Monotonie & Performance



Monotonie

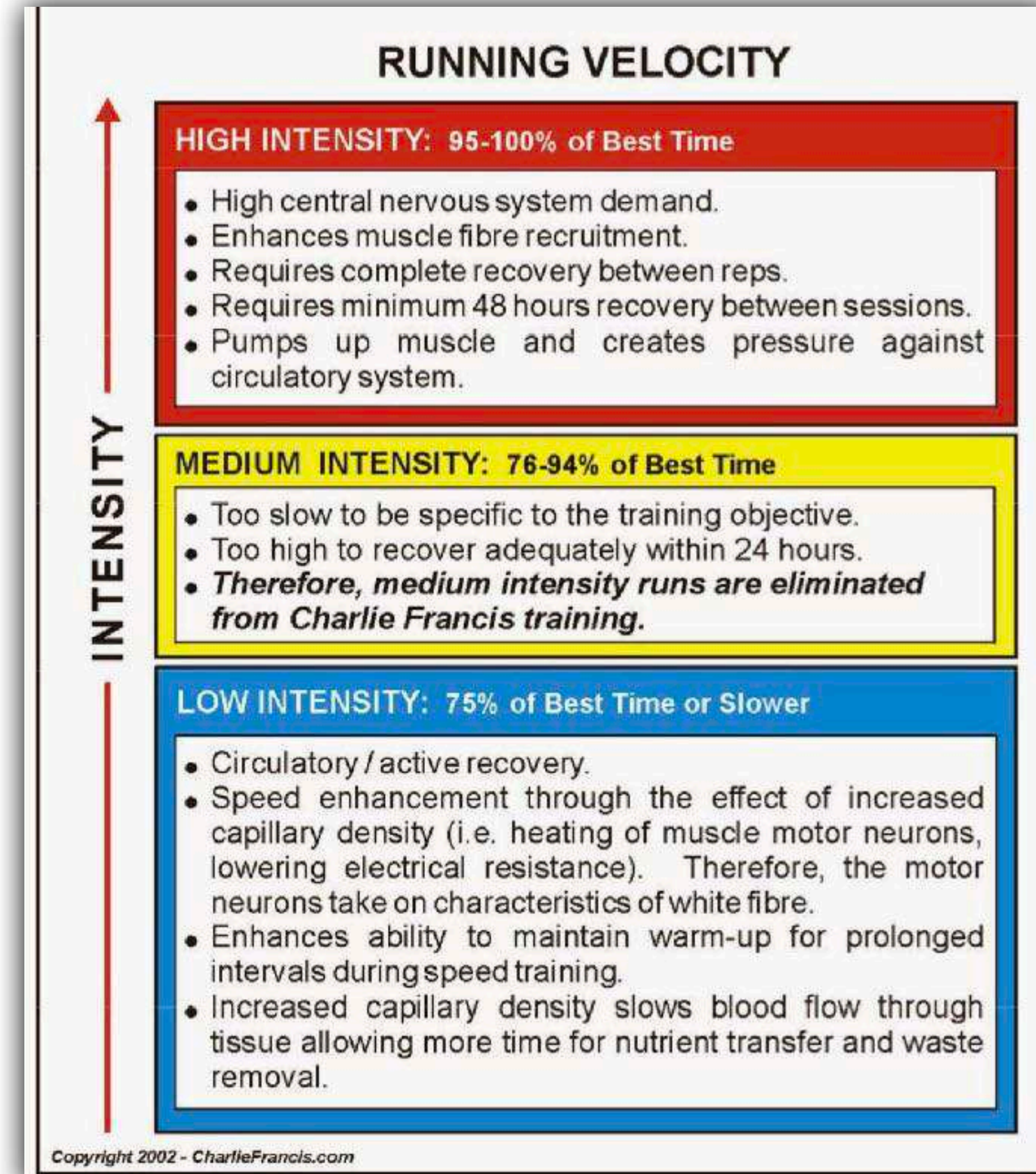
=



Performance



Modèle "High/Low"



Règles du Modèle "High/Low"

Règle #1

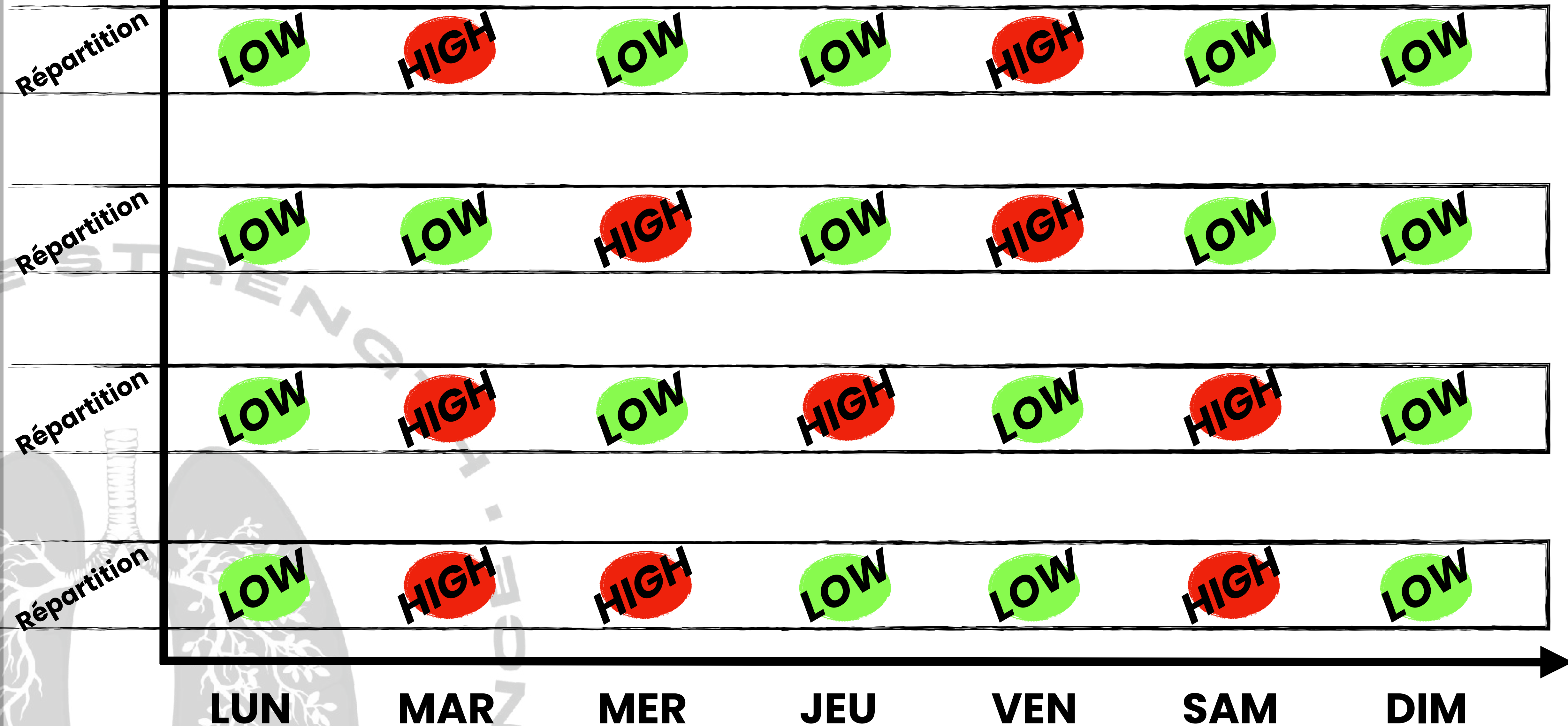
✓ *Maximum 2 jours "HIGH" de suite*

Règle #2

✓ *MAX 3 jours "HIGH" par semaine*

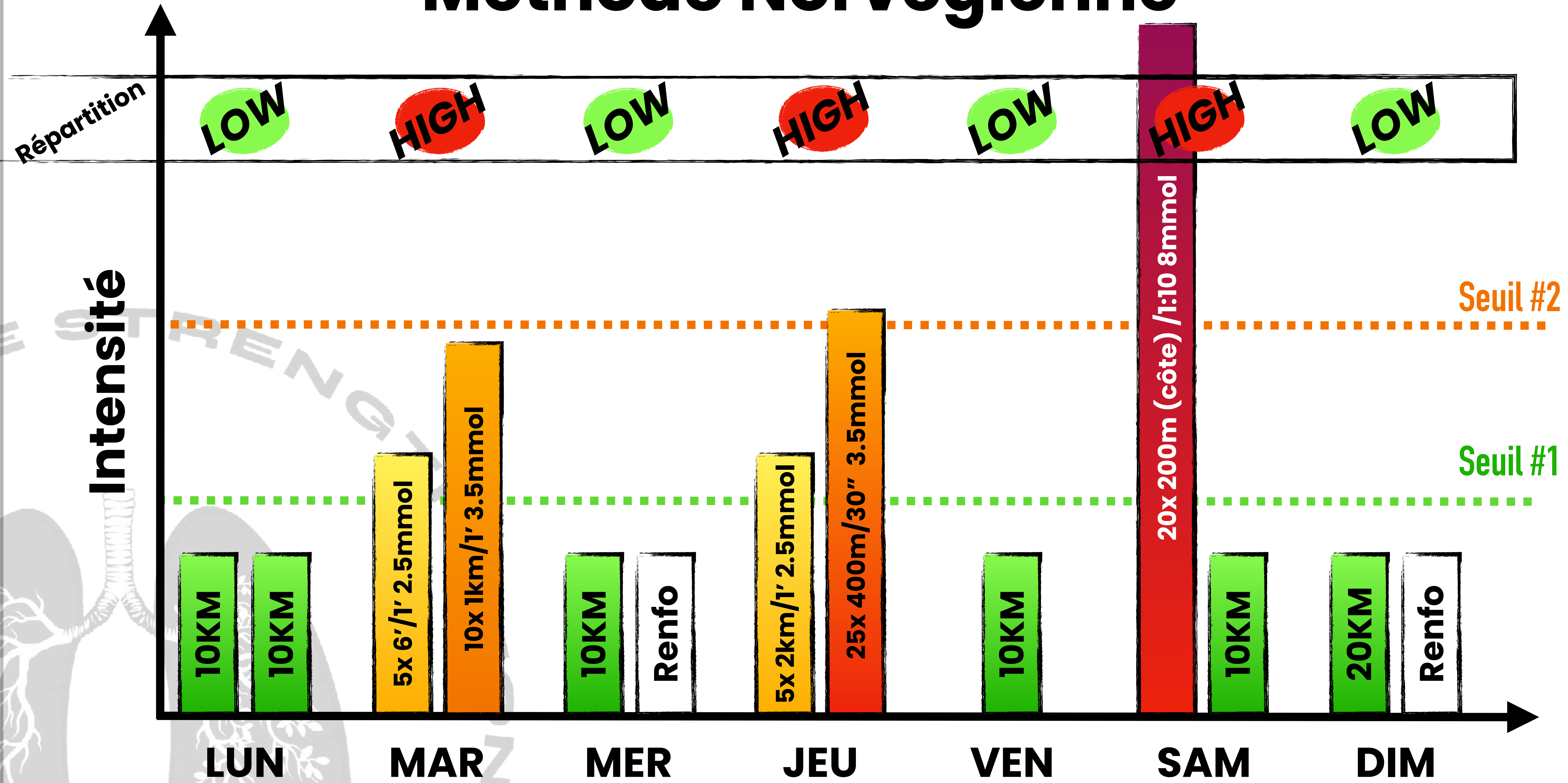


Modèle "High/Low"



Source: Marius Bakken

Méthode Norvégienne



Kilian Jornet

LOW

HIGH

LOW

LOW

HIGH

LOW

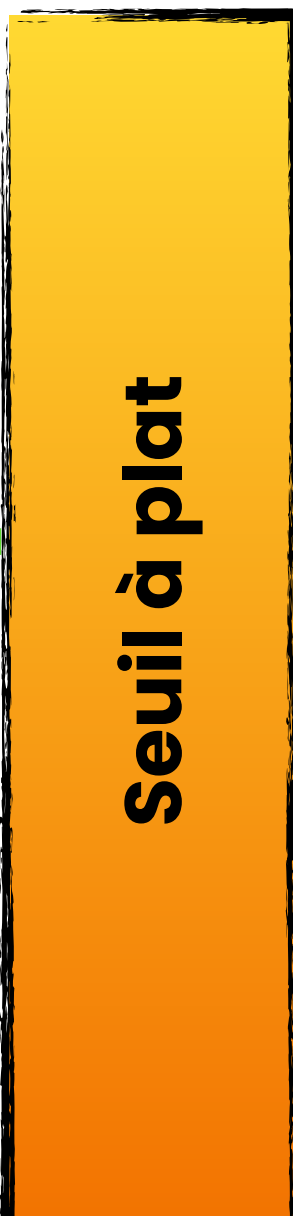
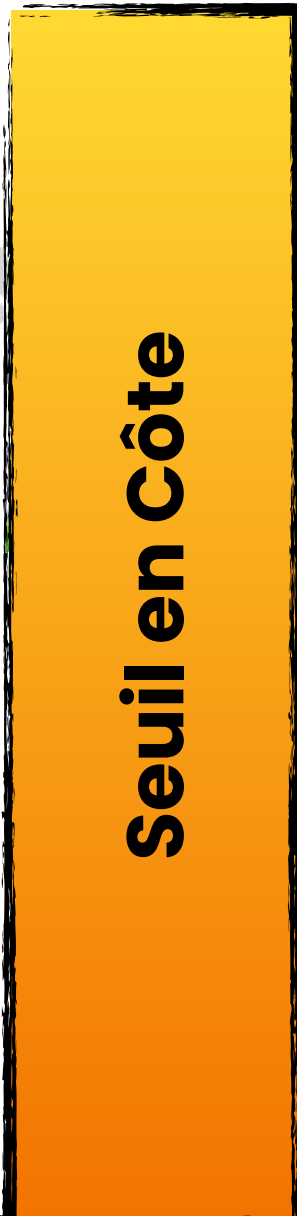
HIGH

Phase Spécifique

Intensi

Seuil #2

Seuil #1



LUN

MAR

MER

JEU

VEN

SAM

DIM

Kilian Jornet



LOW

LOW

LOW

LOW

LOW

LOW

HIGH

Phase Fondamentale

Intensi

Seuil #2

Seuil #1

Z2 - 5-6h

Z2 - 5-6h

Z2 - 5-6h

Z2 - 5-6h

Z2 - 5-6h

Z1

Z4-5

LUN

MAR

MER

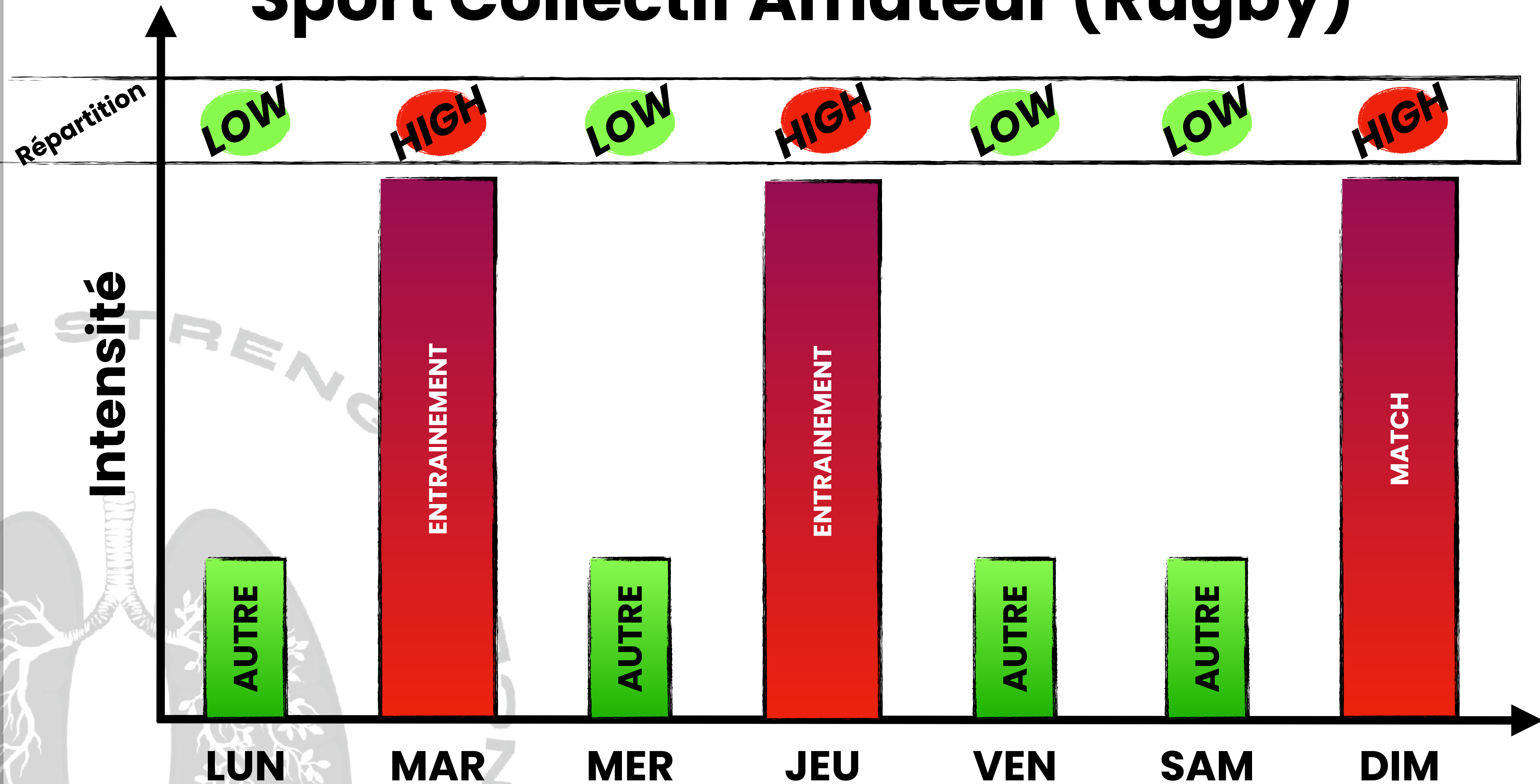
JEU

VEN

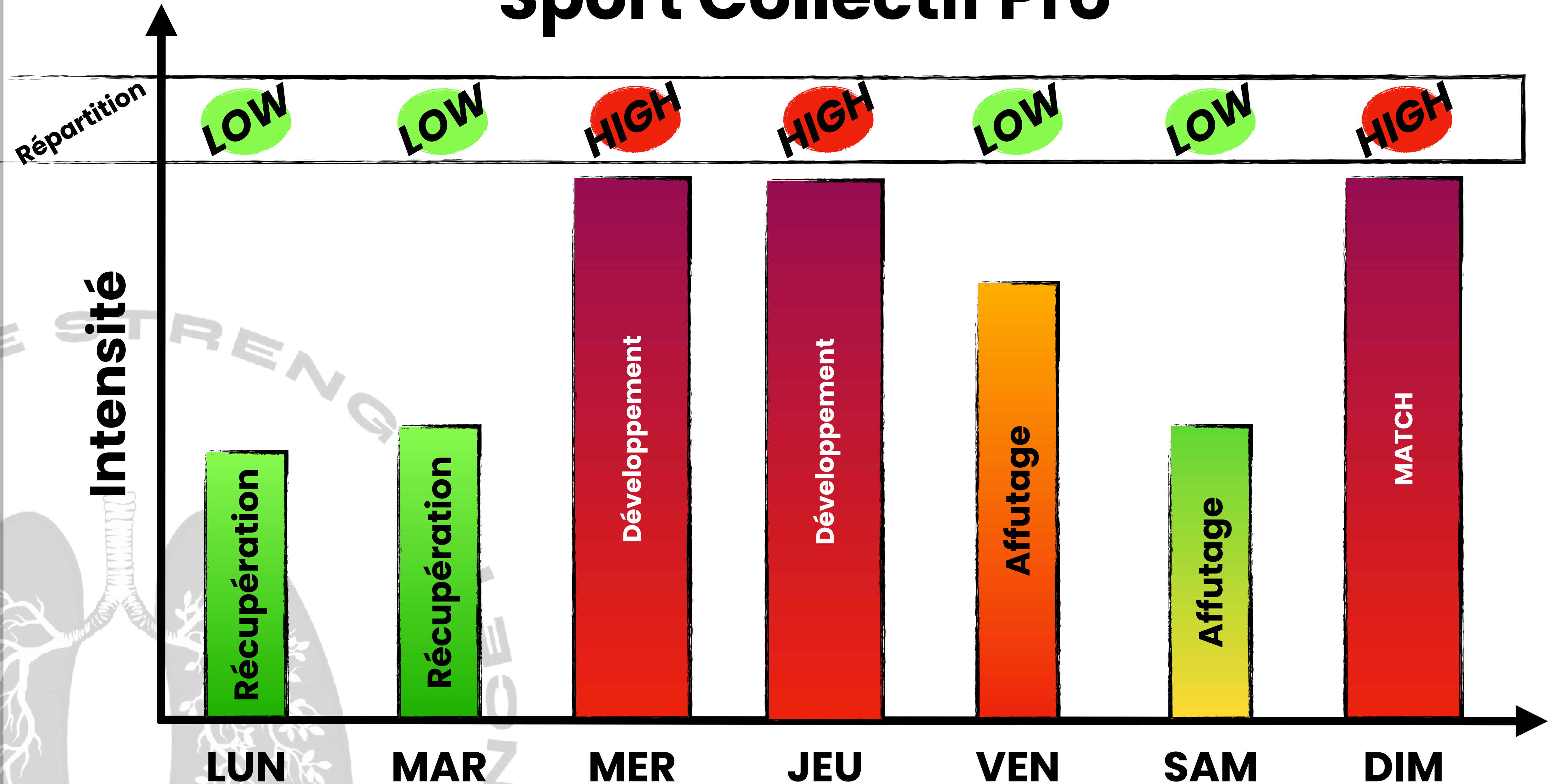
SAM

DIM

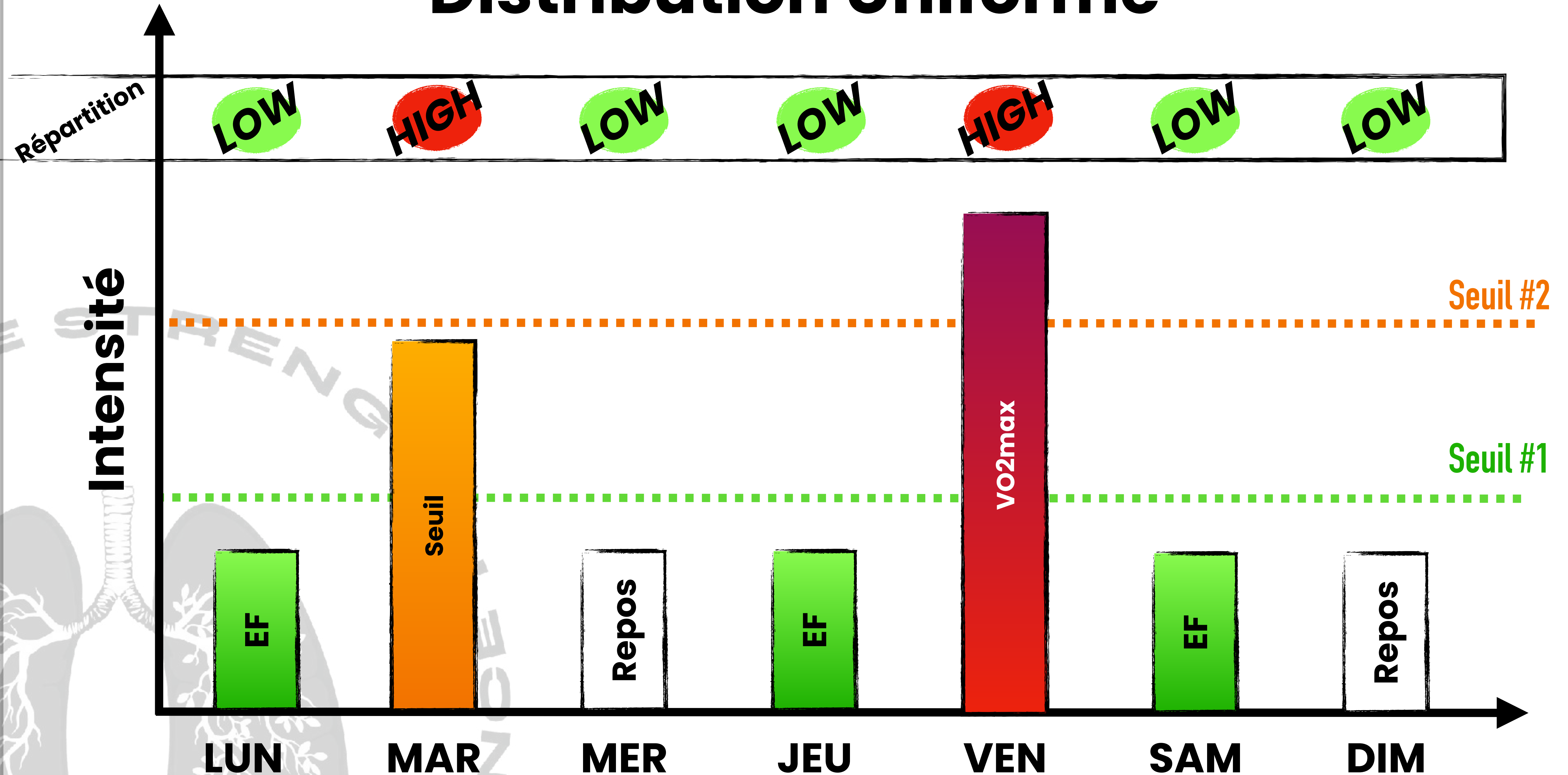
Sport Collectif Amateur (Rugby)



Sport Collectif Pro



Distribution Uniforme



Intensités par Semaine

0

Intensités

1

Intensités

2

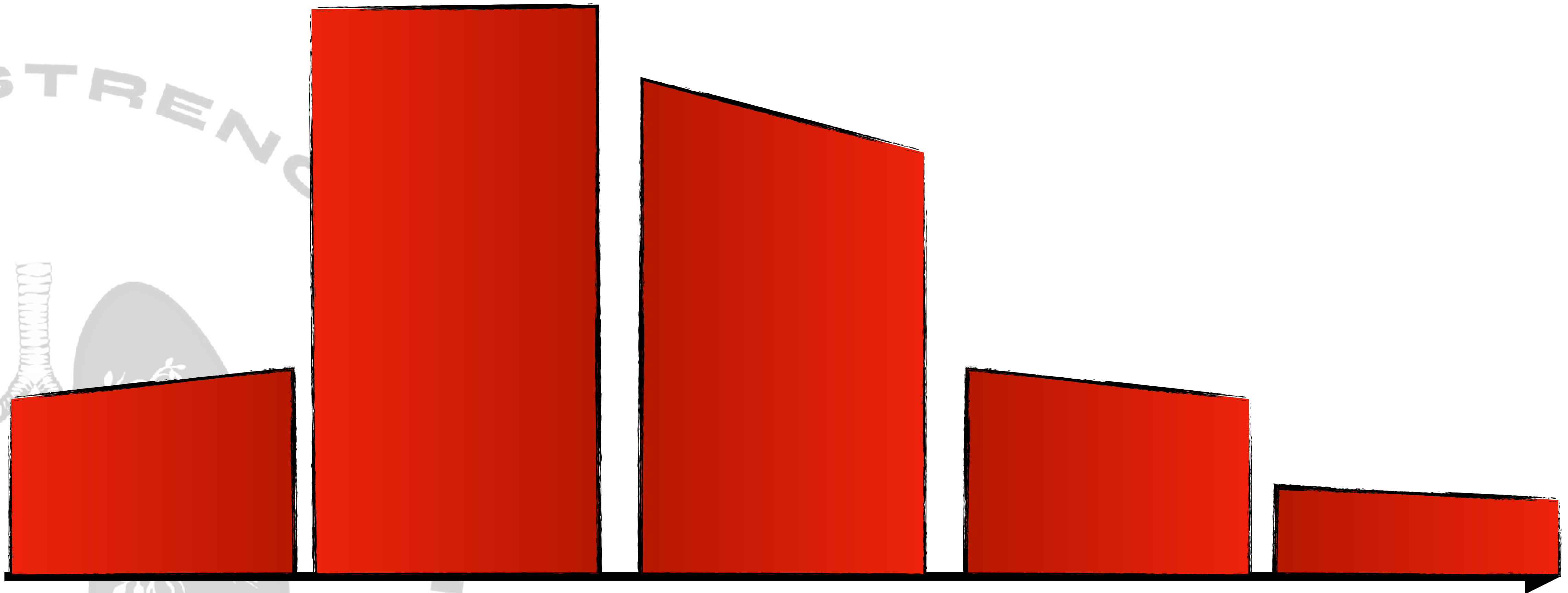
Intensités

3

Intensités

4

Intensités

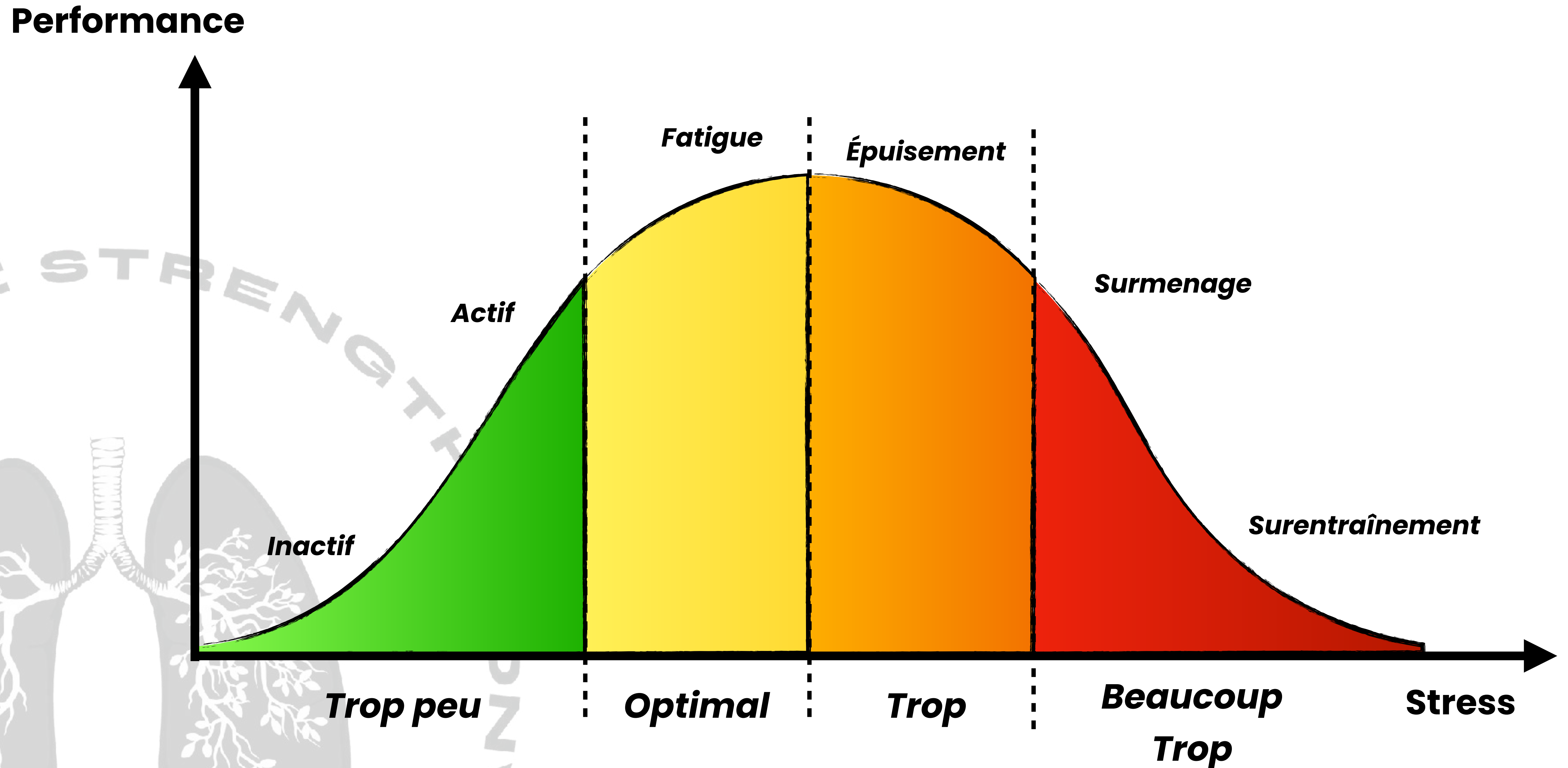


Actif

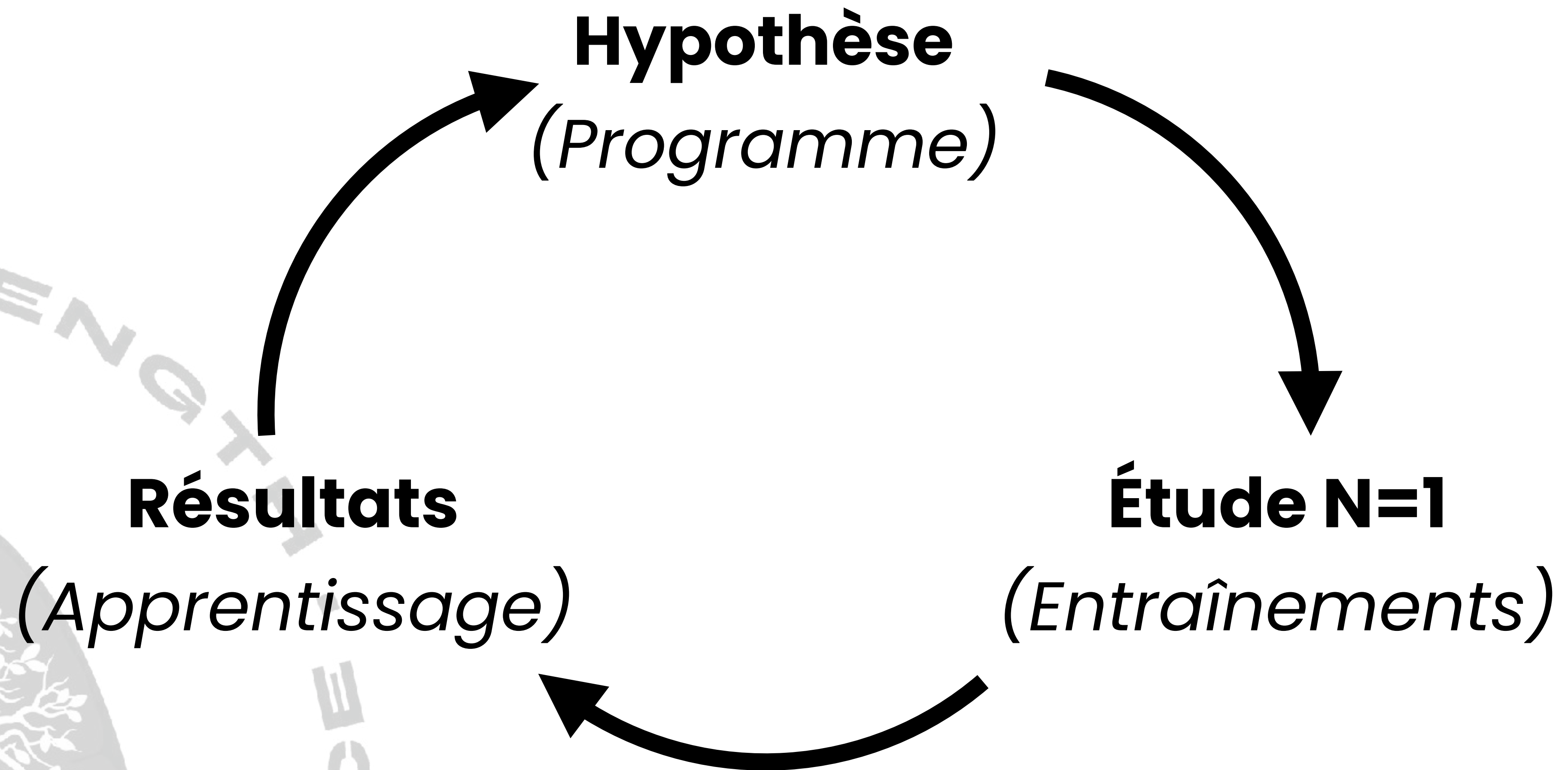
Inactif

Trop peu

STRENGTH



La Programmation



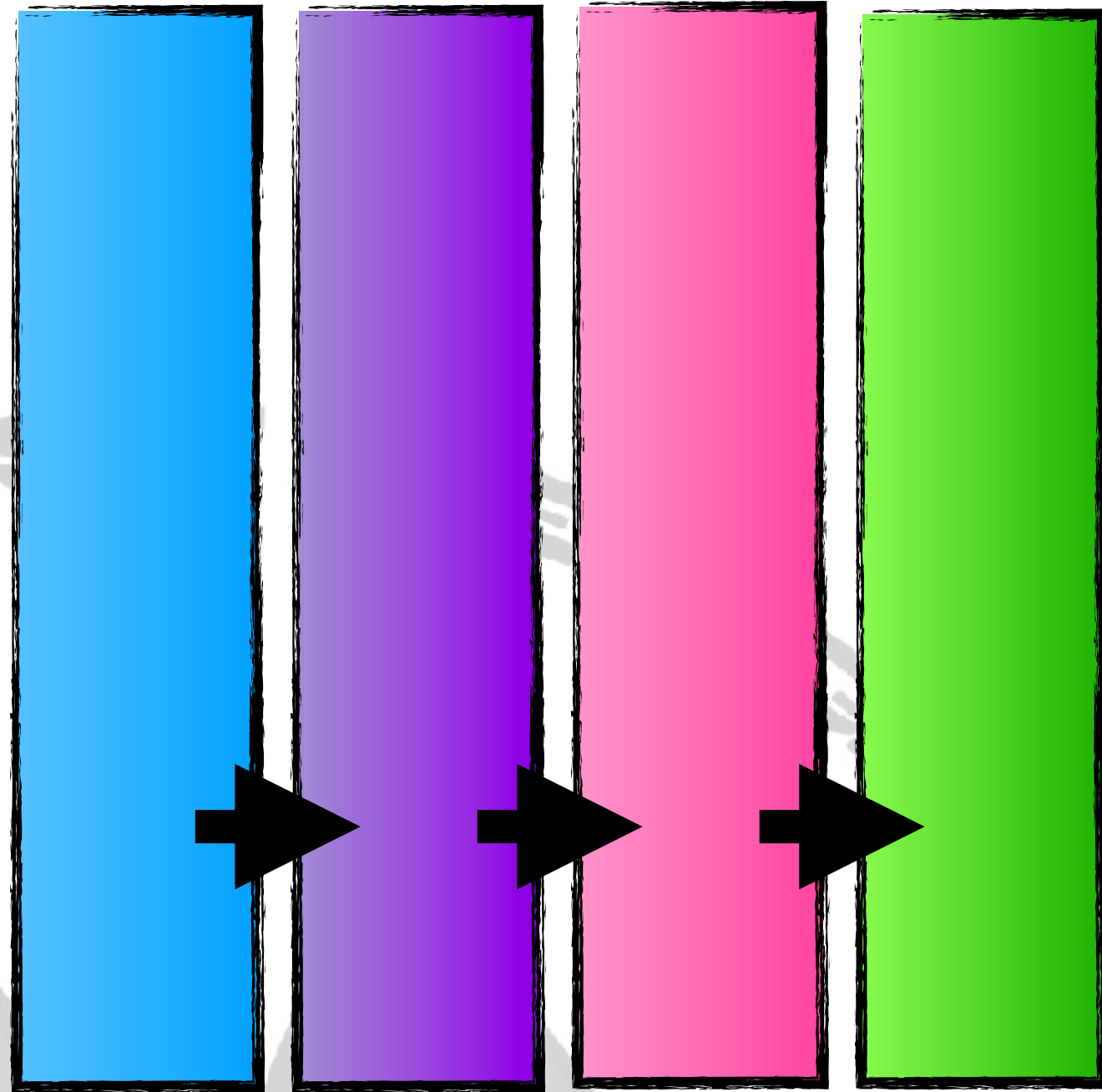
La réalité



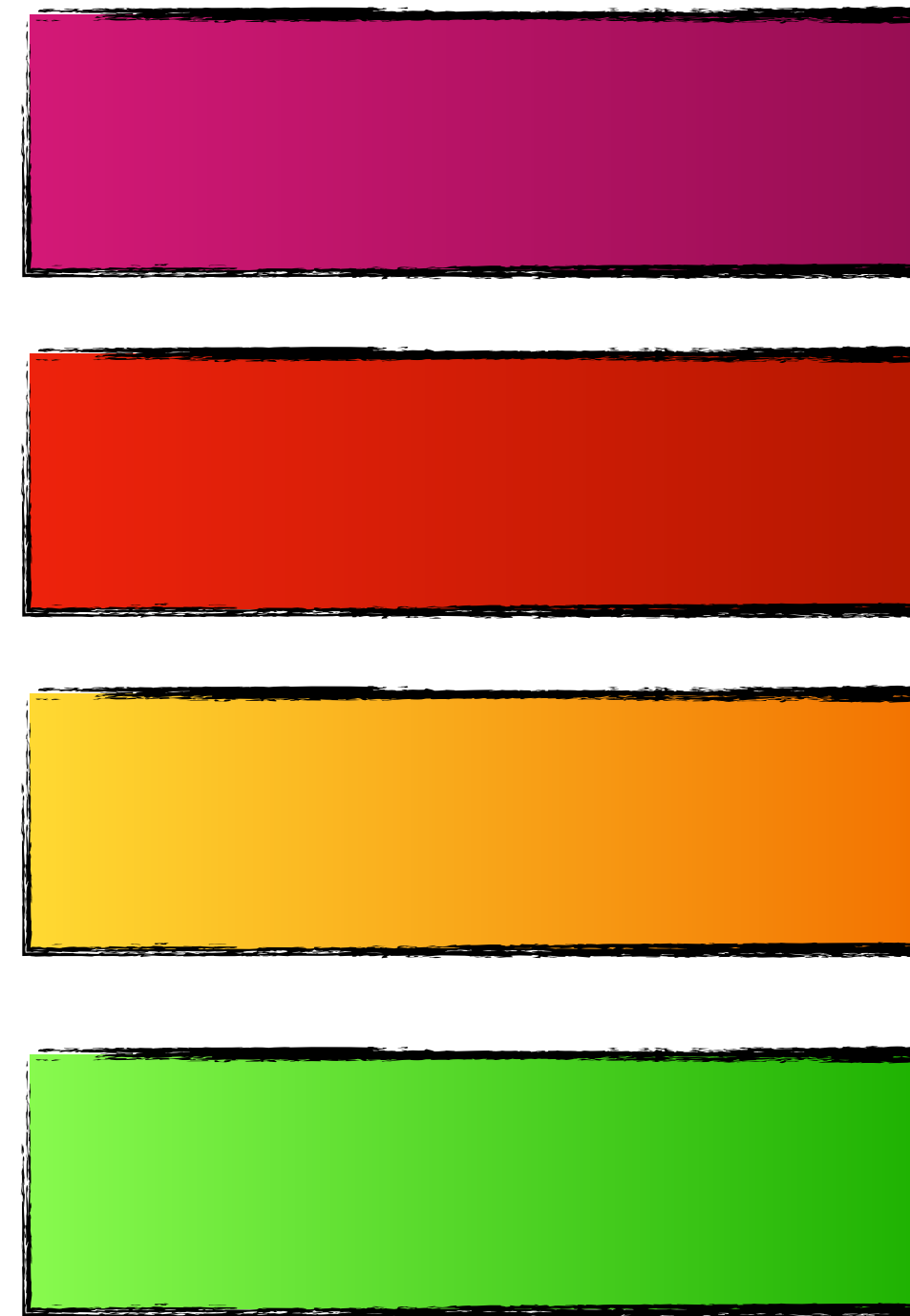
“La vie est vraiment simple, mais nous nous obstinons à la rendre compliquée.”

Confucius

Organiser le Microcycle



Quelle Phase?
Quelle Distribution?



Quelles Priorités?
Quelles Séances?

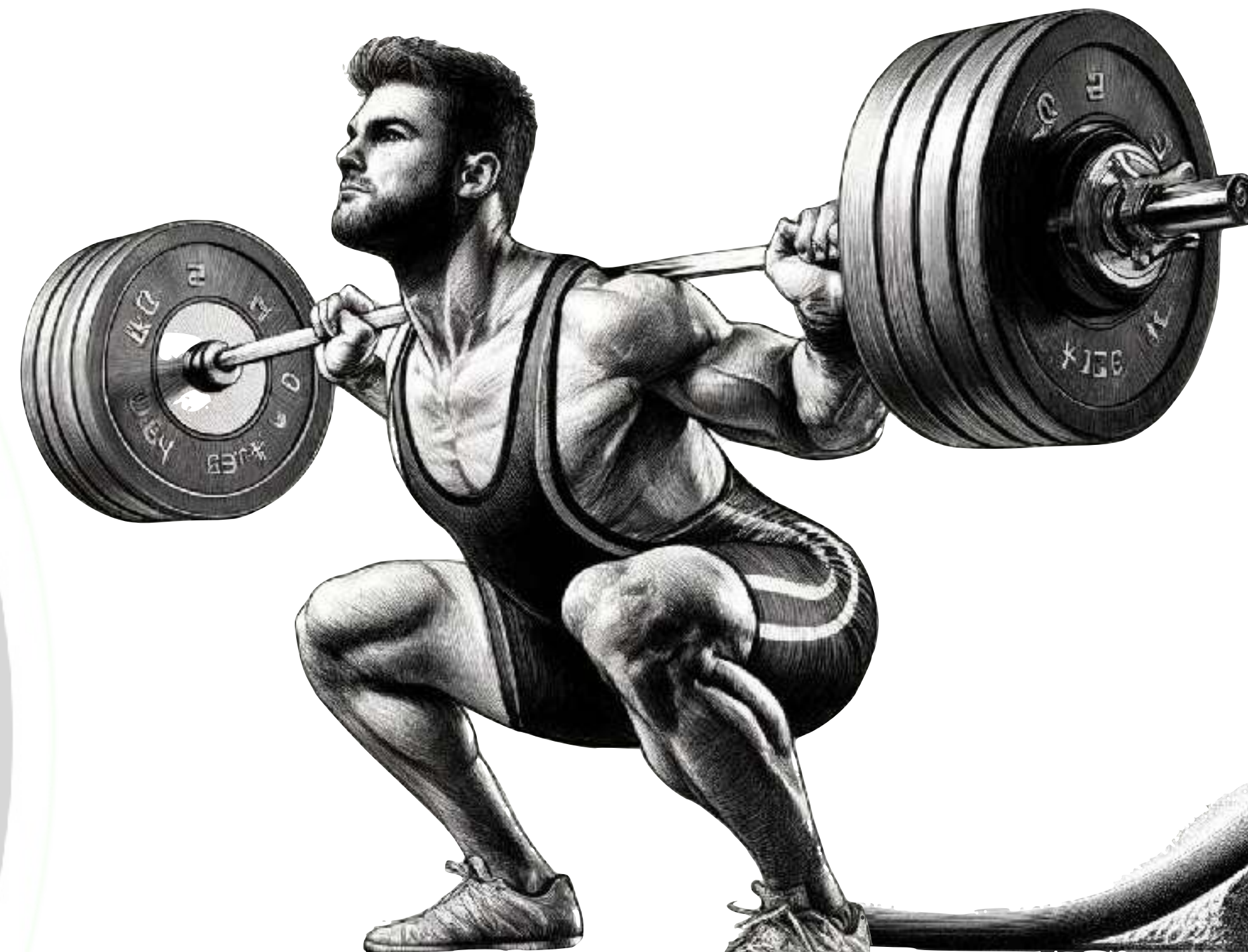


Quelle Répartition?

FORMATION

SPSL 2025

Les Zones d'Entraînement

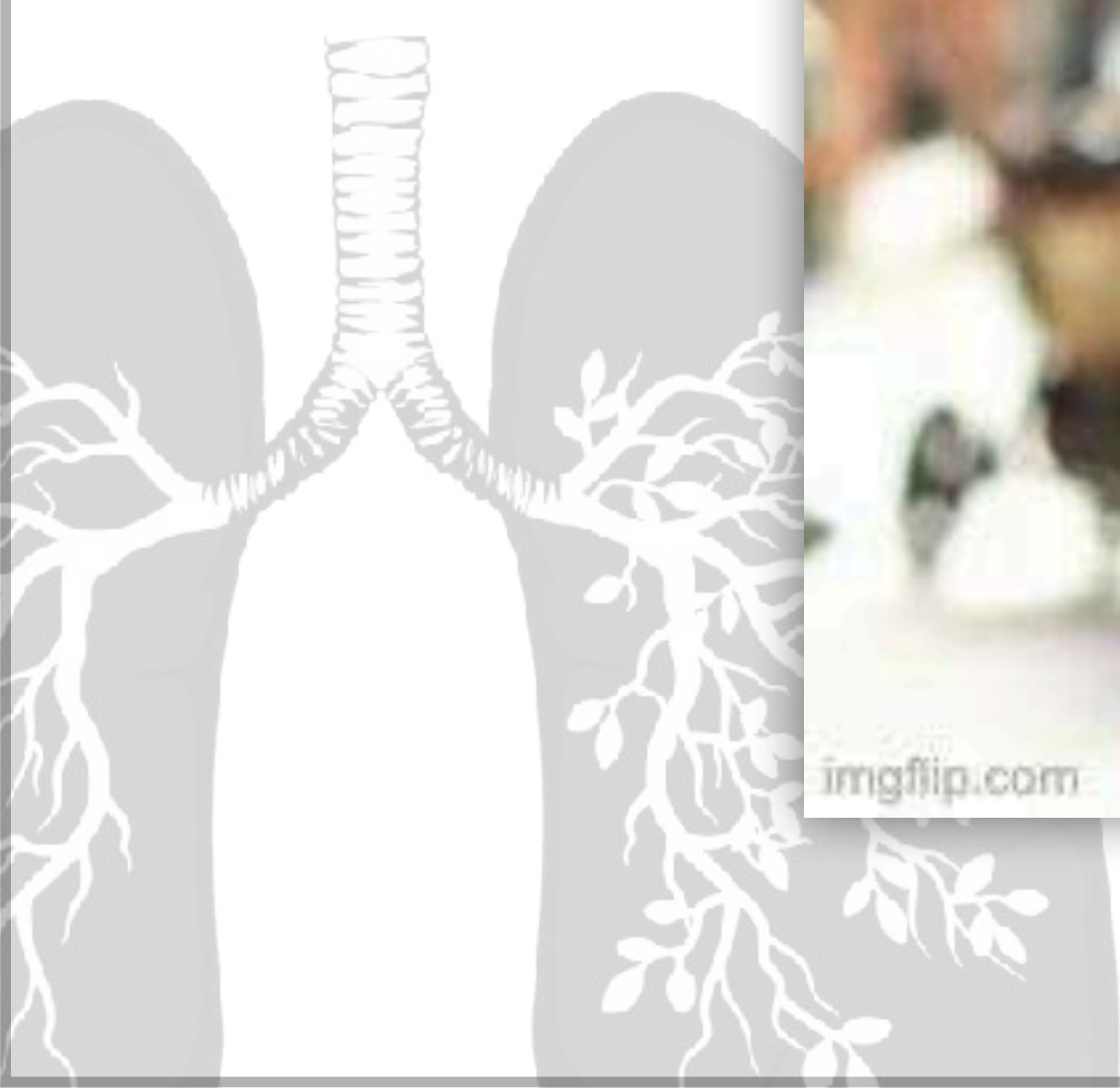


Jem Arnold



“Les domaines d’intensité sont descriptifs. Il décrivent les réactions physiologiques à différentes intensités. Les zones sont prescriptives. Elles permettent de mieux prescrire/structurer les entraînements.”

E STRE



imgflip.com

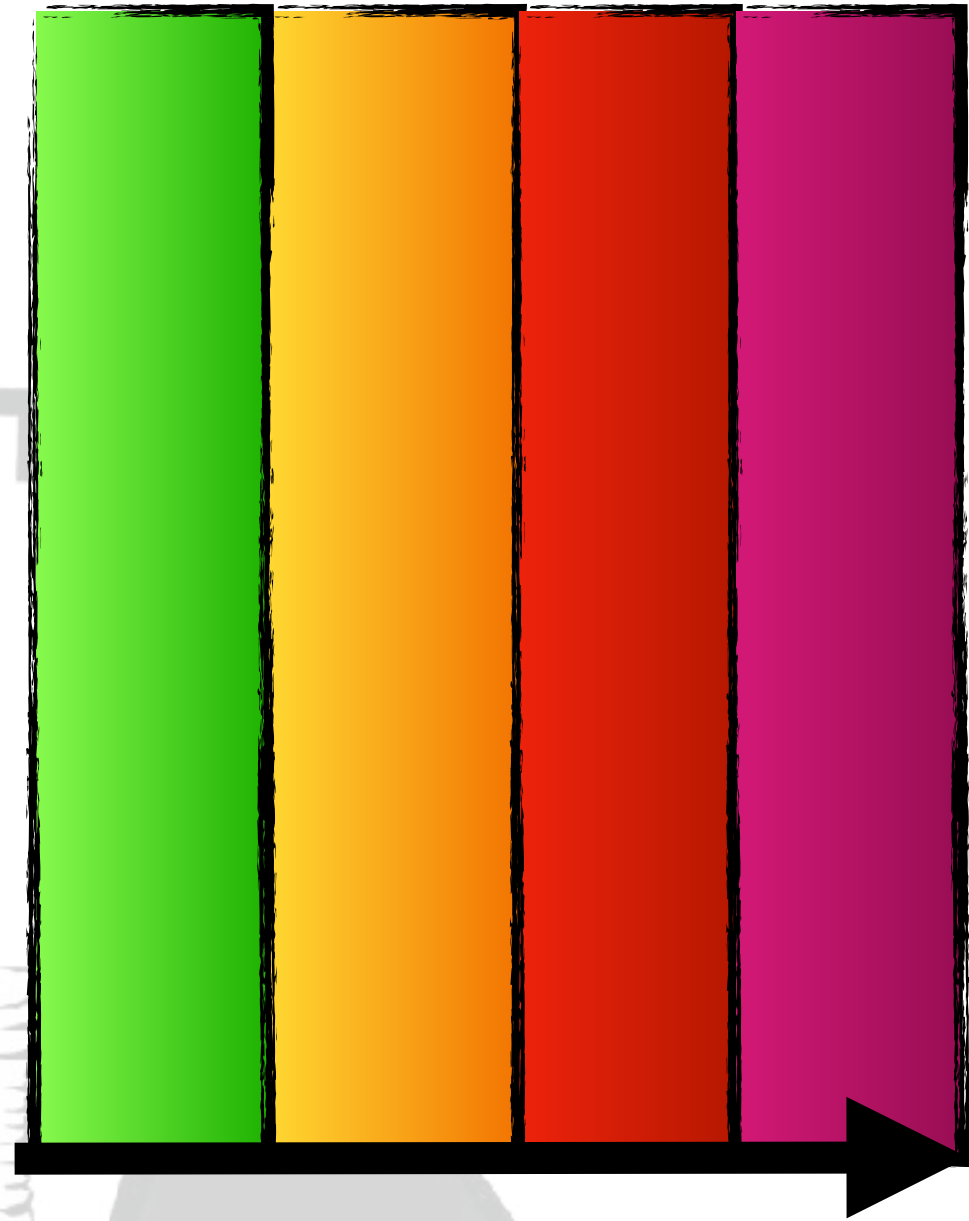
LES ZONES

LES COACHES

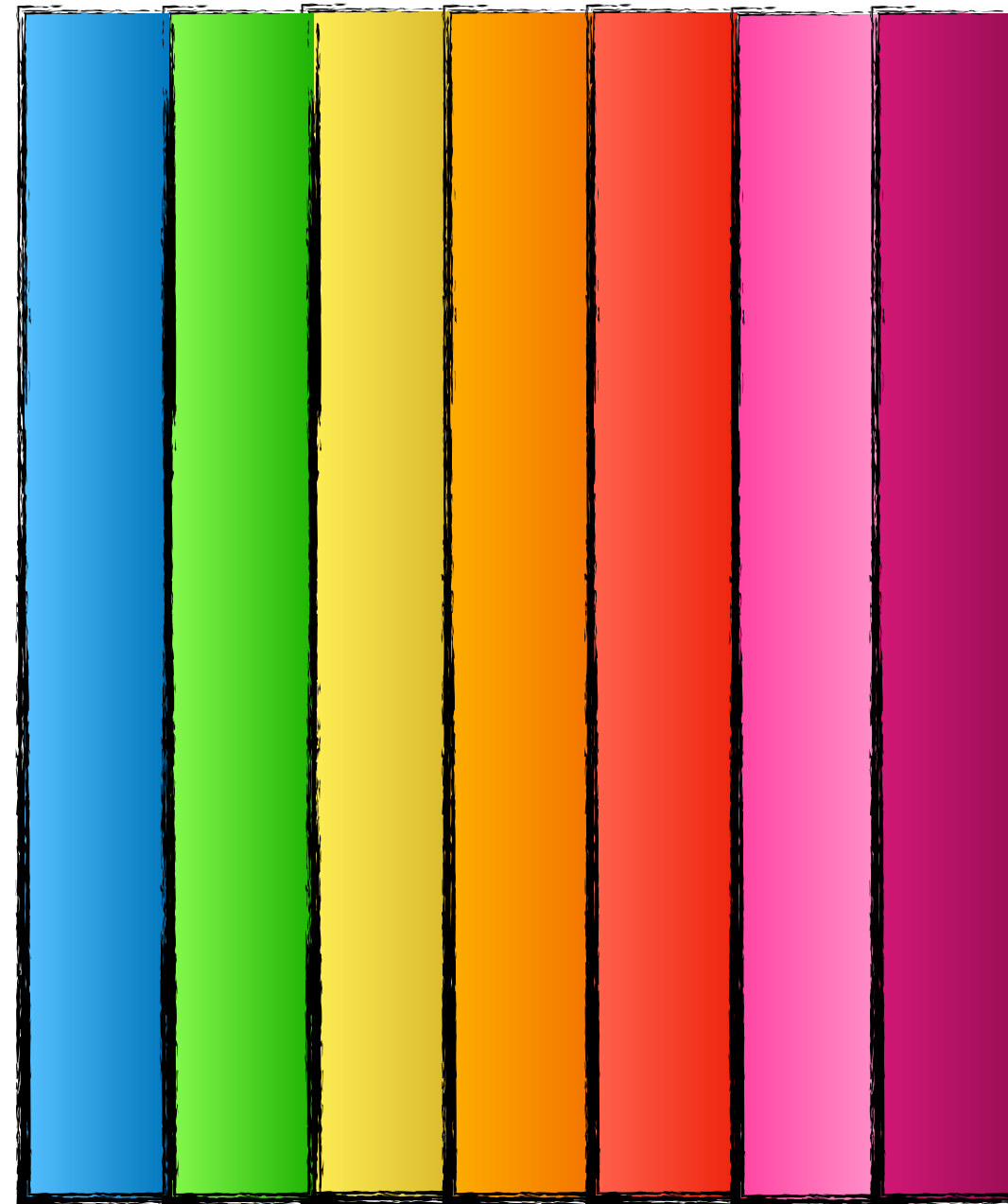
**LES
DOMAINES
D'INTENSITÉ**

Z

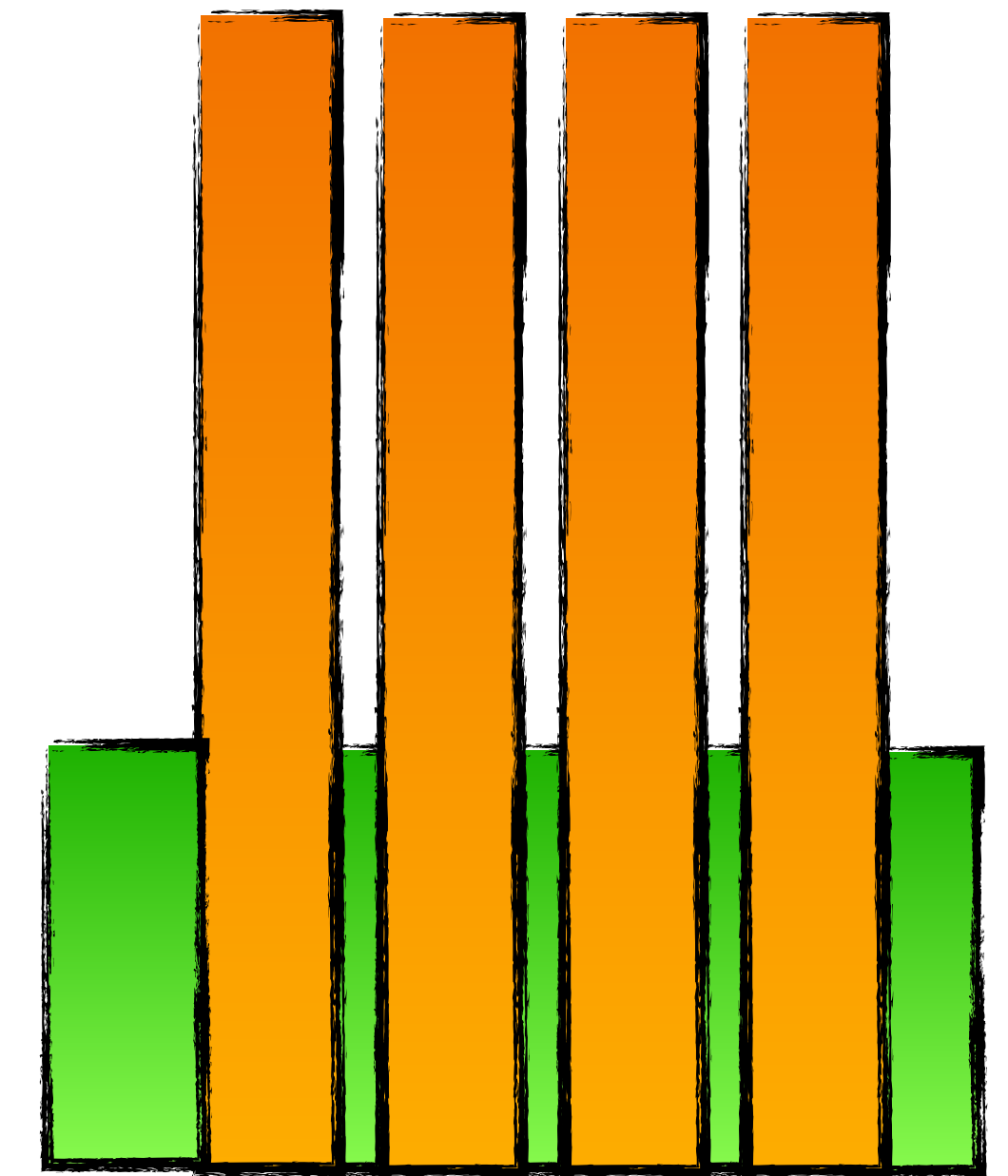
Le plan du jour



***Les Domaines
d'Intensité***

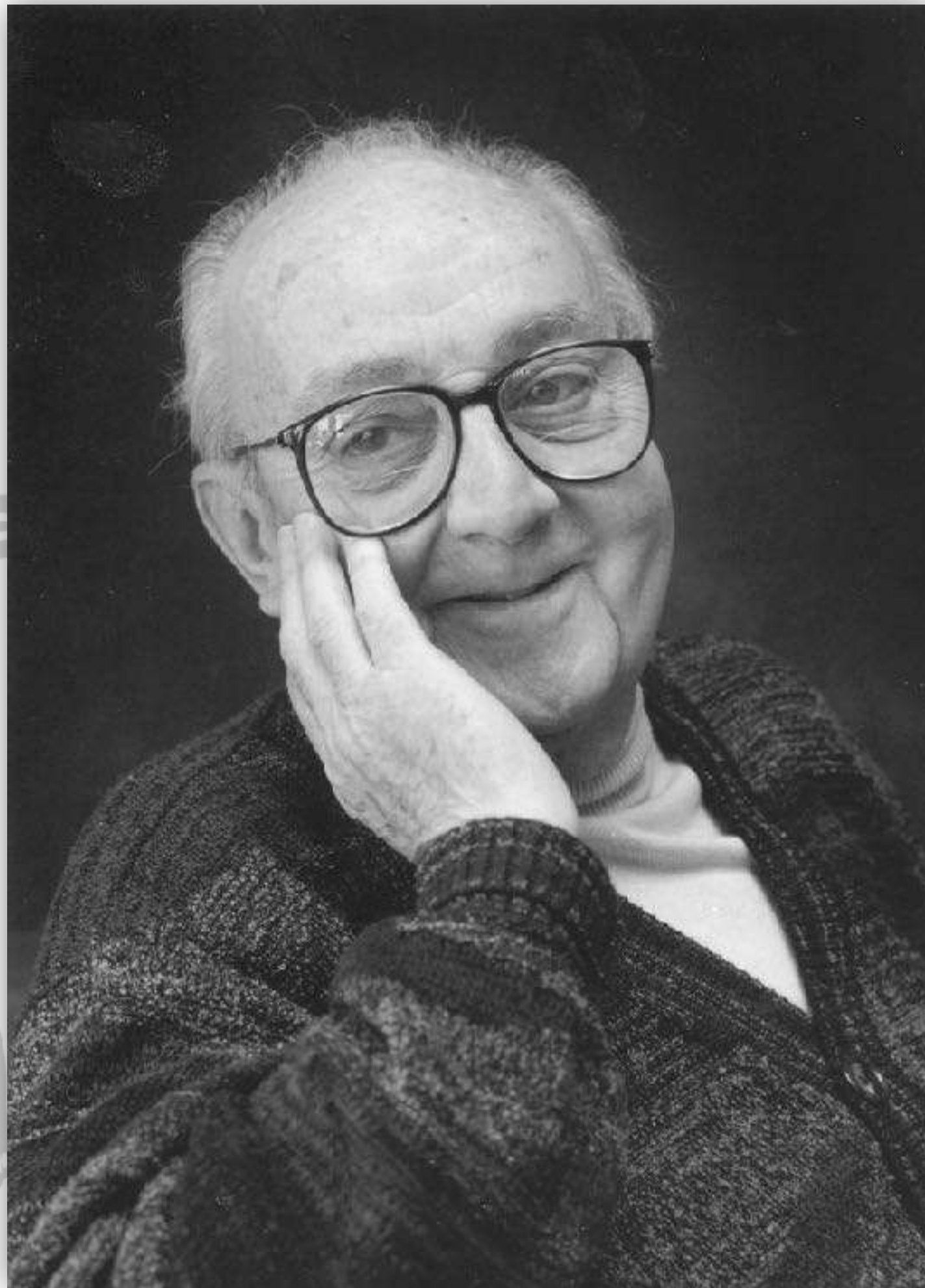


***Les Zones
d'Entraînement***



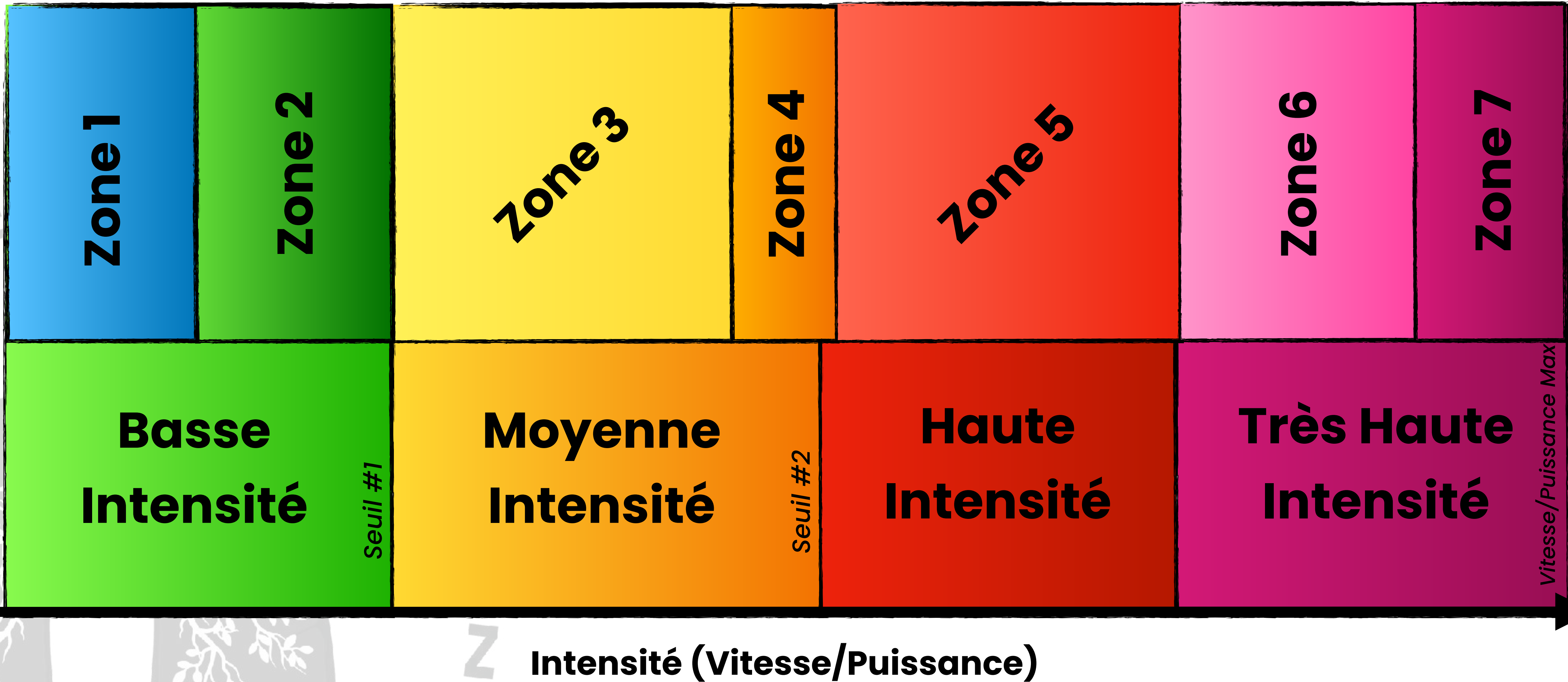
***Les Zones
Appliquées***

George Box (1919 – 2013)



***“Tous les modèles sont faux
mais certains sont utiles”***

Les Zones d'Entraînement

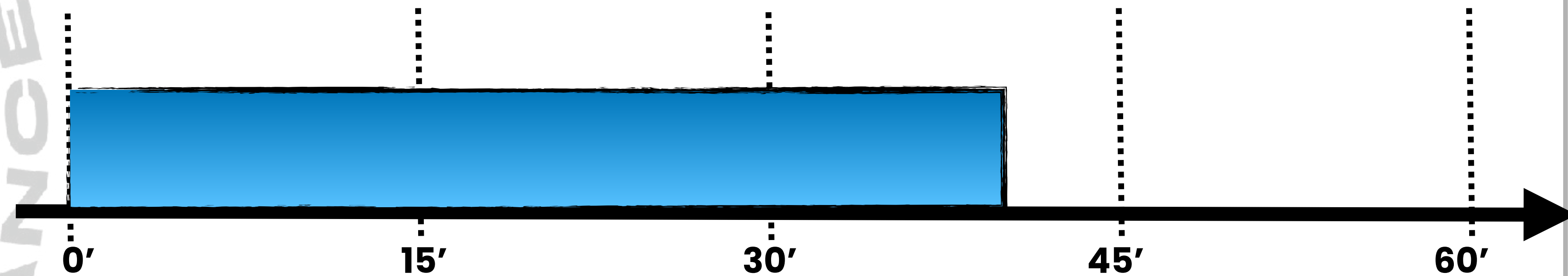
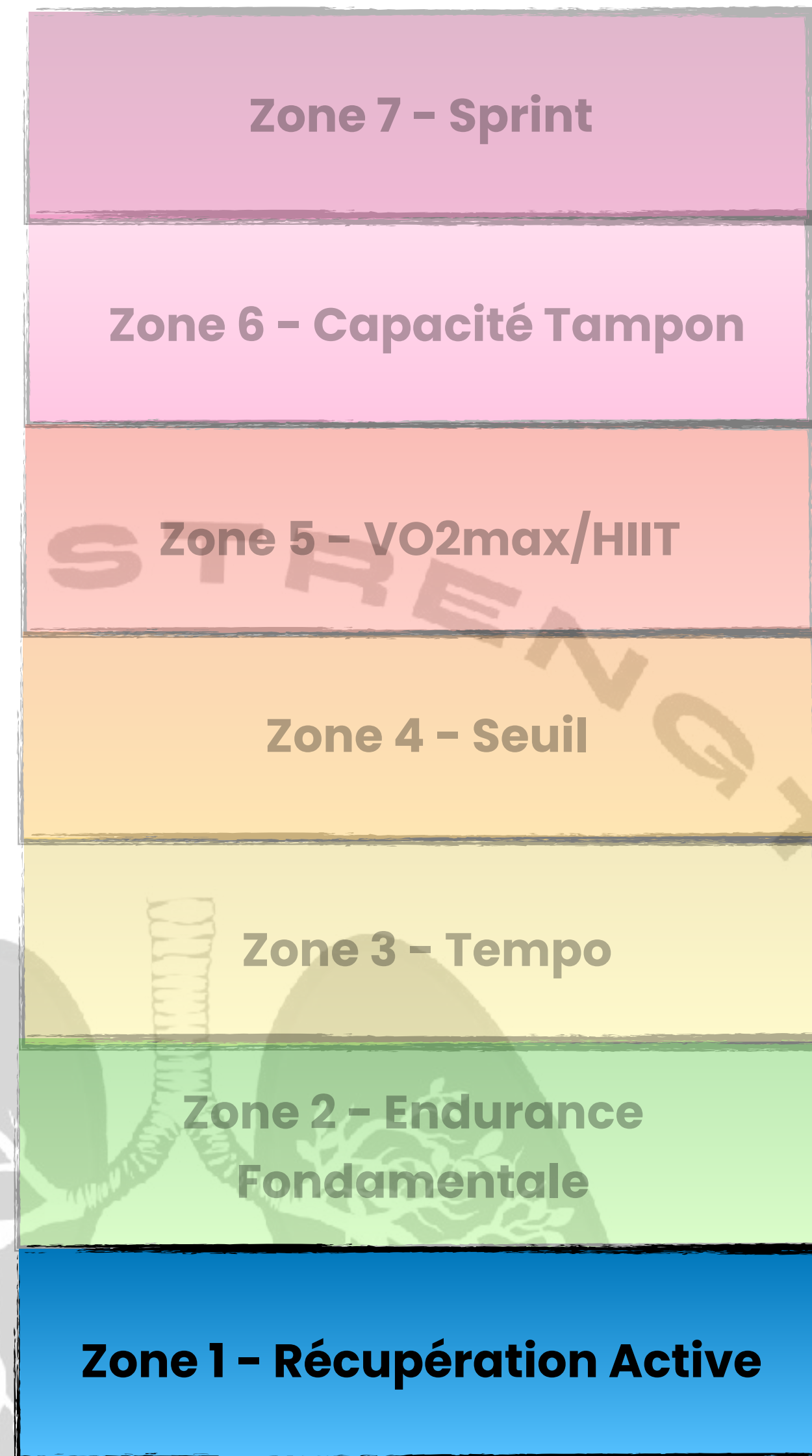




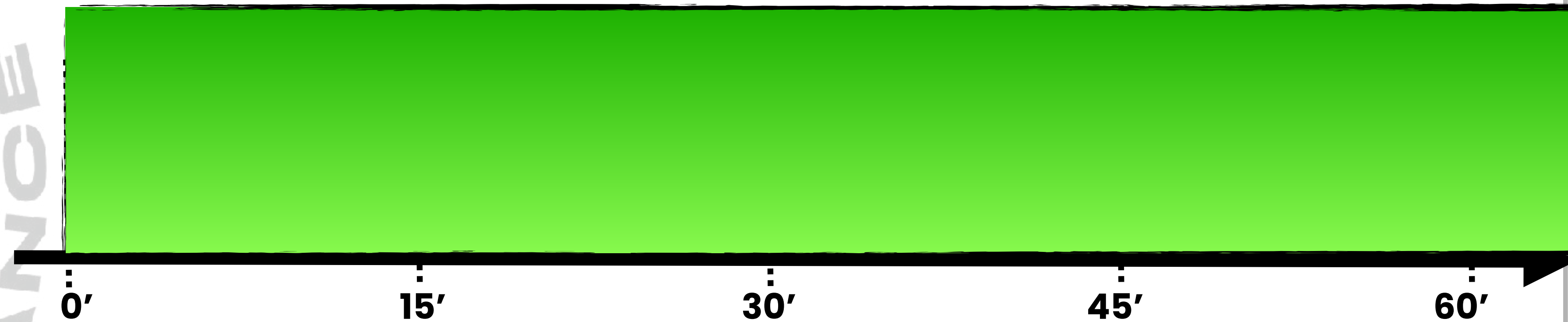
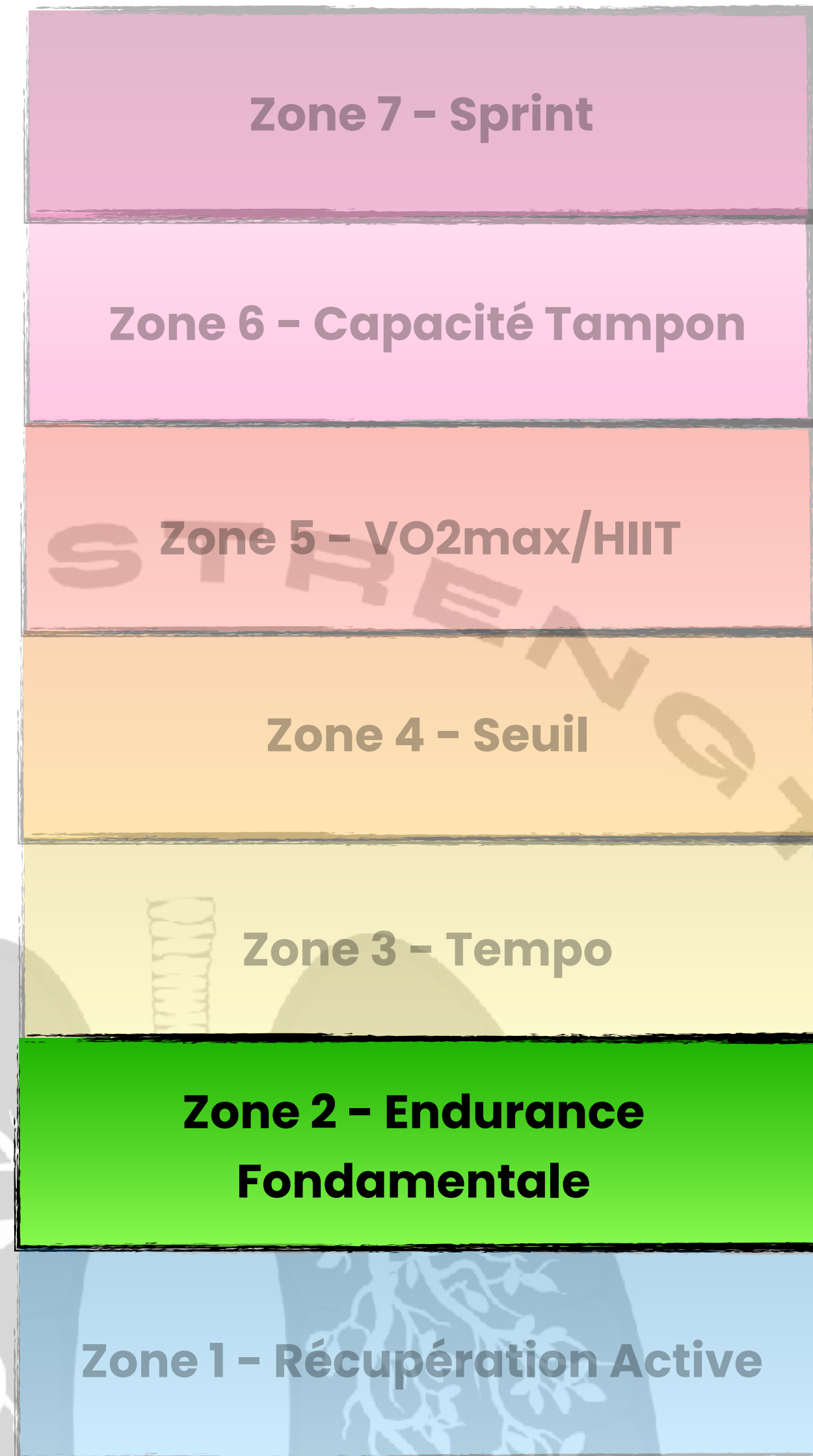
Les Zones d'Entraînement

Zone	Travail:Repos	Durée d'intervalle	Volume / séance
Zone 7 – Sprint	1:8 à 1:20	Sprint Court: 6" à 12" Sprint Interval Training: 15–30"	Sprint Court: 3 à 10 reps SIT: 2 à 4 reps
Zone 6 – Capacité Tampon	1:3 à 1:4	45" à 2'	3 à 5 reps
Zone 5 – VO2max/HIIT	2:1 à 1:1	Fractionné: 20" à 60" Intervalles Longs: 3–5'	Fractionné: 2–4x8–15reps Intervalles Longs: 10–25' total
Zone 4 – Seuil	4:1 à 3:1	6' à 12'	10' à 60' total
Zone 3 – Tempo	4:1 à 3:1	8' à 30'	15' à 120' total
Zone 2 – Endurance Fondamentale	10:1 à NA	20' à >60'	20' à 7h total
Zone 1 – Récupération Active	NA	20–60'	20–60'

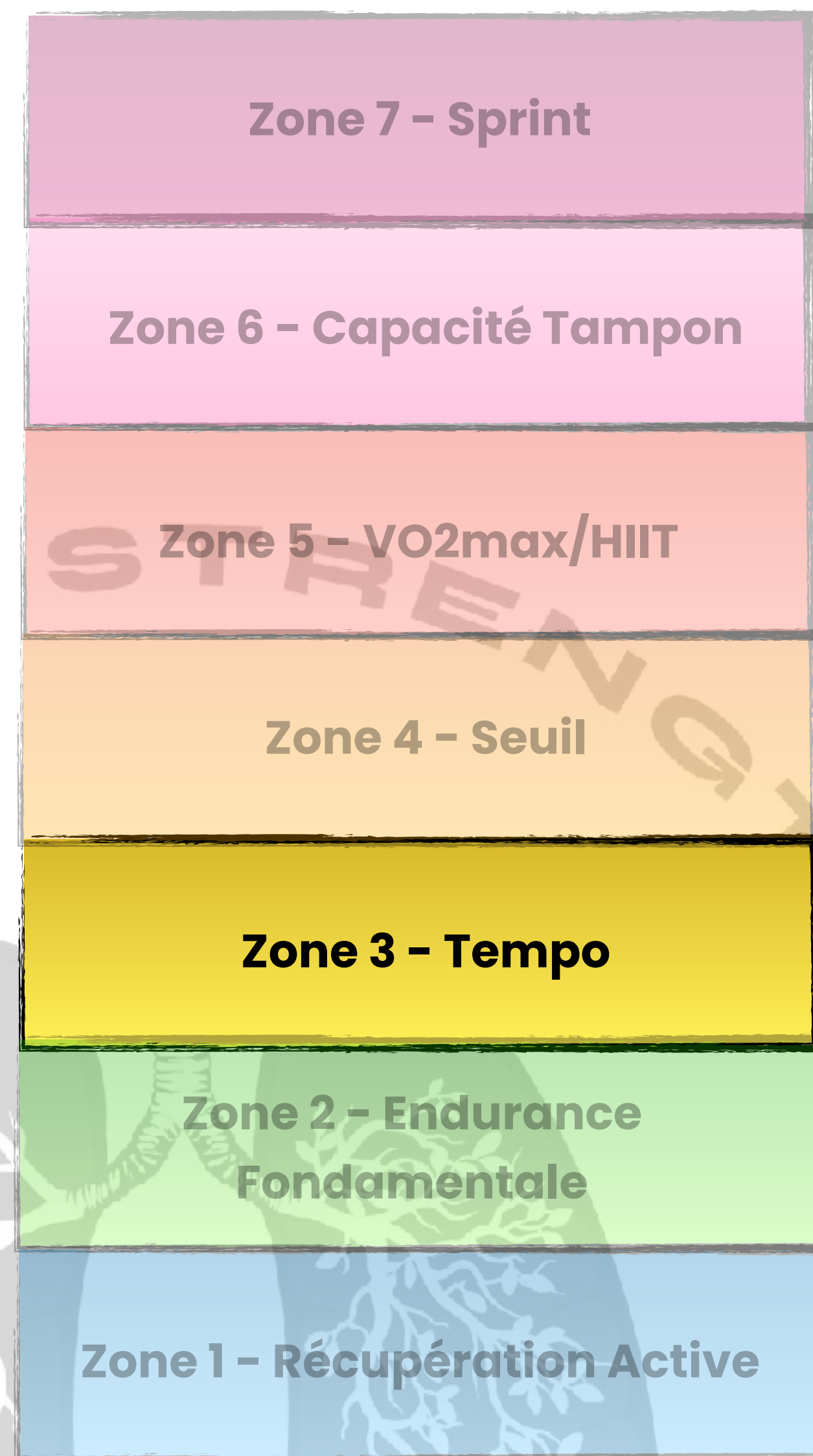
Récupération Active



Endurance Fondamentale

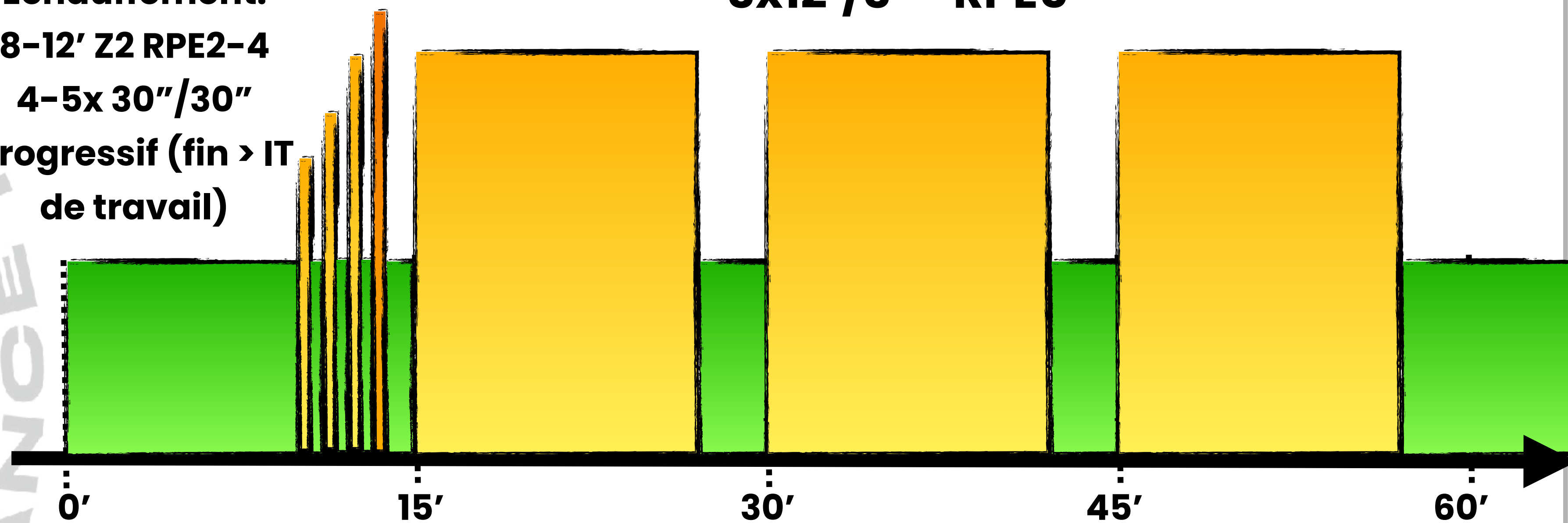


Tempo "long"

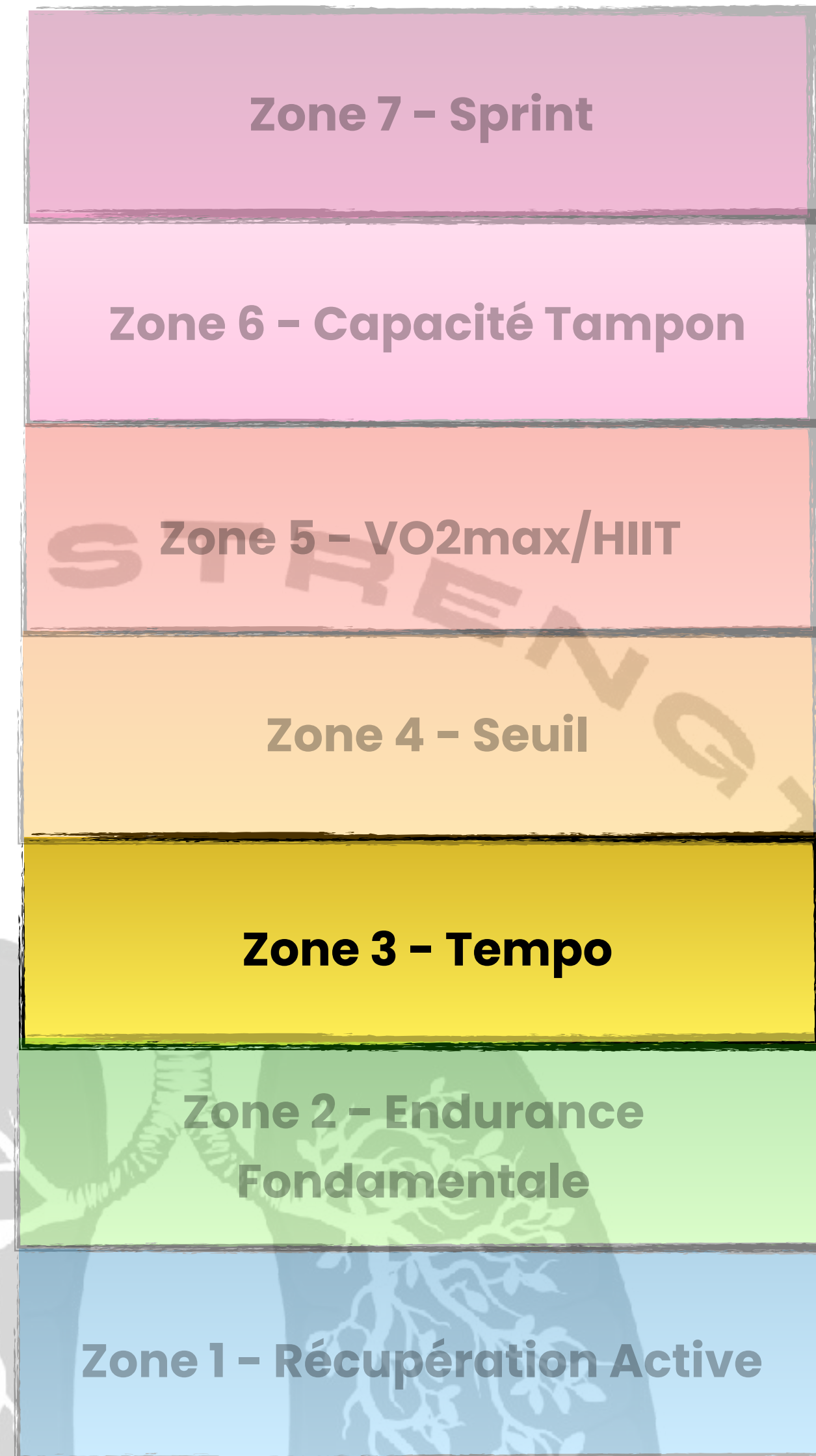


Échauffement:
8-12' Z2 RPE2-4
4-5x 30"/30"
progressif (fin > IT
de travail)

3x12'/3' - RPE5

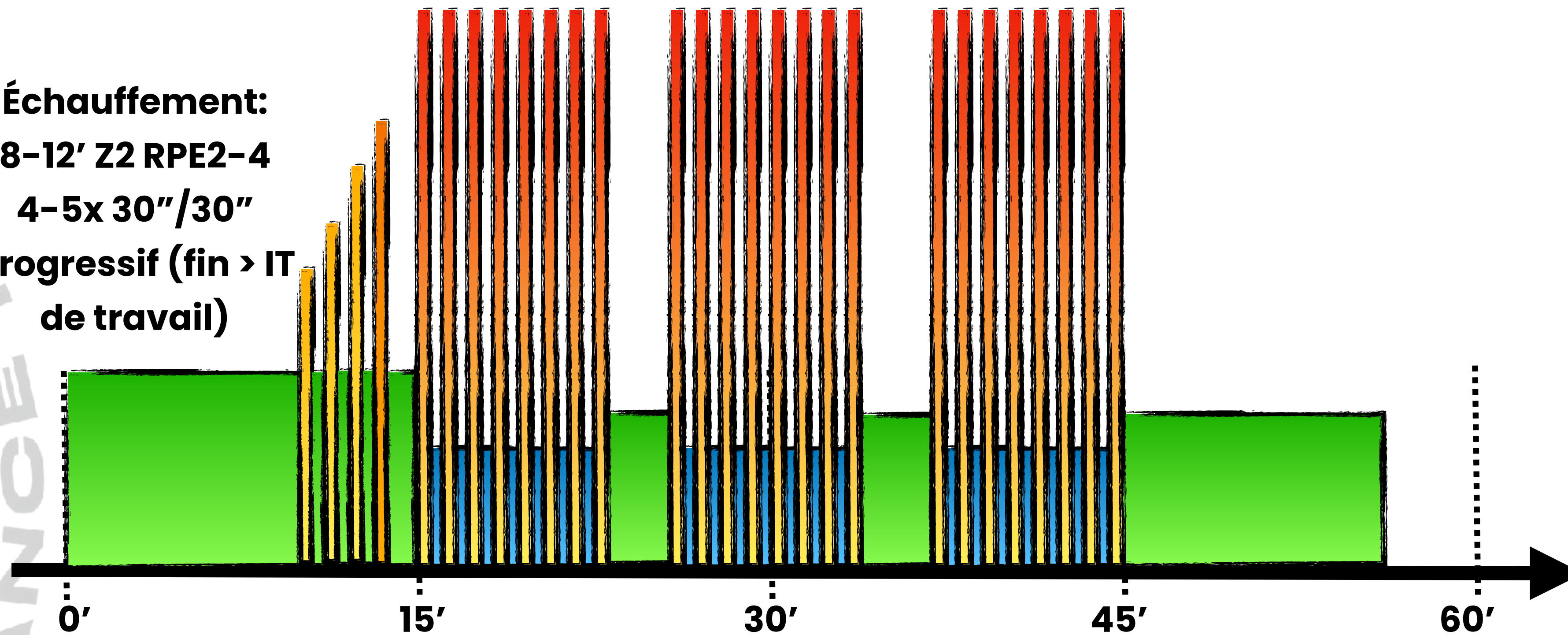


Tempo "court"

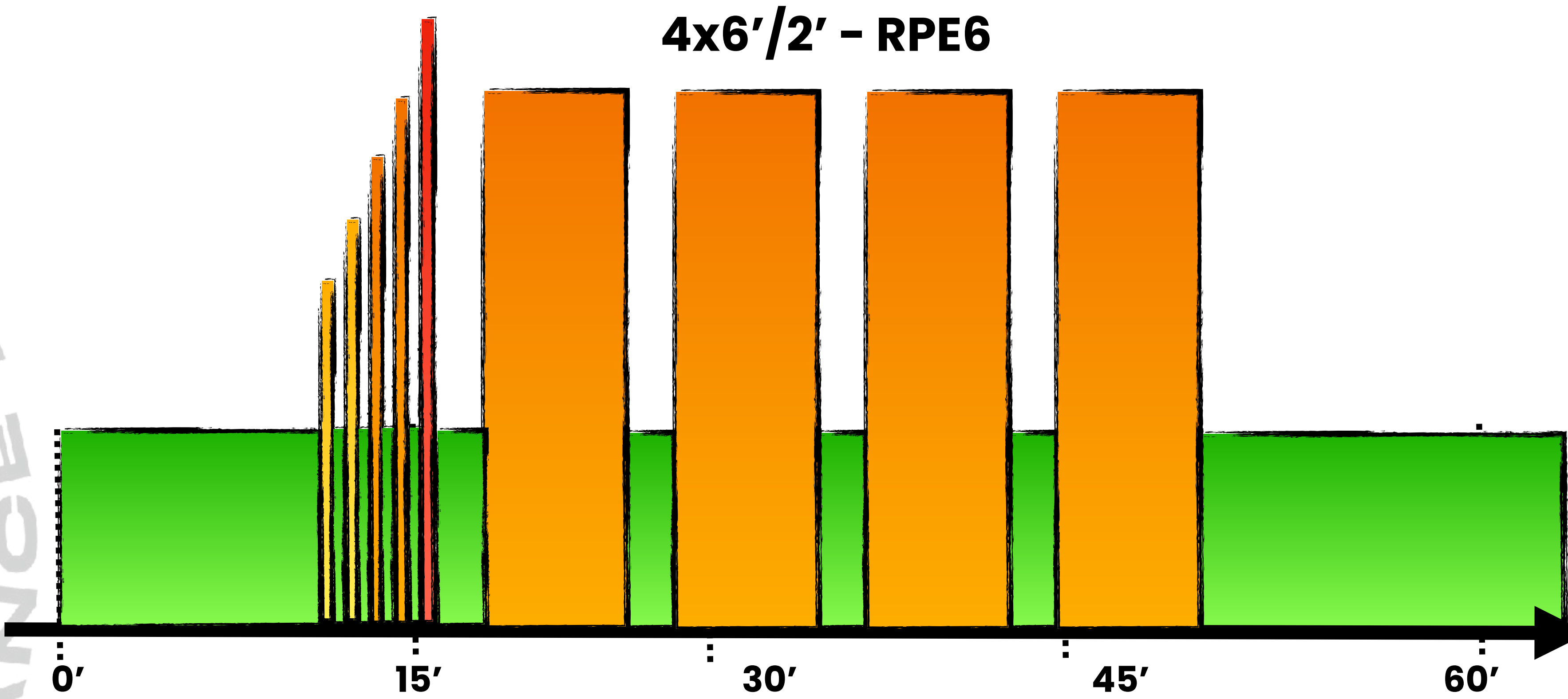
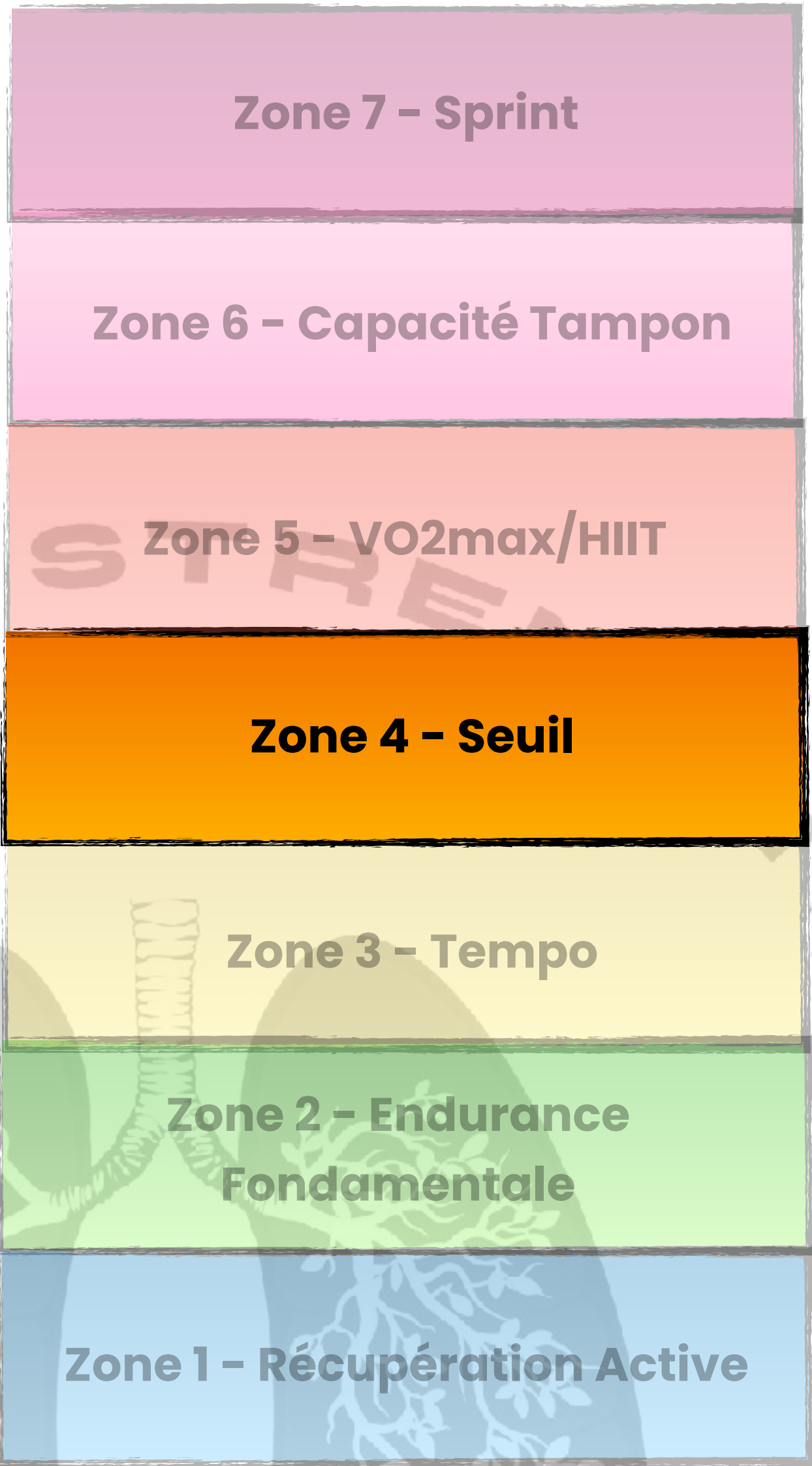


3x8x20"/40"/4' - RPE5

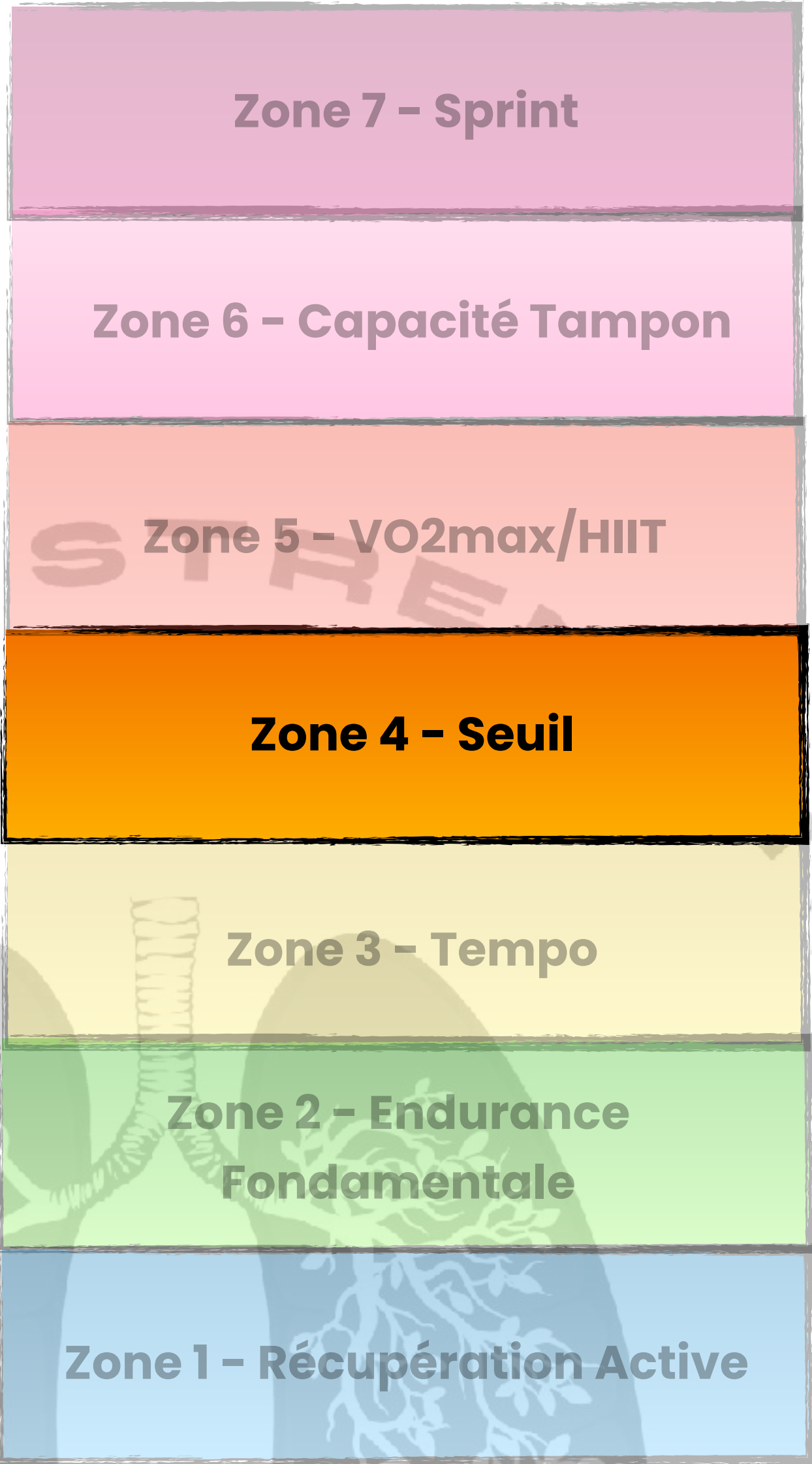
Échauffement:
8-12' Z2 RPE2-4
4-5x 30"/30"
progressif (fin > IT
de travail)



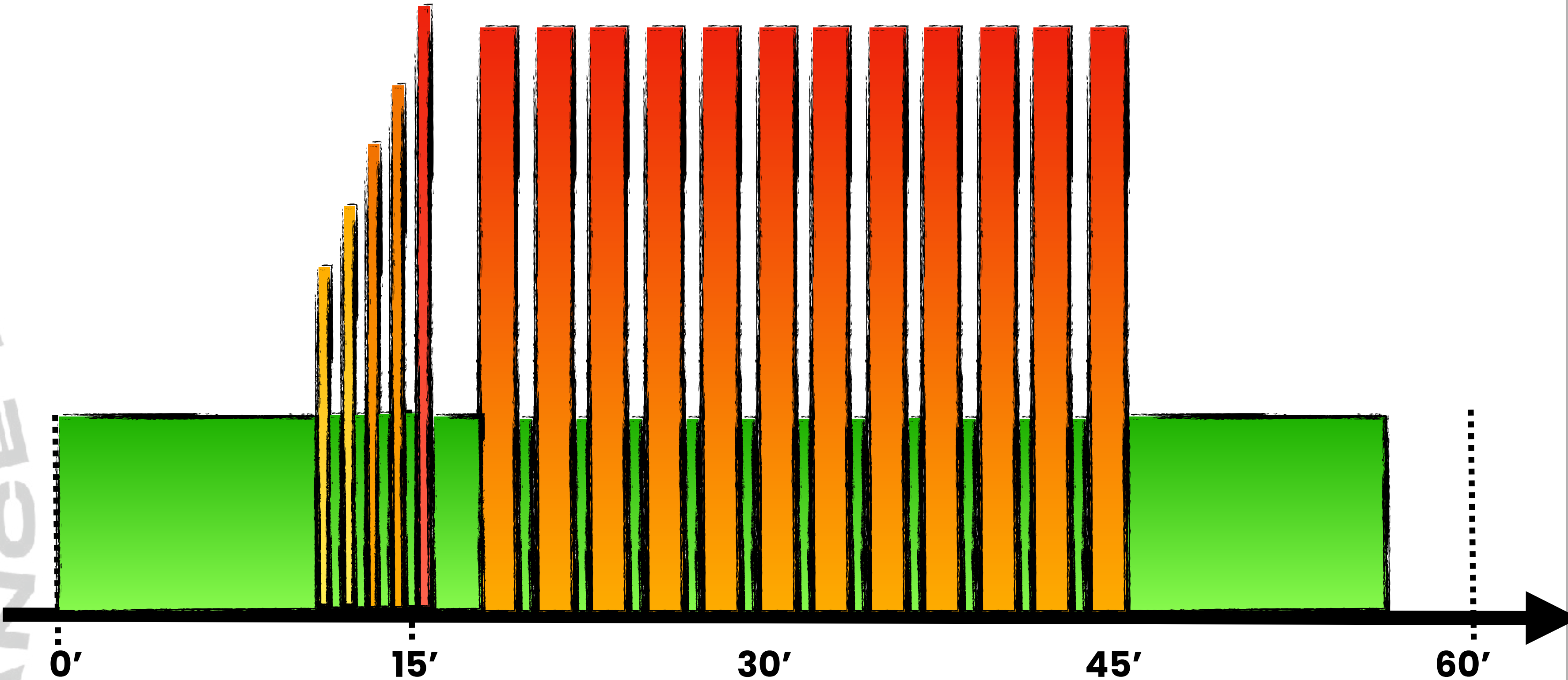
Seuil “long”



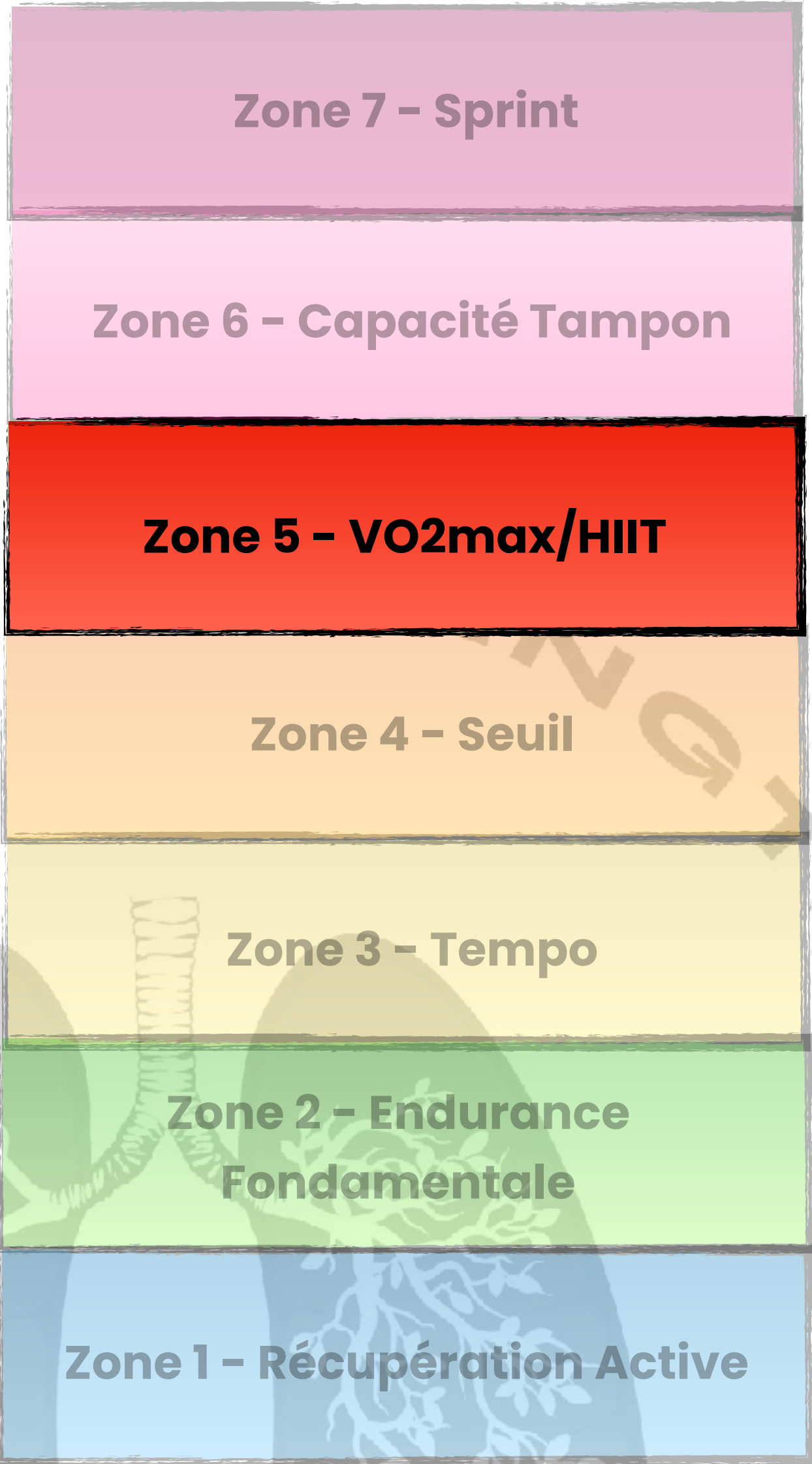
Seuil "court"



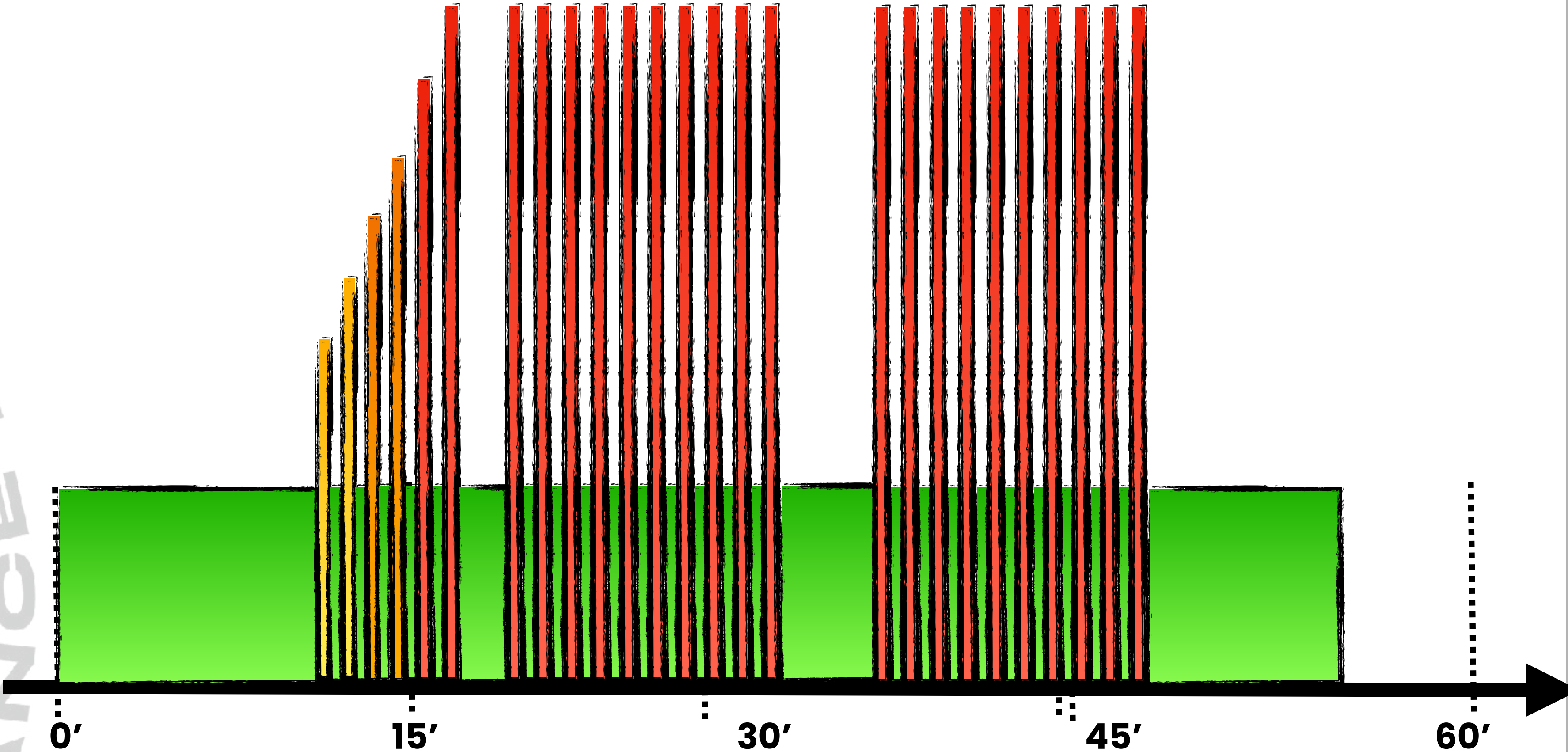
12x1:30/30" - RPE7



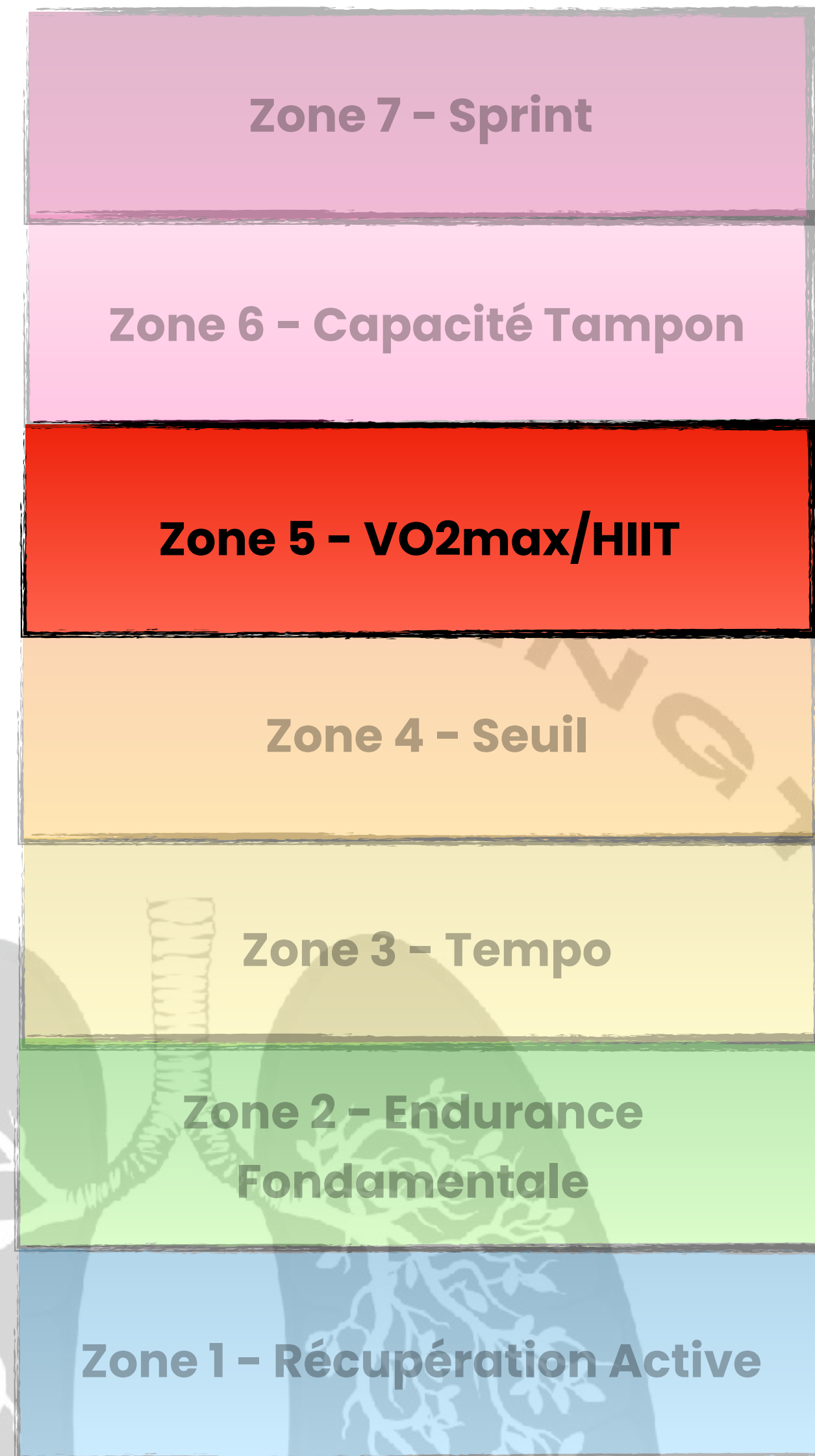
VO2max "court"



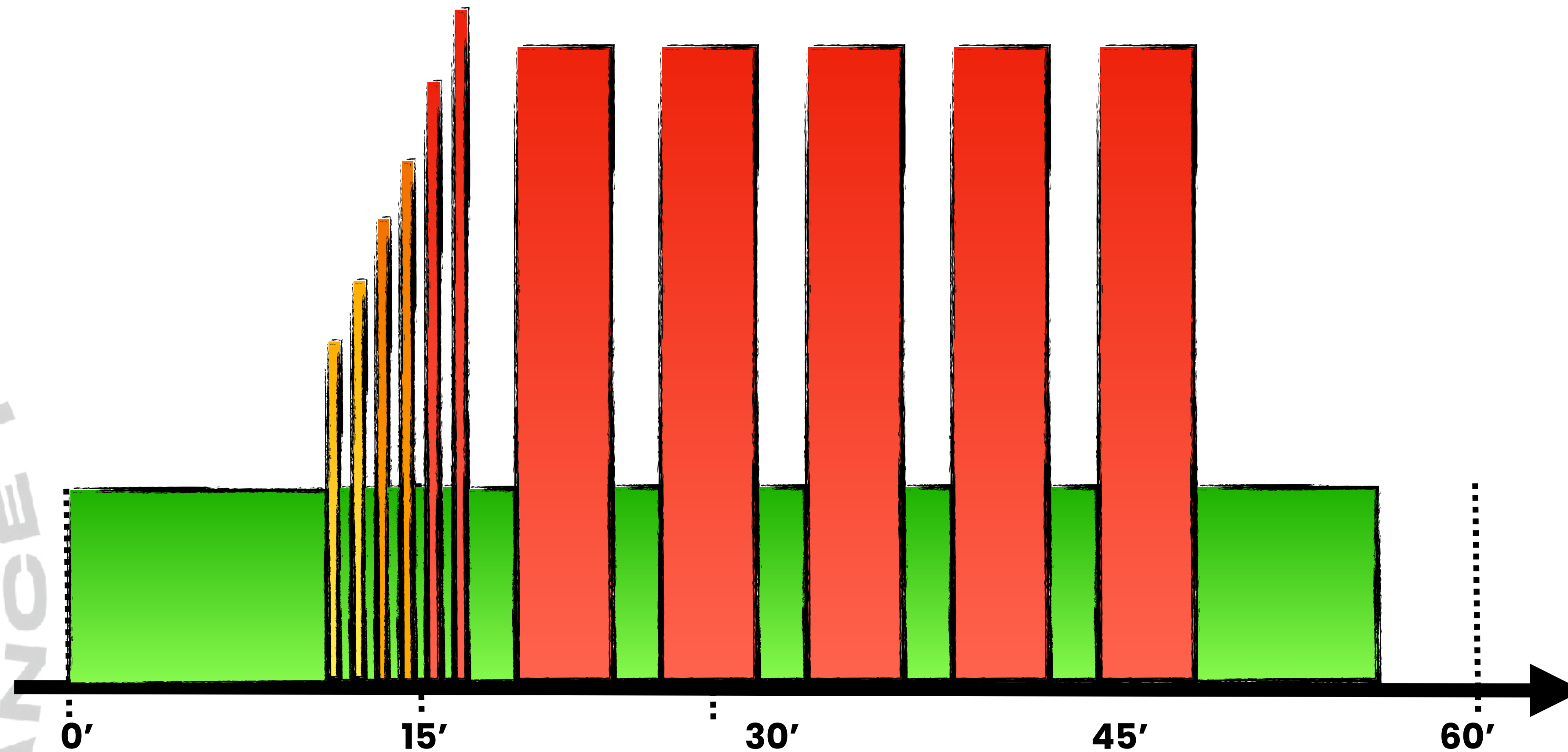
2x10x30"/30" RPE8



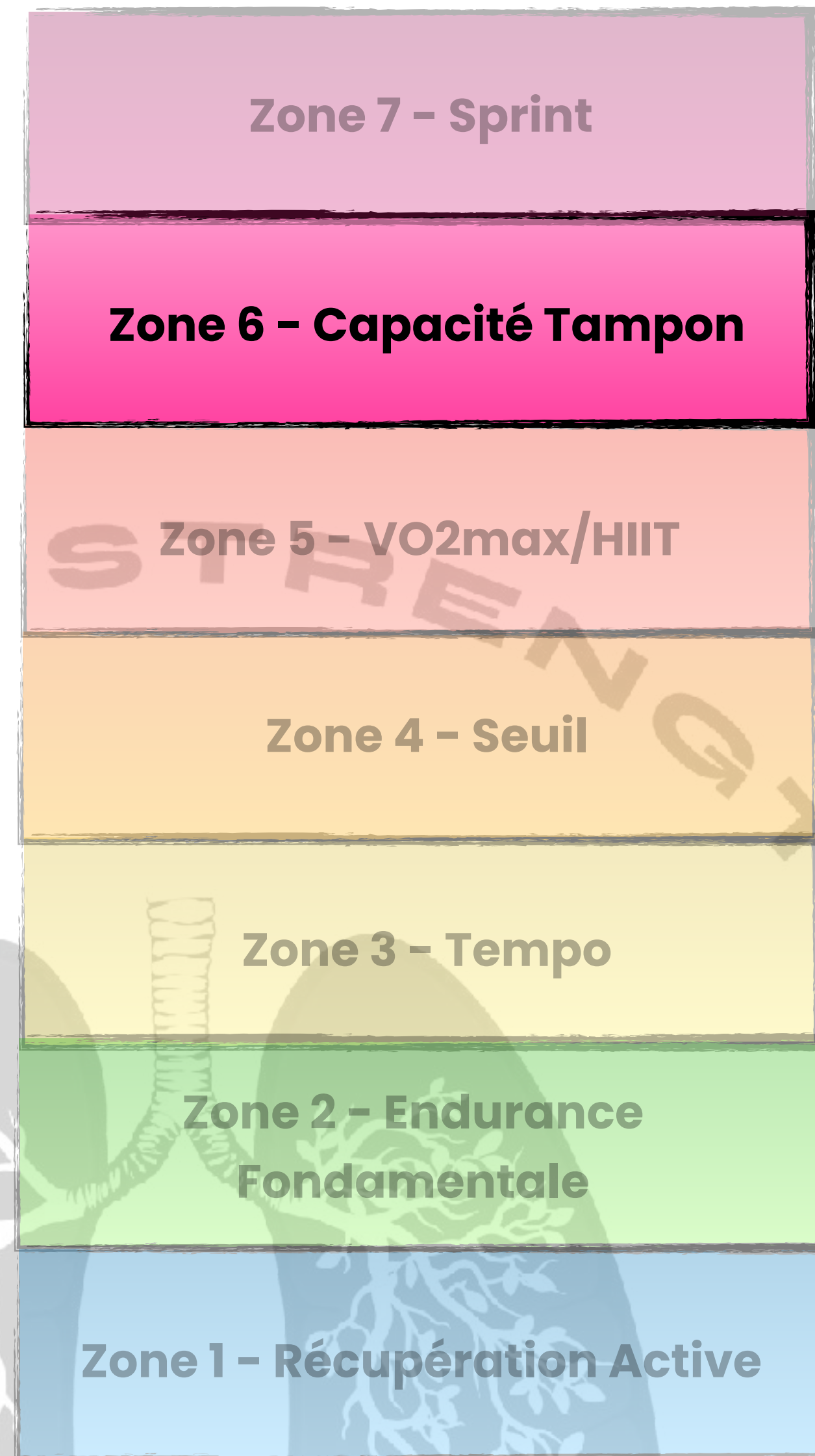
VO2max "long"



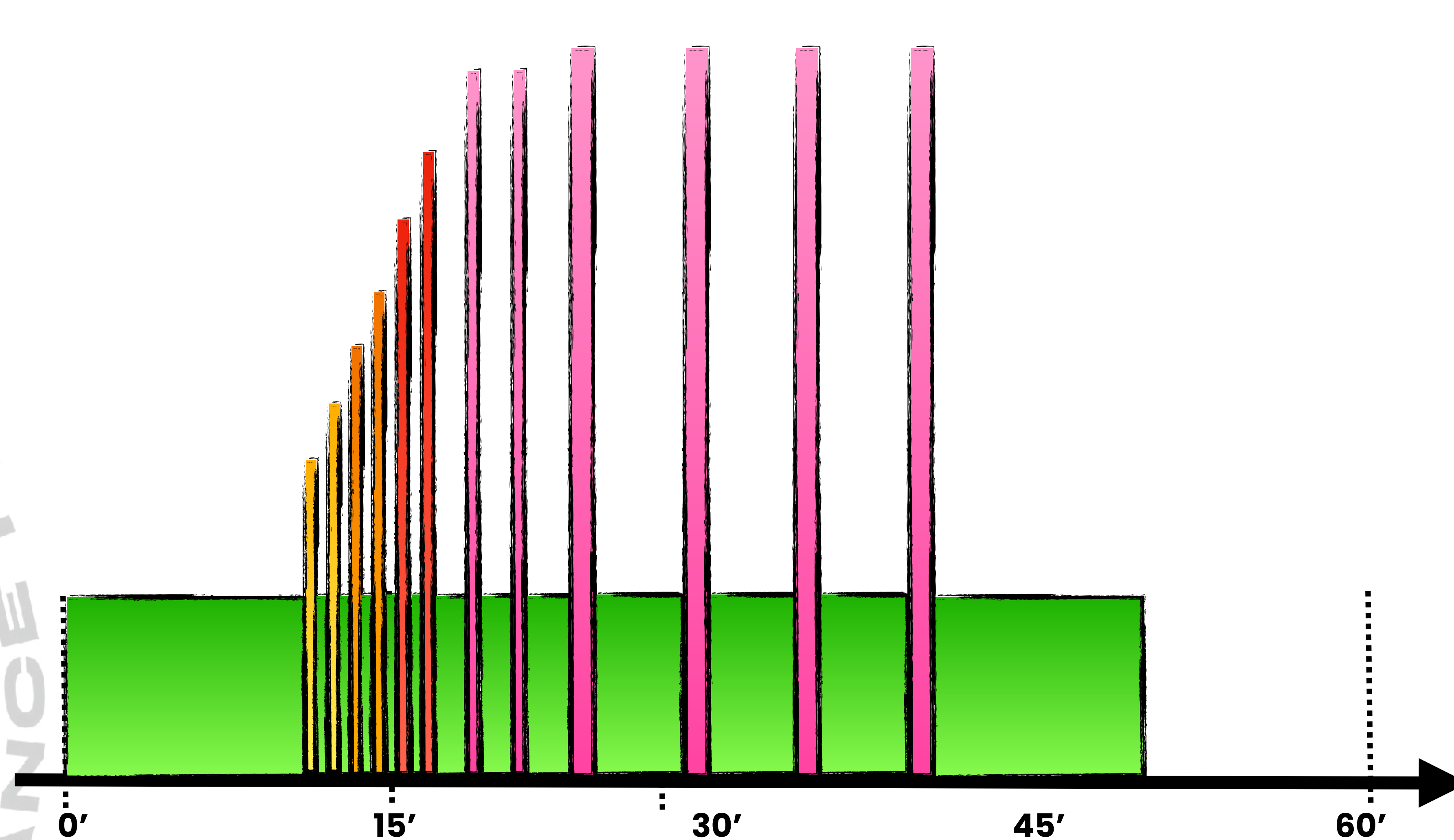
5x4'/2' - RPE8



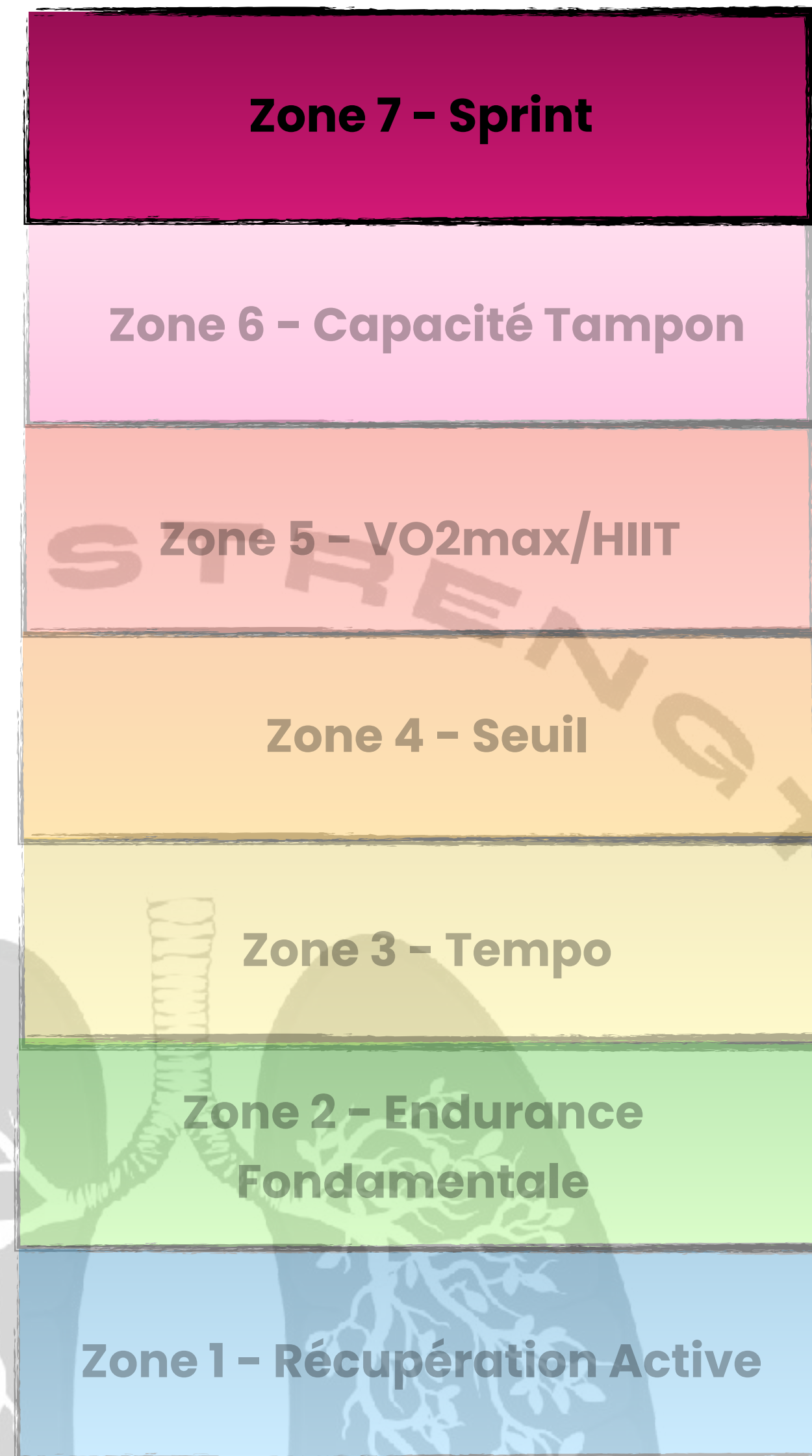
Capacité Tampon



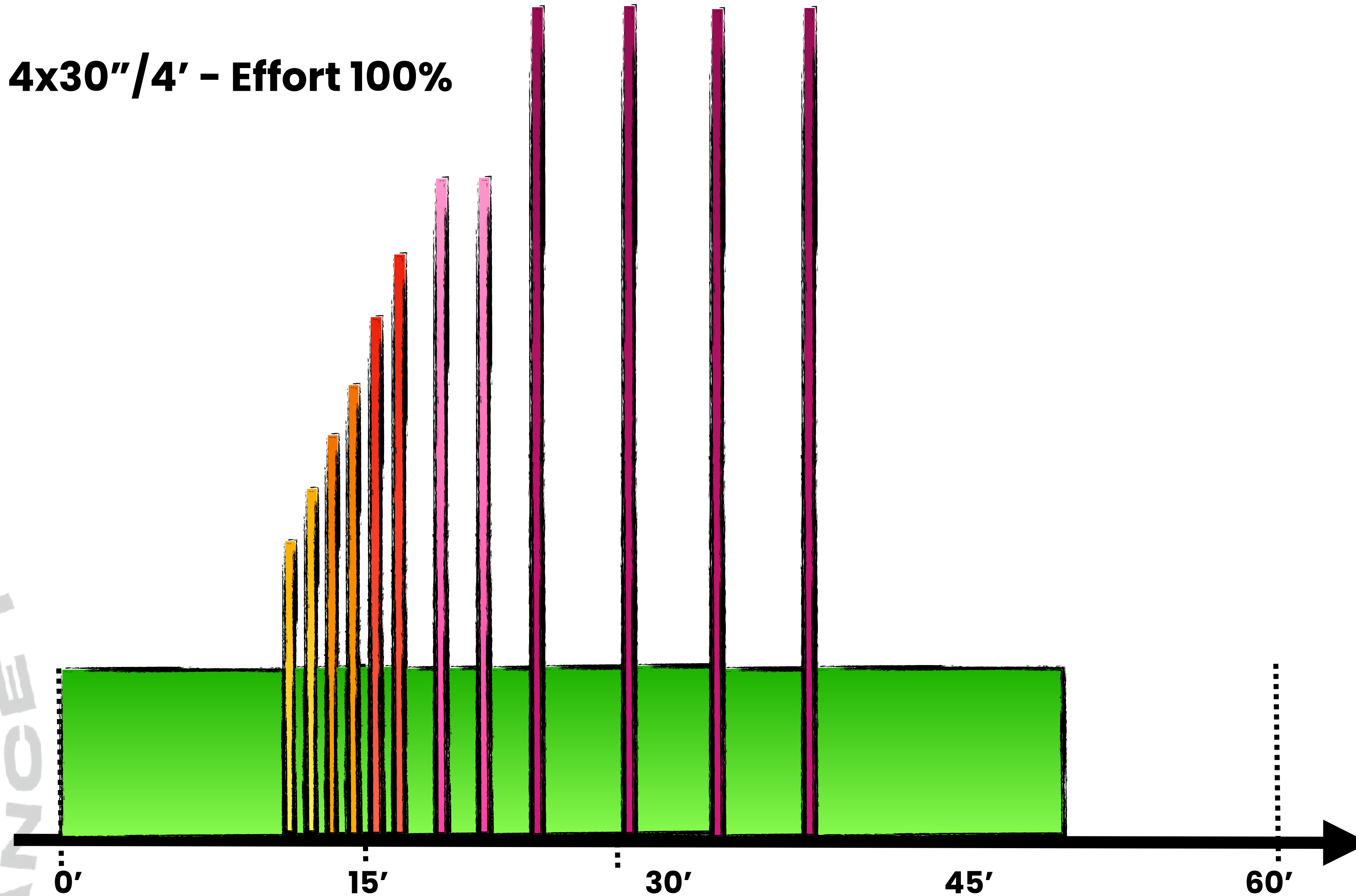
4x1'/4' - RPE9.5



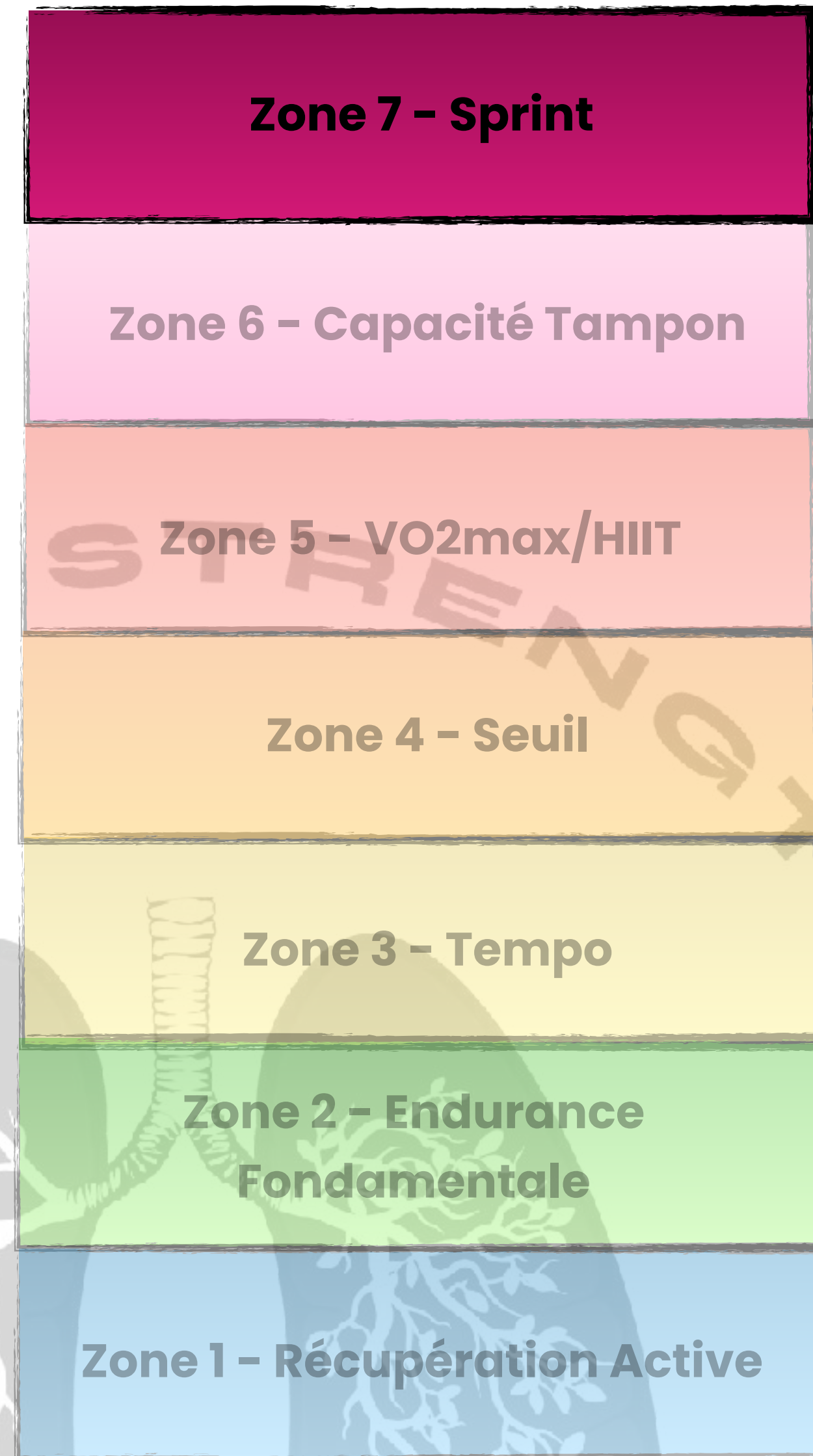
Sprint Interval Training (SIT)



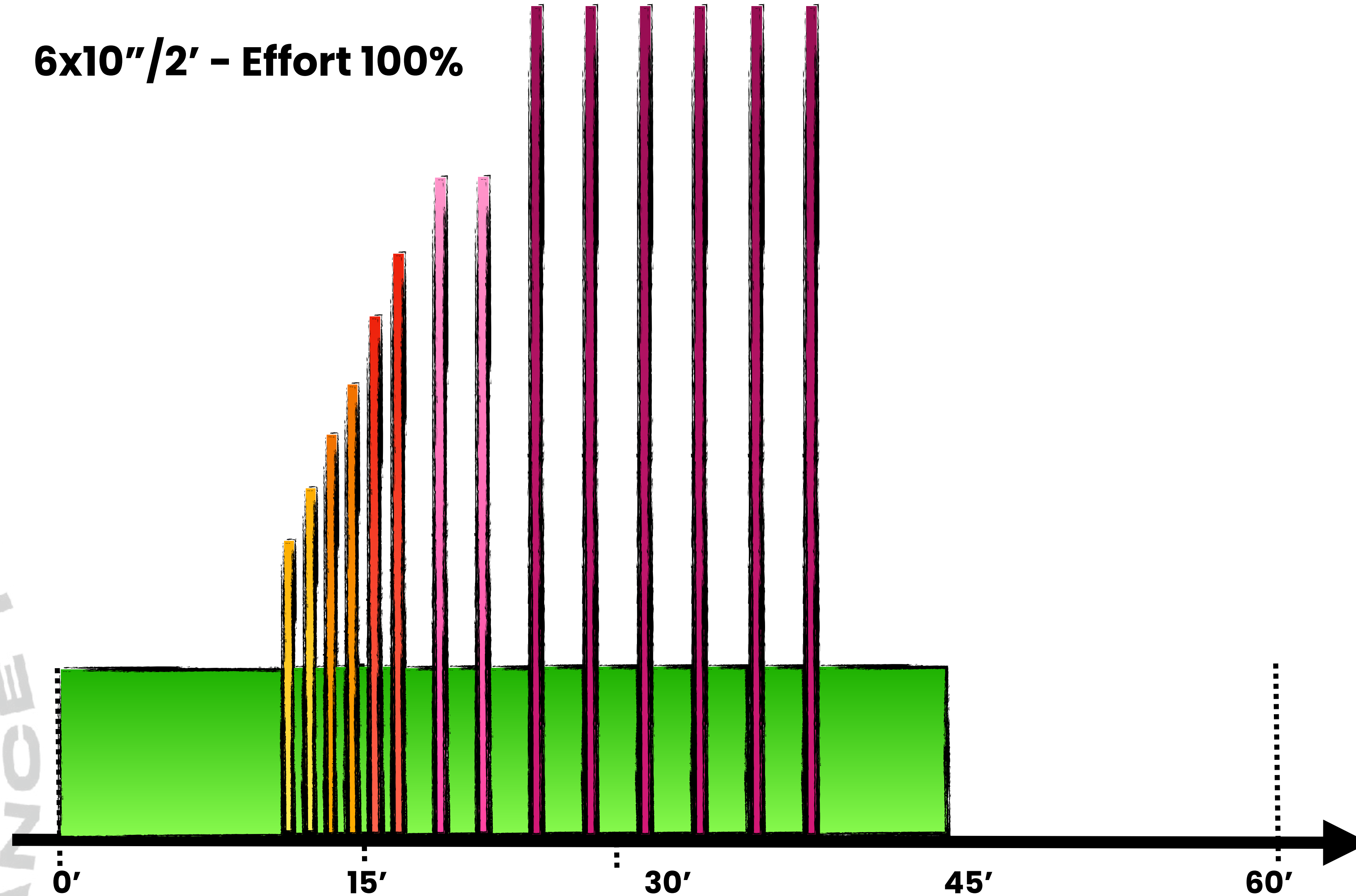
4x30"/4' - Effort 100%



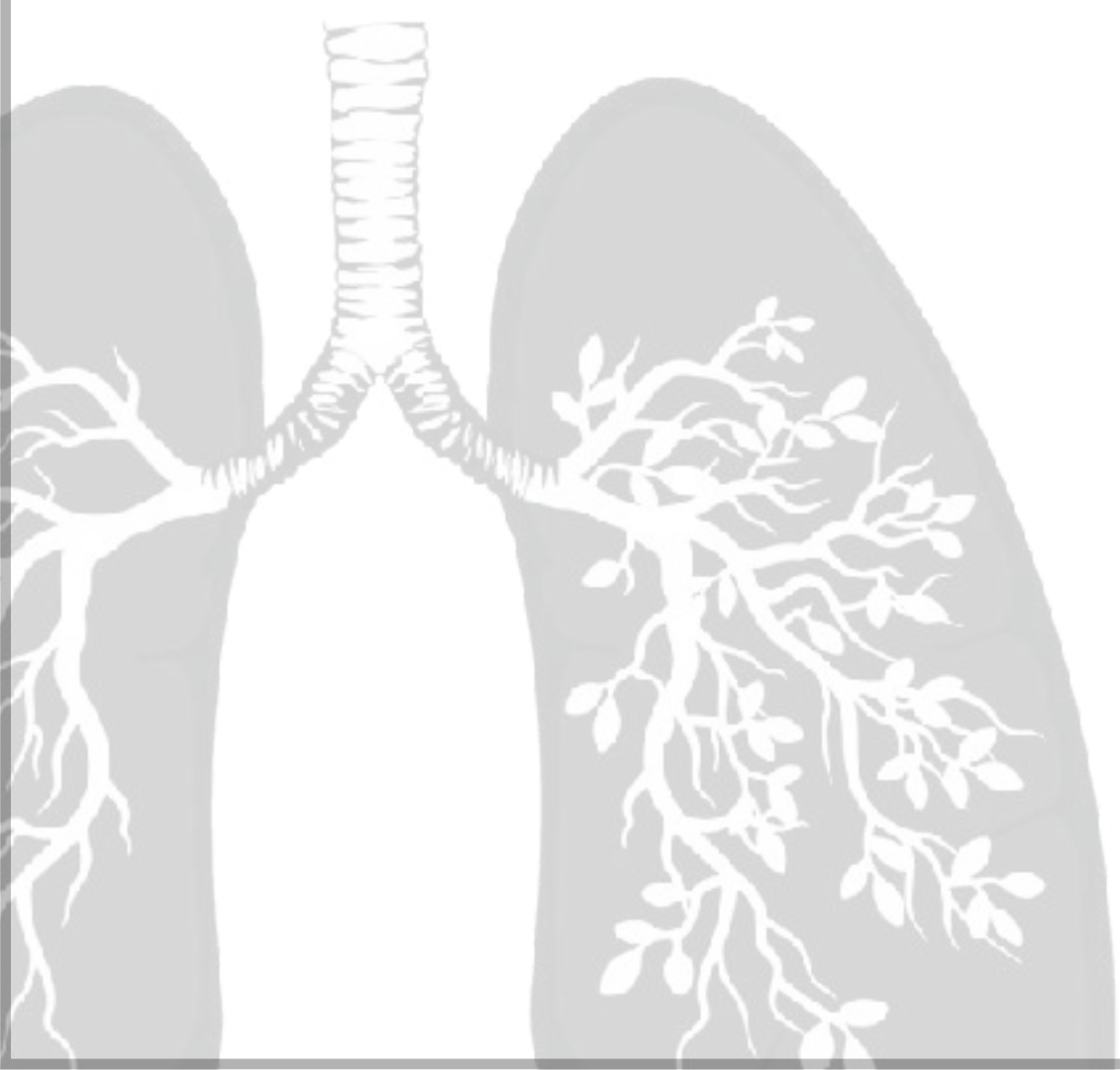
Sprint Court



6x10"/2' – Effort 100%

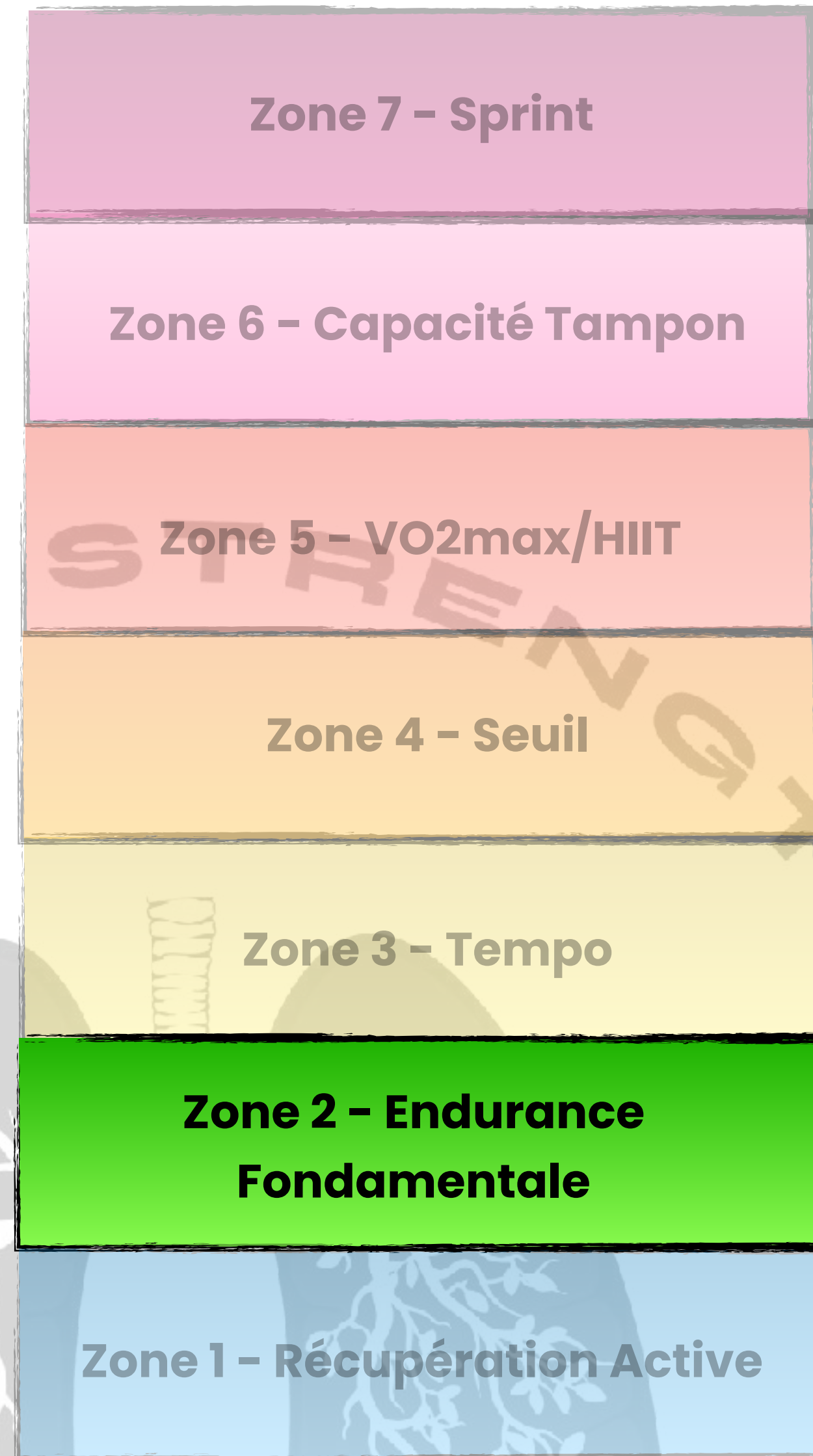


***Quel volume de séance par
zone d'entraînement?***



STRENGTH
ANCE

Endurance Fondamentale



- A) 750m à 1500m - 3x 10x25m/15"
- B) 1200m à 2000m - 3x 10x50m/20"
- C) >2000m - 3x 4x200m/2'



- A) 10' (f) à 30' (f) - 10x2'/1'
- B) 30' à 1h30
- C) 30' à >2h

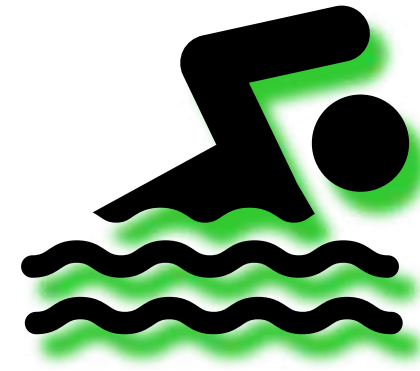
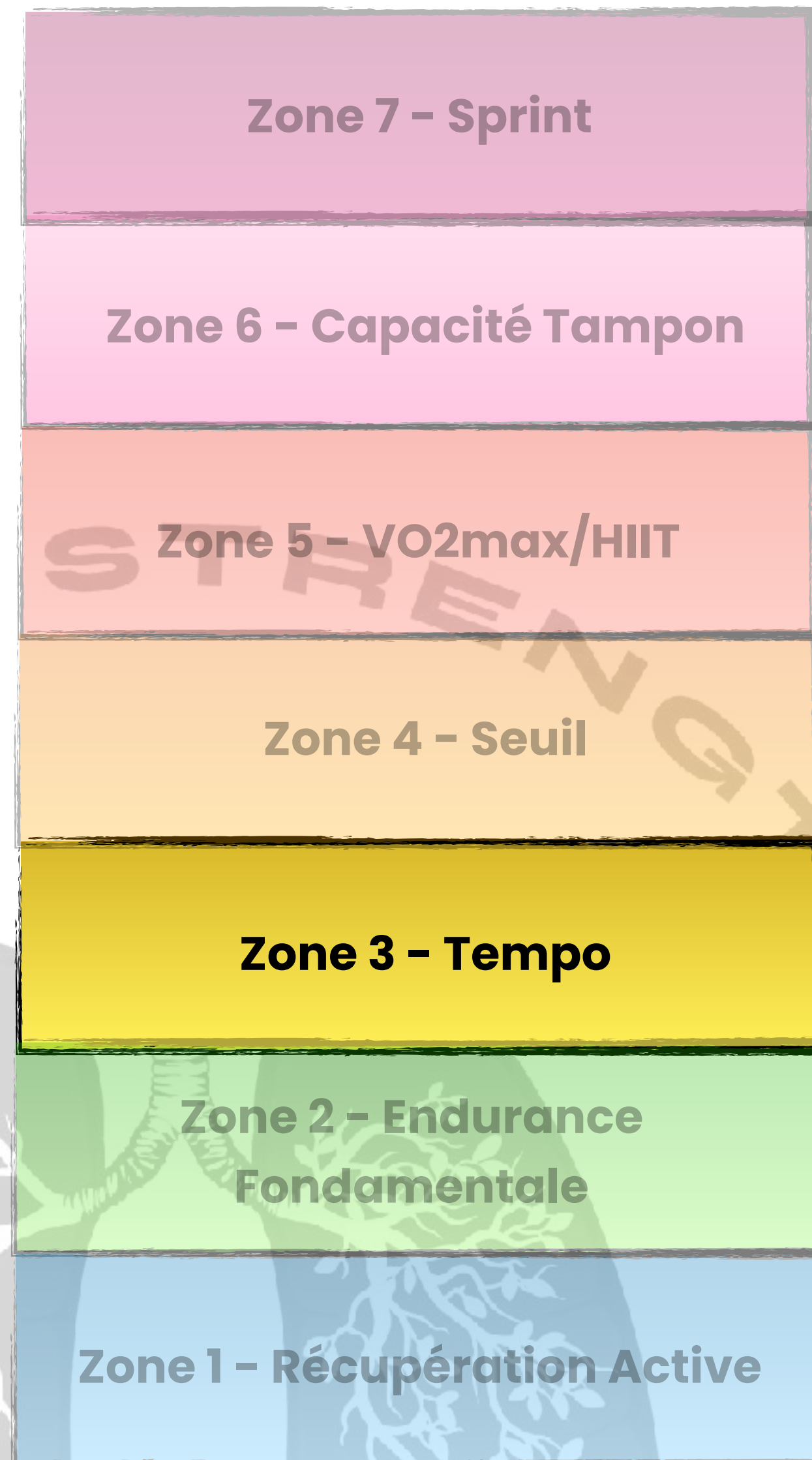


- A) 20' à 40'
- B) 40' à 1h30
- C) 30' à >3h



- A) 10-30' - 3x10'/2'
- B) 30-60' - 3x20'/2'
- C) >60' - 3x30'/3'

Tempo



- A) 300m à 600m – 15x25m
- B) 500 à 800m – 2x 5x50m
- C) >800m – 10x 100m



- A) 10' à 20' – 2x5'/1'
- B) 20' à 40' – 3x10'/2'
- C) >40' – 3x20'/4'



- A) 15' à 30' – 2x8'/2'
- B) 30' à 1h15 – 3x20'/4'
- C) >1h30 – 3x30'/7'



- A) 10' à 20' – 4x3'/1'
- B) 20' à 40' – 3x10'/2'
- C) >40' – 4x15'/4'

Seuil



A) 200m à 300m – 4x50m

B) 300 à 500m – 6x75m

C) >500m – 5x 100m



A) 8' à 16' – 2x4'/1'

B) 15' à 30' – 3x8'/2'

C) >30' – 4x10'/3'



A) 10' à 20' – 2x5'/1'

B) 20' à 40' – 3x10'/2'

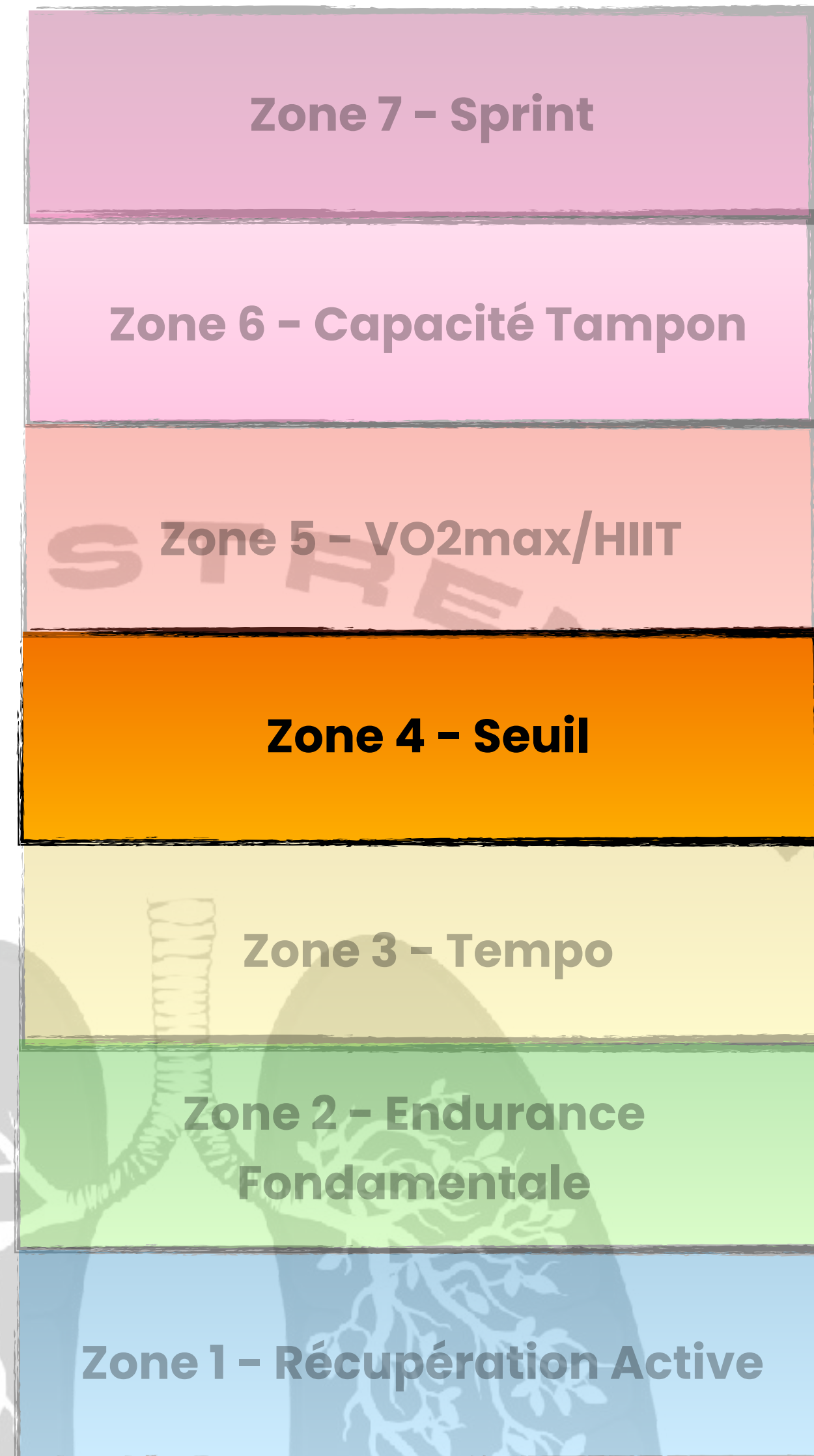
C) >40' – 6x10'/3'



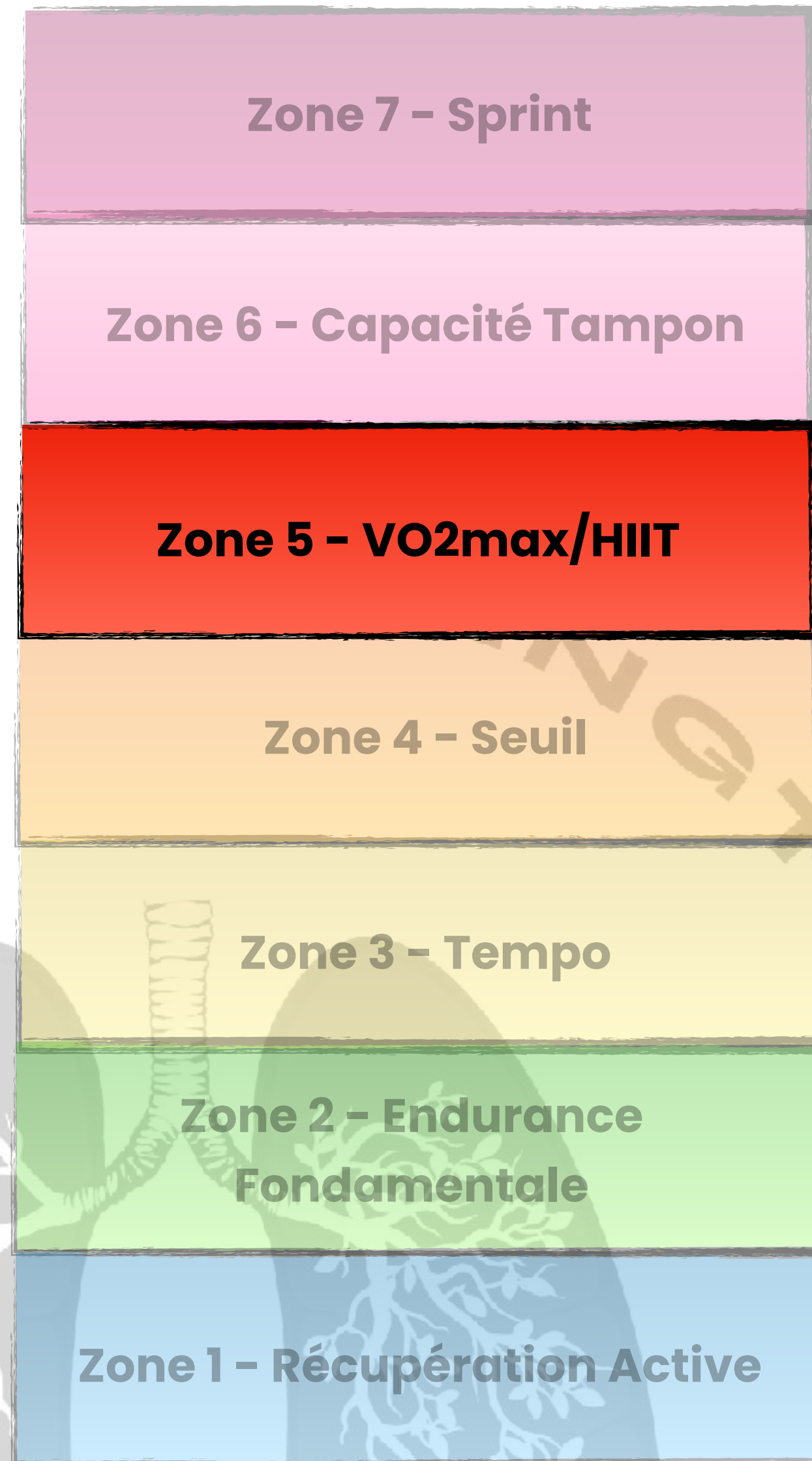
A) 8' à 16' – 2x4'/1'

B) 15' à 30' – 3x8'/2'

C) >30' – 4x10'/3'



VO2max



- A) 150m à 250m - 8x25m
- B) 300 à 600m - 2x8x25m
- C) >600m - 2x7x50m



- A) 5' à 10' - 2x10x30"/30" OU 3x3'/3'
- B) 10' à 20' - 3x12x30"/30" OU 4x4'/3'
- C) >20' - 2x (5'/3' + 4'/2:30 + 3'/2' + 2'/1:30)

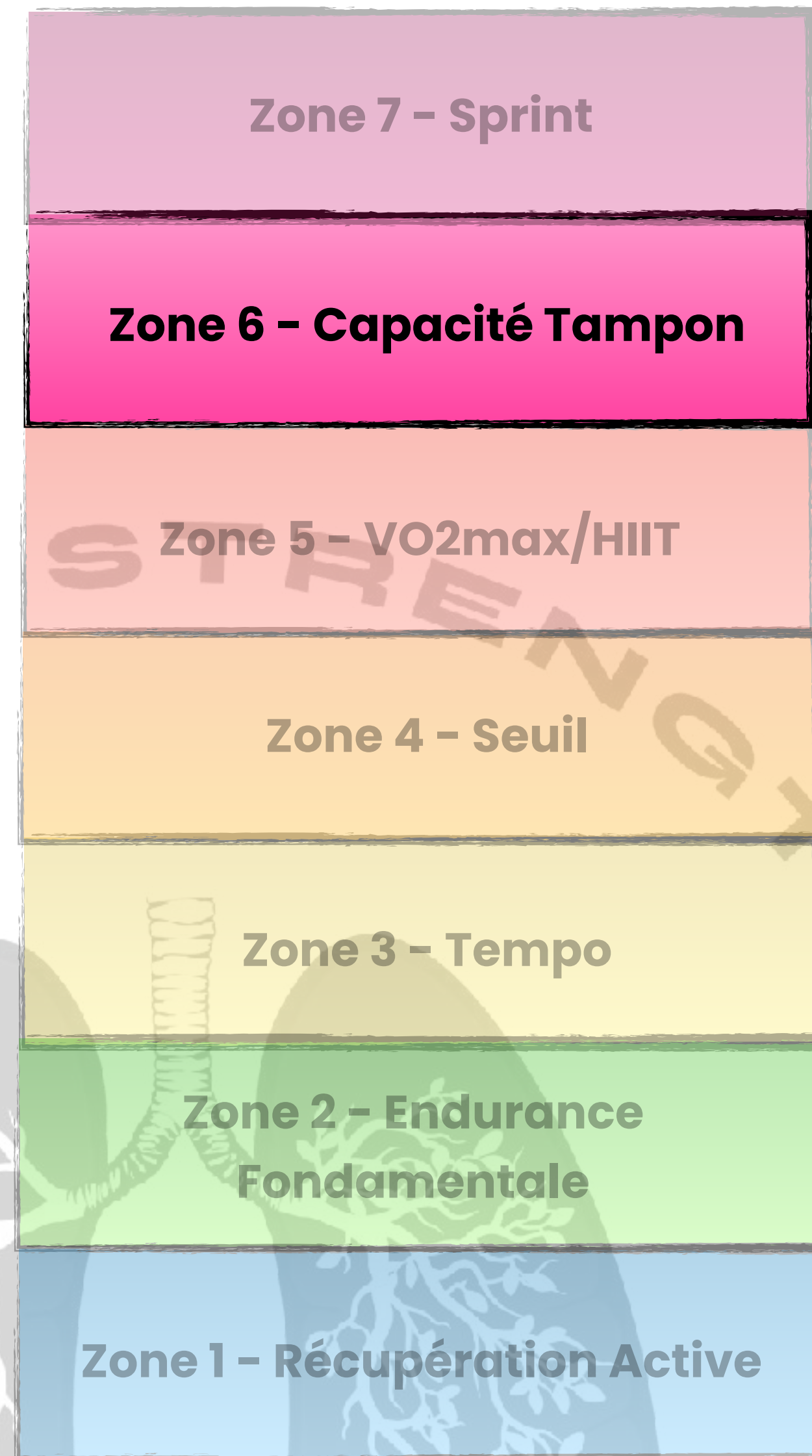


- A) 10' à 15' - 2x10x30"/15" OU 3x4'/3'
- B) B) 15' à 25' - 3x14x30"/15" OU 6x4'/2'
- C) C) >25' - 4x12x40"/20" OU 5x5'/3'



- A) 8' à 12' - 6x2'/2'
- B) 12' à 20' - 8x2'/2'
- C) >20' - 6x4'/2'

Capacité Tampon



2' à 8' – 3x400m/10'

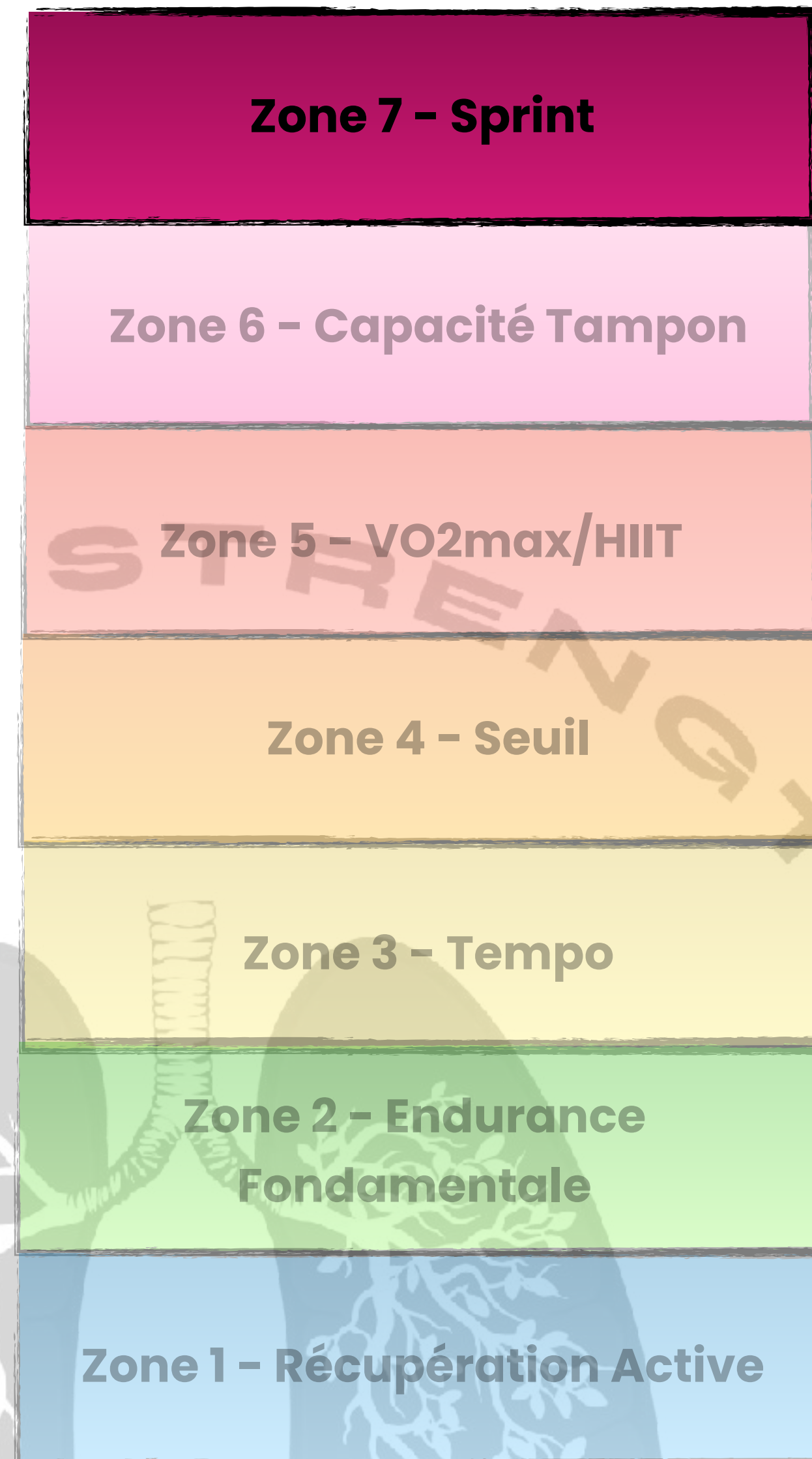


3' à 10' – 3x1:30/5'



3' à 10' – 5x250m/4'

Sprint



SC: 20" à 40" – 5x15m/3'
SIT: 30" à 2' – 4x20"/4'

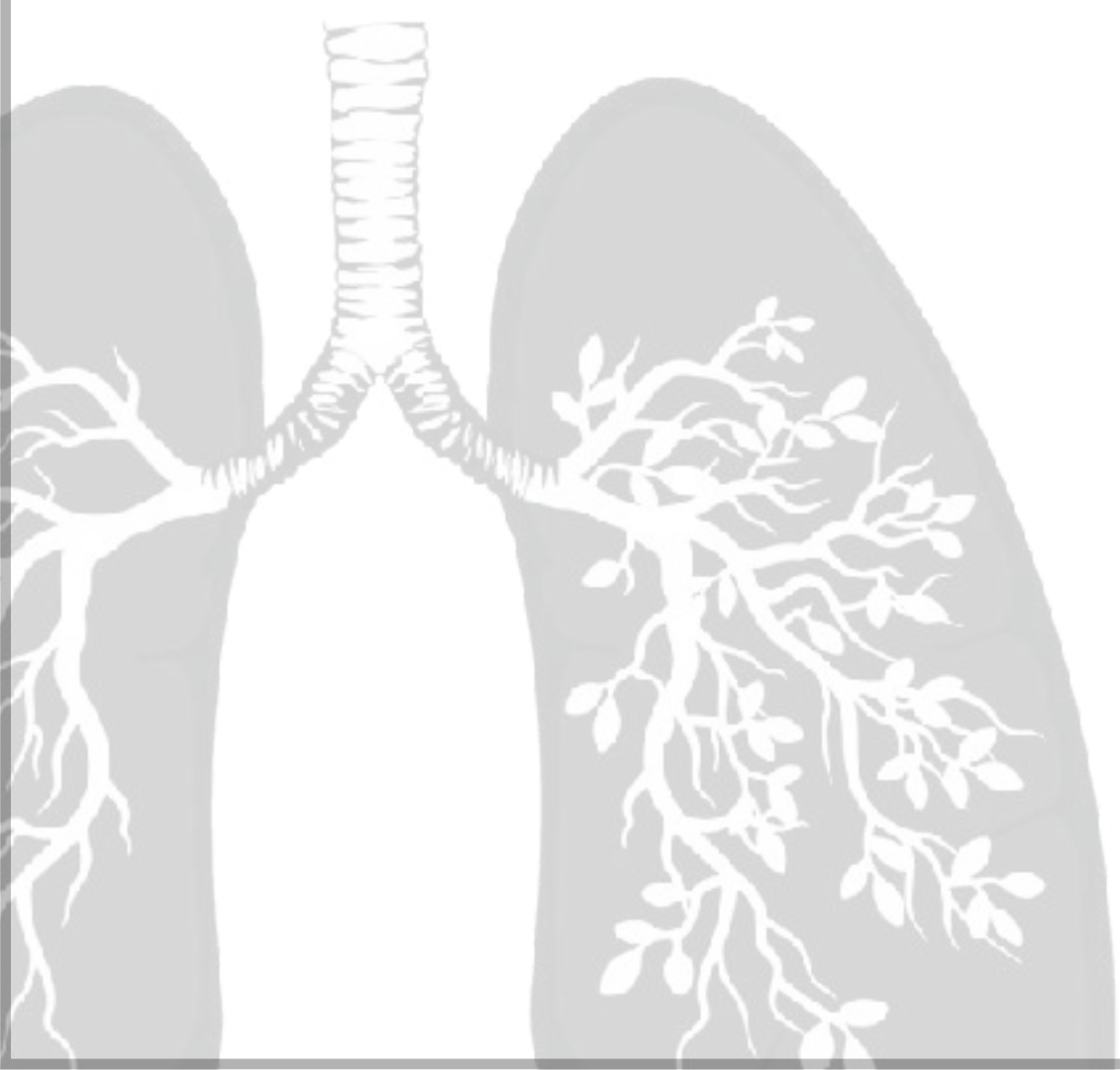


SC: 20" à 60" – 6x8"/2'
SIT: 30" à 3' – 3x30"/4'



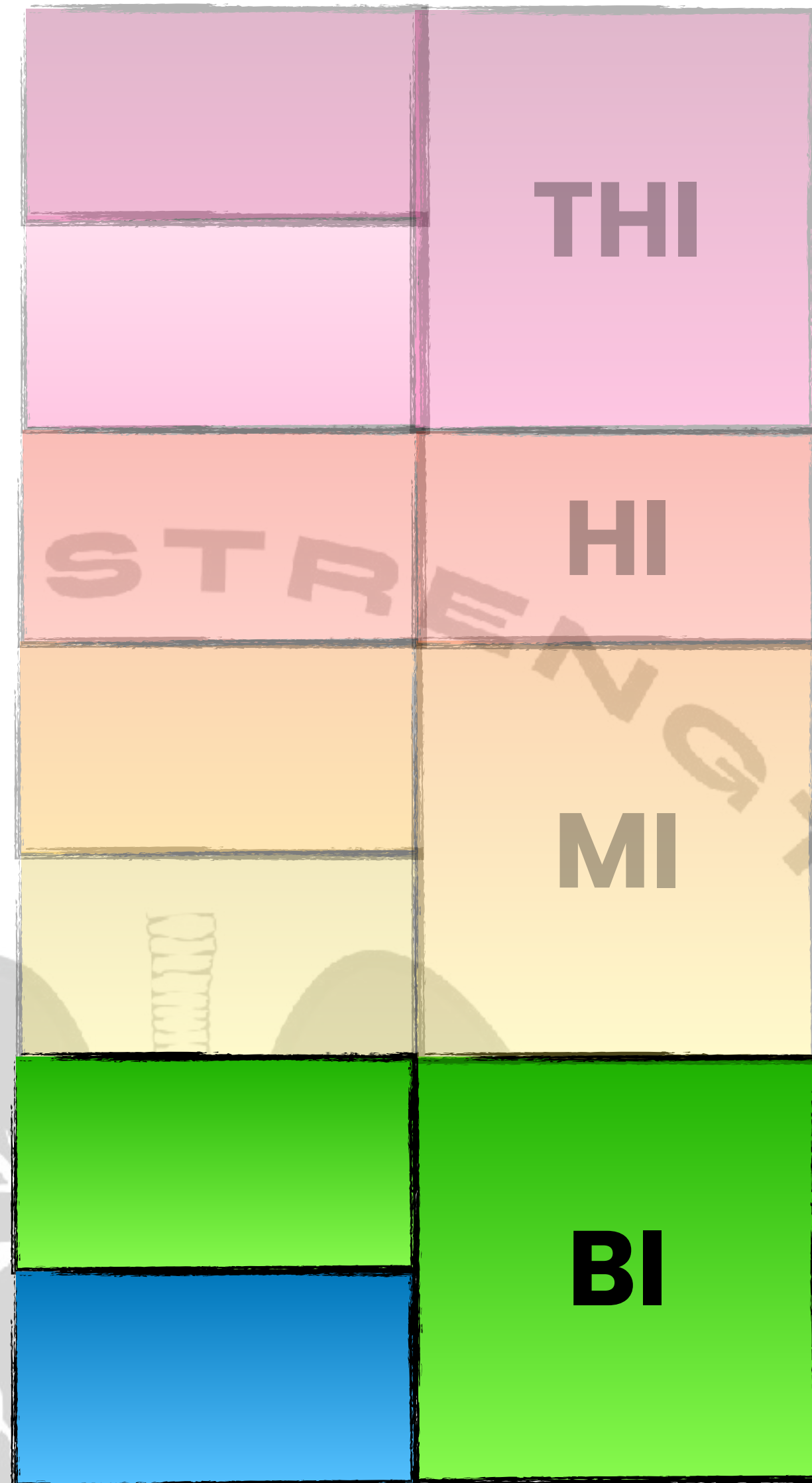
SC: 20" à 60" – 6x8"/2'
SIT: 30" à 3' – 3x30"/4'

*Comment progresser les
séances d'entraînement?*



E STRENGTH
ANCE

Basse Intensité

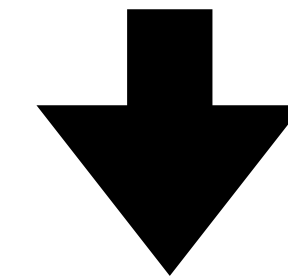
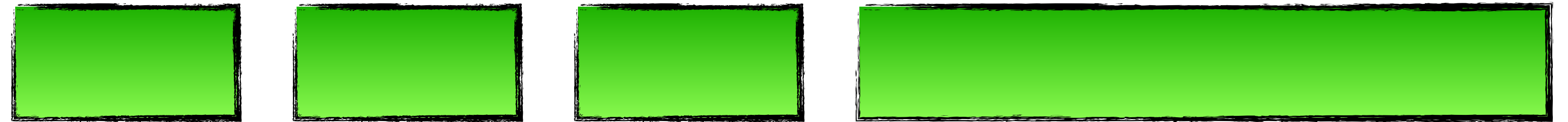


*Progression via le volume
hebdomadaire total*

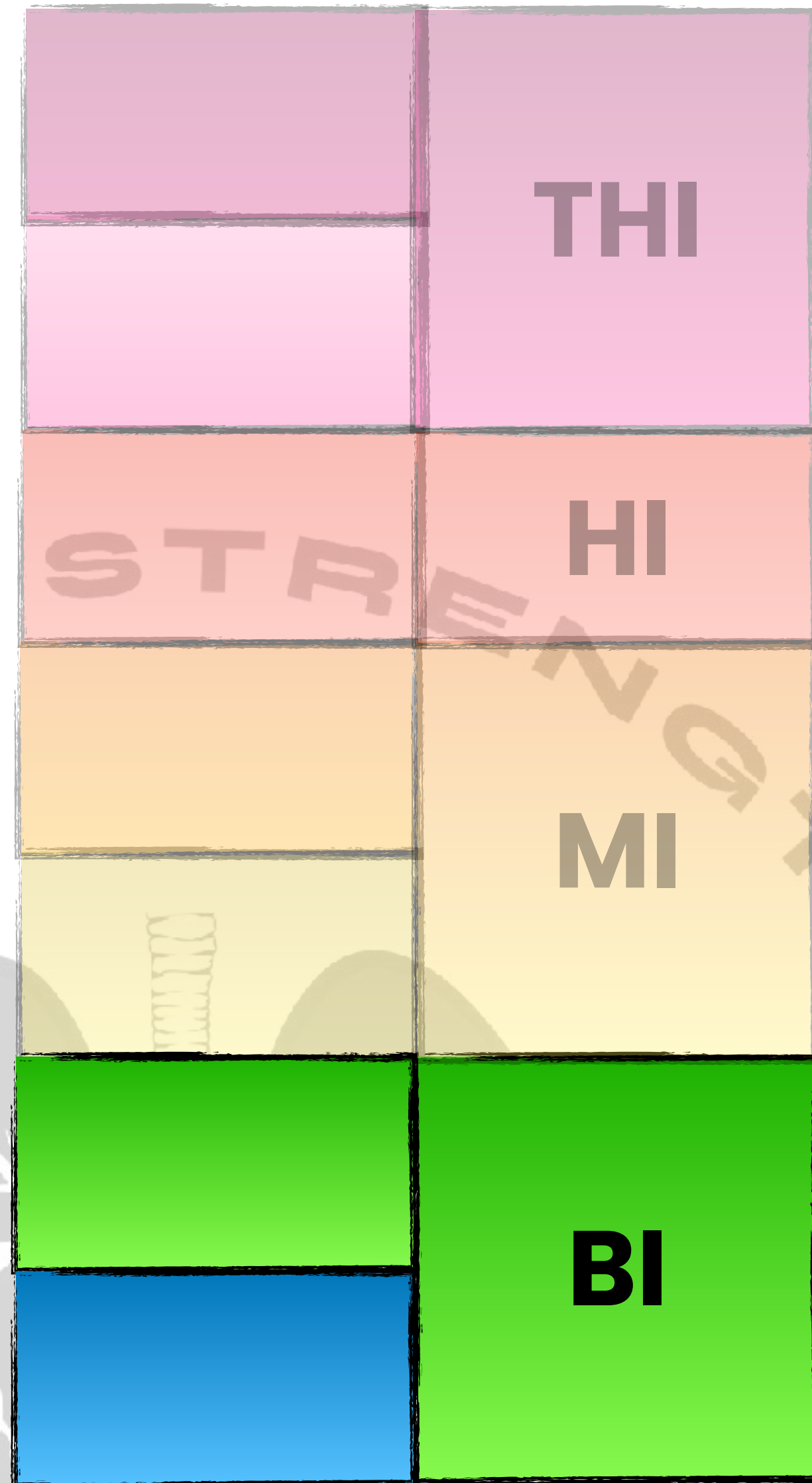
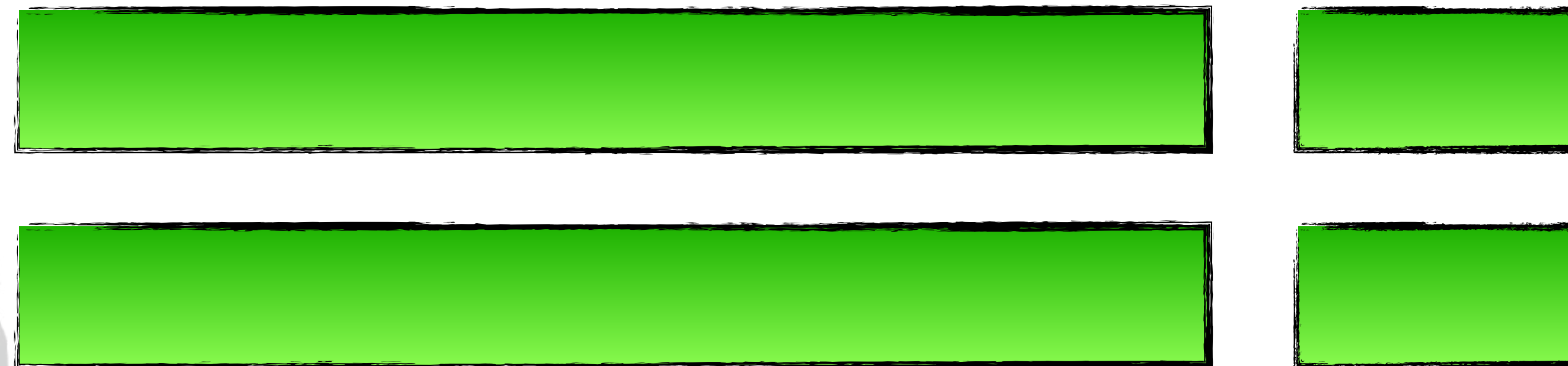
⚠ ***Progresser l'intensité très rarement
et de manière conservatrice***

Basse Intensité

3x20' + 1x40' (total: 100') - RPE 2-3



2x60' + 2x20' (total: 160') - RPE 2-3

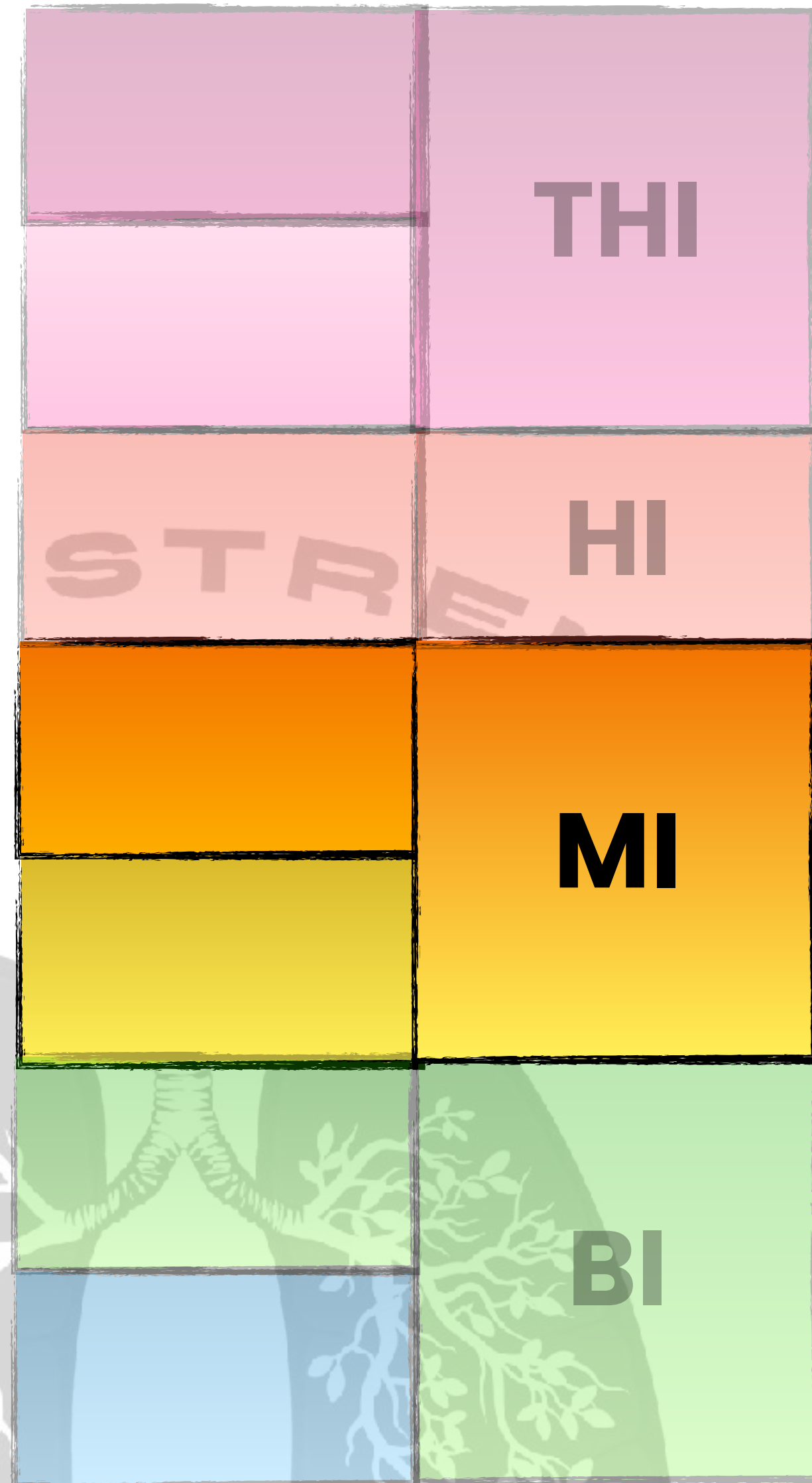


Moyenne Intensité

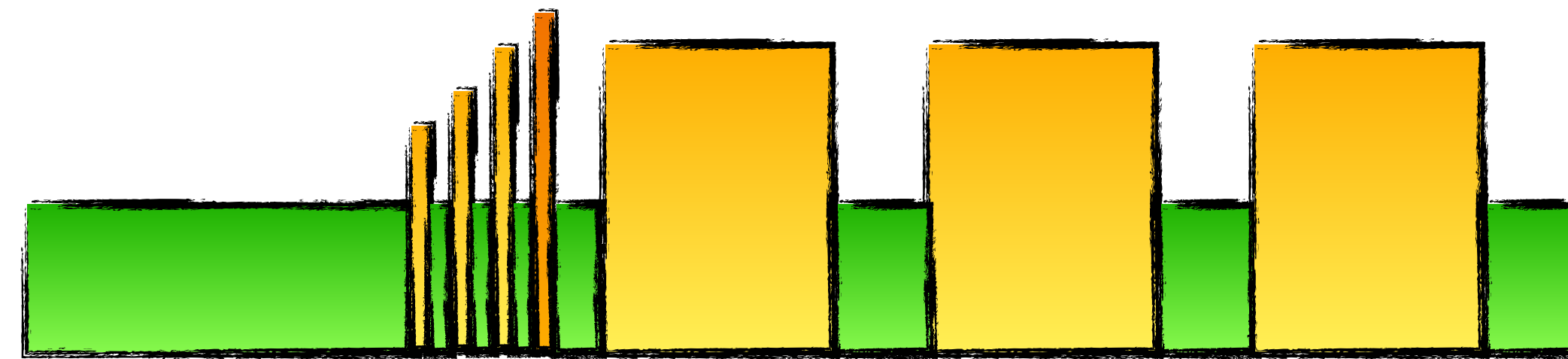
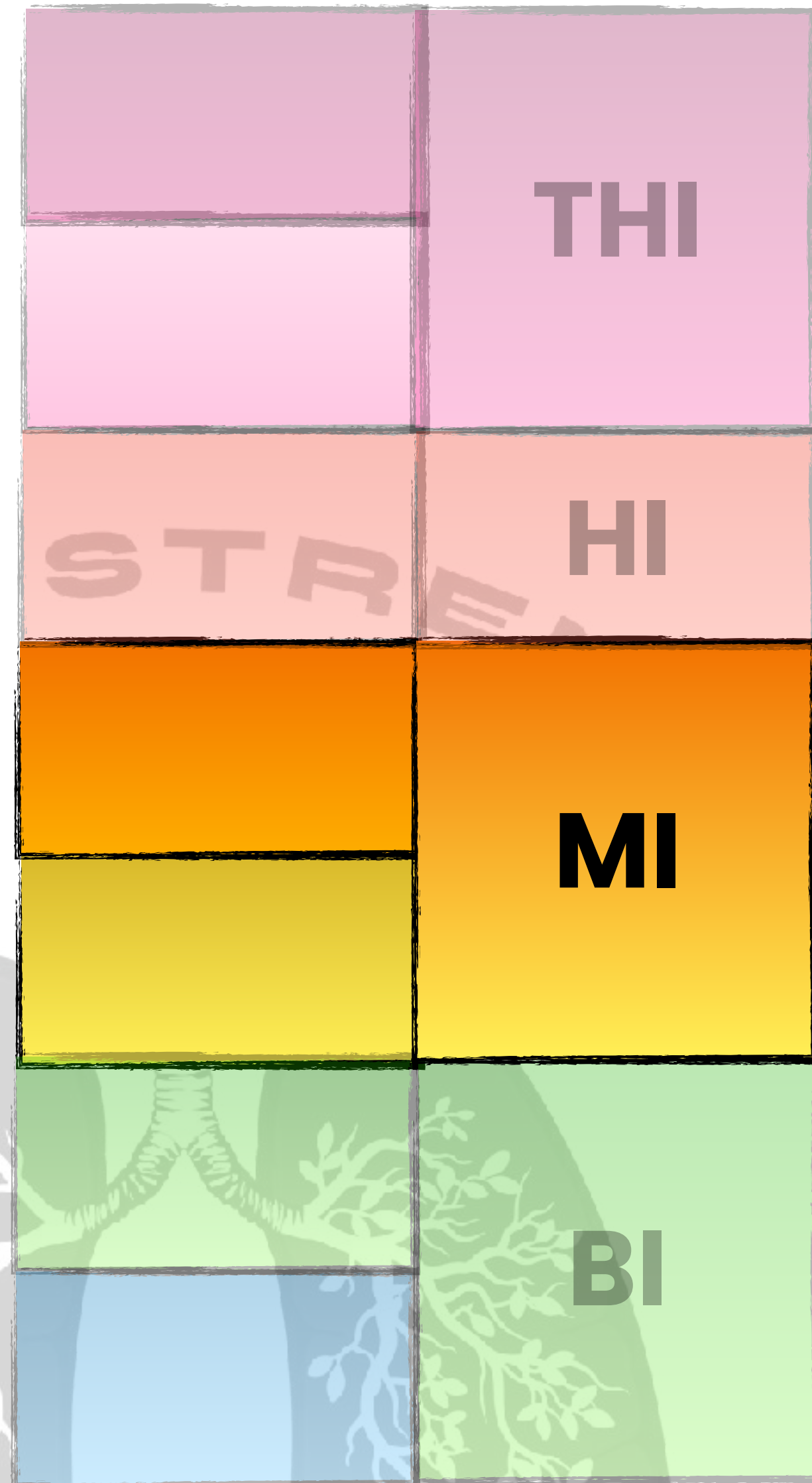
*Progression via le volume de séance
et le volume hebdomadaire total
(extensification)*

⚠ *Progresser l'intensité rarement et
de manière conservatrice*

*Utiliser les 3P pour calibrer la
progression (RPE en priorité)*

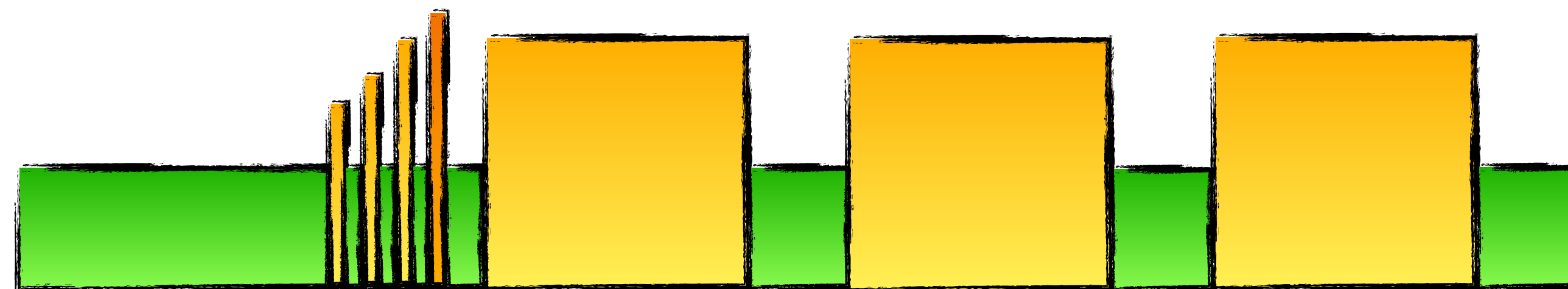
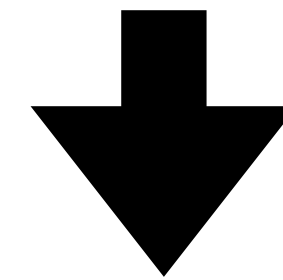


Moyenne Intensité



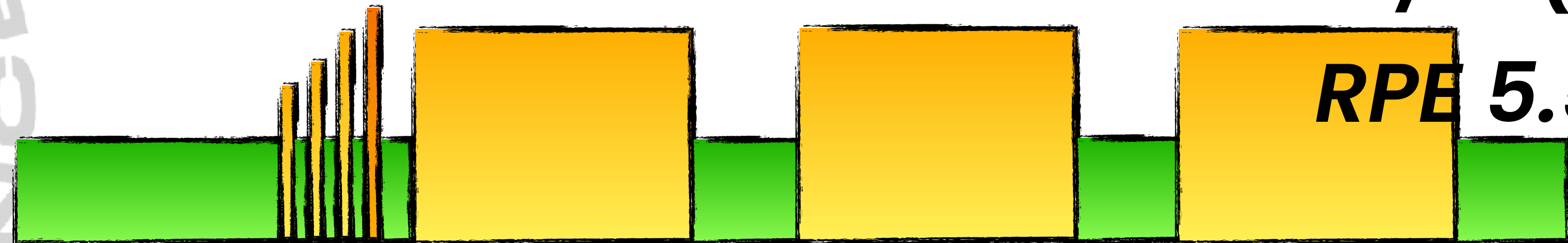
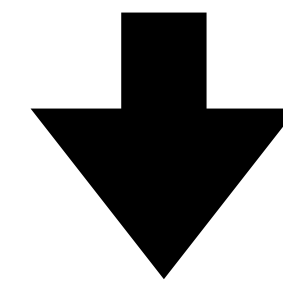
3x12'/3' (36')

RPE 4.5



3x16'/4' (48')

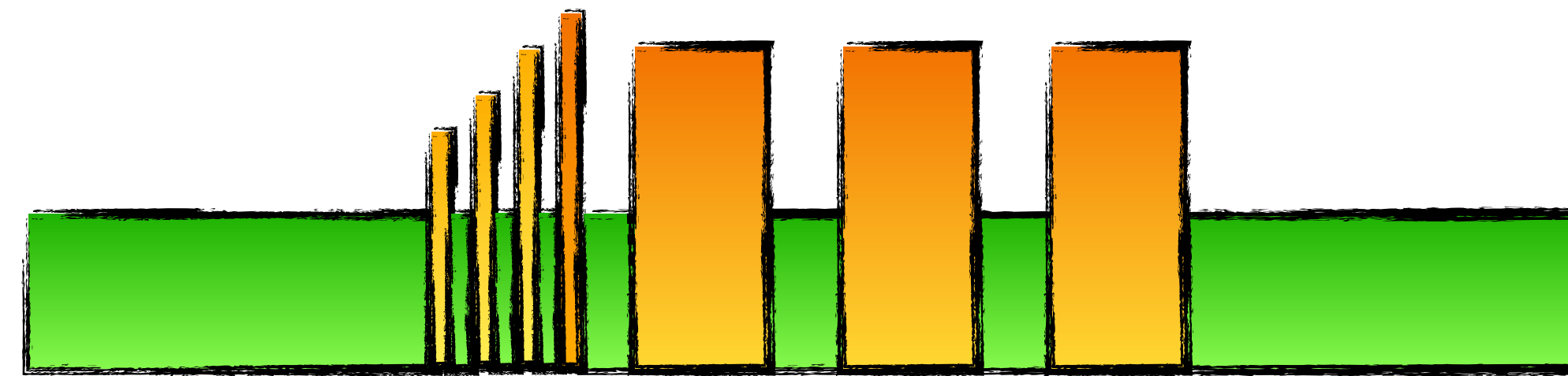
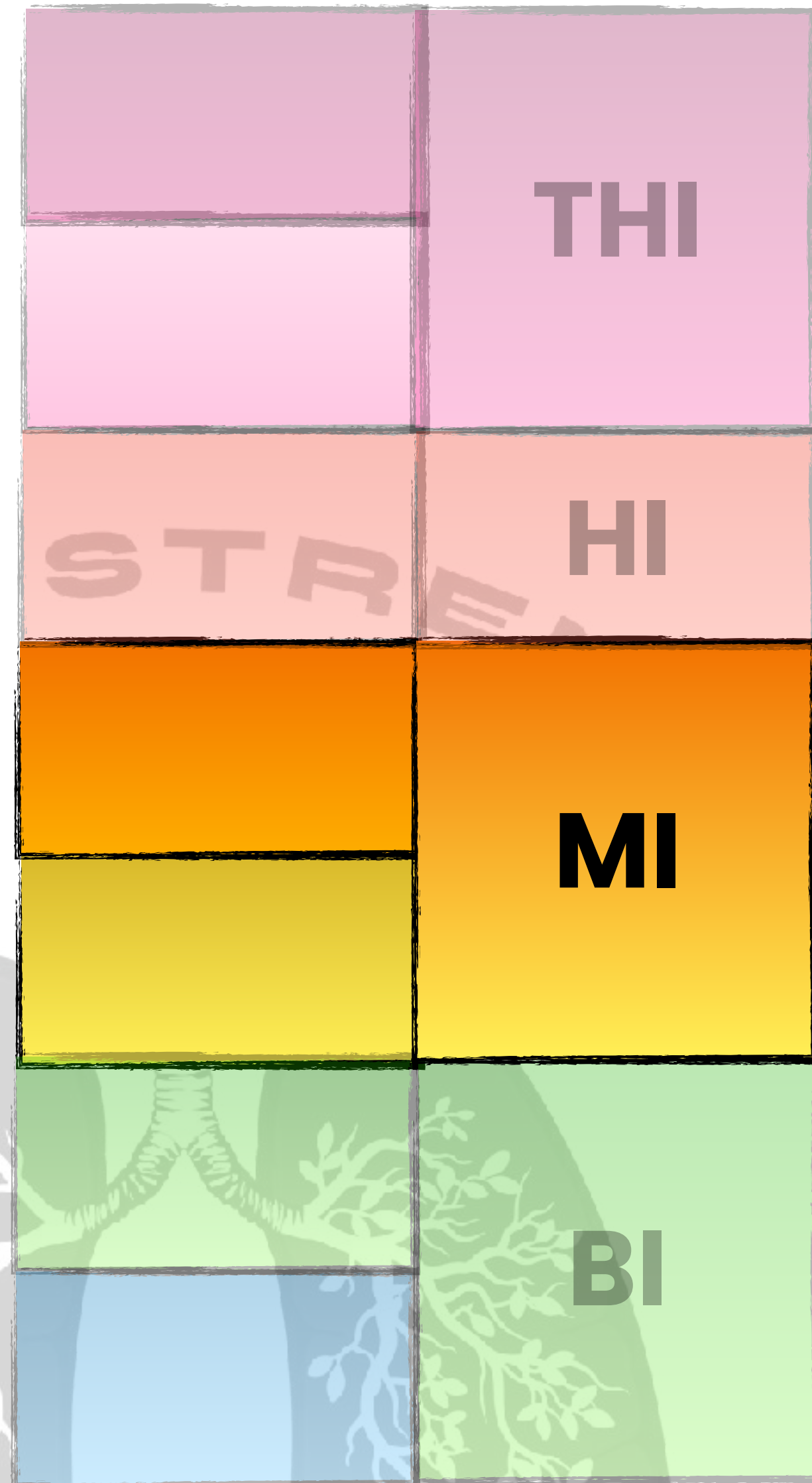
RPE 5



3x20'/5' (60')

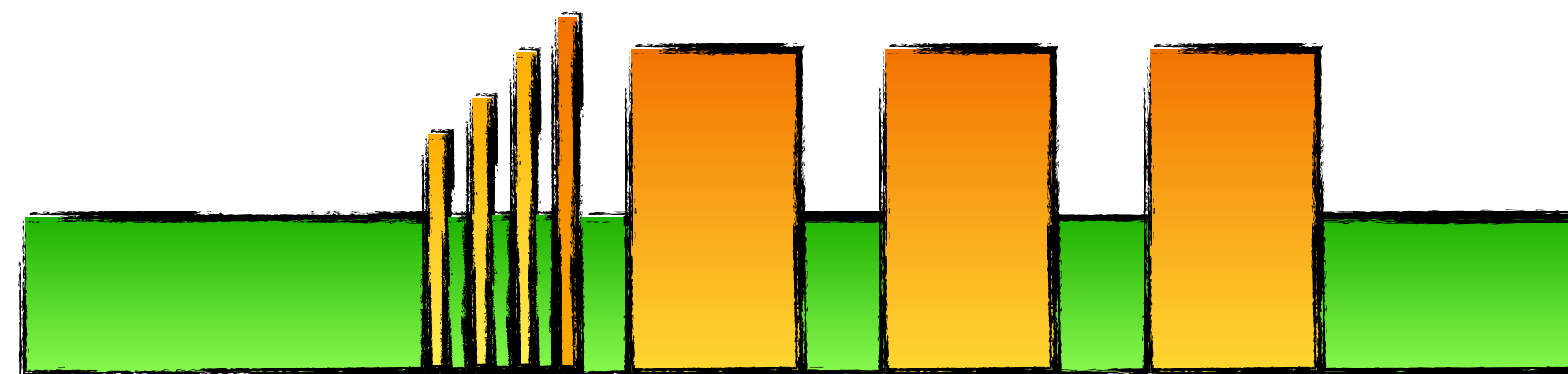
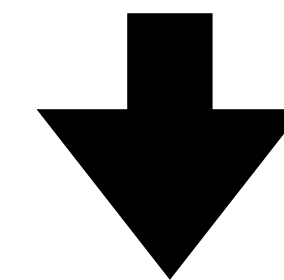
RPE 5.5

Moyenne Intensité



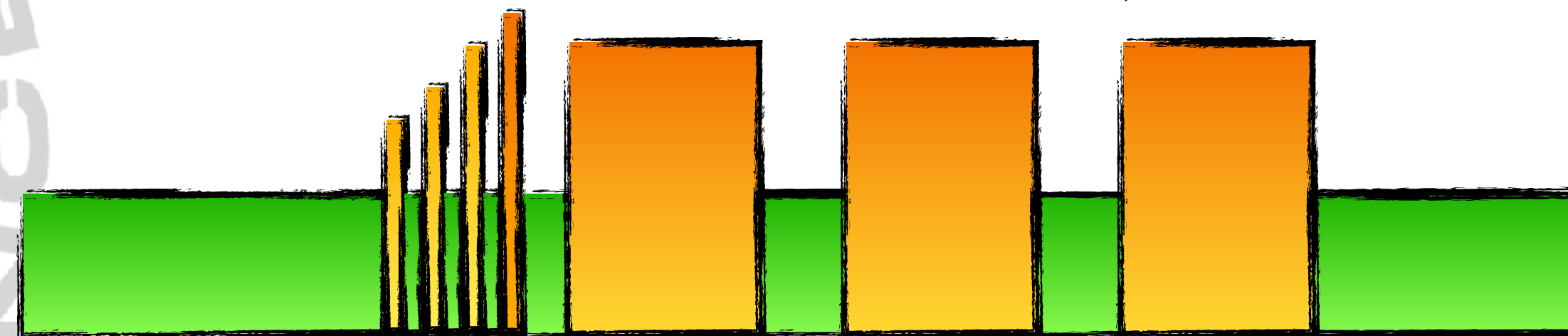
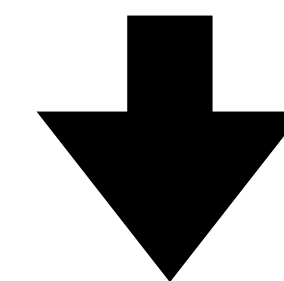
3x6'/2' (18')

RPE 6



3x8'/3' (24')

RPE 6.5



3x10'/5' (30')

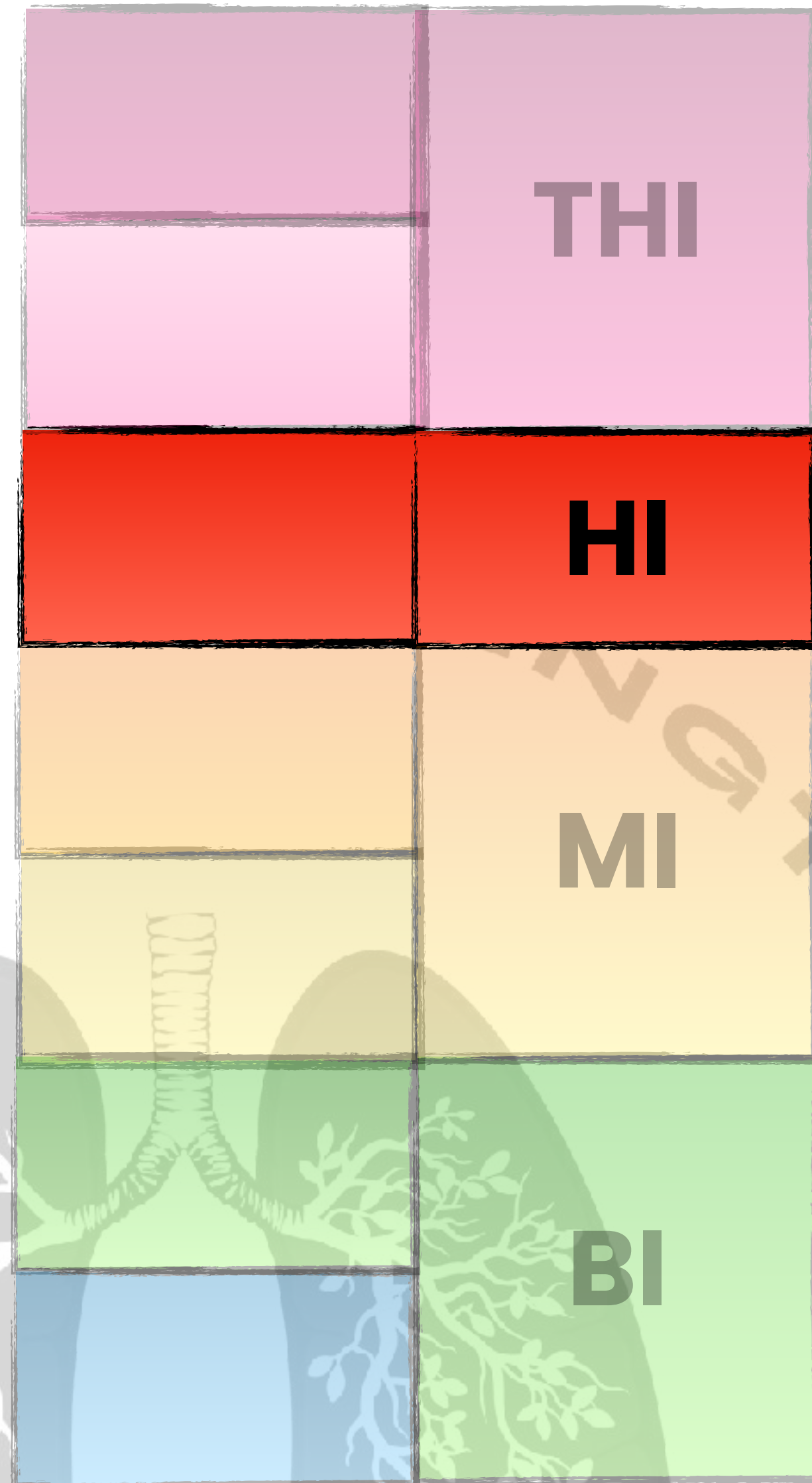
RPE 7

Haute Intensité

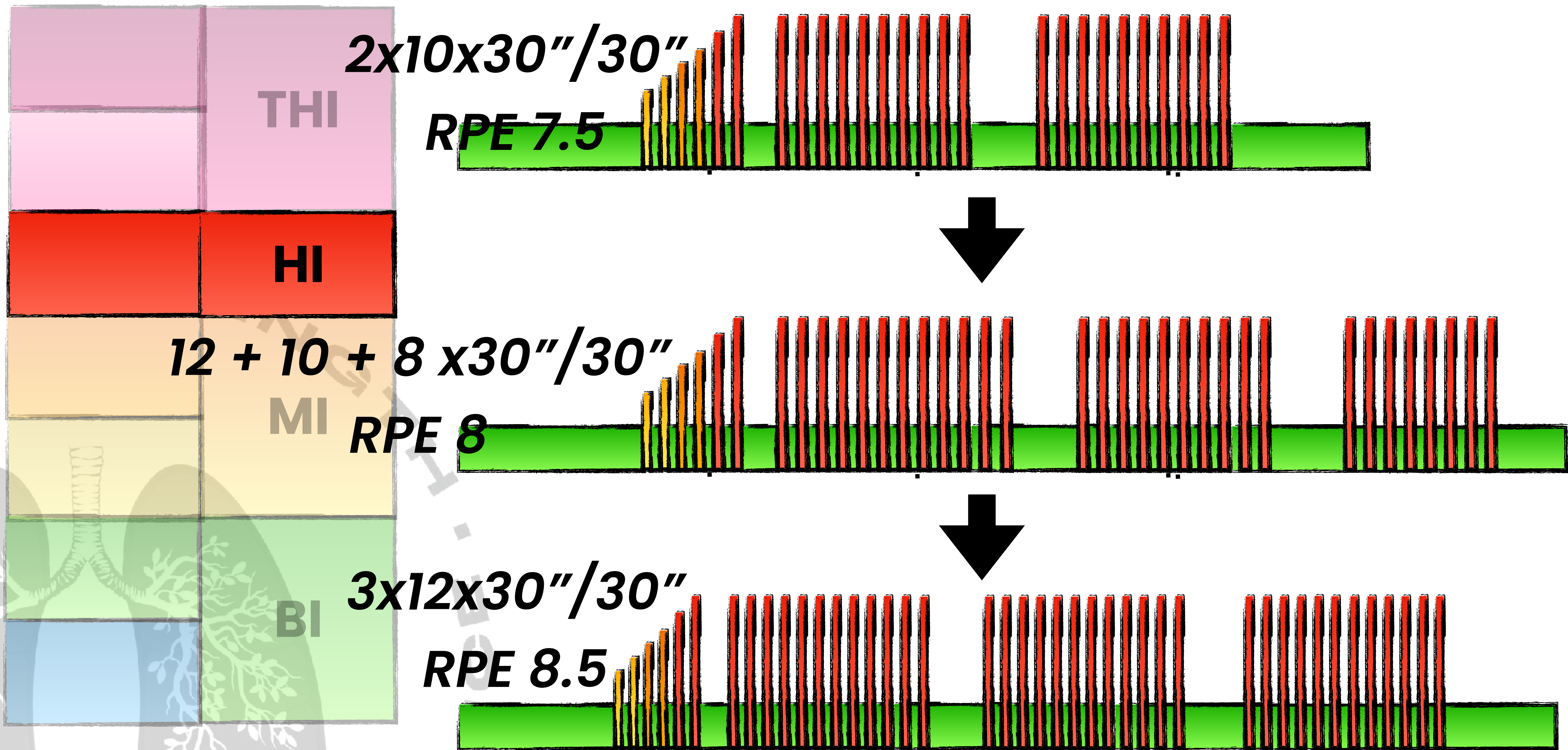
*Progression via le volume de séance
et l'intensité de séance
(intensification)*

Progression de format court => long

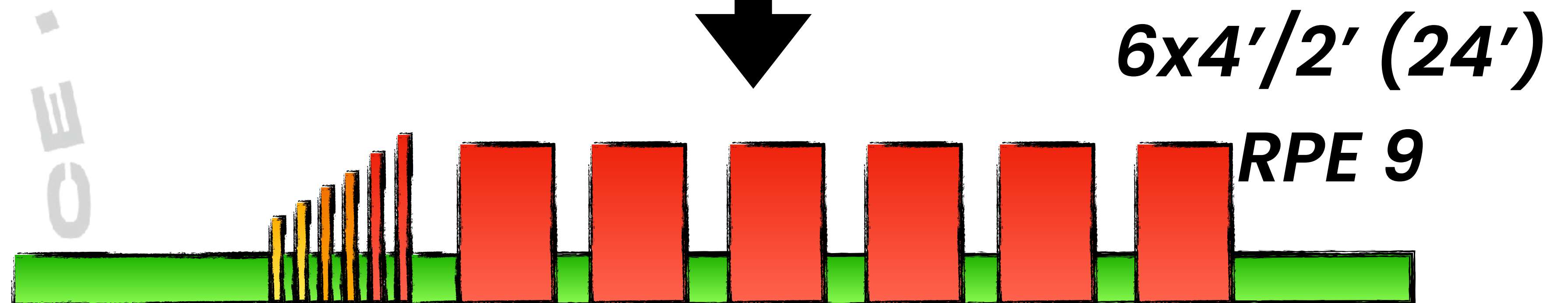
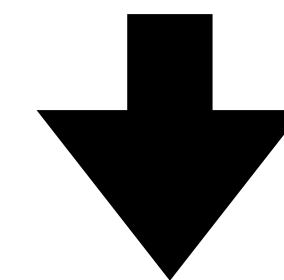
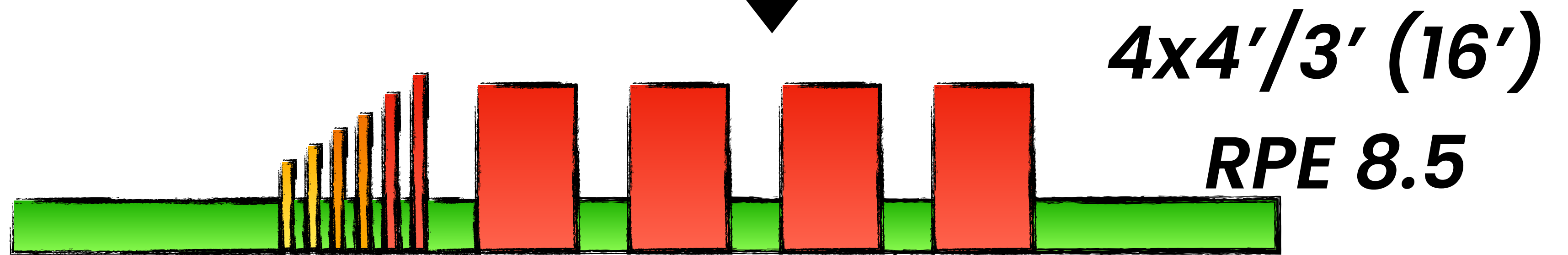
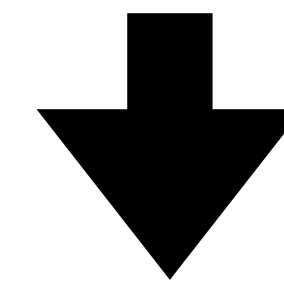
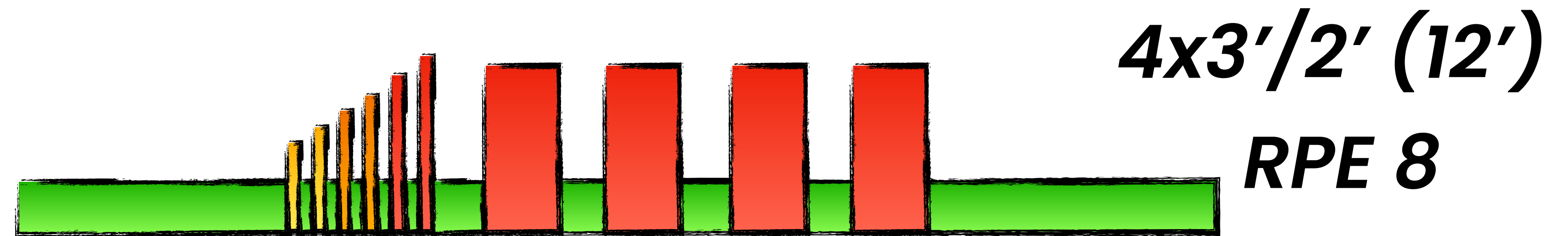
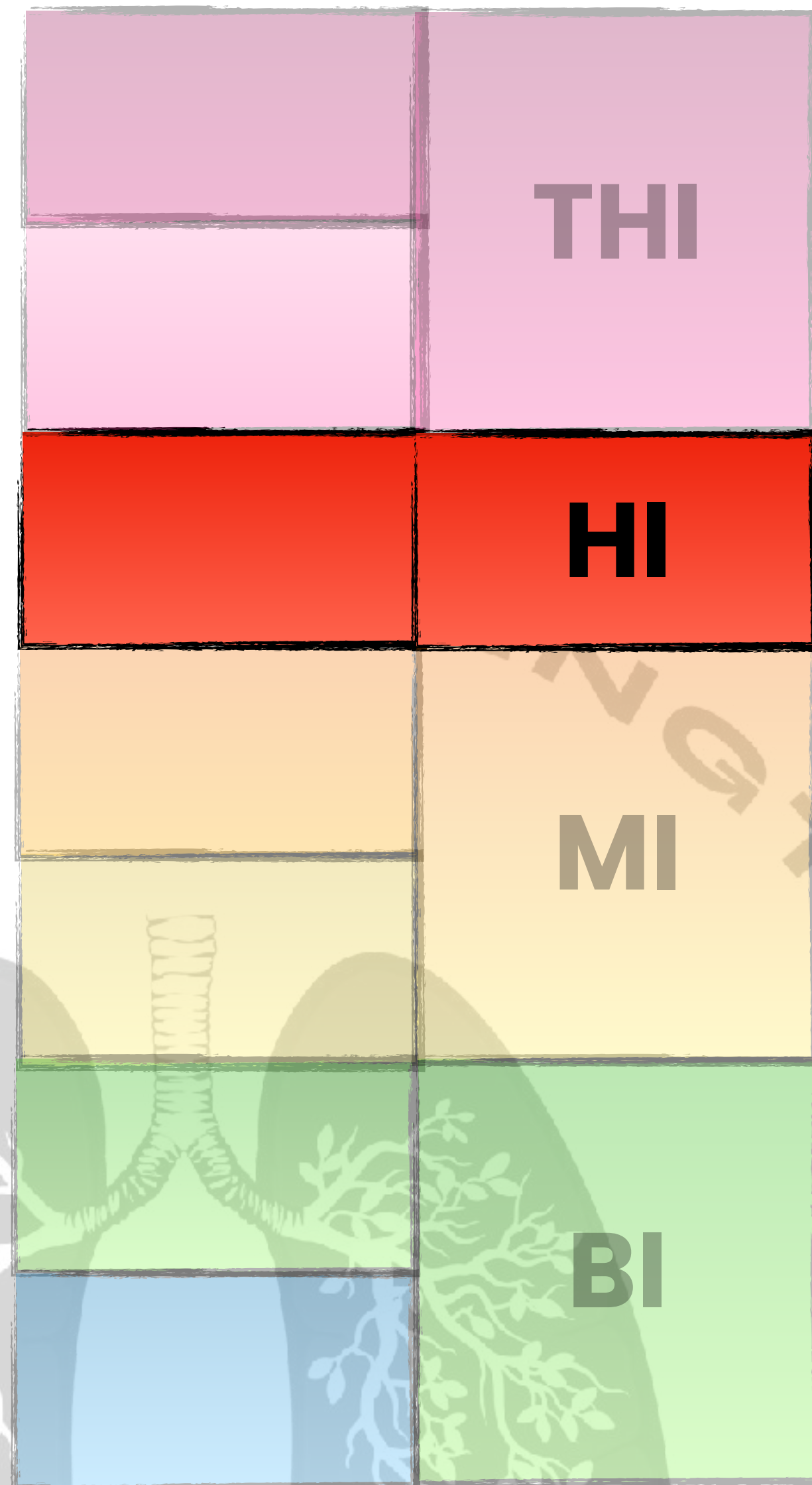
*Utiliser les 3P pour calibrer la
progression (RPE en priorité)*



Haute Intensité "court"



Haute Intensité "long"



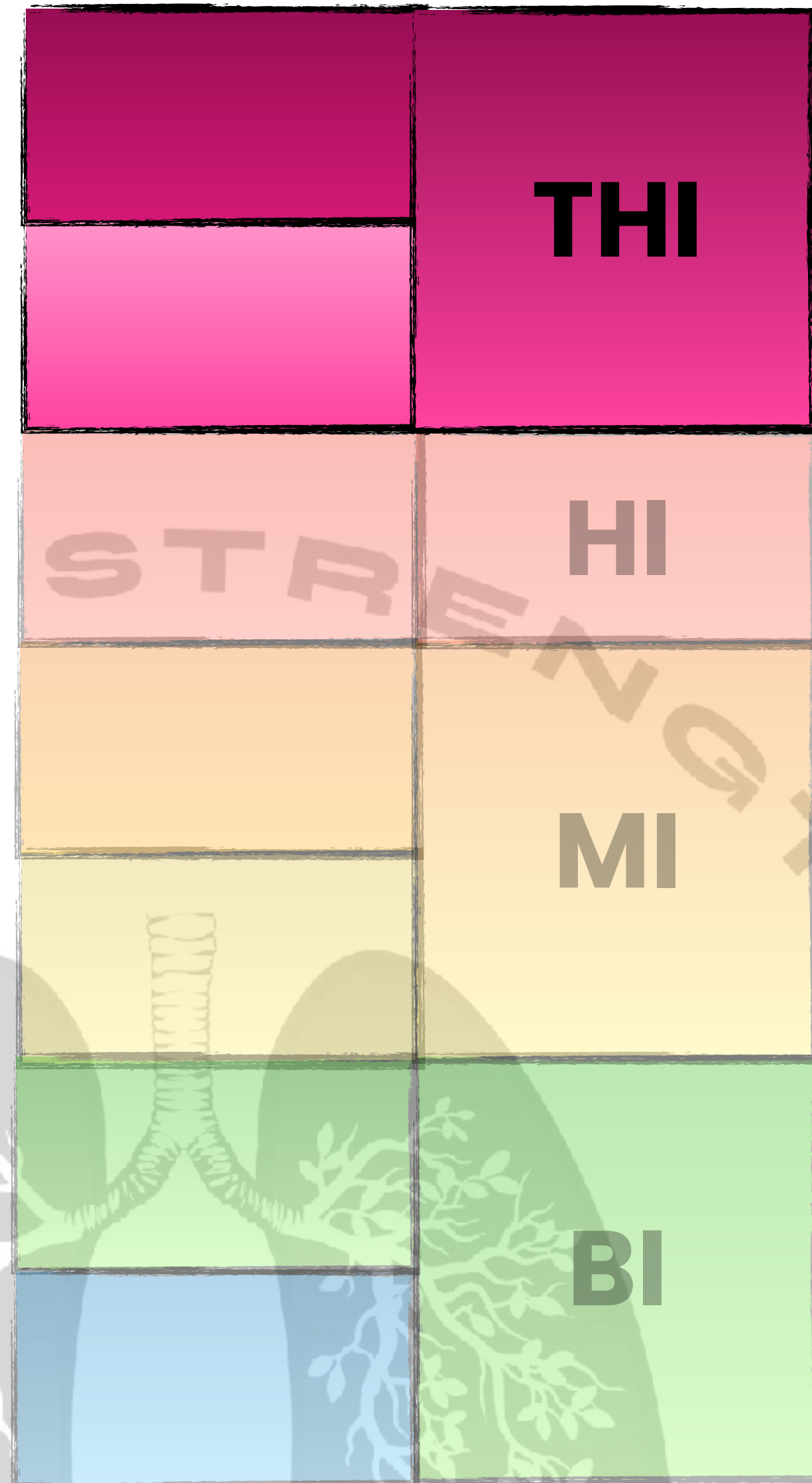
Très Haute Intensité

*Progression via le volume de séance
(conservateur)*

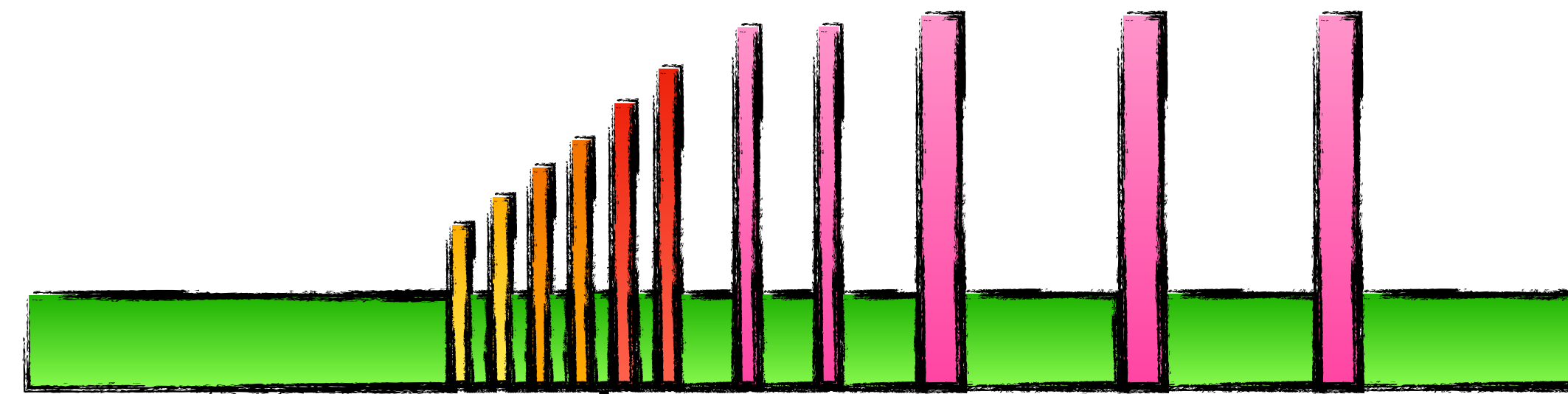
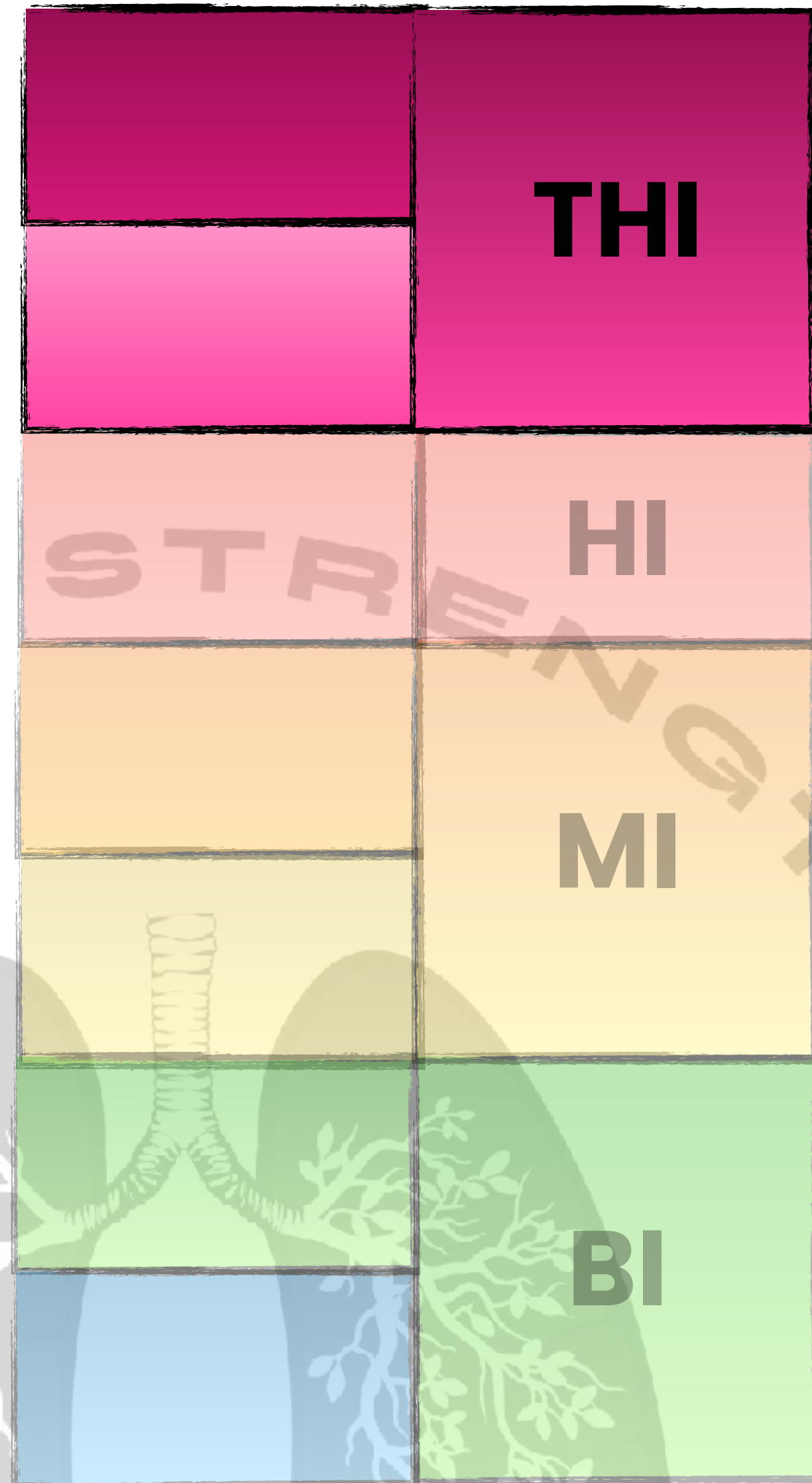
⚠ *Qualité avant quantité pour le
sprint court*

Tampon = RPE

Sprint Court = Effort (sur 100%)

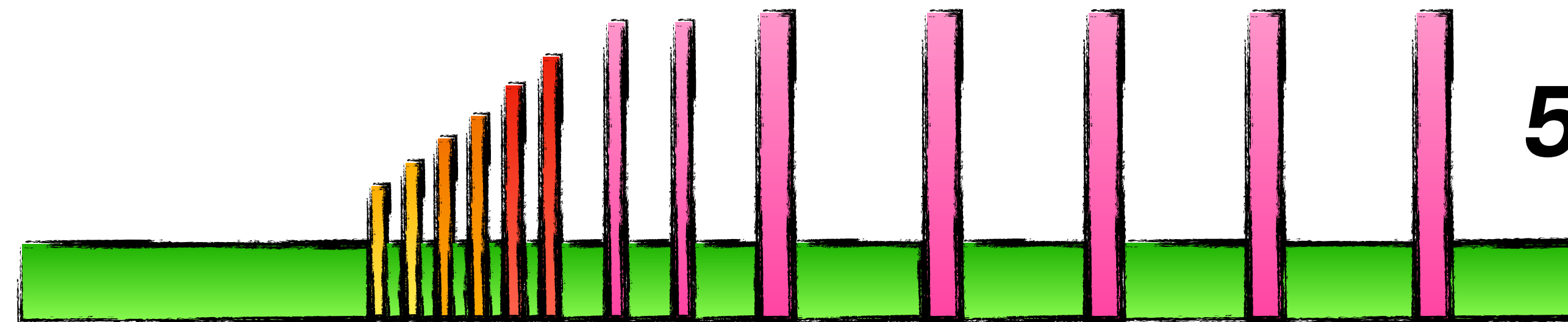
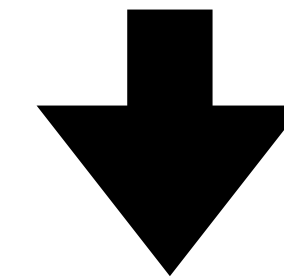


Très Haute Intensité



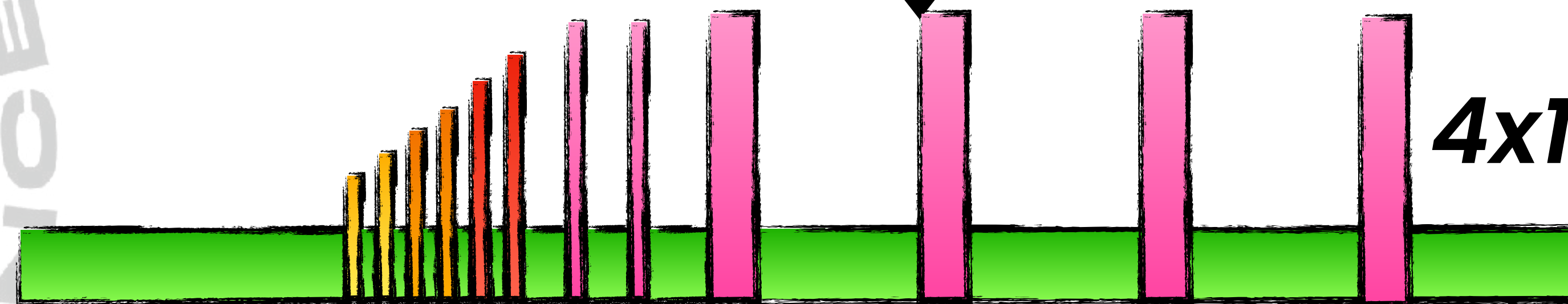
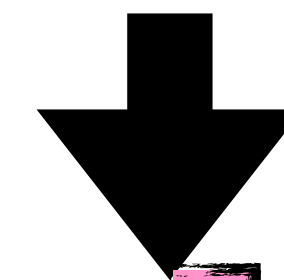
3x1' / 4' (3')

RPE 9



5x1' / 4' (5')

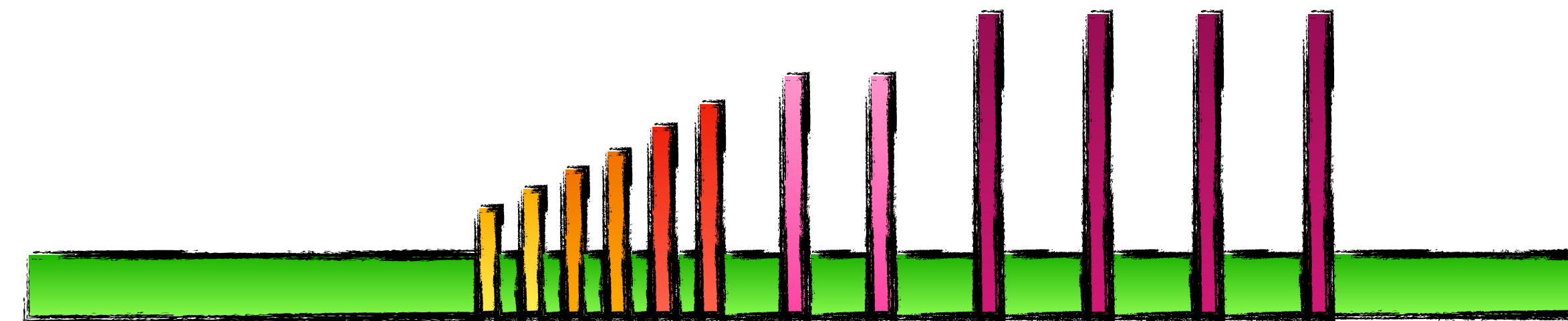
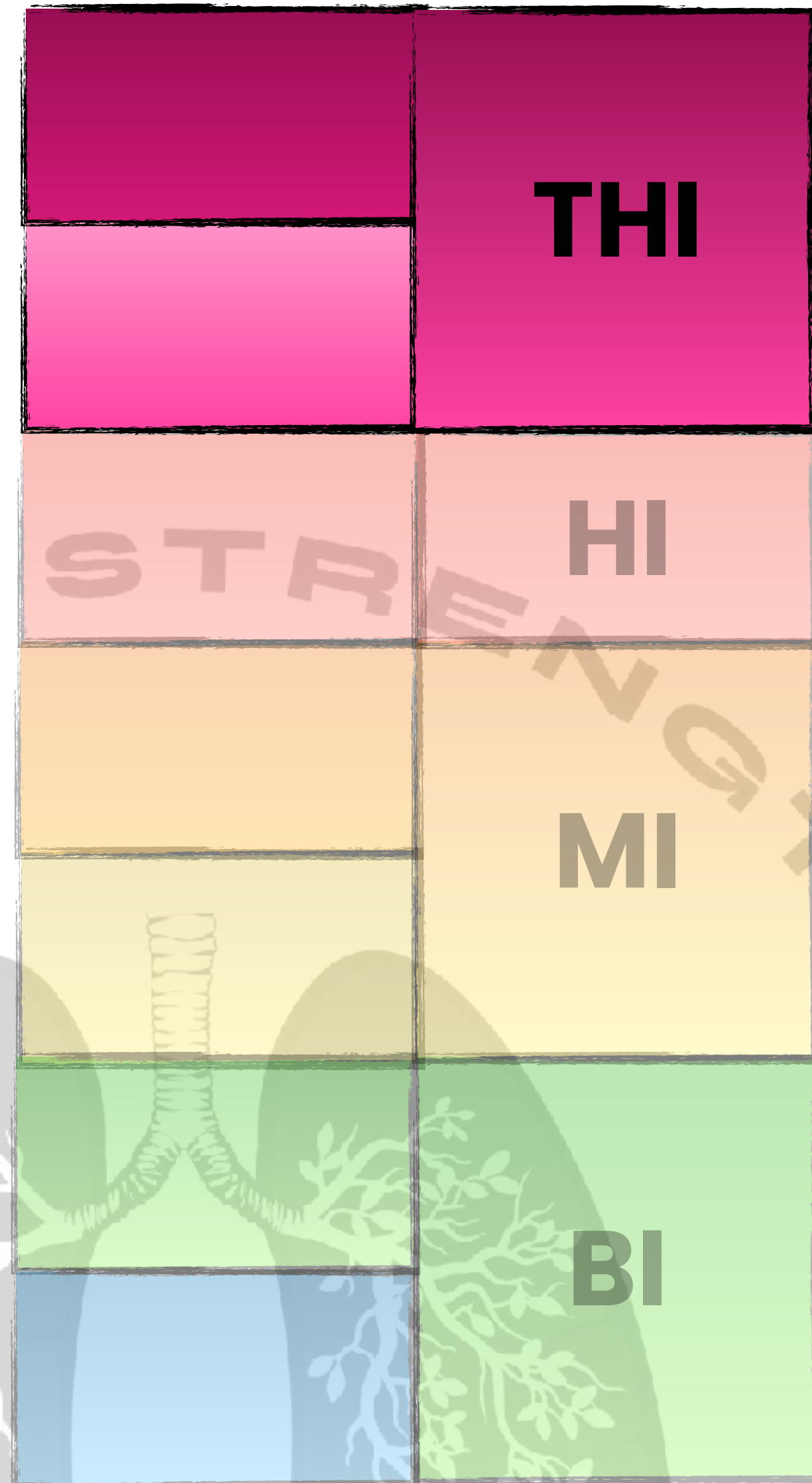
RPE 9.5



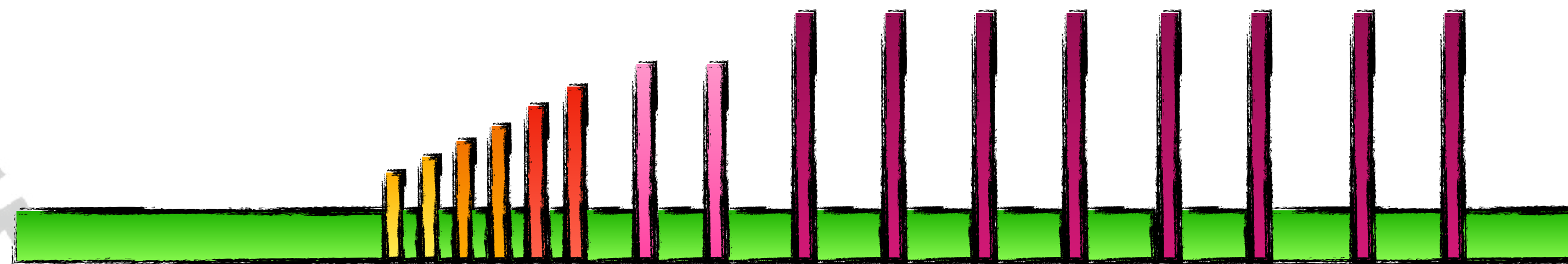
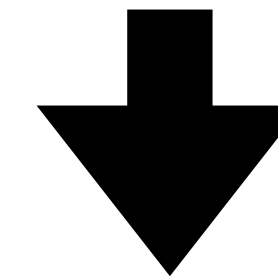
4x1:30 / 5' (6')

RPE 10

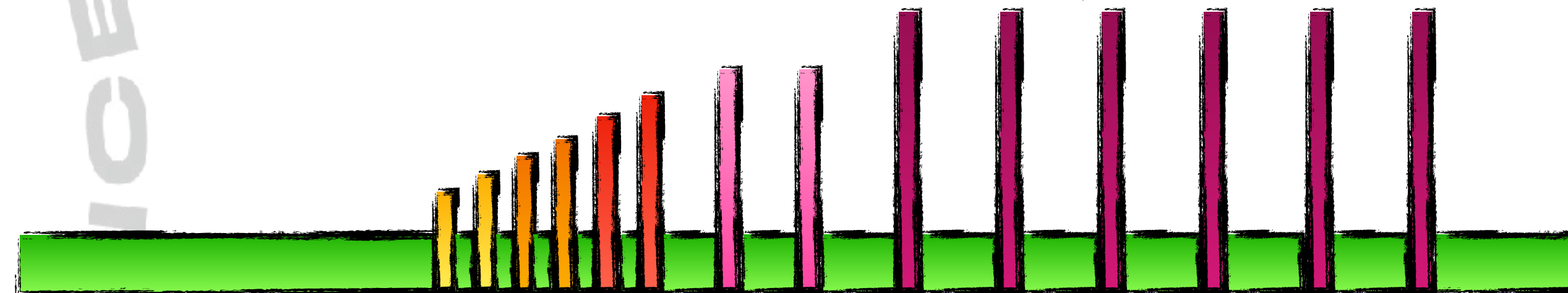
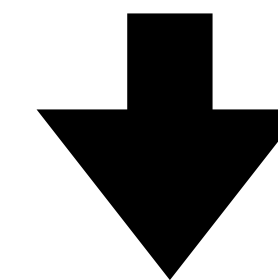
Très Haute Intensité



4x6"/2' (24")
95%

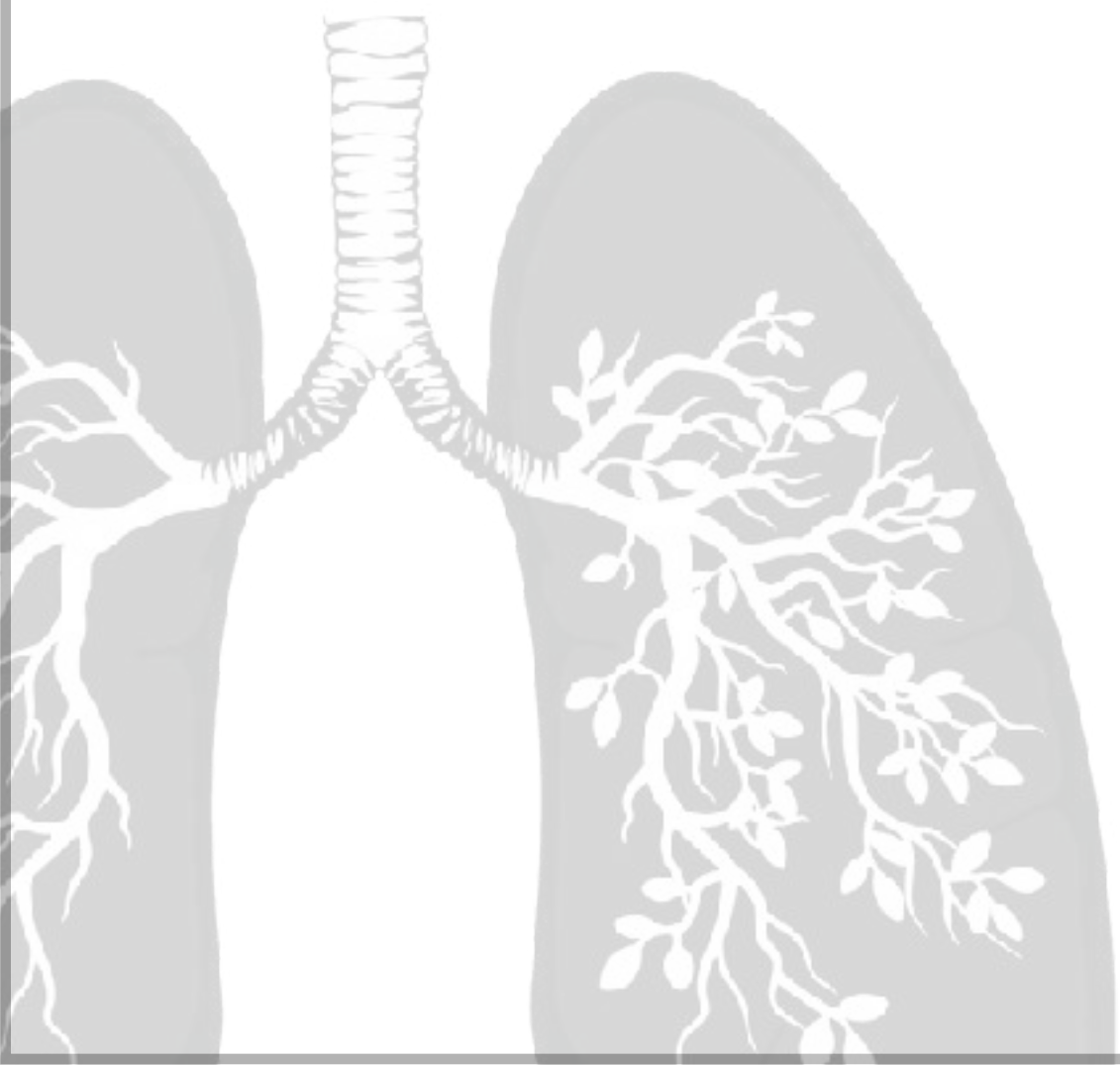


8x6"/2' (48")
100%



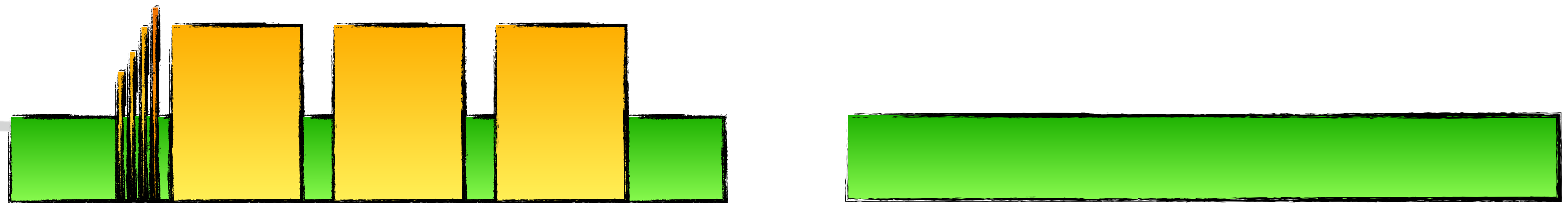
6x10"/3' (60")
100%

***Comment organiser les
séances selon les objectifs & le
profil?***

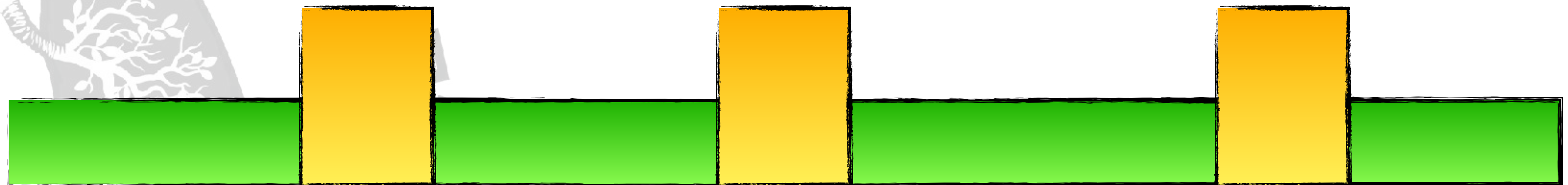


Durée d'Effort (continu)

Épreuve < 60' => Dissocier les séances

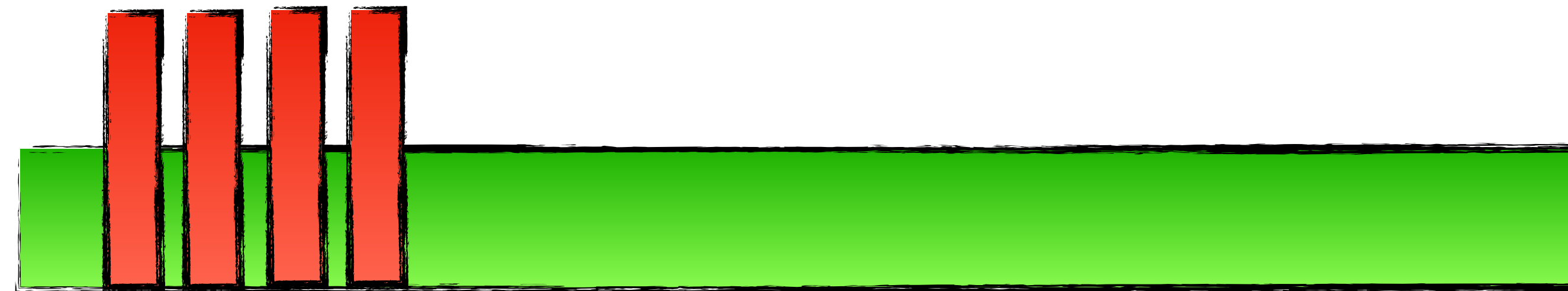


Épreuve > 60' => Intégrer l'intensité dans le long

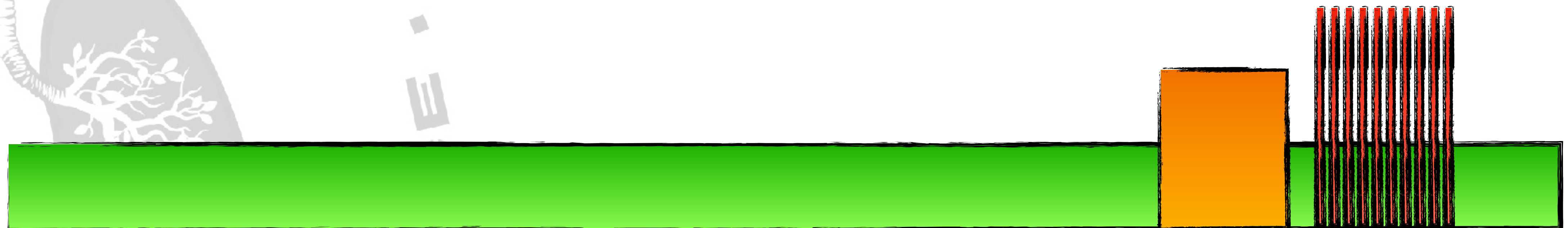


Endurance + Intensité

Épreuve < 60' => Intensité puis fondamental

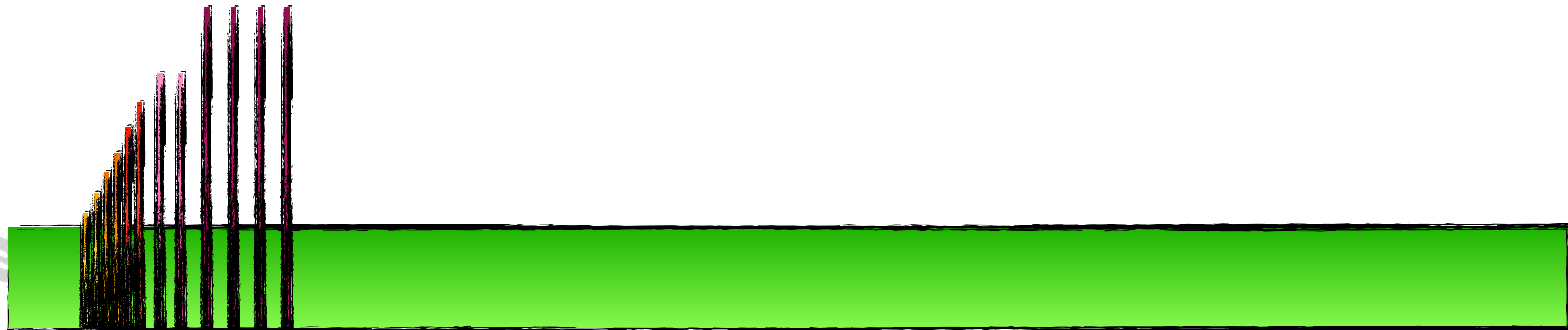


Épreuve > 60' => intensité en fin de séance

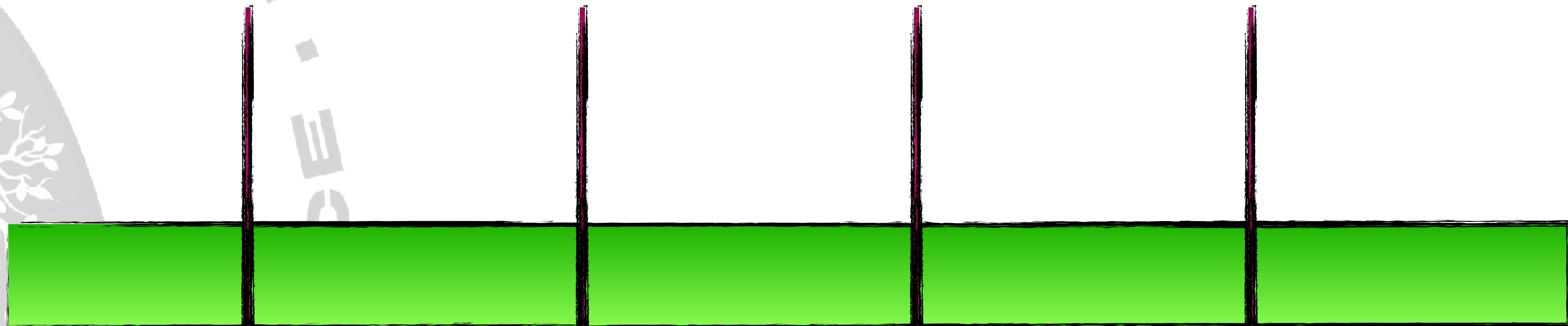


Sprint + Fondamental

Sprint post échauffement

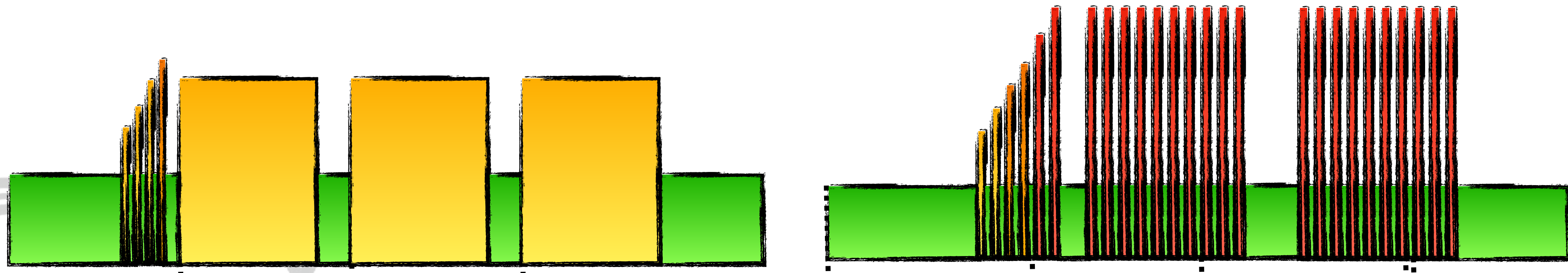


Sprint dans la séance

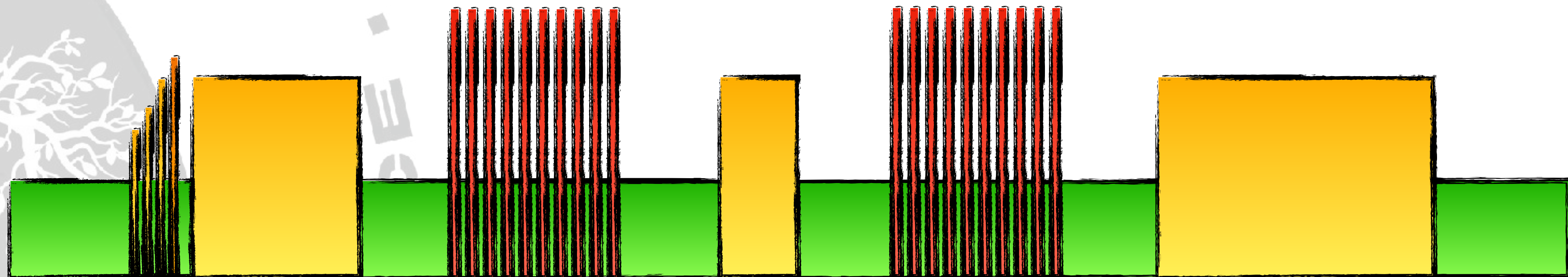


Dissocié VS Combiné

Loin de l'échéance => Dissocier les qualités



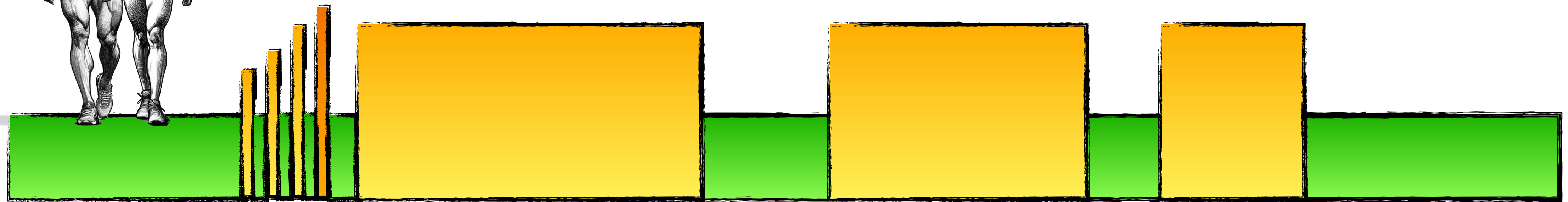
Proche de l'échéance => Combiner les qualités



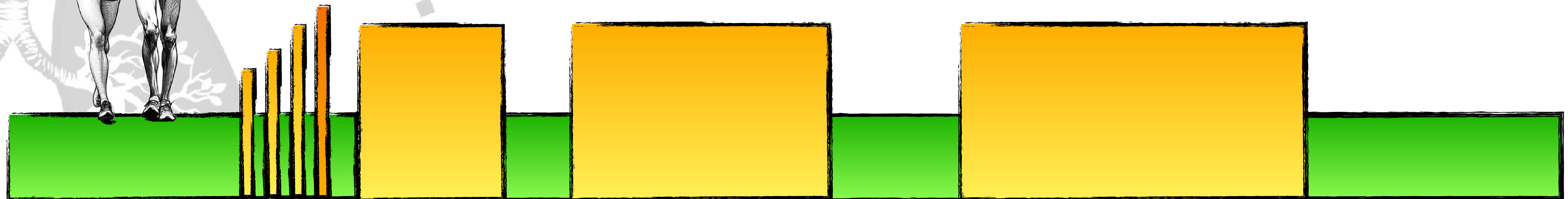
Profil Puissant VS Endurant



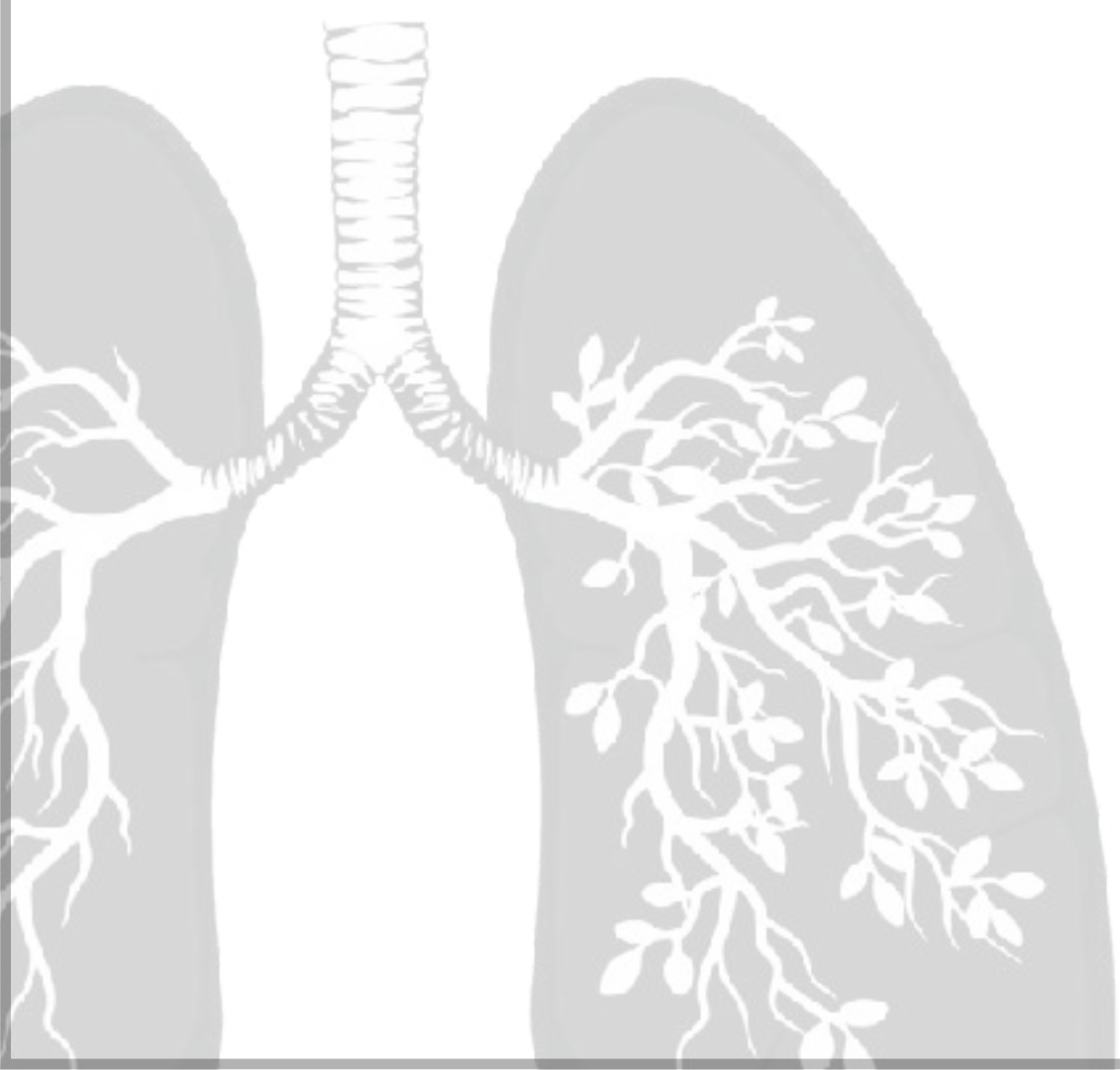
Profil Puissant: Faible Durabilité



Profil Endurant: Haute Durabilité

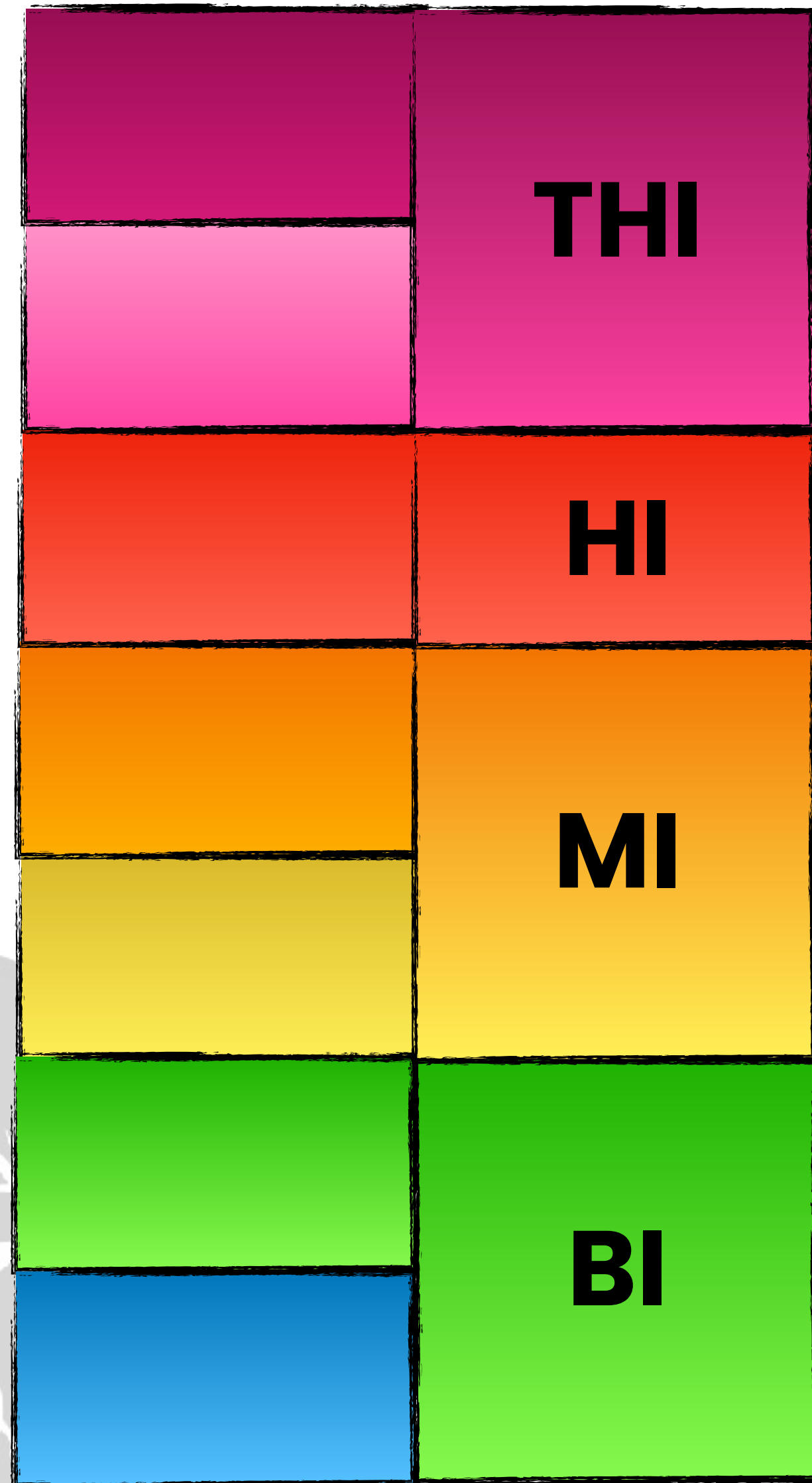


*Quels idées respecter pour la
progression des séances?*



E STRENGTH
ANCE

Progression de Séance

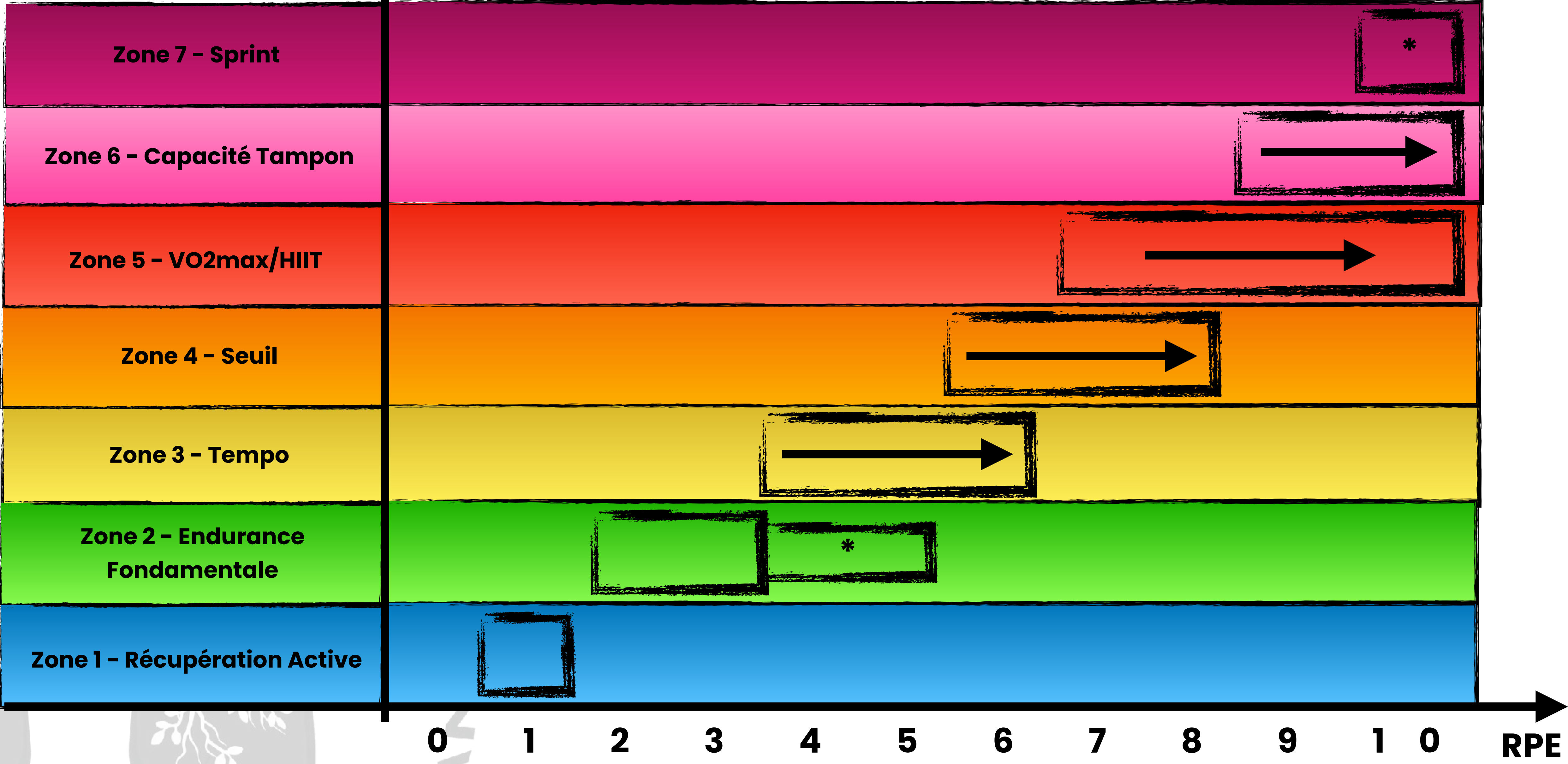


Quel est le niveau du sportif? Quel volume d'endurance effectué?

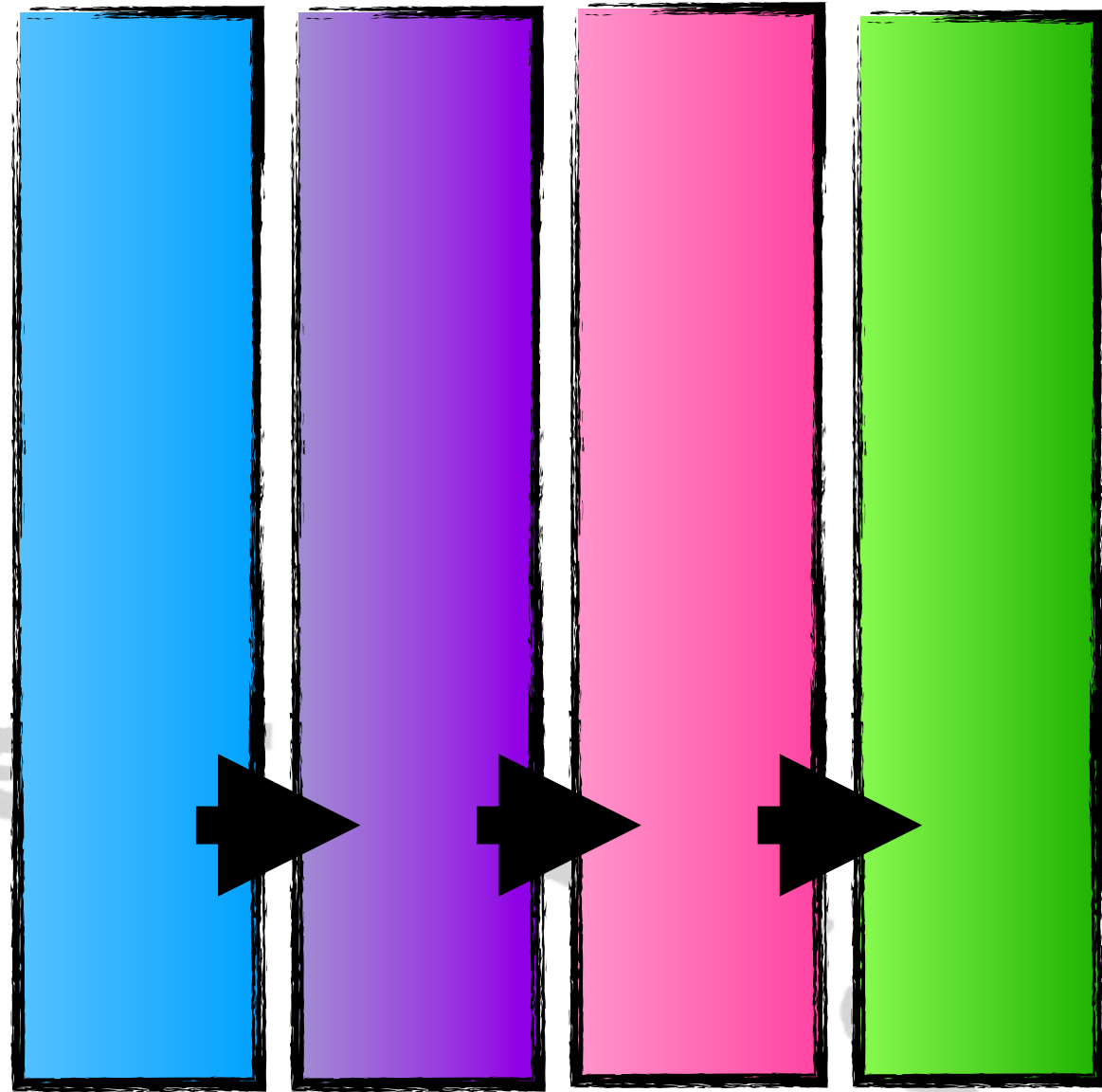
Toujours laisser de la marge pour permettre une progression continue

Programmer au RPE: autorégulation selon la forme du jour

Zones & RPE

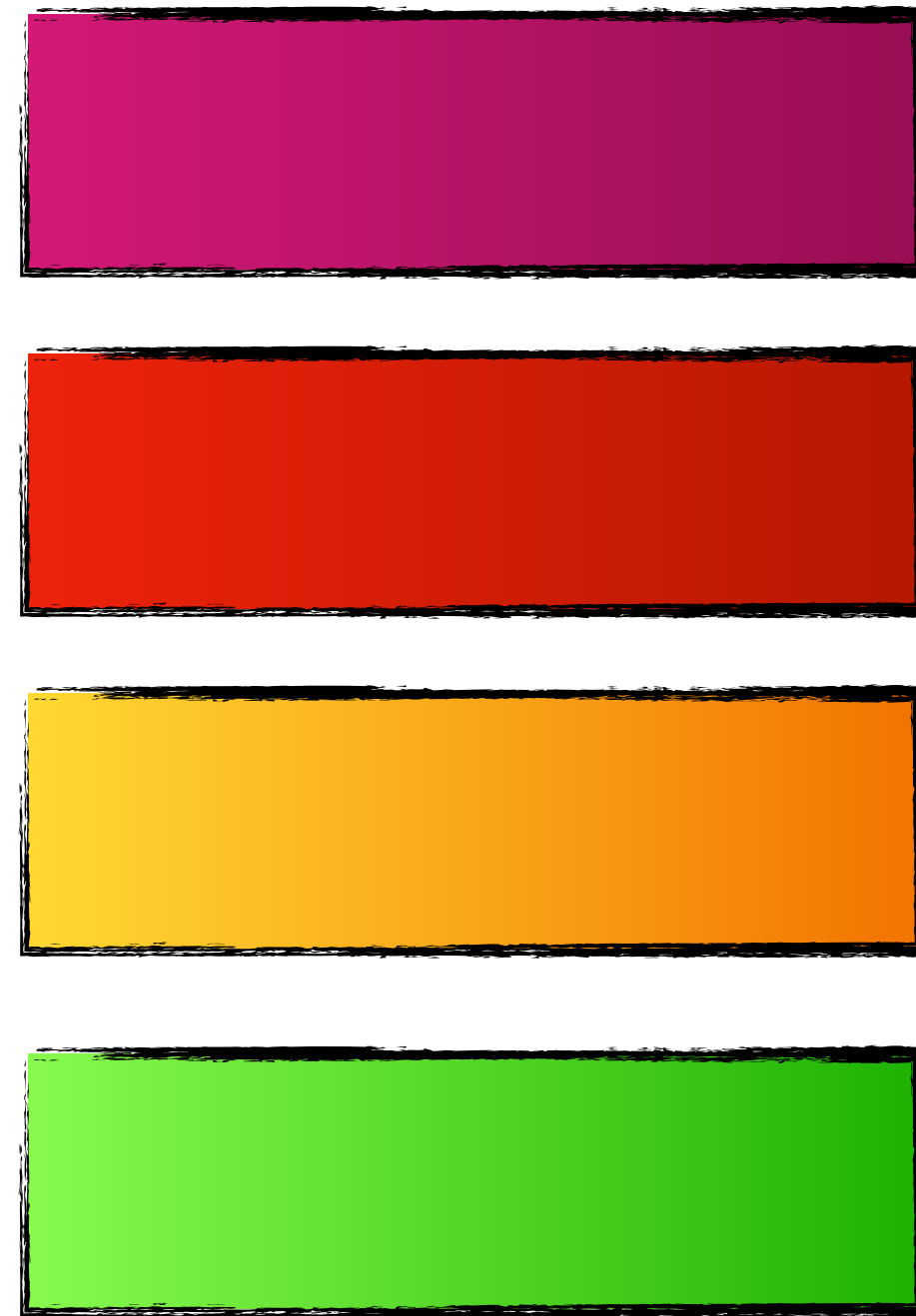


Choisir les Séances



Quelle Phase?

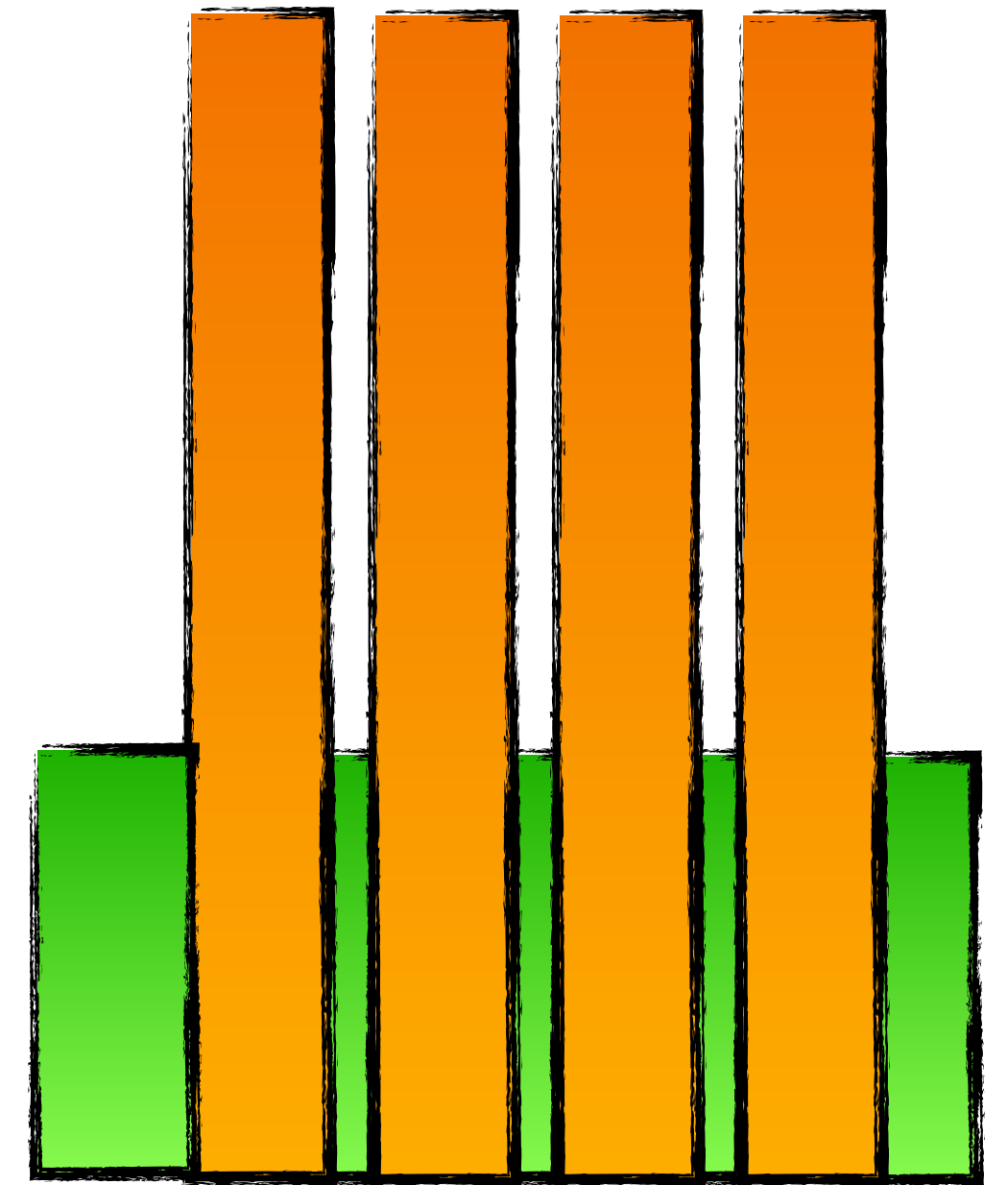
Quelle Distribution?



Quelles Priorités?



***Quelle
Répartition?***



Quelle Séance?

Quel Volume?

Quelle Progression?

Horizon de Programmation



90	50	110
4x8/2	3x12/3 (Z3) + 3x4/1:3 (Z4)	3x16/4 + 2x4 (Z4)
40	50	60
4x12/3	3x16/4'	3x8/2' (Z3) + 3x4/2' (Z5)
50	x	50

Allure Spécifique



Prog 10km

ON
TRACK

Fiche de Suivi des Entraînements

Utilise cette fiche pour noter tes résultats et suivre tes progrès

Semaine	Séance 1	Séance 2	Séance 3	Séance 4 (option)
Semaine 1	50' Z2 + Gammes 4 + 5 KL - RPE3	20' Z2 + 20x400m 100-110%VC /30" + 10' Z2 - RPE7	WU1 + 3x 10' 90-100%VC /2' + 10' Z2 - RPE6	40' Z2 - RPE2
Semaine 2	50' Z2 + Gammes 5 + 5 KL - RPE3	20' Z2 + 22x400m 100-110%VC /30" + 10' Z2 - RPE7	WU1 + 3x 12' 90-100%VC /2' + 10' Z2 - RPE6-7	40' Z2 - RPE2
Semaine 3	50' Z2 + Gammes 6 + 5 KL - RPE3	20' Z2 + 25x400m 100-110%VC /30" + 10' Z2 - RPE7	WU1 + 2x 20' 90-100%VC /2' + 10' Z2 - RPE7	40' Z2 - RPE2
Semaine 4	40' Z2 - RPE3	50' Z2 - RPE3	20' Z2 + 2x 15' 80-90%VC /5' + 15' Z2 - RPE5	

Semaine 5	50' Z2 + Gammes 4 + 5 KL - RPE3	WU2 + 8x 1000m allure 10km /2' + 10' Z2 - RPE9	WU2 + 10x45"/45" + 4' repos + 10x30"/30" + 10' Z2 - RPE7	40' Z2 - RPE2
Semaine 6	50' Z2 + Gammes 5 + 5 KL - RPE3	WU2 + 4x 2000m allure 10km /3' + 10' Z2 - RPE9	WU + 4'/2' + 4x1'/1' + 3'/1:30 + 4x 30"/30" + 10' Z2 - RPE8	40' Z2 - RPE2
Semaine 7	50' Z2 + Gammes 6 + 5 KL - RPE3	WU2 + 7x (200m Z5 + 1000m allure 10km)/1:30 + 10' Z2 - RPE9	WU2 + 3x (10x40"/30") /4' + 10' Z2 - RPE8	40' Z2 - RPE2
Semaine 8	40' Z2 + 5 KL - RPE3	WU1 + 3x 8'/2' + 10' Z2 - RPE6	50' Z2 - RPE3	
WU2: 15' Z2 + 5x 30"/30" Progressif Z4 => Z5 / repos 2'				
Semaine 9	60' Z2 - RPE3	WU2 + 3000m/3' + 2x 1500m/1:30 + 4x1000m/1' + 10' Z2 - RPE9	40' Z2 + 5KL - RPE3	
Semaine 10	30' Z2 + 10x 30"/30" (easy) + 10' Z2 - RPE6	20' Z1 + Gammes 5 + 5 KL - RPE2	WU + Gammes 4 + 10km - RPE10	

Progression Ski/Row

Semaine 1: 20'

10x35/25 Ski (1x RPE6)
9x35/25 Row

Semaine 4: 20'

10x45/15 Ski (1x RPE6)
9x45/15 Row (1x RPE6)

Semaine 2: 30'

9x40/20 Row TECH
Row 2x5'/1' R18 RPE4
10x40"/20" Ski Tech (1xRPE7)

Semaine 5: 40'

9x40/20 Row TECH (1x Full RPE7)
Row 2x5'/1' R18 RPE4
10x40"/20" Ski Tech (1x Full RPE7)
Ski 2x5'/1' R35-40 RPE4

Semaine 3: 30'

9x40/20 Row TECH
Row 2x5'/1' R18 RPE4
10x40"/20" Ski Tech (1xRPE7)
Ski 2x5'/1' R35-40 RPE4

Semaine 6: 50'

9x40/20 Row TECH (1x Full RPE7)
10x40"/20" Ski Tech (1x Full RPE7)
Row&Ski (alterné) 6x4'/1'
R20 Row & R35-40ski RPE4-5

Semaine 7: 60'

9x40/20 Row TECH (1x Full RPE7)
10x40"/20" Ski Tech (1x Full RPE7)
Row&Ski (alterné) 8x4'/1'
R20row & R35-40ski RPE4-5

Semaine 4: 30'

9x40/20 Row TECH (1x Full RPE7)
10x40"/20" Ski Tech (1x Full RPE7)
Row 2x5'/1' R18 RPE4

Force x3 & Endurance

\$1	Renfo 1	Z2	Renfo 2	REPOS	Z3	Renfo 3	REPOS
\$2	Renfo 1	Z2	Renfo 2	REPOS	Z2	Renfo 3	REPOS
\$3	Renfo 1	Z2	Renfo 2	REPOS	Z3	Renfo 3	REPOS
\$4	Renfo 1	Z2	Renfo 2	REPOS	Z2	Renfo 3	REPOS
	LUN	MAR	MER	JEU	VEN	SAM	DIM

Force x2 & Endurance

Focus Force

SA

SB

Focus ENDU

SA

SB

Renfo 1	Z5	Z2	REPOS	Renfo 2	Z2	REPOS
Renfo 1	Z5	Z2	REPOS	Renfo 2	Z5	REPOS
Z4	Z2	Renfo 1	REPOS	Z3	Z2	REPOS
Z4	Z2	Renfo 1	REPOS	Z2	Renfo 2	REPOS
LUN	MAR	MER	JEU	VEN	SAM	DIM

Force x2 & Endurance

Focus Force
Focus Endu

SA

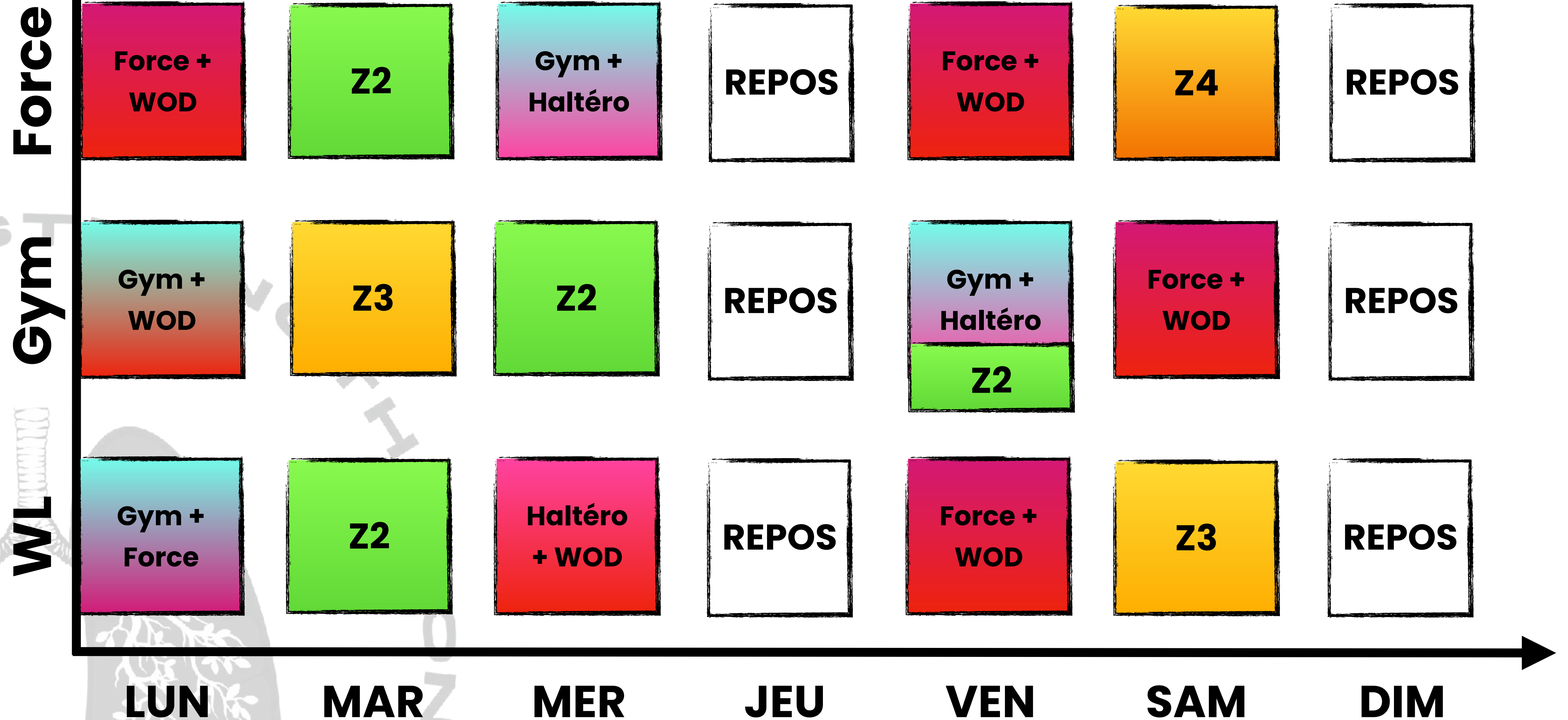
SB

SA

SB

Renfo 1	REPOS	Z5	REPOS	Renfo 2	Z2	REPOS
Renfo 1	REPOS	Z2	REPOS	Renfo 2	Z5	REPOS
Z4	REPOS	Renfo 1	REPOS	Z3	Z2	REPOS
Z4	REPOS	Renfo 1	REPOS	Z2	Renfo 2	REPOS
LUN	MAR	MER	JEU	VEN	SAM	DIM

CrossFit & Endurance



Trail & Ultra Distance

Ultra - skimo



Entre course

REPOS	Force	Z1 (10% D+)	Z1 (10% D+)	Z2 (15% D+)	Z1 (25% D+)	Z1 (40% D+)
Z1 (10% D+)	Force	Z2 (25% D+)	Z1 (10% D+)	REPOS	Z1 (40% D+)	Z1 (15% D+)
REPOS Ou Z1	Z1 Récup	Z1 - 4 (15% D+)	VITESSE	 Z1	Course	Z1 Longue

LUN MAR MER JEU VEN SAM DIM

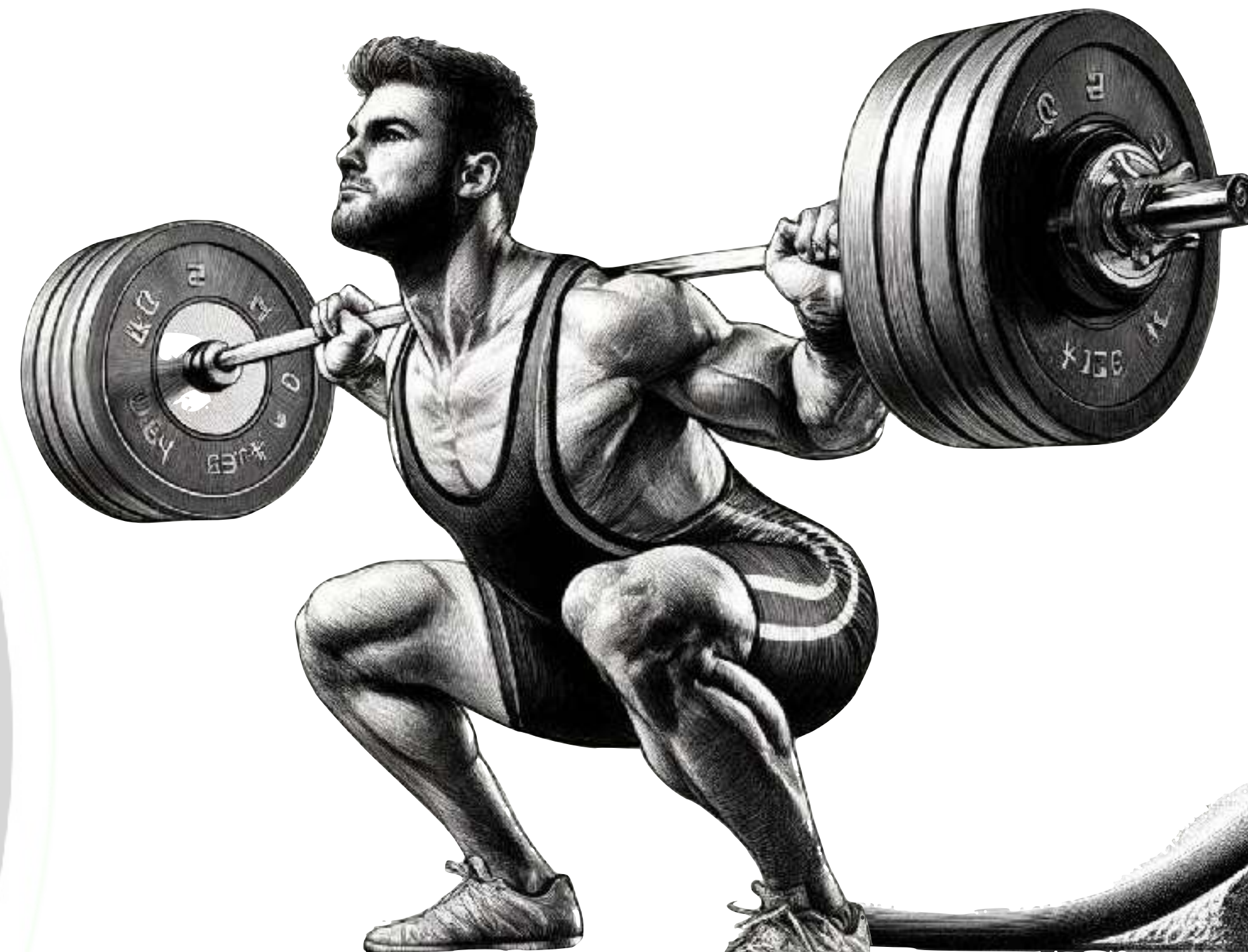
S1 / PS	10' PS 3x10'/2' Z2 RPE3	10' PS 8x4'/1' Z3L RPE5	10' PS 8x4'/1' Z RPE6
S2	3x15'/2' Z2 RPE3	3x15'/2' Z2 RPE3	3x20'/2' Z RPE3
S3 / PS	10' PS 6x4'/1' Z3L RPE4	10' PS 2x8'/2' + 4x4'/1' Z3 RPE5	10' PS 5x4'/1' Z RPE5
S1	Basket	Basket	Basket
S2	Basket	Basket	Basket
S3	Crampons	Crampons	Crampons

[illegible]

FORMATION

SPSL 2025

L'Entraînement Respiratoire

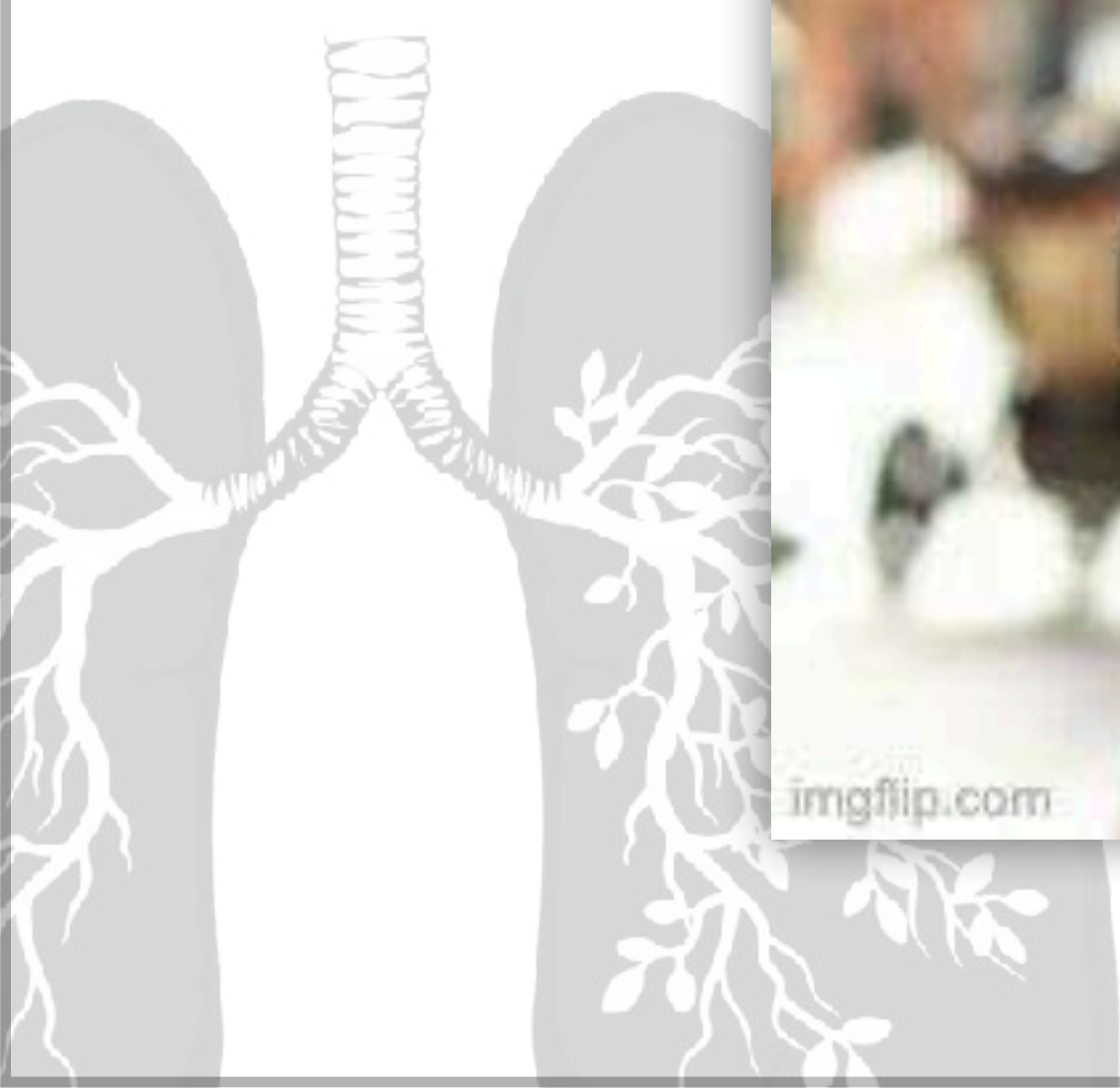


Brian Kozak



***“Si tu ne contrôle par
ta respiration, c’est
elle qui te contrôle.”***

E STRA



**LES BOSU,
LES ÉCHELLES
D'AGILITÉ ET LITÉRALLEMENT
TOUT LE RESTE**

LES COACHS

**L'ENTRAÎNEMENT
RESPIRATOIRE**

imgflip.com

Le plan du jour



***l'EMR pour
l'Endurance***

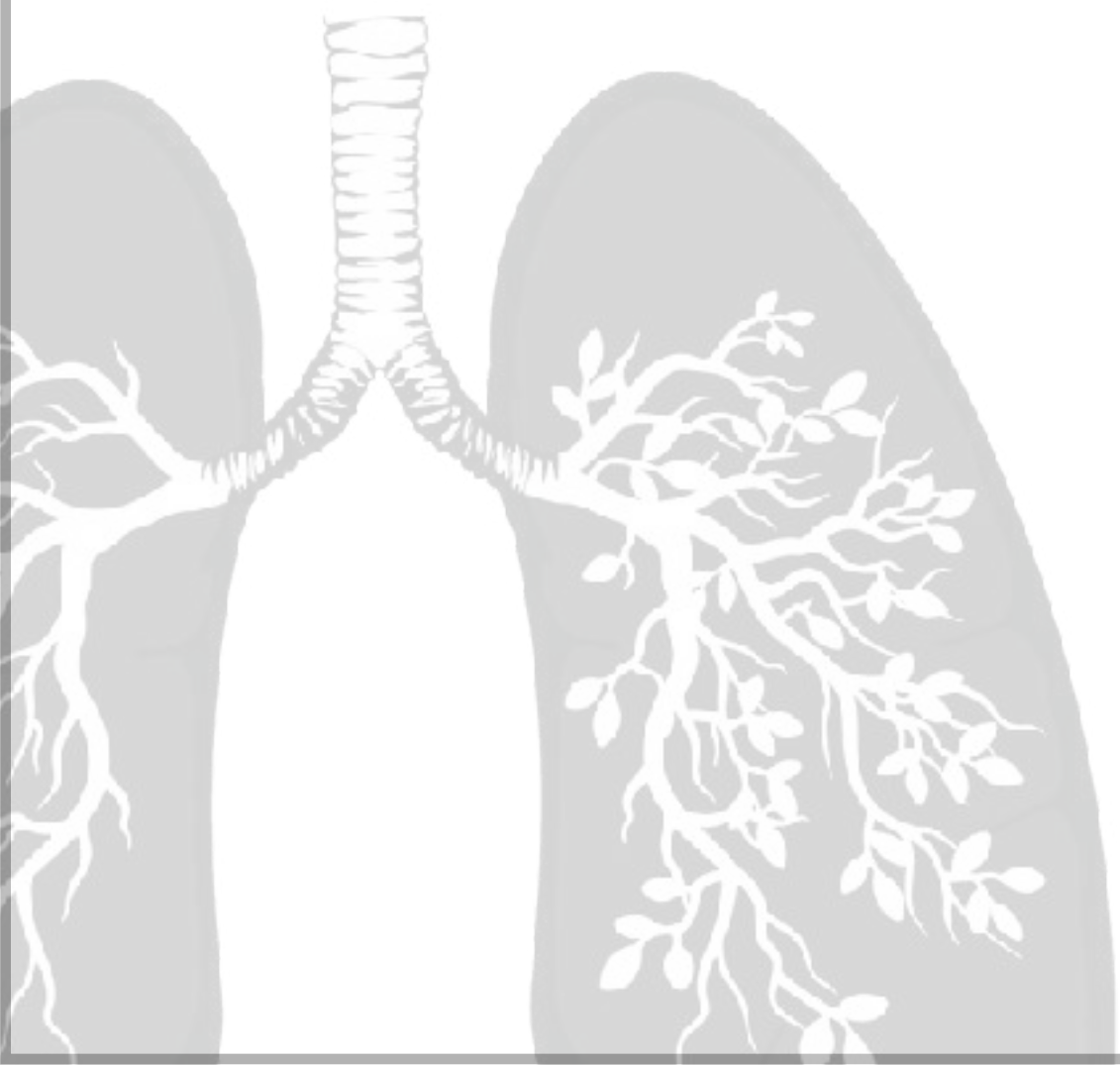


***Exemple
d'Entraînements***



***Concepts
Complémentaires***

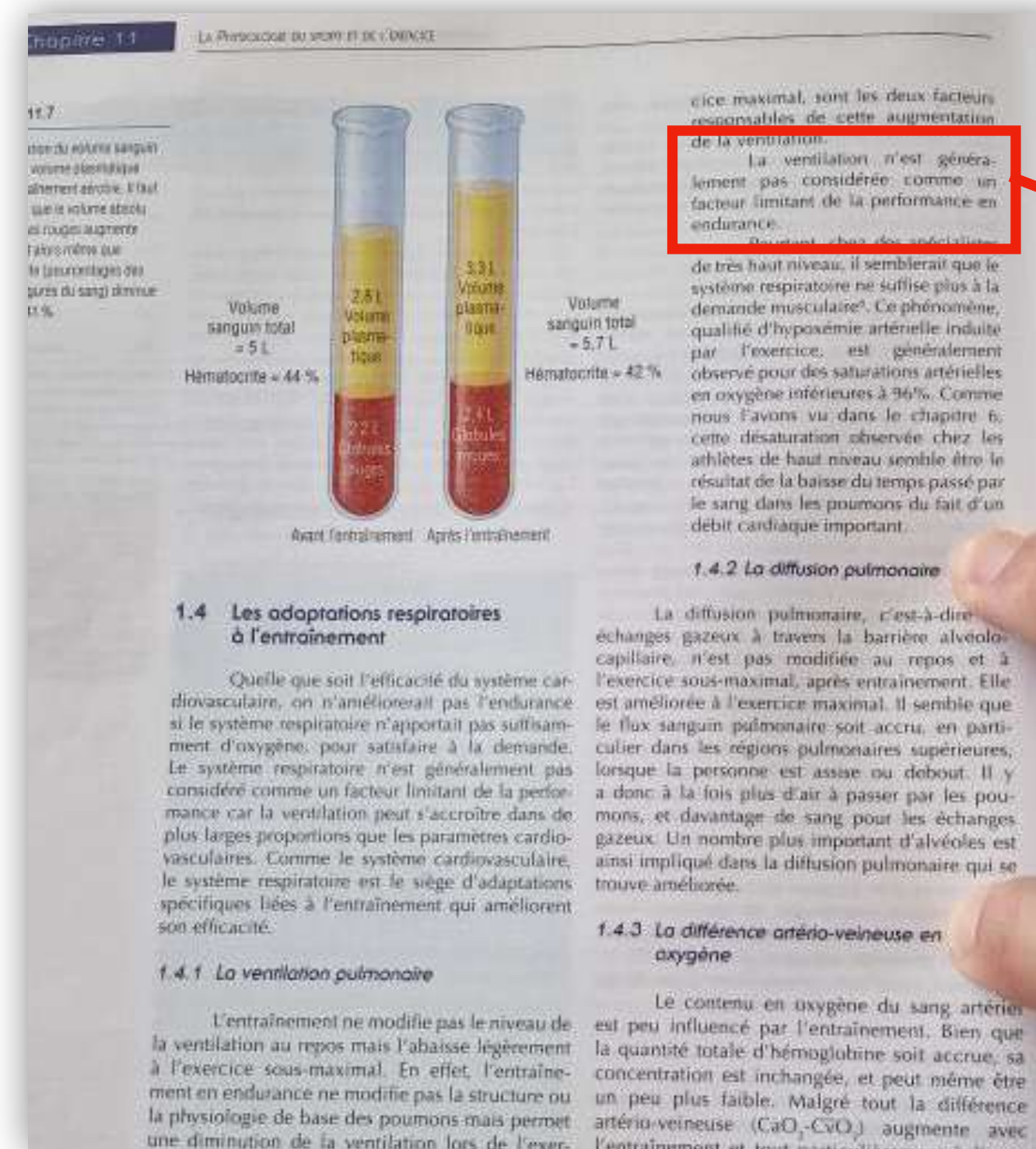
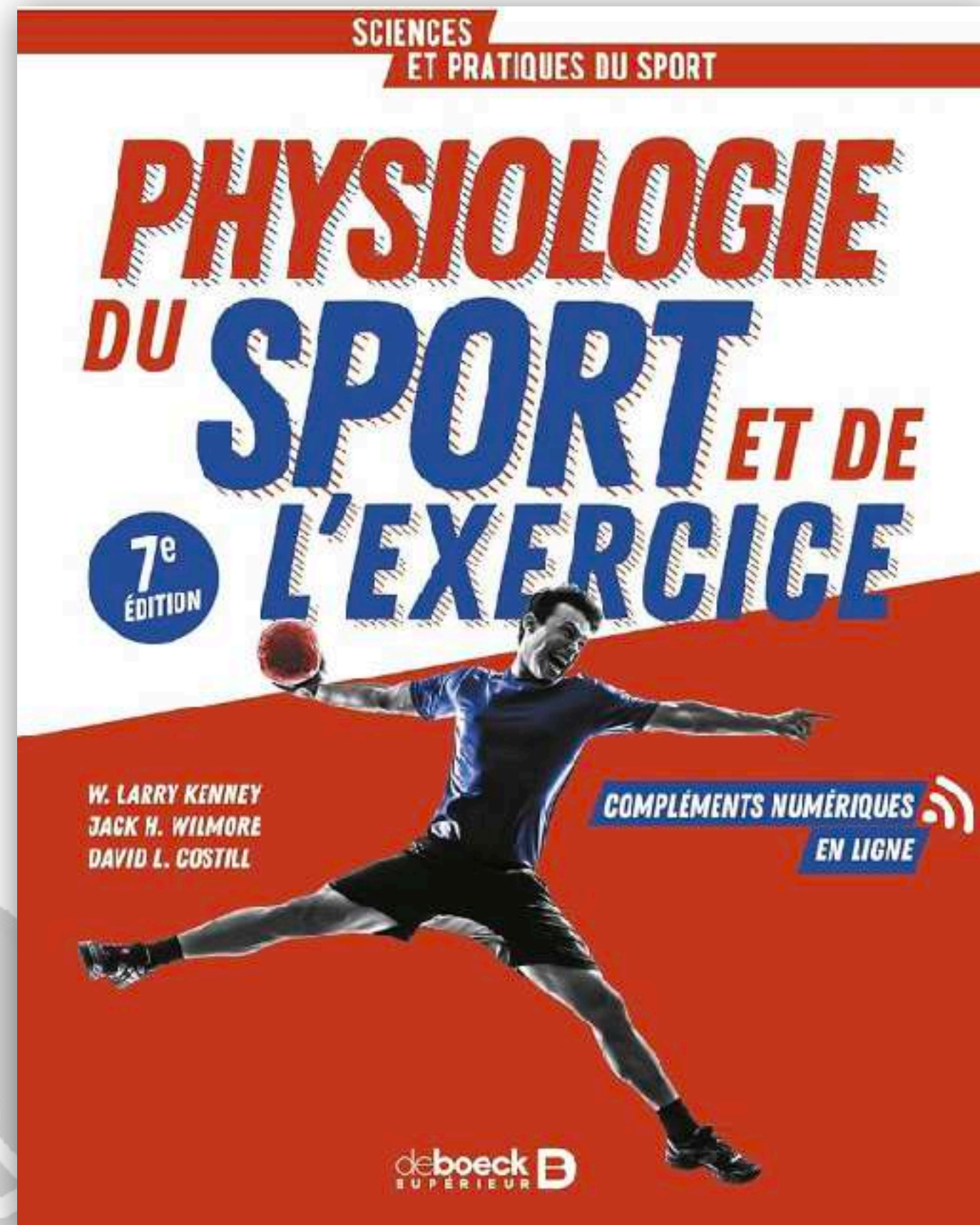
***Pourquoi l'entraînement
respiratoire est souvent
décrié?***



STRENGTH
ANCE

Origine de Myth

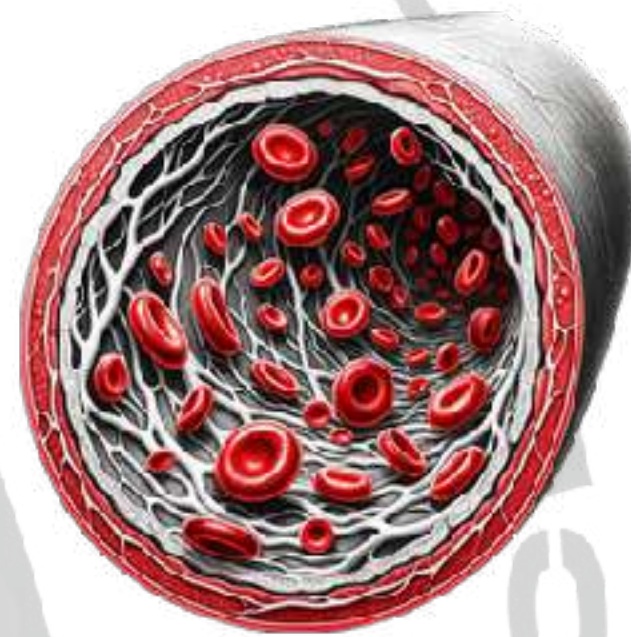
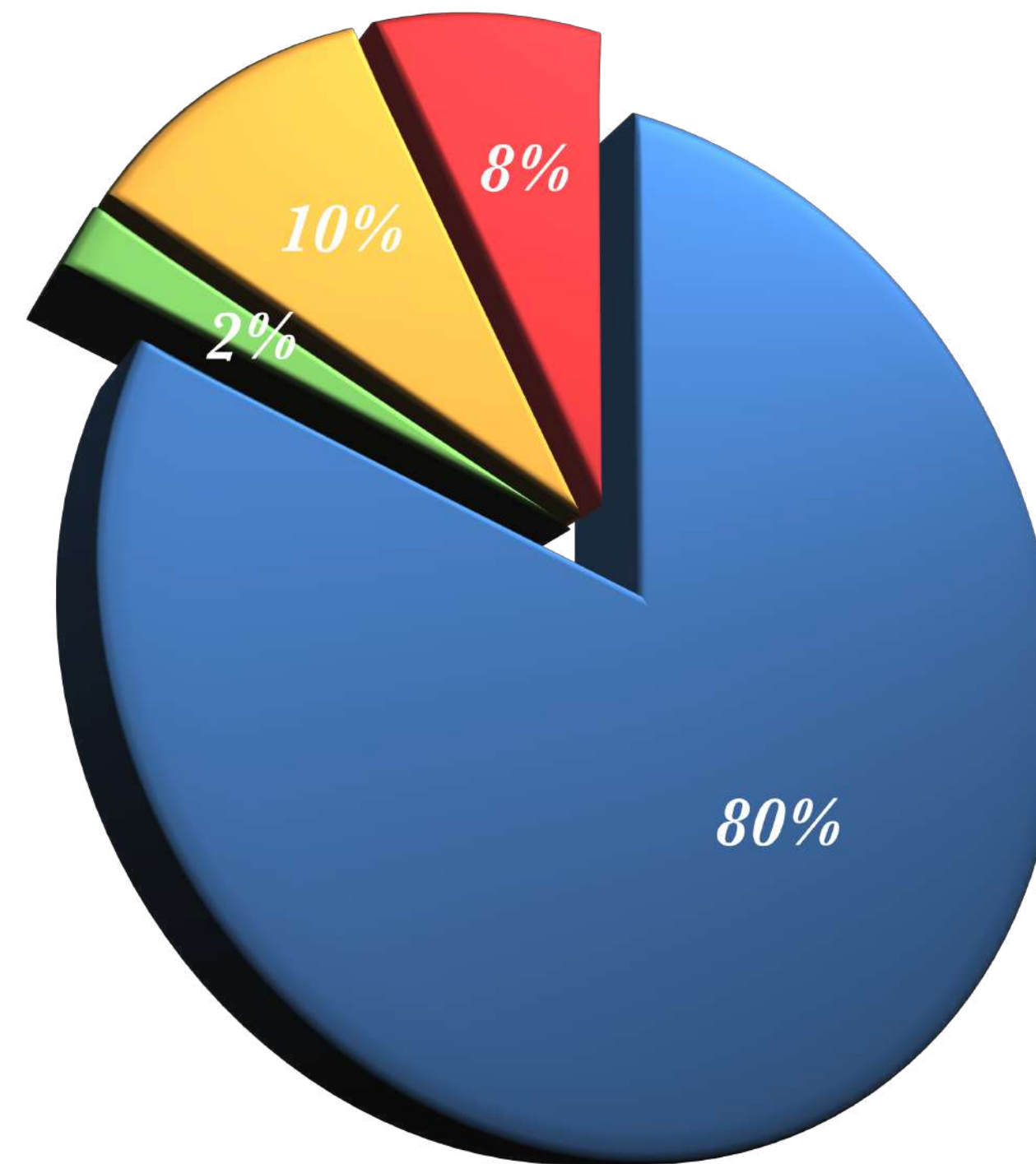
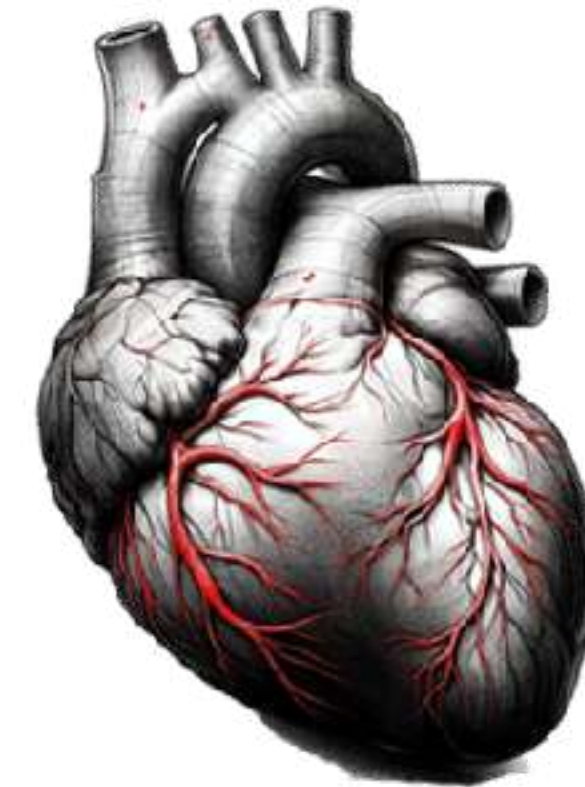
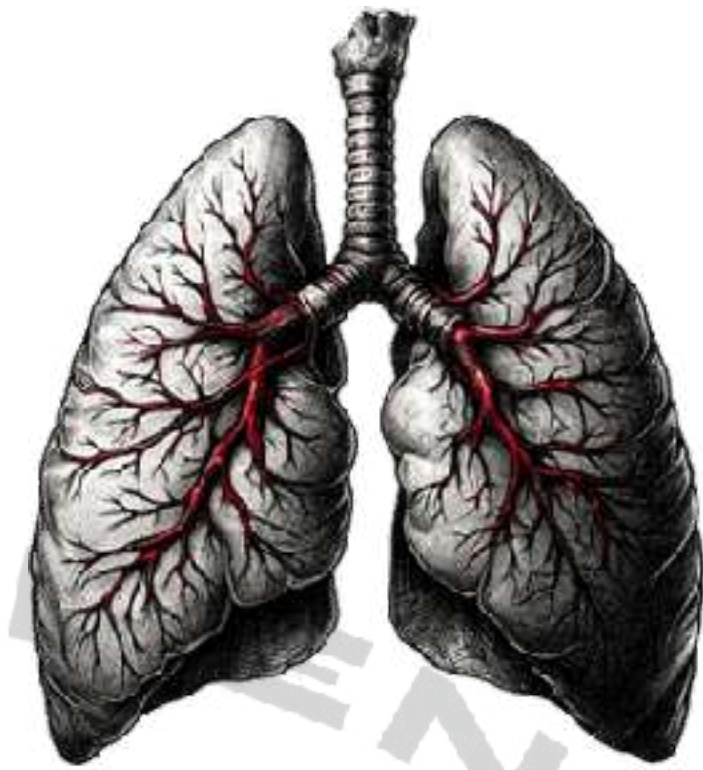
Chapitre 1.4.1



“La ventilation n'est généralement pas considérée comme un facteur limitant de la performance en endurance”

VO2max Limitation

● Cardiaque ● Respiratoire ● Vasculaire ● Musculaire



La Réalité

“L’Entraînement des Muscles Respiratoires (EMR) est associé à **une amélioration des performances d'endurance et de la fonction pulmonaire**, ainsi qu'à **une réduction de la fatigue respiratoire, de la perception de l'effort ou de l'essoufflement.**”

OPEN

Practical Application of Respiratory Muscle Training in Endurance Sports

Tomasz Kowalski, MSc,¹ Dominika Granda, PhD,² and Andrzej Klusiewicz, PhD³

¹Department of Physiology, Institute of Sport-National Research Institute, Warsaw, Poland; ²Department of Nutrition Physiology, Institute of Sport-National Research Institute, Warsaw, Poland; and ³Department of Physiology and Biochemistry, Faculty of Physical Education and Sport in Białá Podlaska, Józef Piłsudski University of Physical Education in Warsaw.

Supplemental digital content is available for this article. Direct URL citations appear in the printed text and are provided in the HTML and PDF versions of this article on the journal's Web site (<http://journals.lww.com/nsca-scj>).

This is an open access article distributed under the Creative Commons Attribution License 4.0 (CCBY), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Since traditional sport-specific training or exercise programs do not create enough stimulus to improve the function of the respiratory muscles, the rationale to introduce respiratory muscle training (RMT) emerged. RMT is associated with improved endurance performance and pulmonary function, and it reduced respiratory fatigue, perceived exertion, or breathlessness. The purpose of this article is to provide coaches with tools to select the appropriate form of RMT in the context of the athletes' needs, using appropriate methods, techniques, devices, and testing protocols. The video abstract is presented in Supplemental Digital Content as SDC 1.

INTRODUCTION

The evidence of the importance of respiratory muscle function in endurance performance

Address correspondence to Tomasz Kowalski, tomasz.kowalski@insp.pl.

emerged during the past decades (10,67,83). However, it appears that the traditional sport-specific training programs do not create enough stimulus to significantly improve the function of the respiratory muscles (12,18), providing the rationale to introduce respiratory muscle training (RMT). The research findings from 50 years ago already indicated that it was possible to enhance the strength and endurance of respiratory muscles in healthy individuals through targeted training (43). However, the effectiveness of RMT has been much debated for decades (50,60). The long-term lack of scientific consensus on RMT may be attributed to the methodological differences in identifying small, worthwhile performance changes between sports and clinical settings. Although <1% differences in athletic performance are decisive for winning medals (14), clinical measures of performance are considered worthwhile based on changes larger than 10% (63).

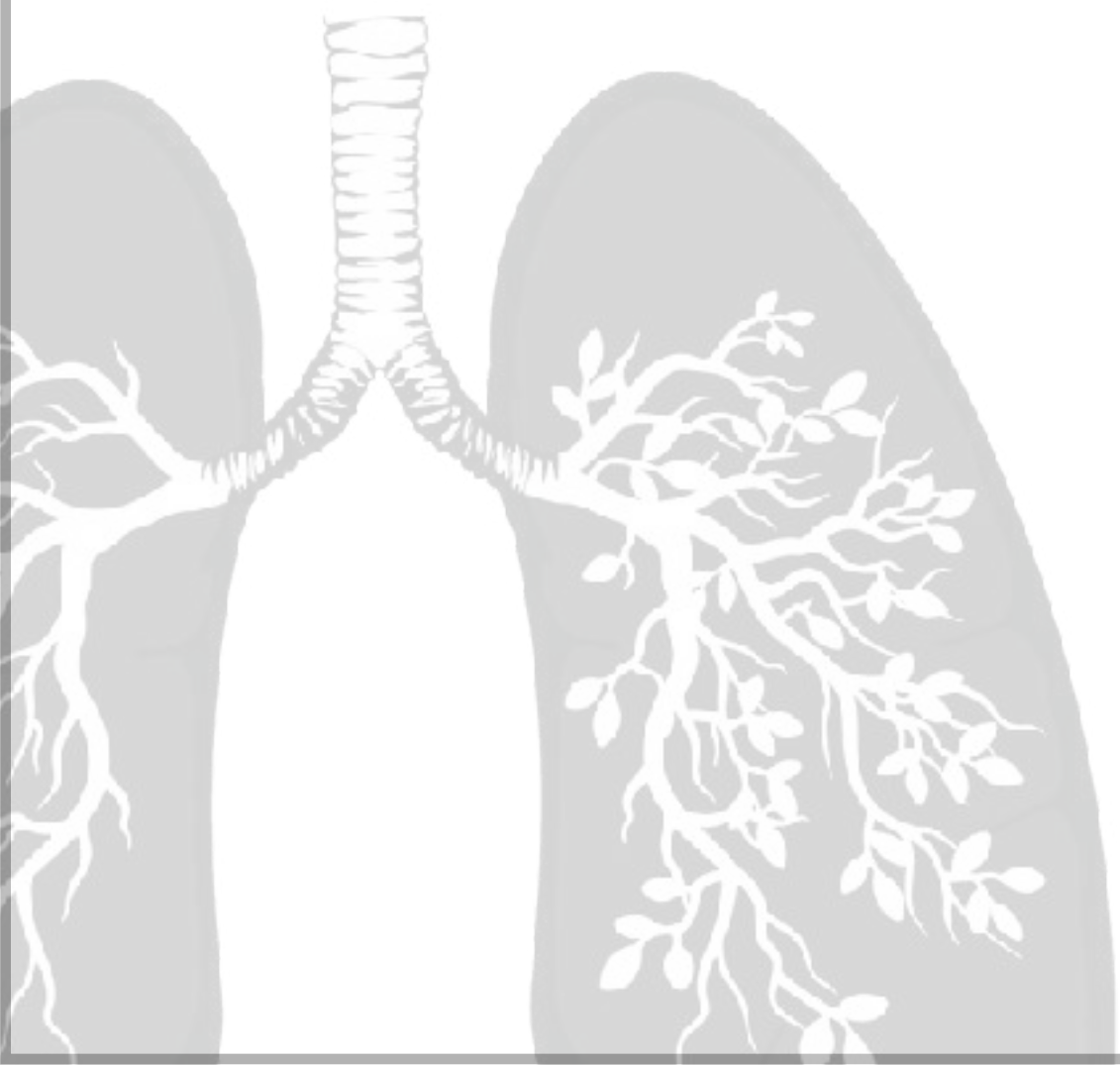
Moreover, it was suggested that methodological factors such as inappropriate

training prescriptions, improper testing measures, lack of sham-control groups, insufficient control over RMT implementation, and small sample sizes have critically influenced the results obtained from RMT studies (52). Finally, identifying respiratory muscle fatigue was elusive during cardiopulmonary exercise testing. Popular laboratory tests usually do not elicit significant fatigue in respiratory muscles due to their limited length and insufficient duration of high-intensity effort (68), whereas longer and more specific time trials are less widespread. Therefore, many scientists did not investigate respiratory muscle function in the context of performance limitation. However, state-of-the-art literature reviews concluded that RMT improves performance during intermittent incremental tests, constant load tests, and time trials.

KEY WORDS:

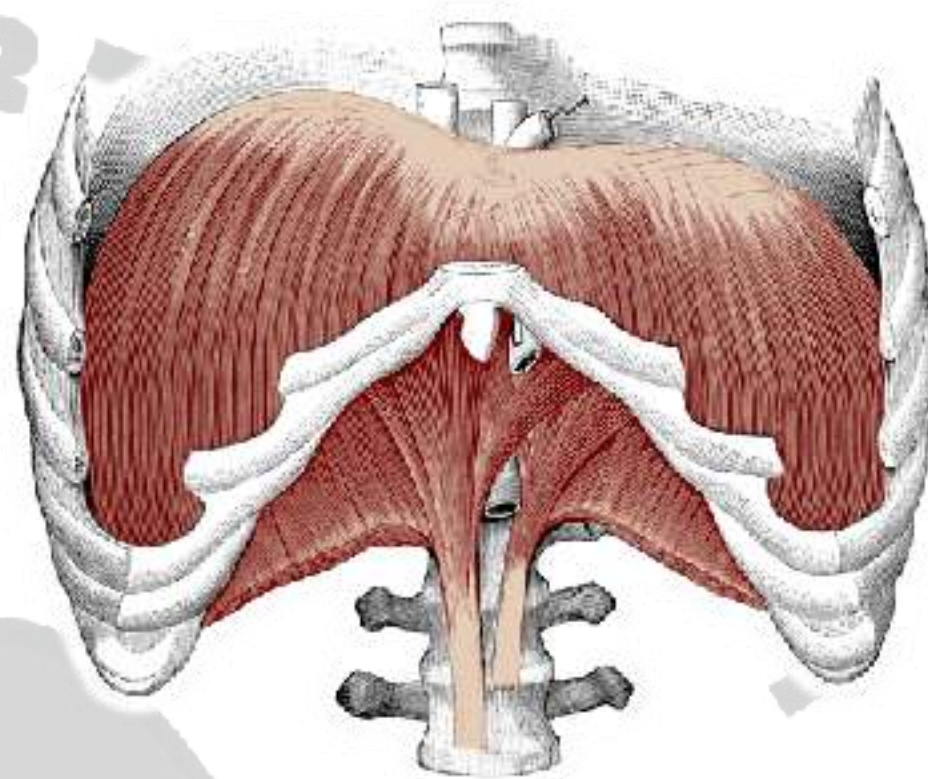
respiratory muscle training; inspiratory muscle training; breathing; performance; respiratory muscles

***Comment fonctionnent les
muscles respiratoires à
l'effort?***

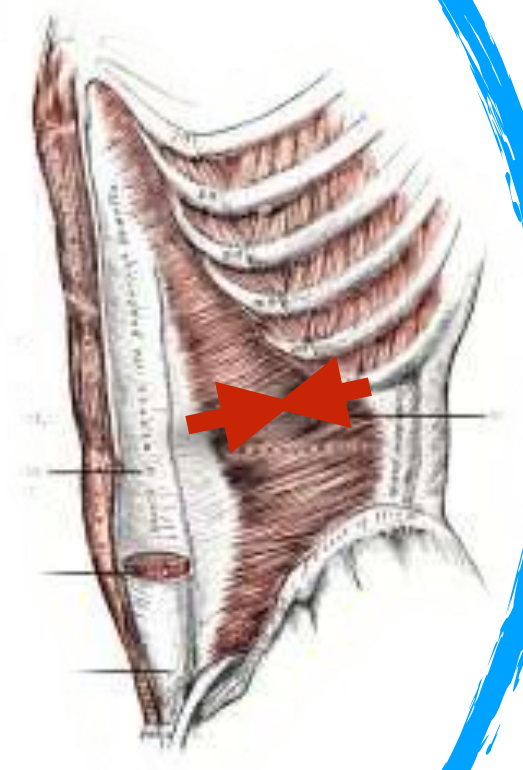
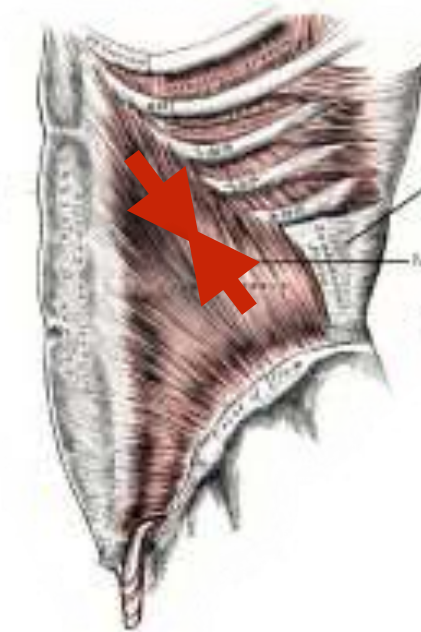
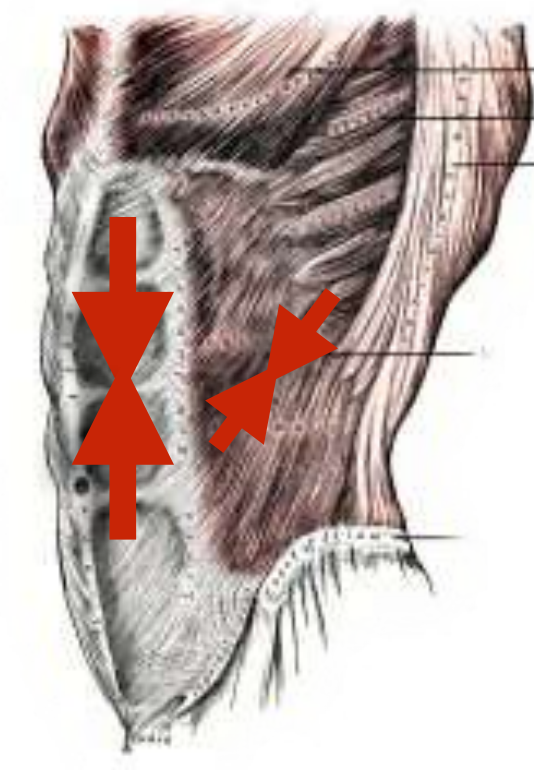
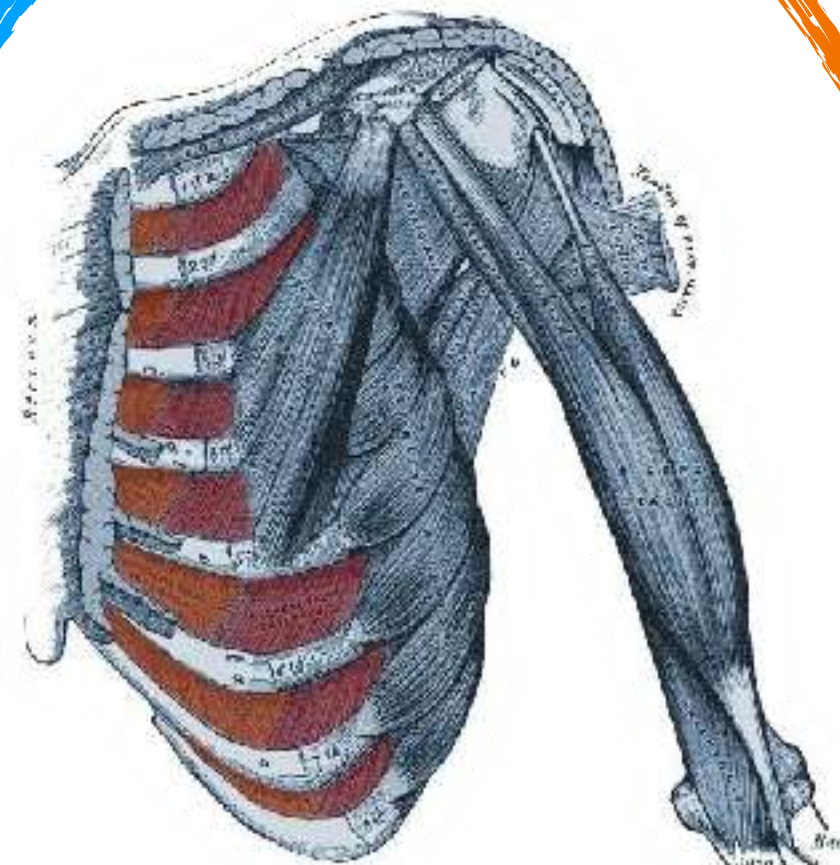


Les Muscles Respiratoires

Inspiration

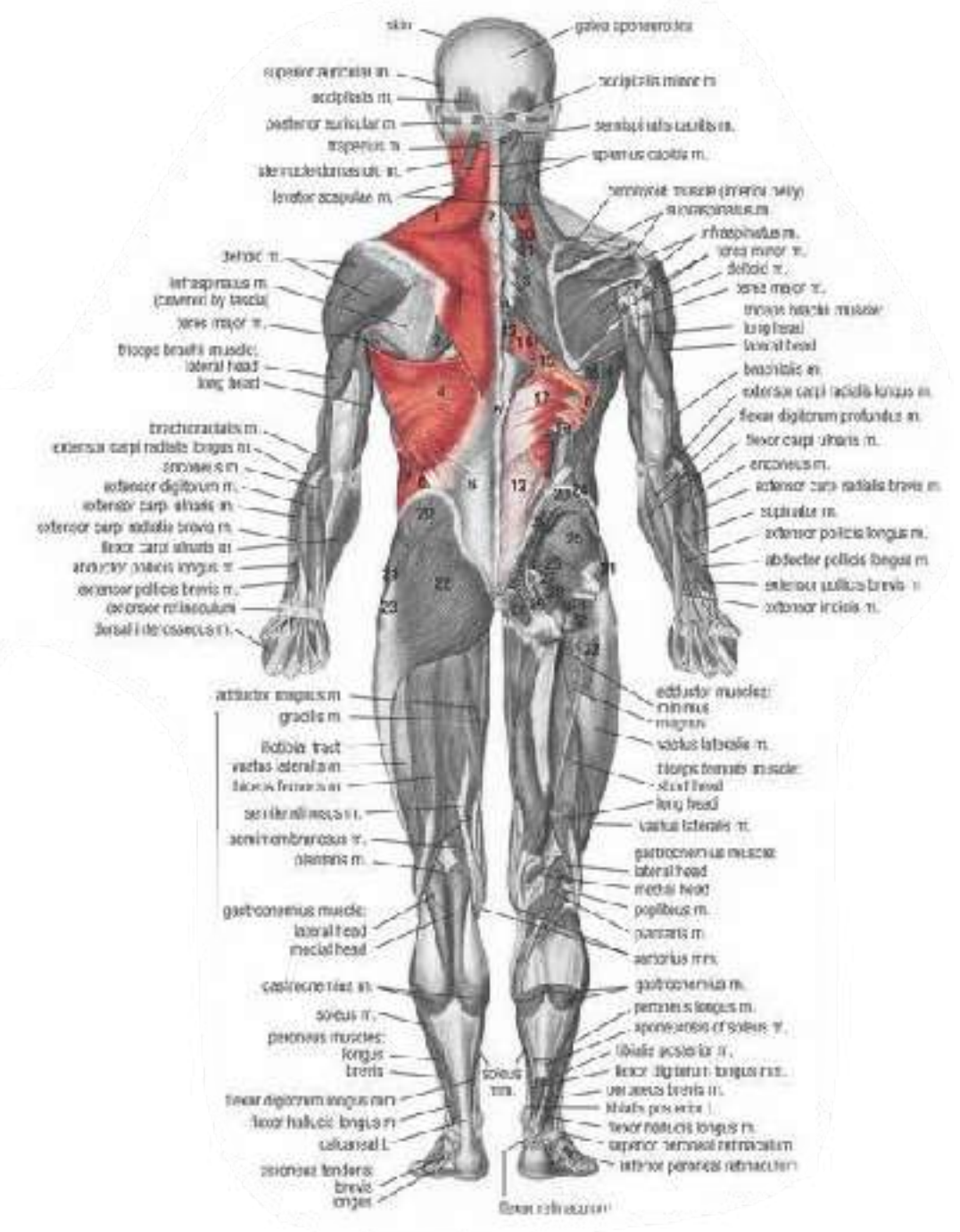
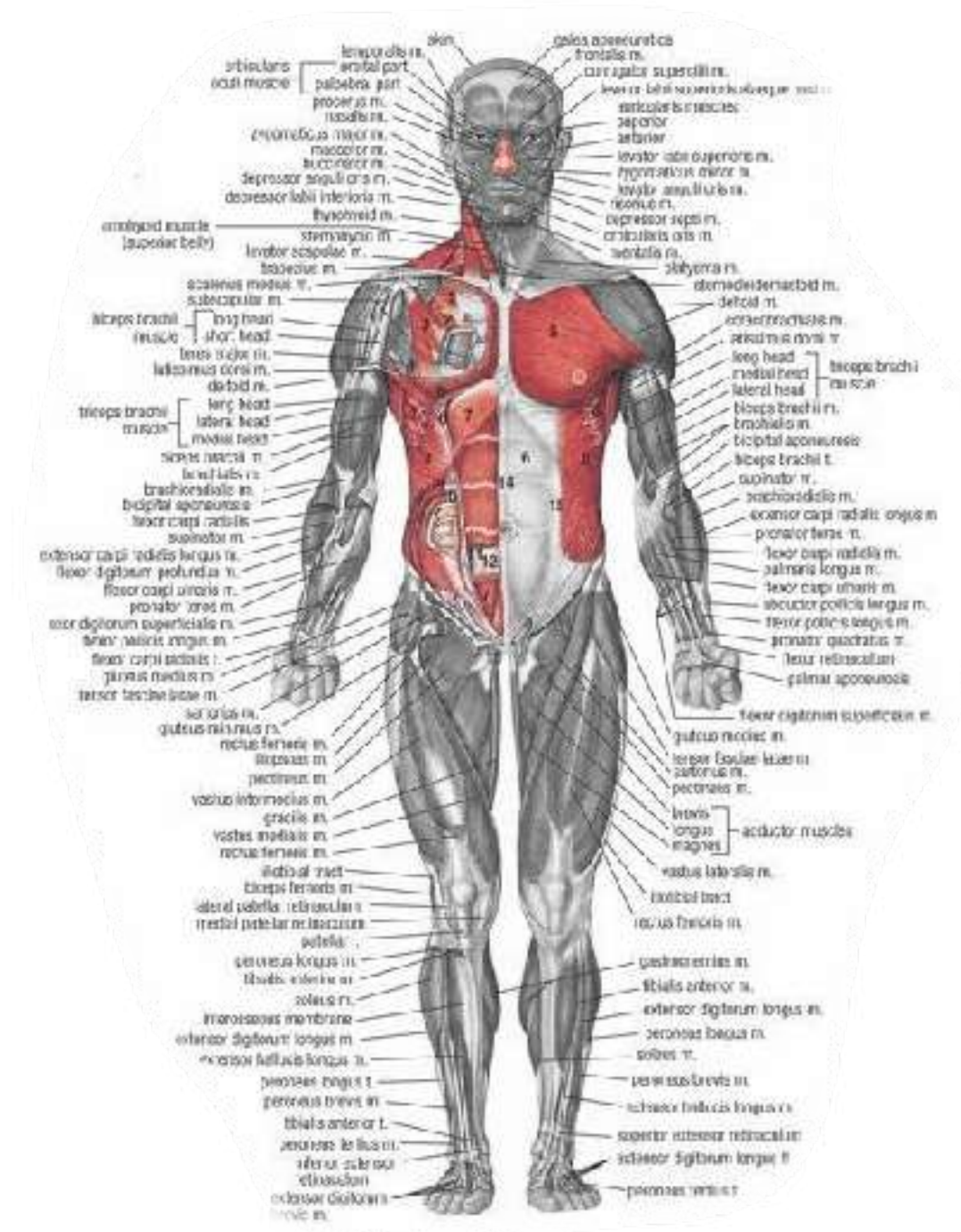
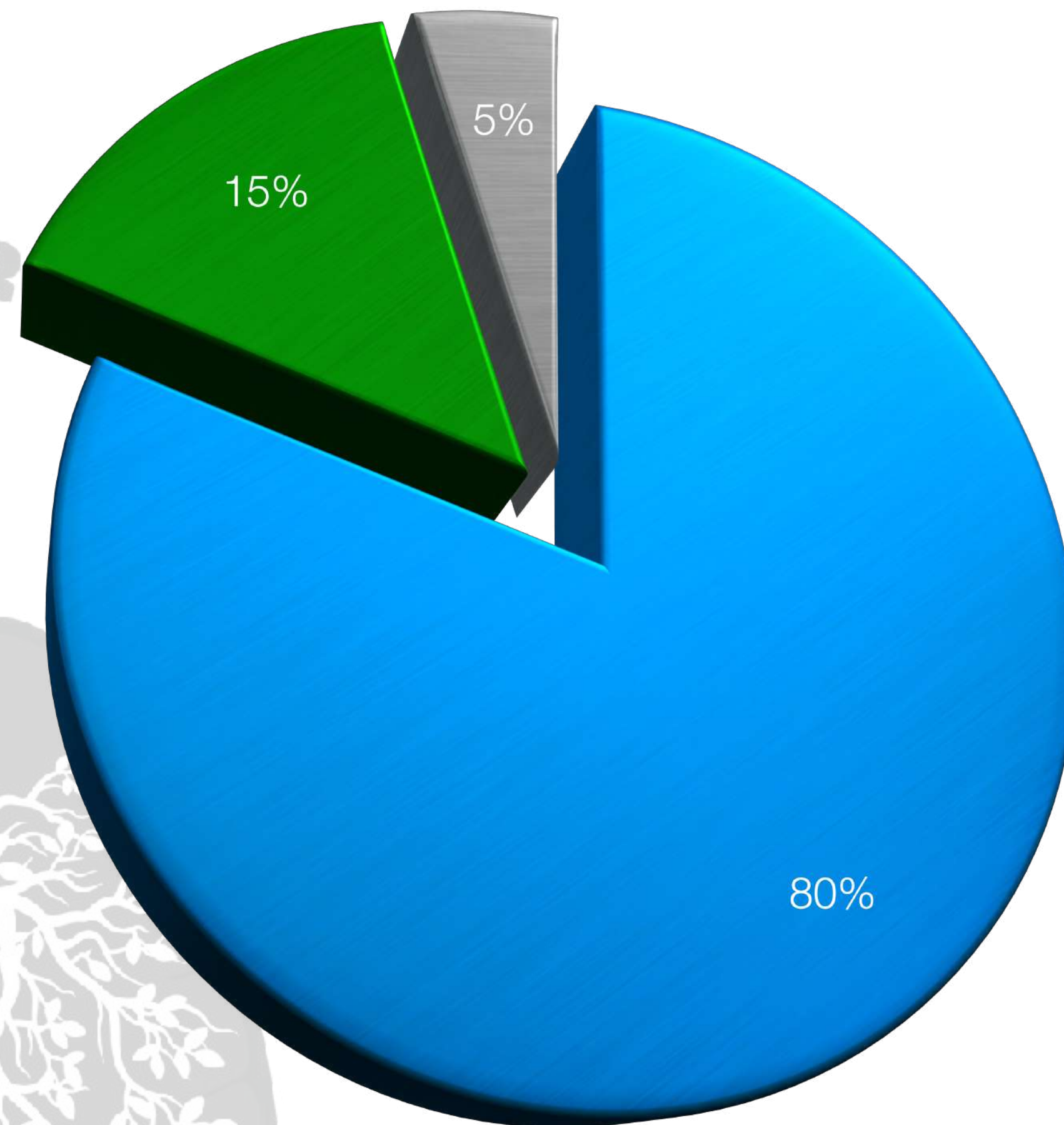


Expiration



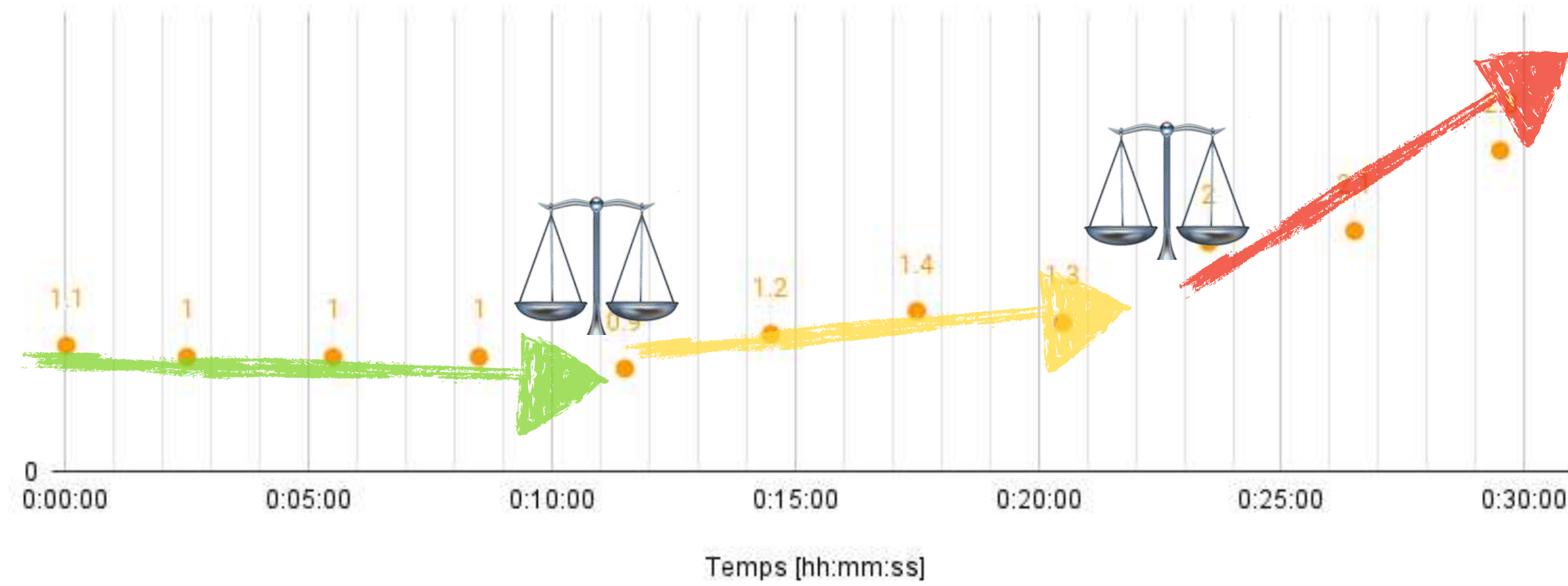
Ventilation à HI

● Jambes ● Respiratoire ● Autre

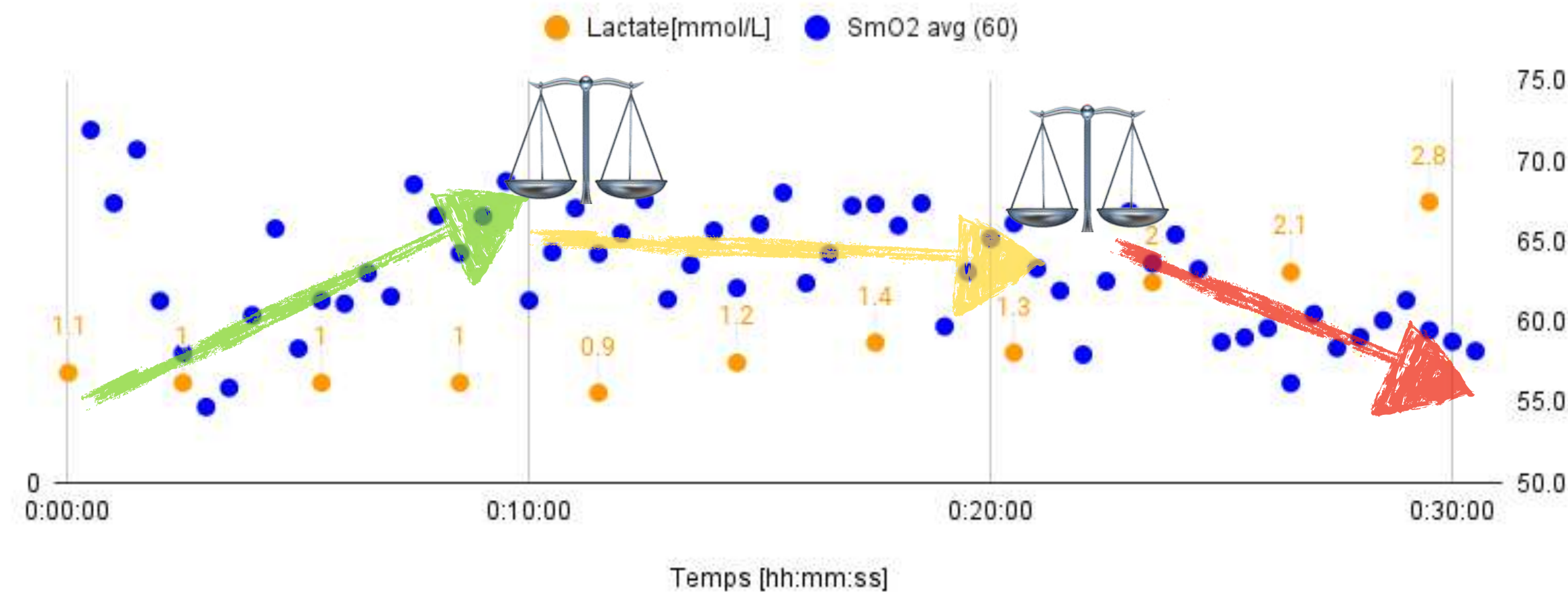


Fatigue à HI

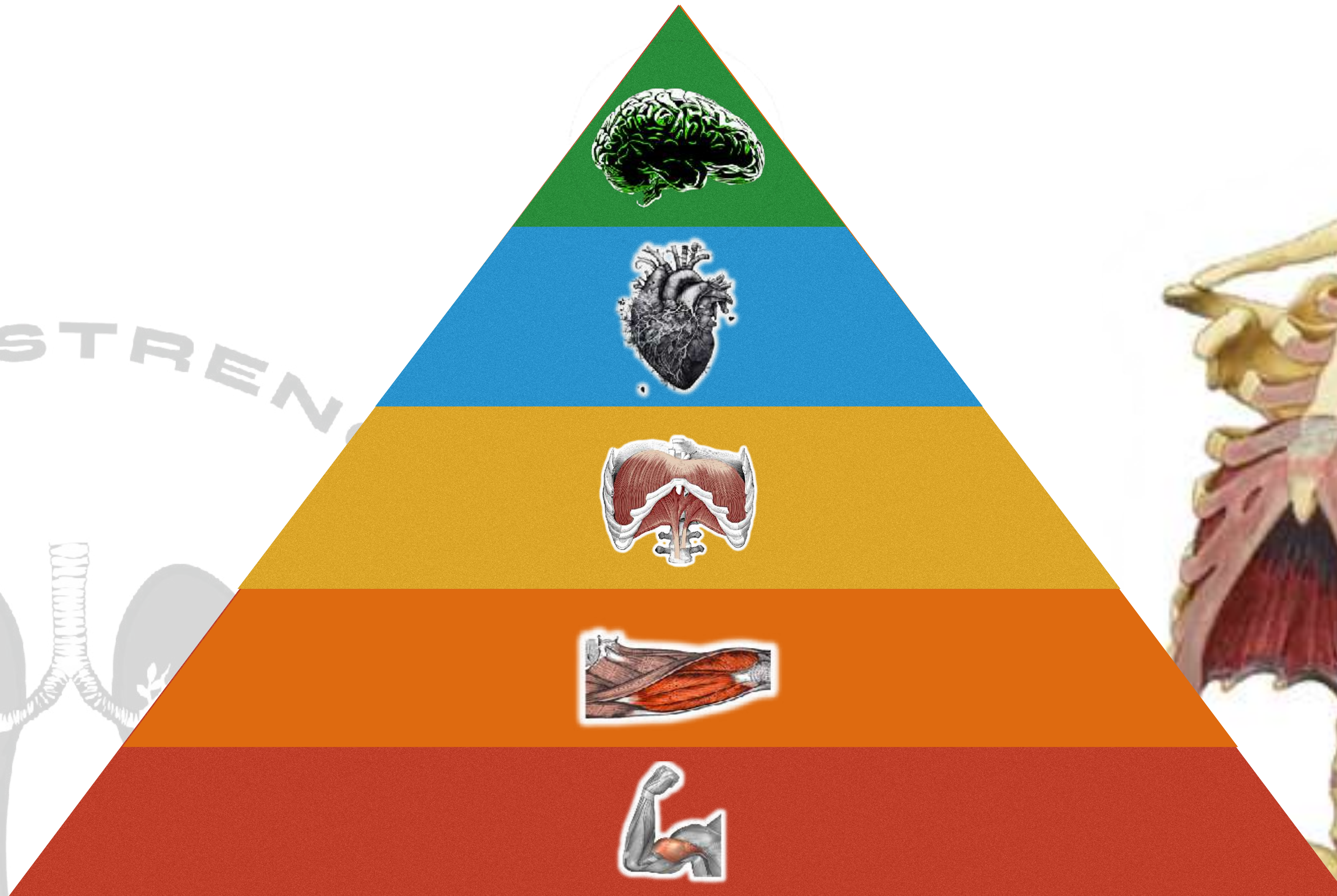
Jules - Test de Coordination Respiratoire 2.0



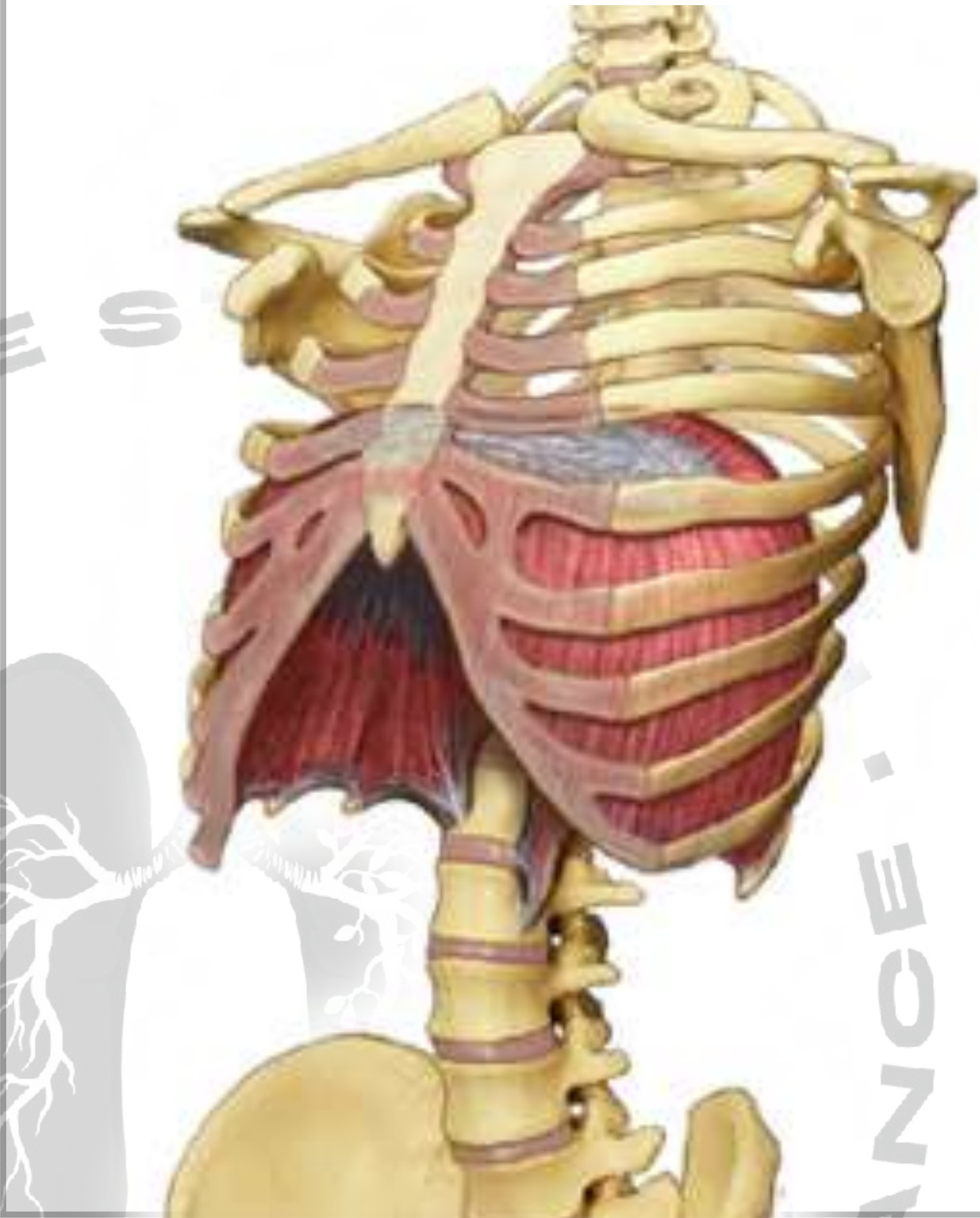
Jules - Test de Coordination Respiratoire 2.0



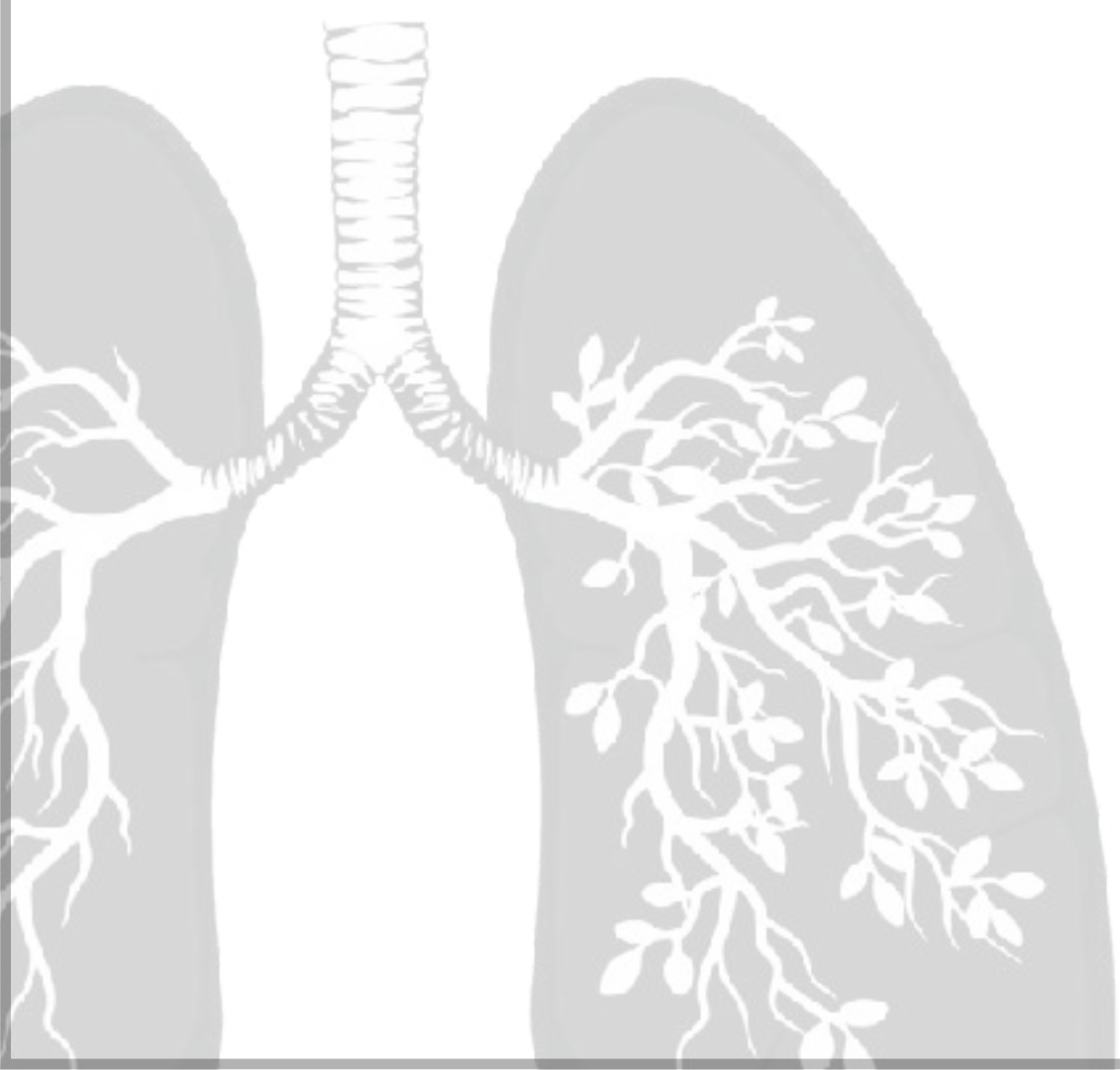
Reflexe Métabolique Respiratoire



Fatigue Respiratoire



***Quel est le potentiel de progrès
avec l'EMR?***

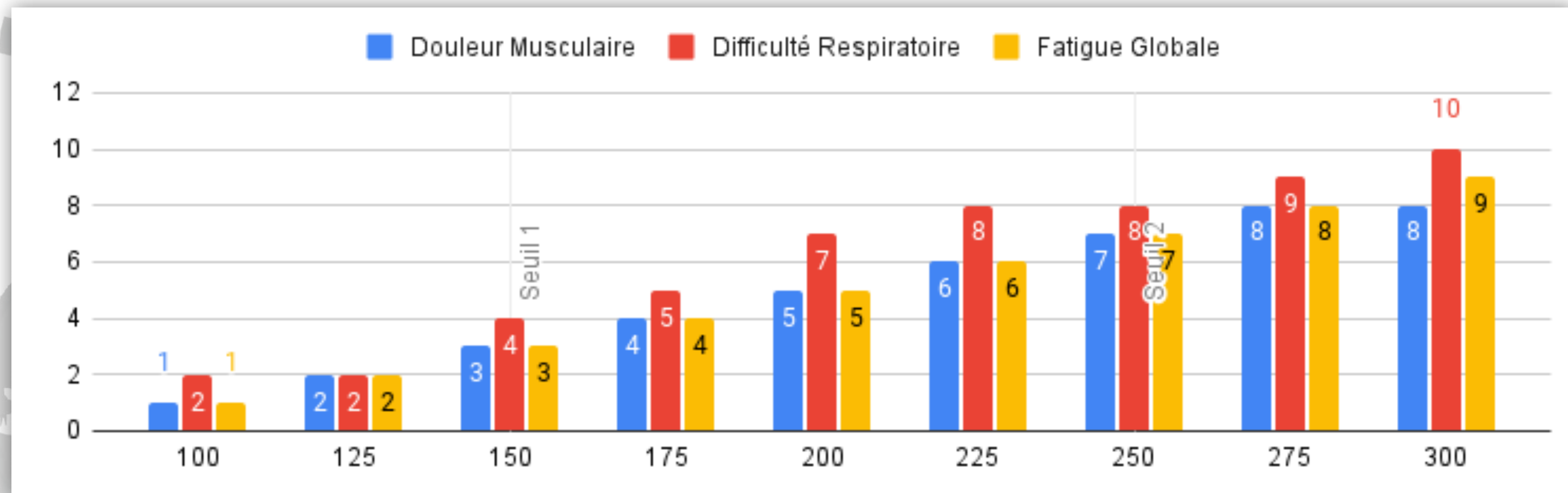
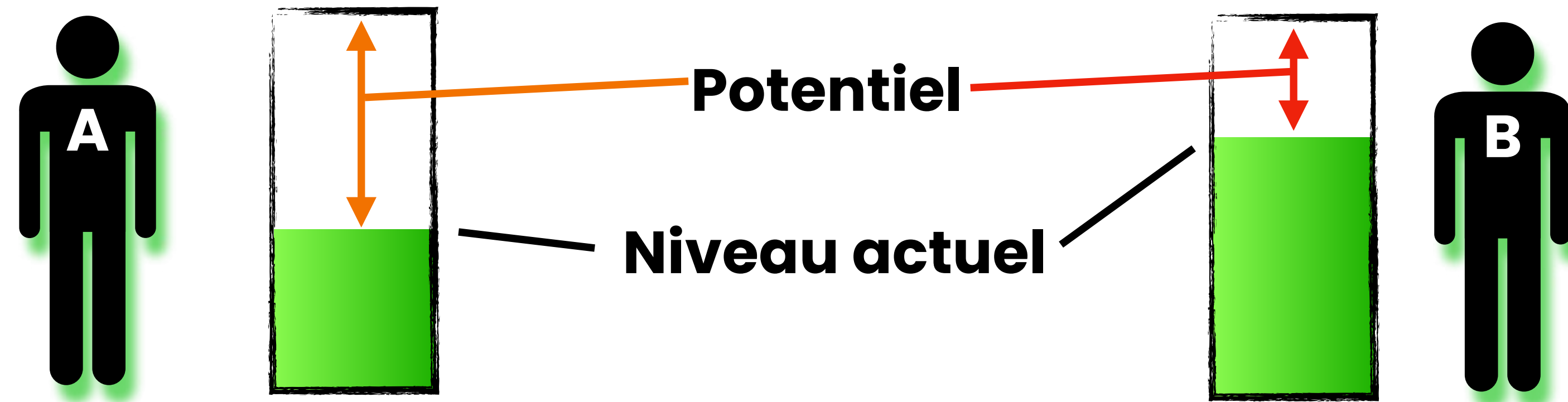


STRENGTH
ANCE

Différences H-F



Différences Individuelles



RPE du Protocole 41



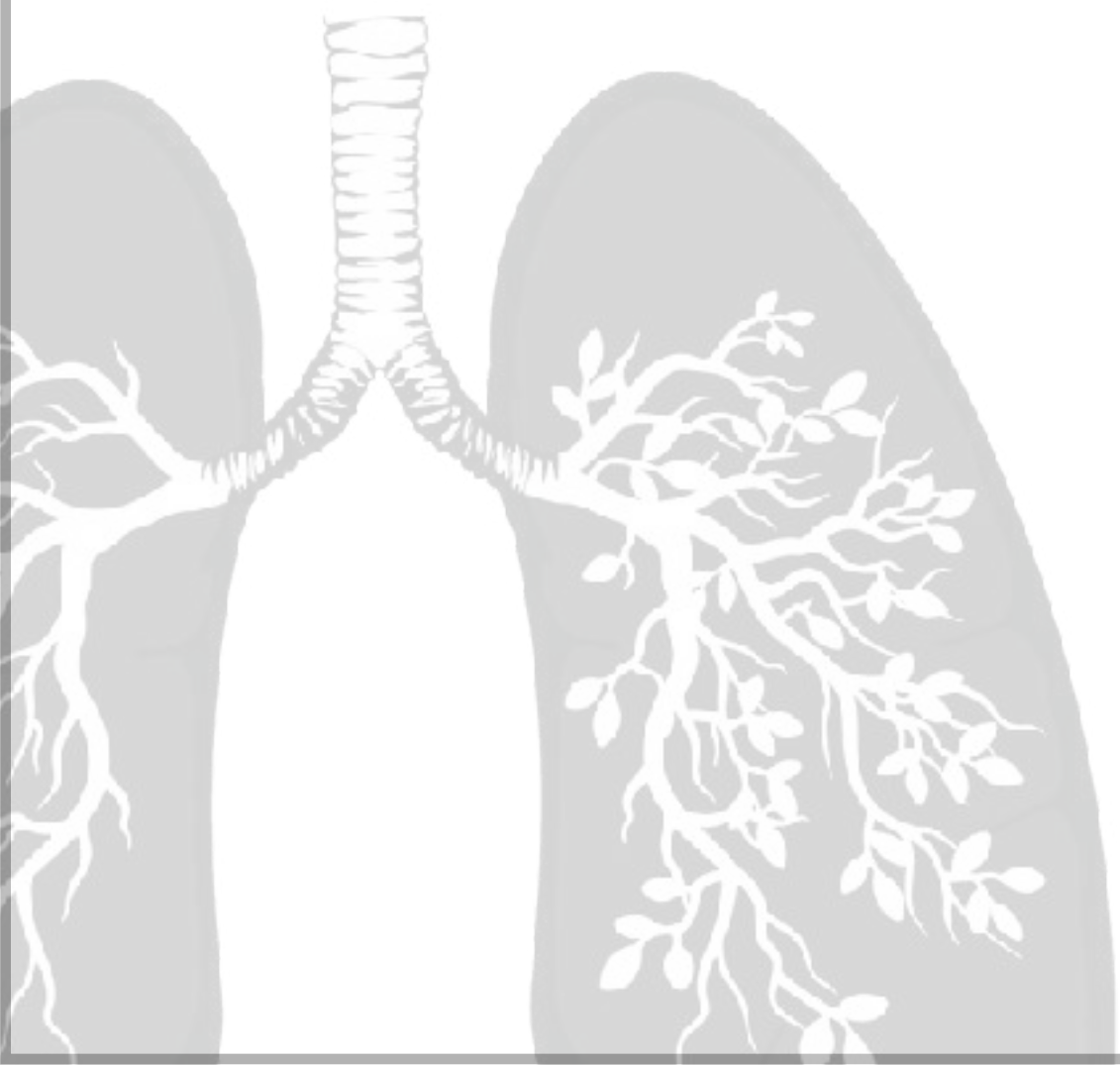




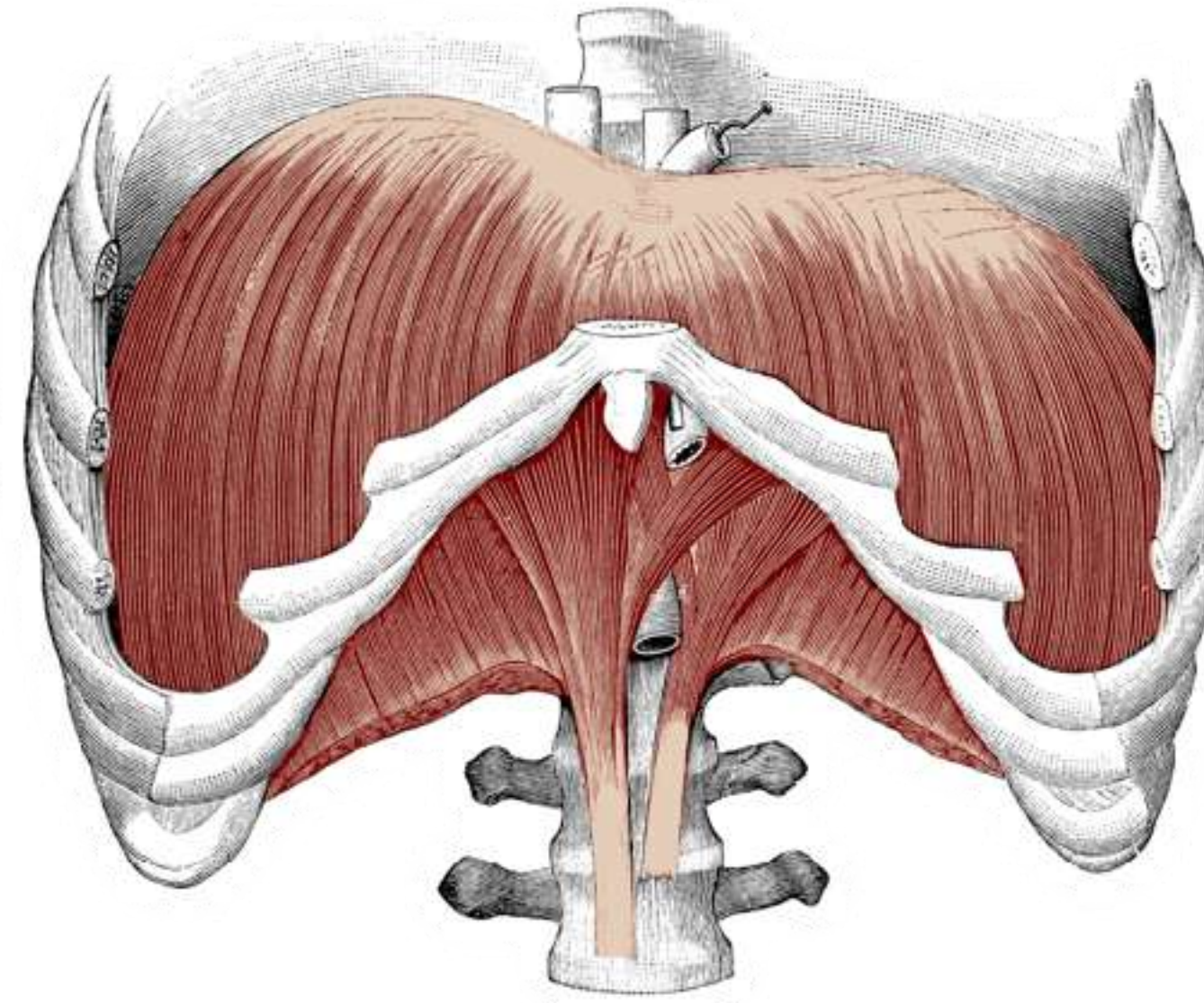
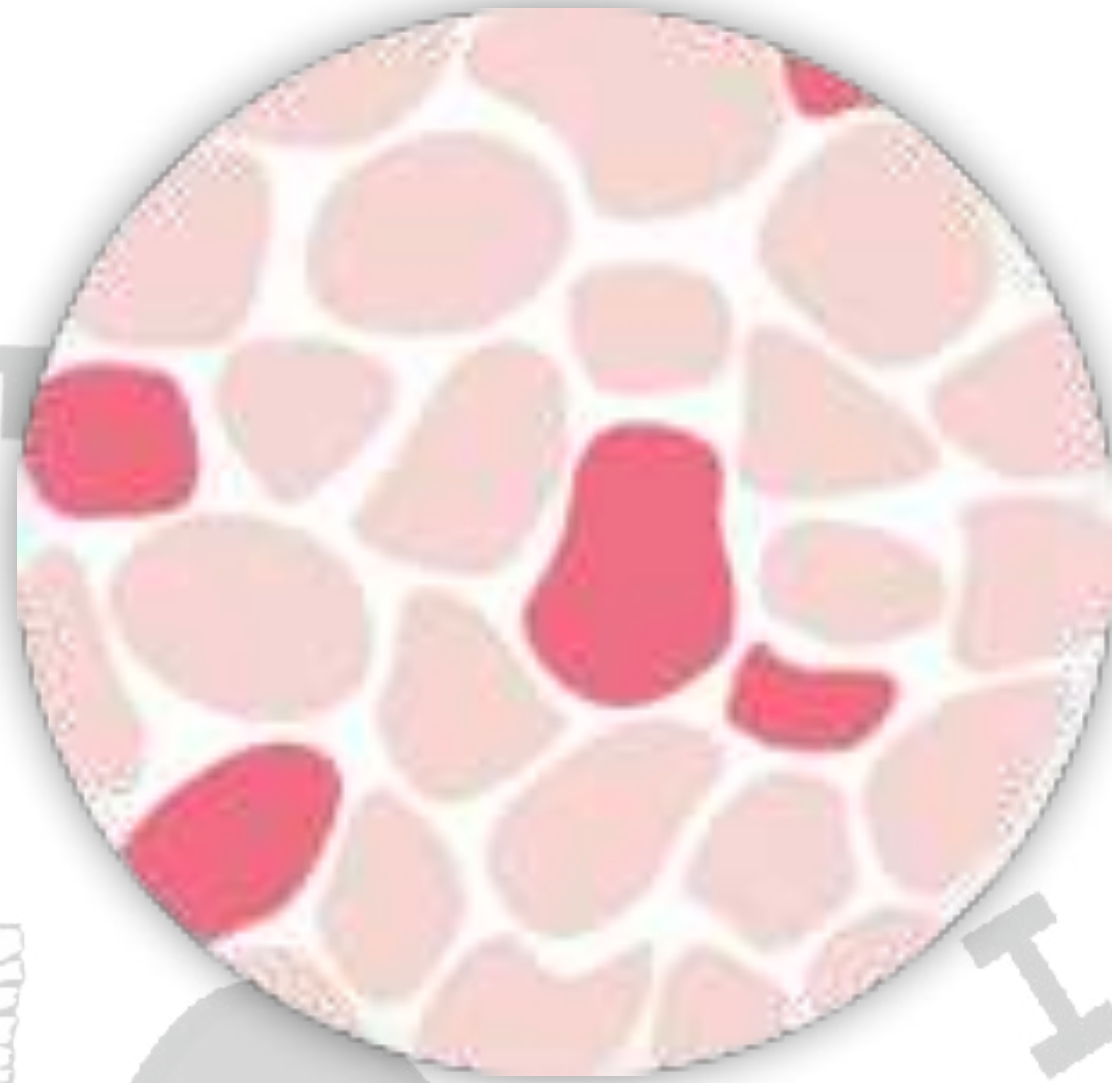




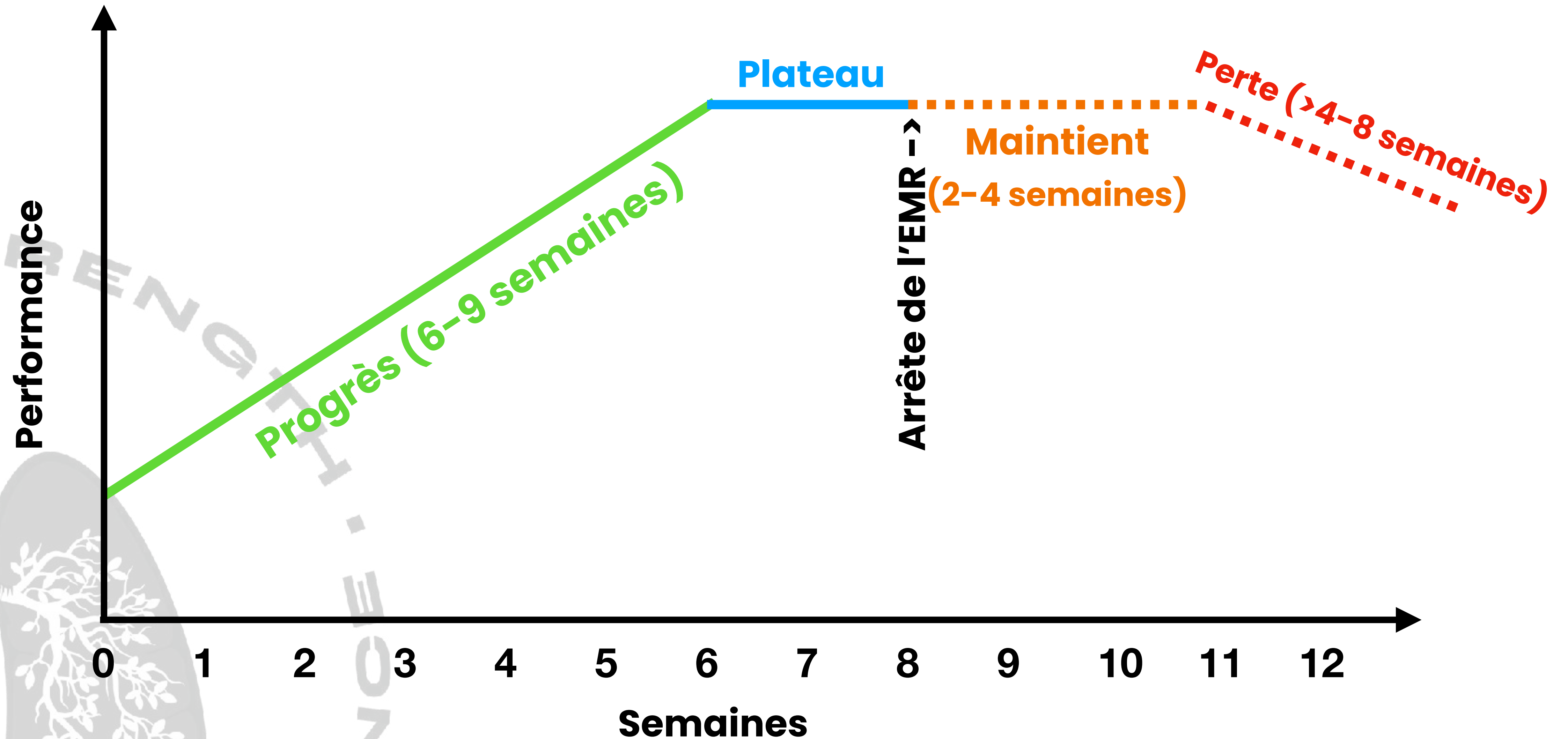
***Comment catégoriser &
planifier l'Entraînement des
Muscles Respiratoires?***



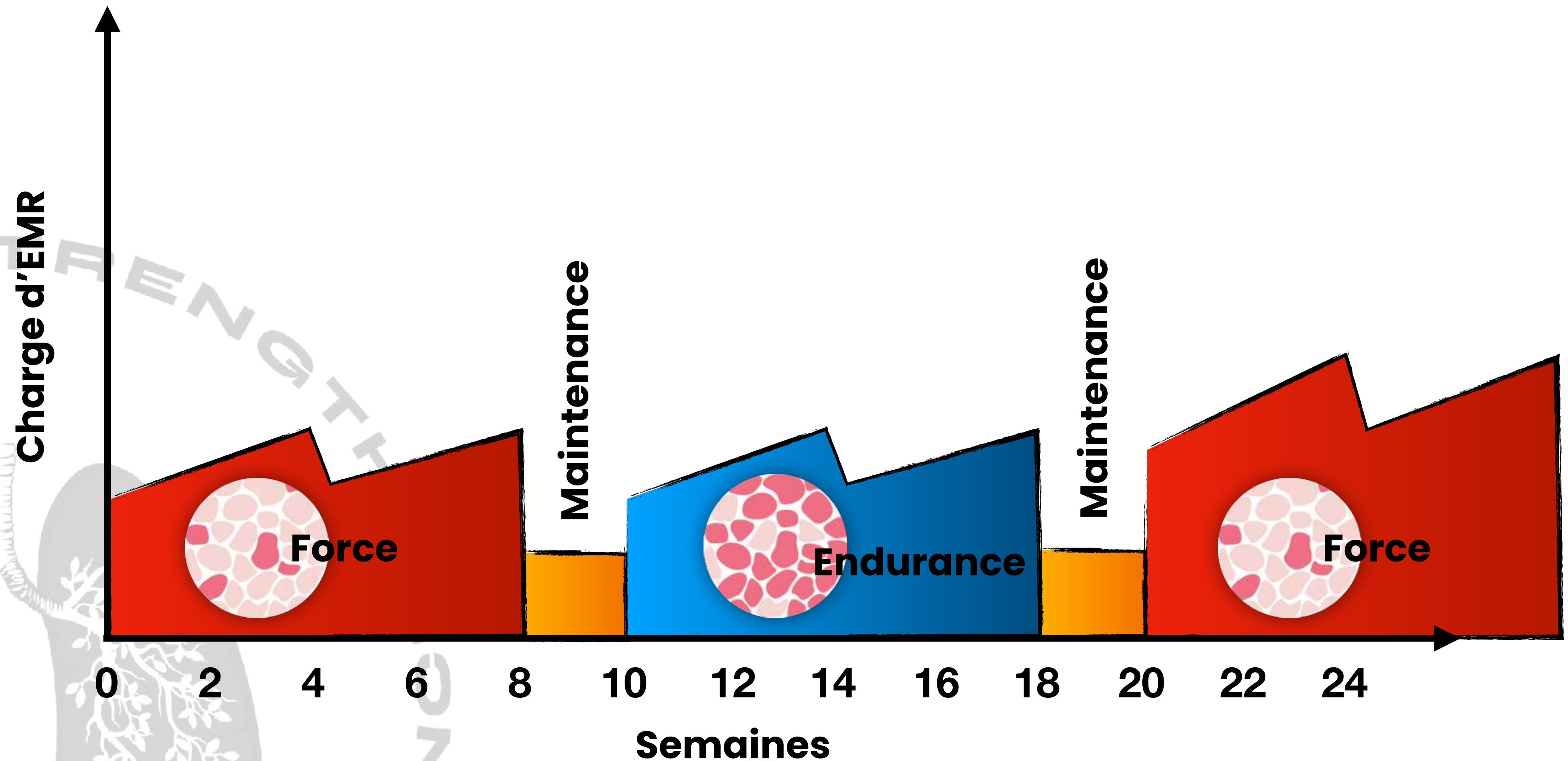
Force & Endurance



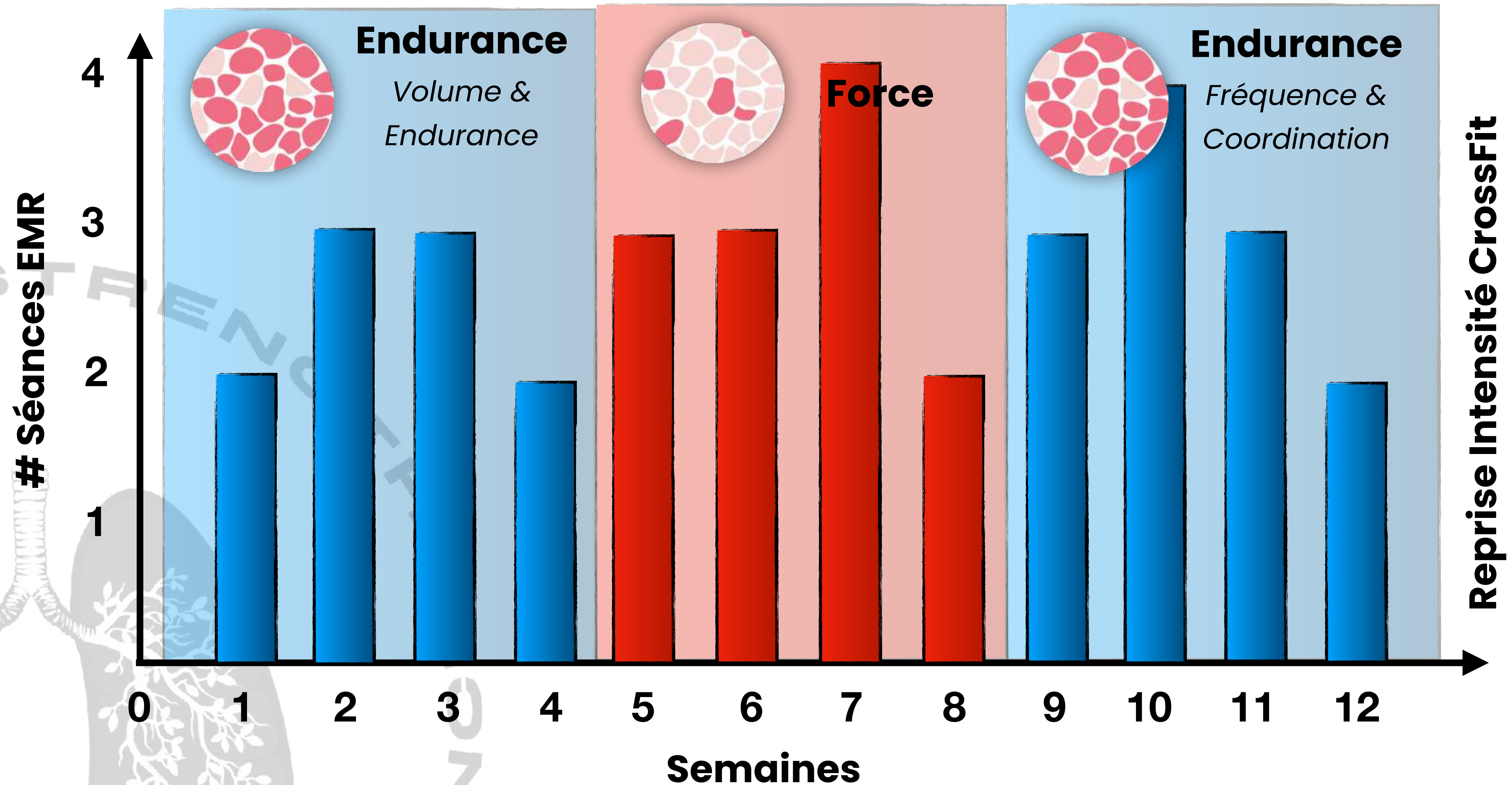
Planification de l'EMR



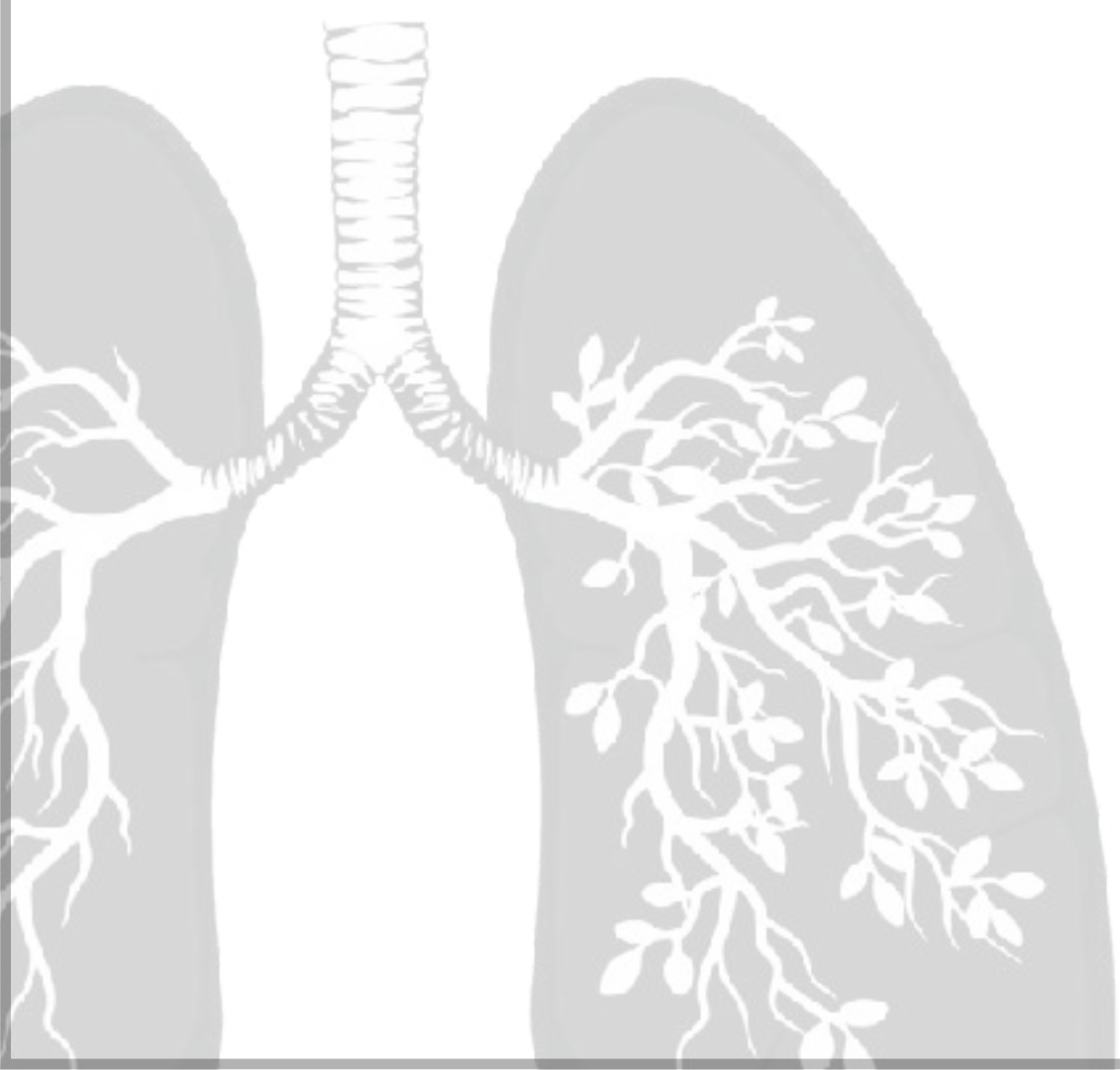
Exemple EMR Général



Exemple EMR Spécifique



***Quels outils utiliser pour
l'Entraînement des Muscles
Respiratoires?***

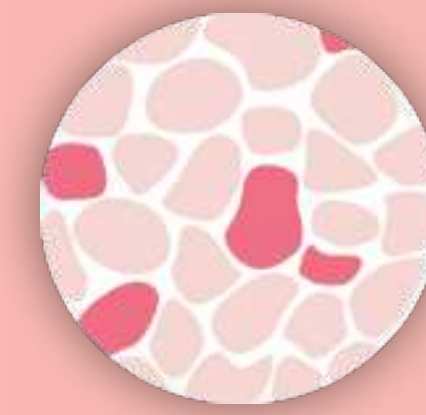


E STRENGTH
ANCE

Les Outils Respiratoires



Endurance



Force



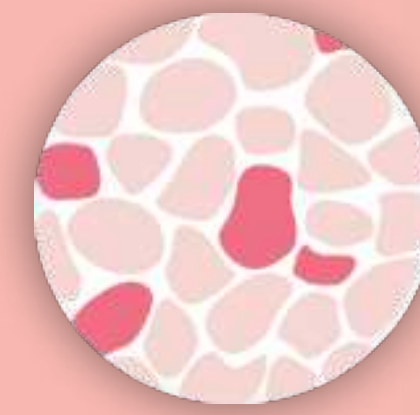
Les Outils Validés



Endurance



Voluntary Isocapnic
Hyperpnea (VIH)



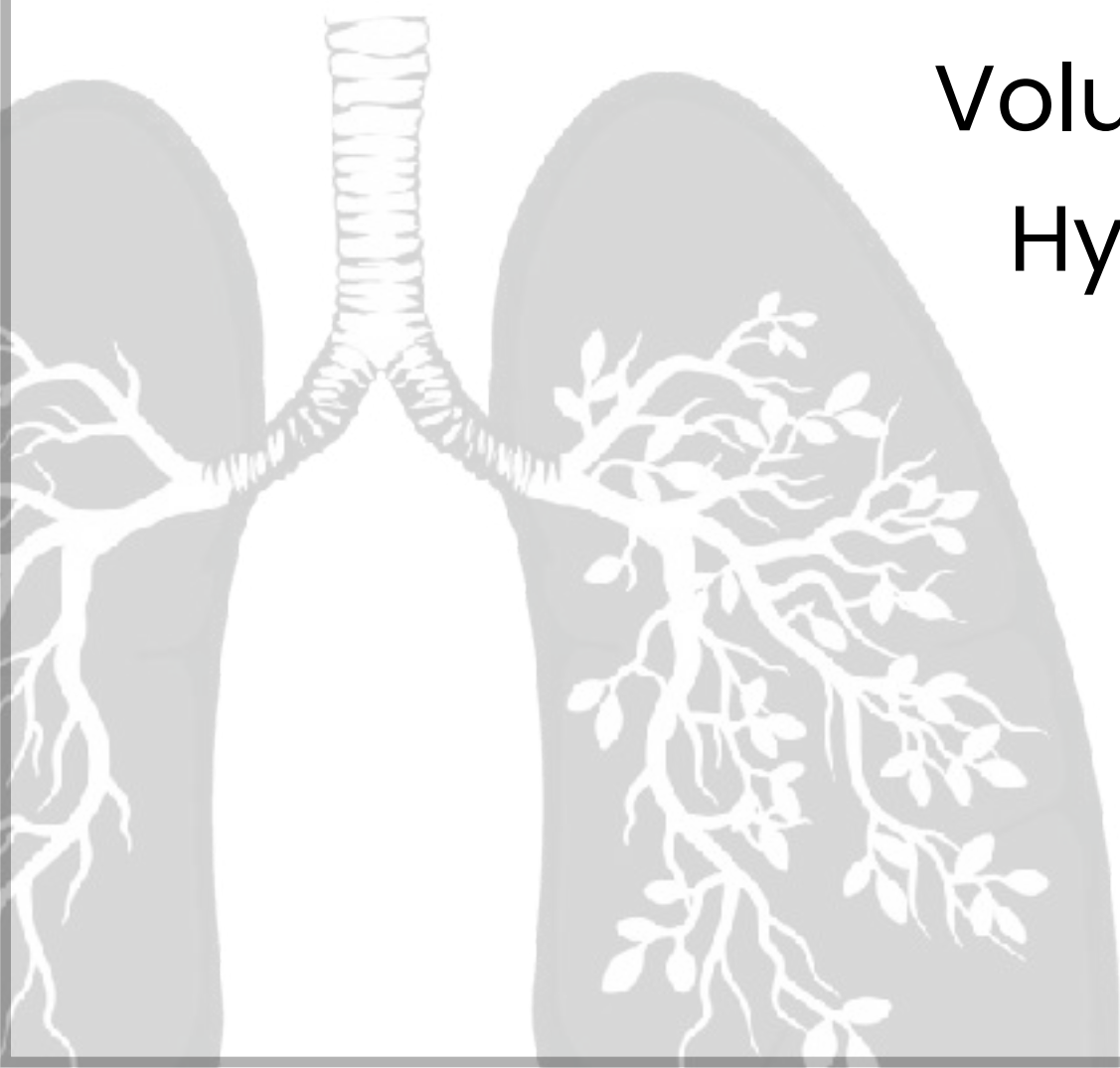
Force



Inspiratory Pressure
Threshold Loading
(IPTL)



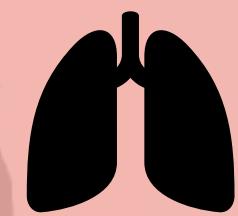
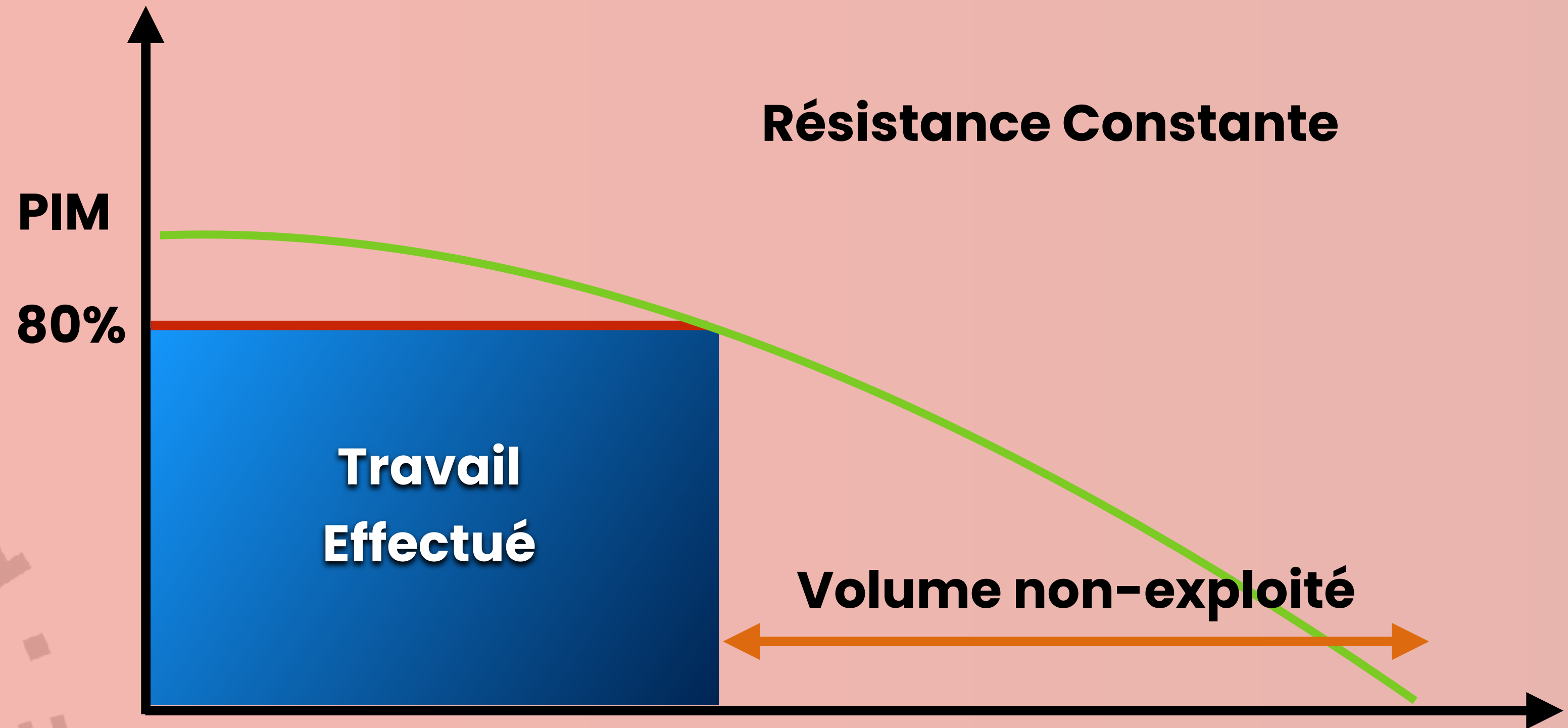
Tapered Flow Resistive
Loading (TFRL)



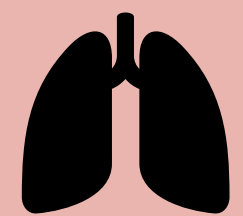
Résistance Constante



Force



Vides

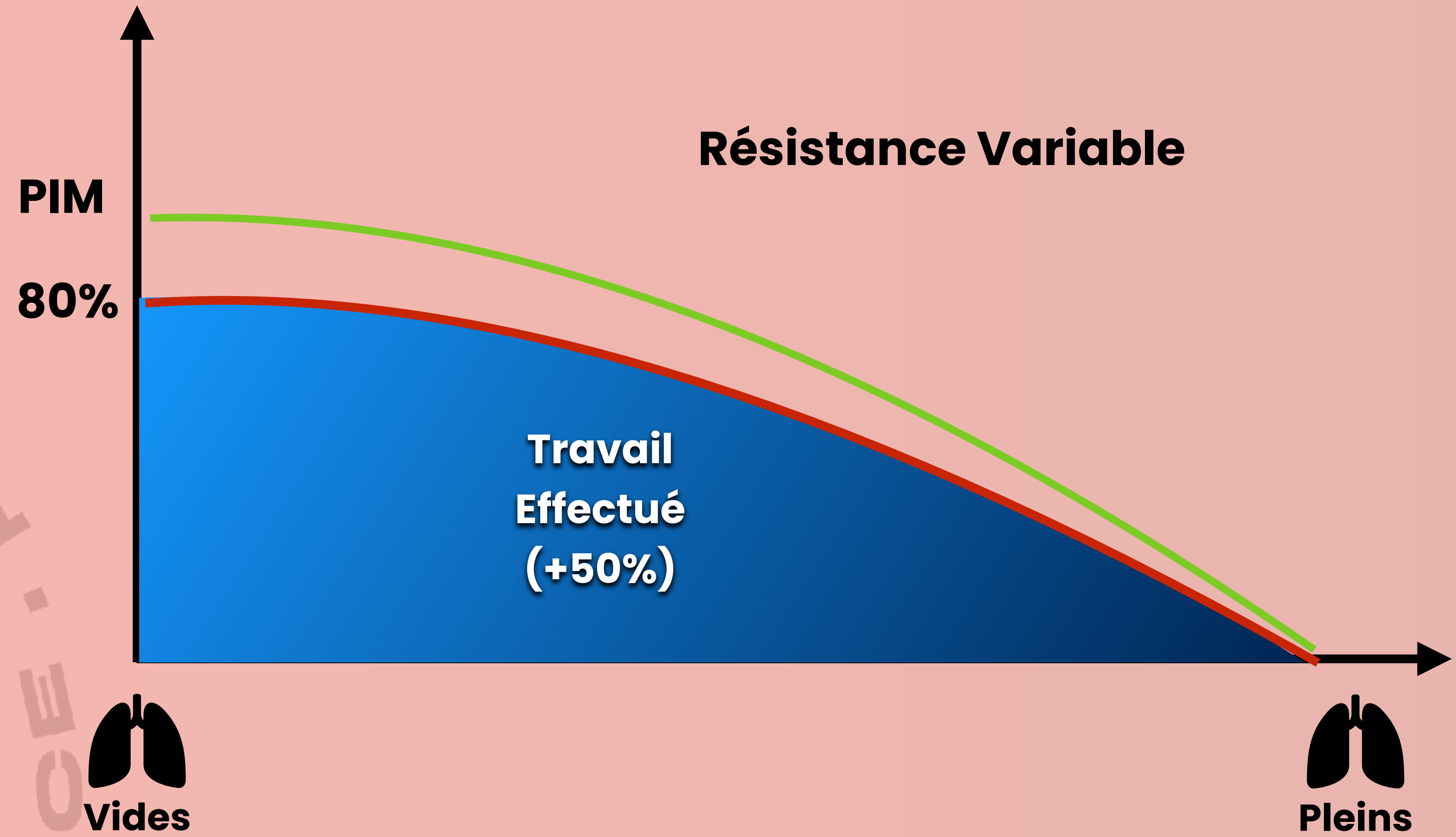


Pleins

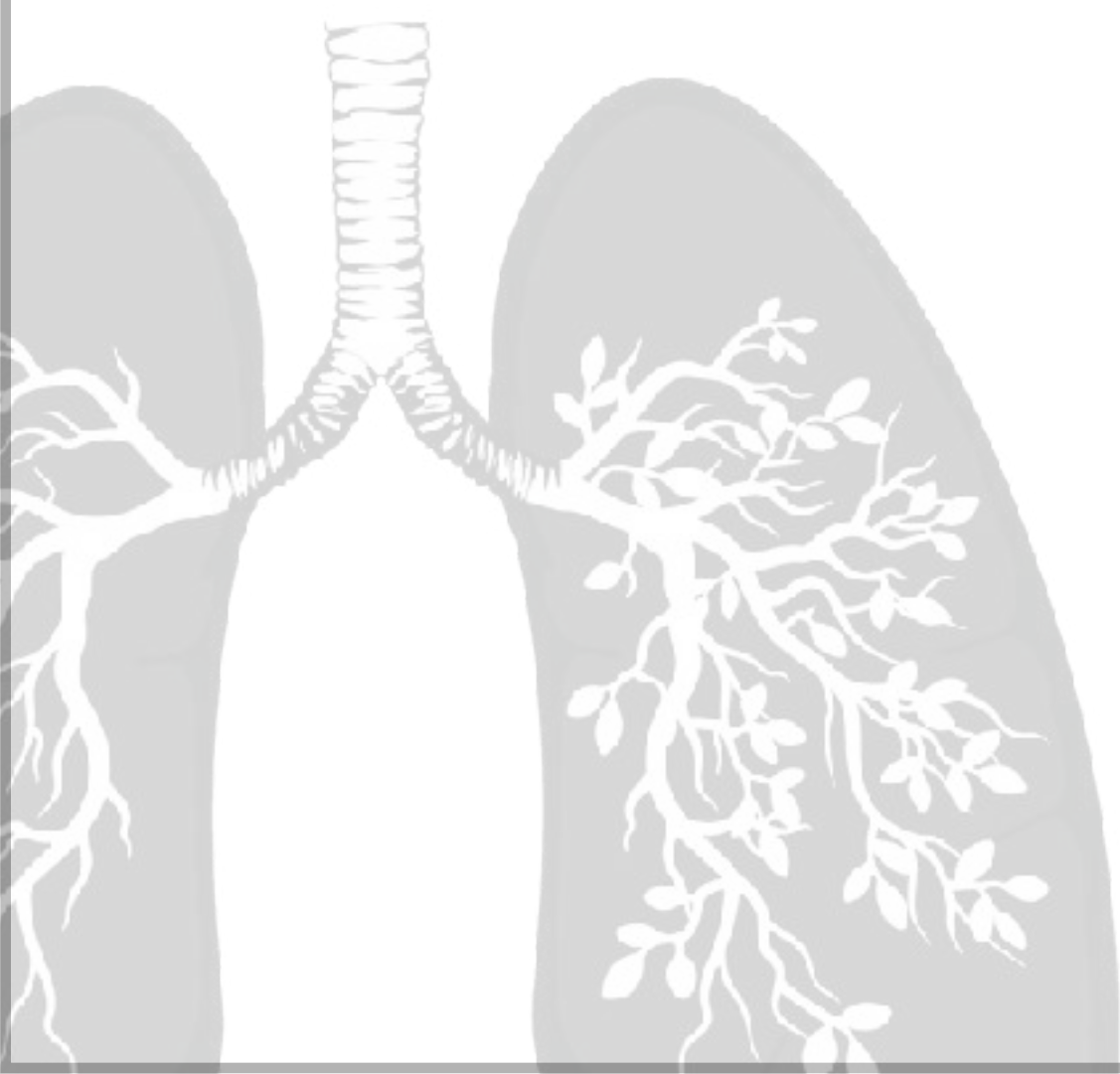
Résistance Variable



Force

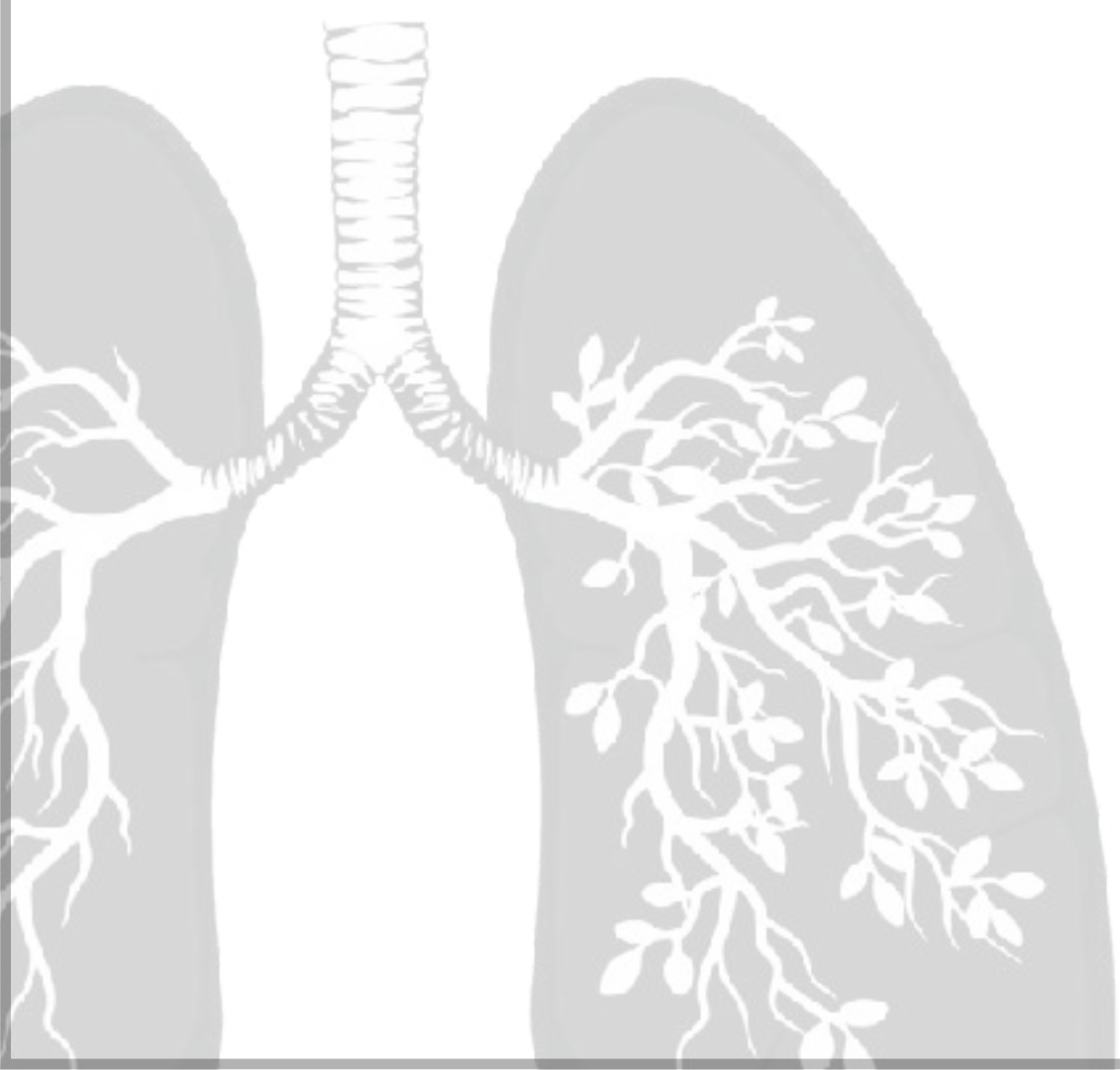


STRENGTH



VERY NICE

***Quelles séances utiliser pour
l'Entraînement des Muscles
Respiratoires?***



E STRENGTH
ANCE

1) Conscience & Contrôle



2) Endurance & Coordination



Endurance



Tech: 8x30"/30" FR10-15

TCR: 1' FR15 +3/min (Volume 90%)

Coordination: 4x1'/30" FR80% TCR

Puissance Exp: 4x1'/1' (Tempo I3E1)

Endurance: 3x4'/1' FR50%

Sprint: 2-4x 30"/1' FRMAX

3) Force

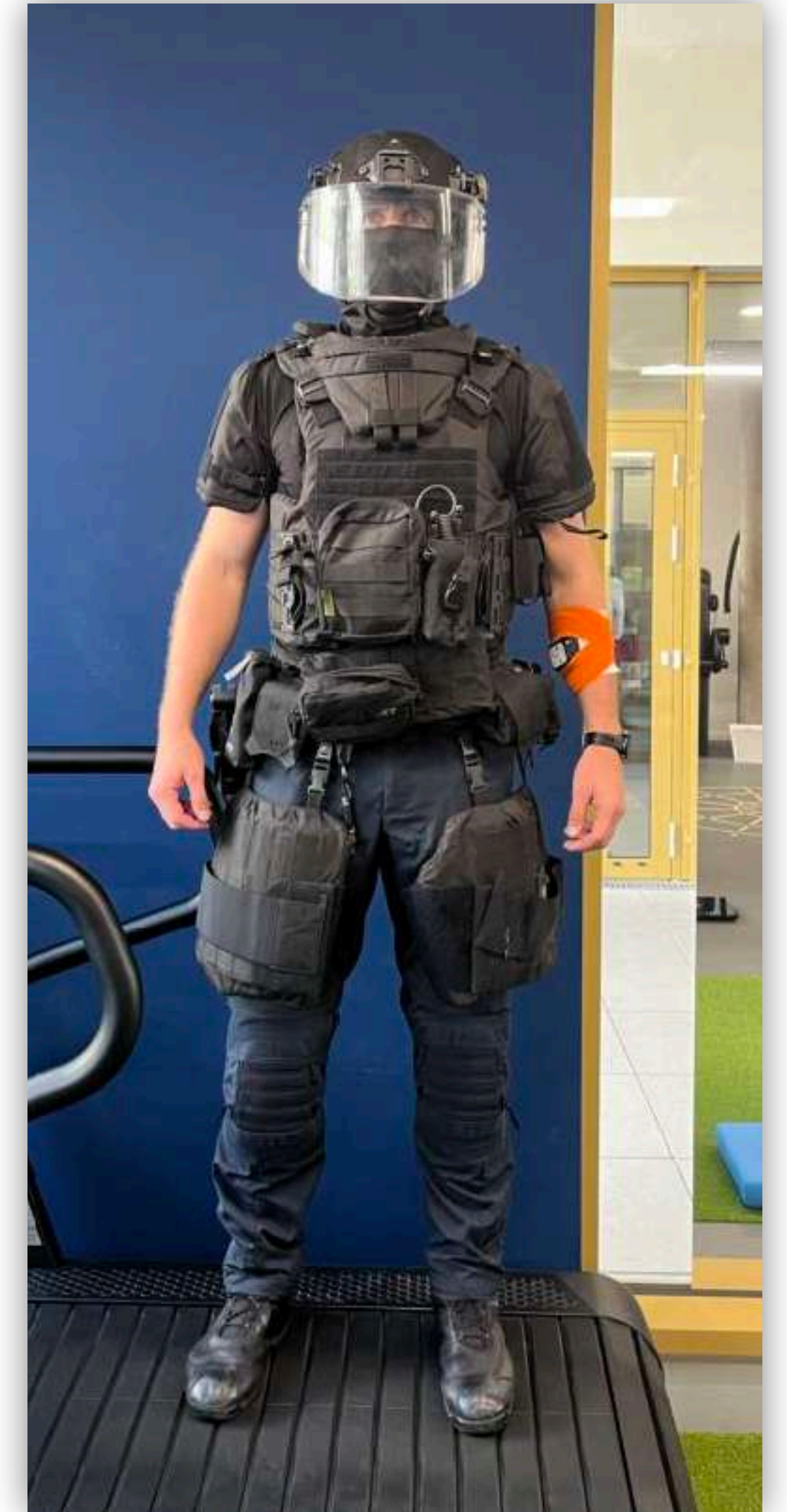


Force



Standard: 1x30 à 30RM (2x/j, 5-7x/sem)

4) Spécifique



Entraînement Respiratoire

✓ **Entraînement spécifique du système respiratoire**

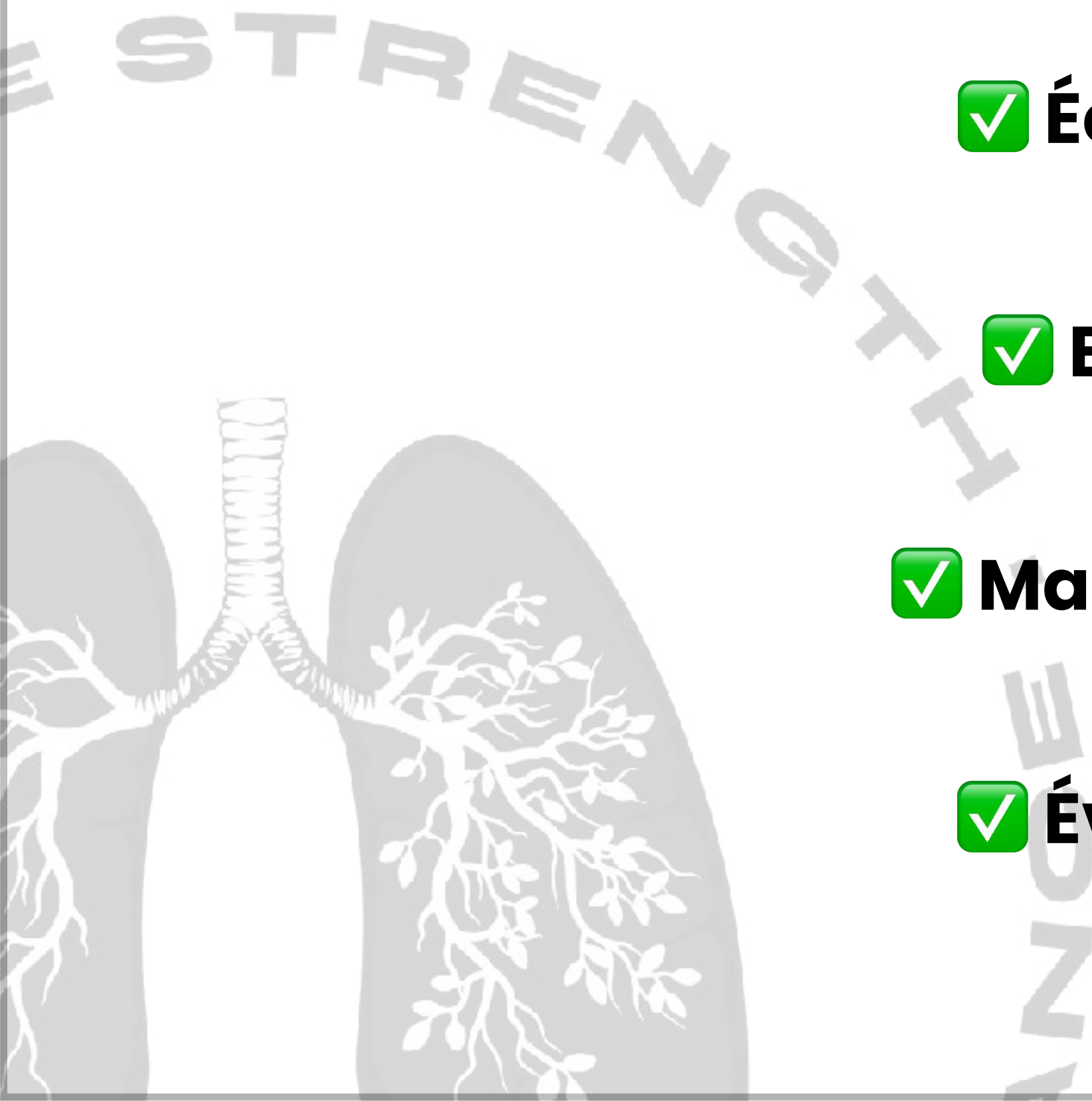
✓ **Entraînement intégré du système respiratoire**

✓ **Échauffement du système respiratoire**

✓ **Entraînement de mobilité positionnel**

✓ **Maintient durant des périodes de blessure**

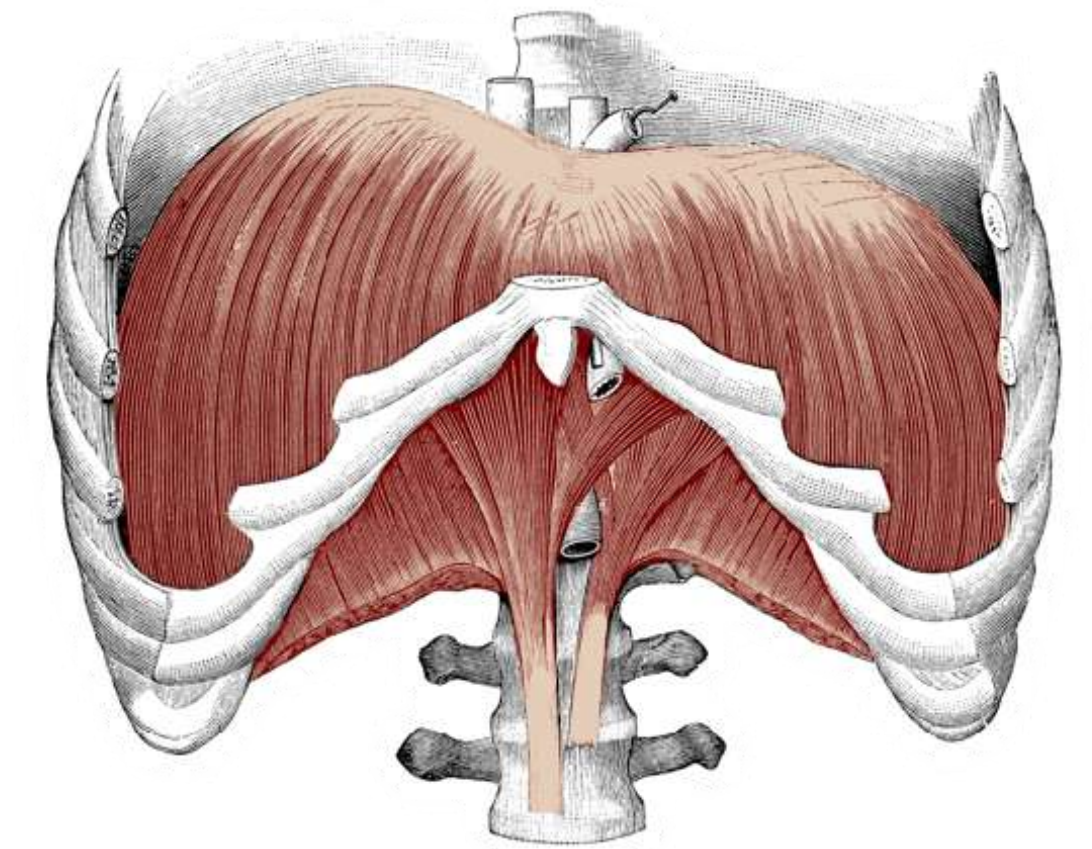
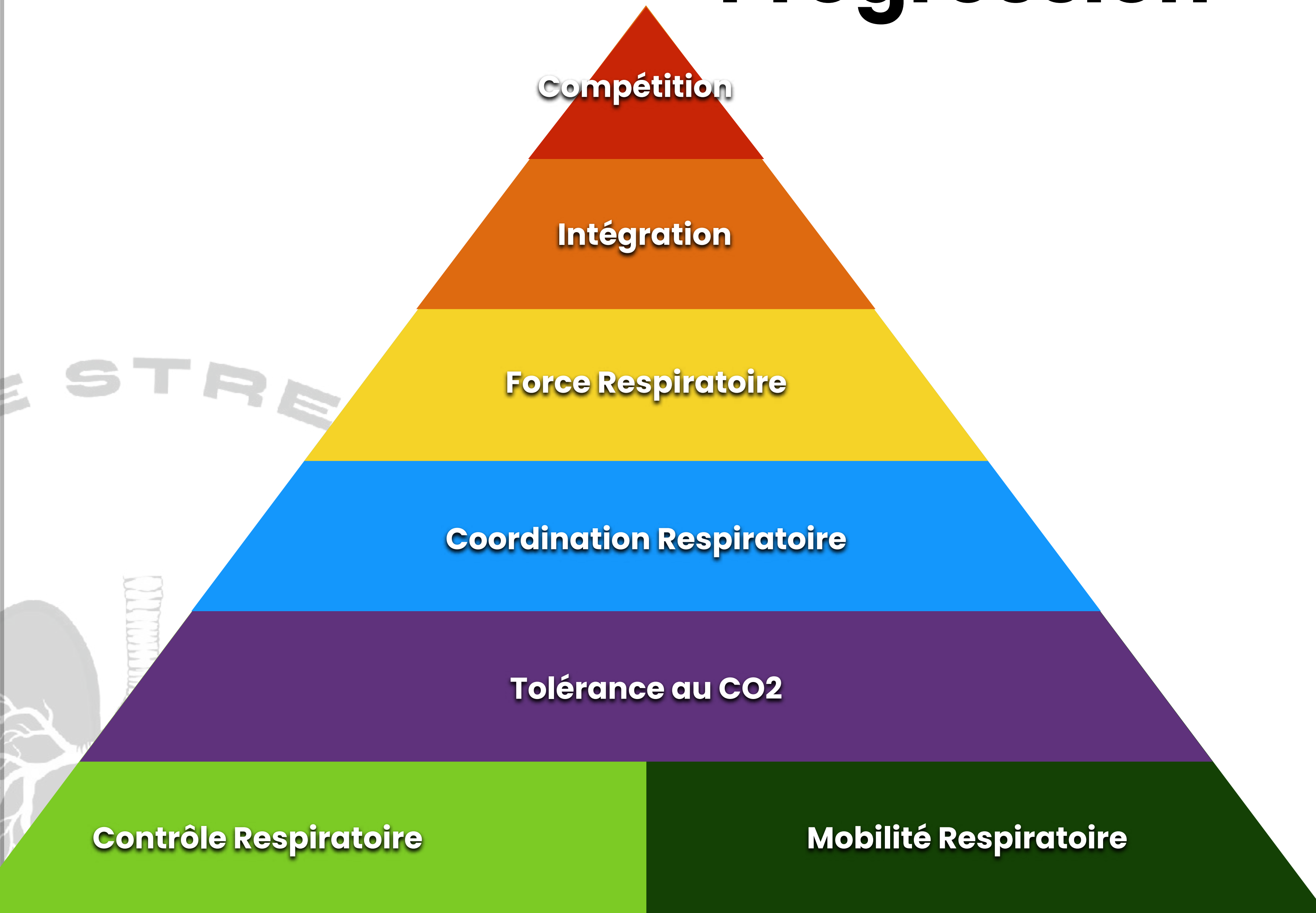
✓ **Évaluation de la capacité respiratoire***



Réponse à l'Entraînement



Progression



PROGRESSIVITÉ

Simple => Complexe.

Lent => Rapide.

Isolé => Intégré.

Tolérance au CO2

E STRE



frontiers | Frontiers in Physiology

TYPE Original Research
PUBLISHED 28 August 2024
DOI 10.3389/fphys.2024.1430837

Check for updates

OPEN ACCESS

EDITED BY
José Antonio de Paz,
University of León, Spain

REVIEWED BY
Santiago Lorenzo,
Lake Erie College of Osteopathic Medicine,
United States
Marcelo Coertjens,
Federal University of Pará, Brazil

*CORRESPONDENCE
Tomasz Kowalski,
✉ tomasz.kowalski@isp.pl

RECEIVED 10 May 2024
ACCEPTED 16 August 2024
PUBLISHED 28 August 2024

CITATION
Kowalski T, Rebis K, Wilk A, Klusiewicz A,
Wiecha S and Paleczny B (2024) Body Oxygen
Level Test (BOLT) is not associated with exercise
performance in highly-trained individuals.
Front. Physiol. 15:1430837.
doi: 10.3389/fphys.2024.1430837

COPYRIGHT
© 2024 Kowalski, Rebis, Wilk, Klusiewicz,
Wiecha and Paleczny. This is an open-access
article distributed under the terms of the
Creative Commons Attribution License (CC BY).
The use, distribution or reproduction in other
forums is permitted, provided the original
author(s) and the copyright owner(s) are
credited and that the original publication in this
journal is cited, in accordance with accepted
academic practice. No use, distribution or
reproduction is permitted which does not
comply with these terms.

Body Oxygen Level Test (BOLT) is not associated with exercise performance in highly-trained individuals

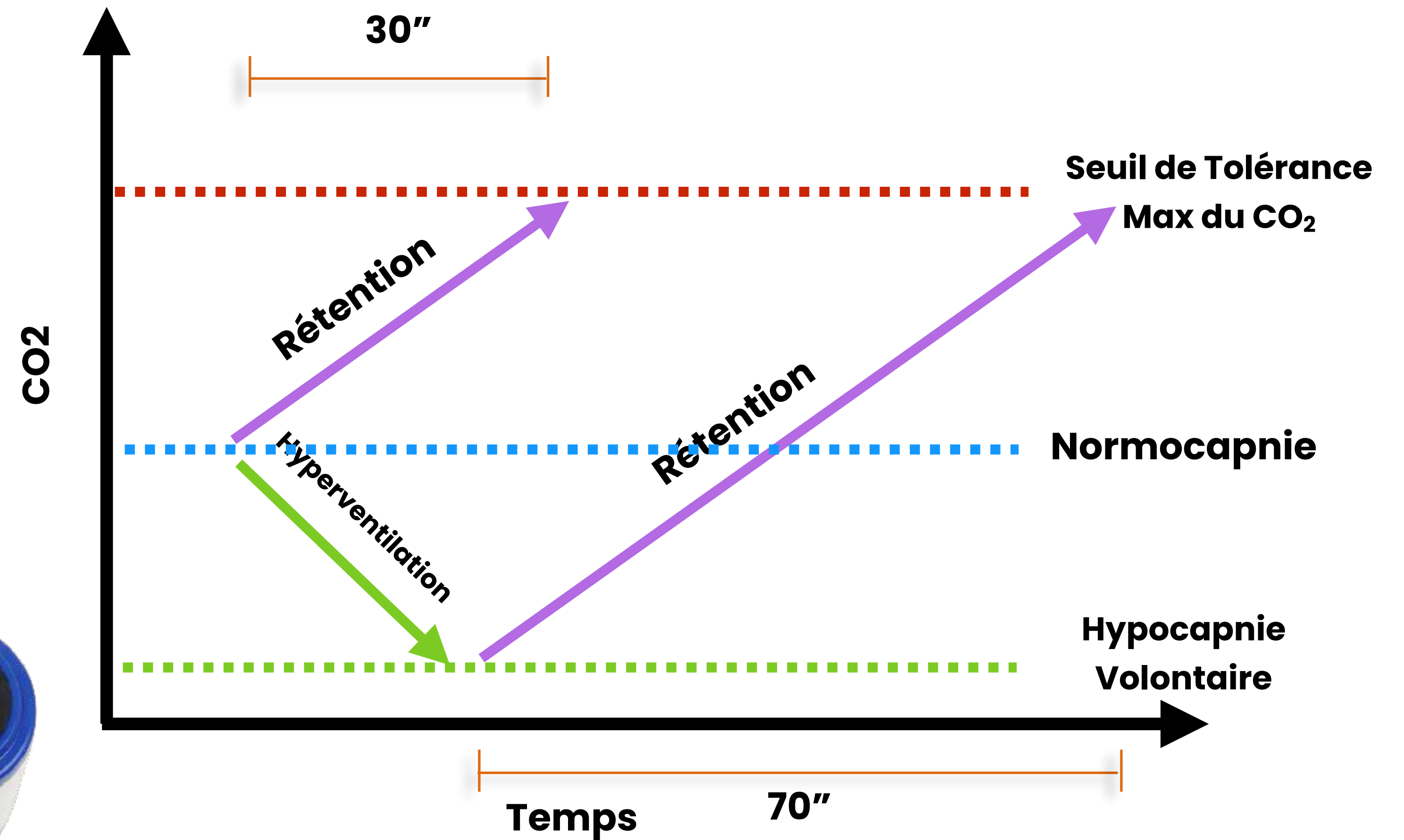
Tomasz Kowalski^{1*}, Kinga Rebis¹, Adrian Wilk¹,
Andrzej Klusiewicz², Szczepan Wiecha² and Bartłomiej Paleczny³

¹Department of Physiology, Institute of Sport – National Research Institute, Warsaw, Poland,
²Department of Physical Education and Health in Białka Podlaska, Józef Piłsudski University of Physical
Education in Warsaw, Warsaw, Poland, ³Department of Physiology, Wrocław Medical University,
Wrocław, Poland

Introduction: The analysis of chemoreflex and baroreflex sensitivity may contribute to optimizing patient care and athletic performance. Breath-holding tests, such as the Body Oxygen Level Test (BOLT), have gained popularity as a feasible way to evaluate the reflex control over the cardiorespiratory system. According to its proponents, the BOLT score reflects the body's sensitivity to carbon dioxide and homeostasis disturbances, providing feedback on exercise tolerance. However, it has not yet been scientifically validated or linked with exercise performance in highly-trained individuals. Therefore, we investigated the association of BOLT scores with the results of standard performance tests in elite athletes.

Methods: A group of 49 speedskaters performed BOLT, Wingate Anaerobic Test (WAnT), and cardiopulmonary exercise test (CPET) on a cycle ergometer. Peak power, total work, and power drop were measured during WAnT. Time to exhaustion and maximum oxygen uptake were measured during CPET. Spearman's rank correlation and multiple linear regression were performed to analyze the association of BOLT scores with parameters obtained during the tests, age, somatic indices, and training experience.

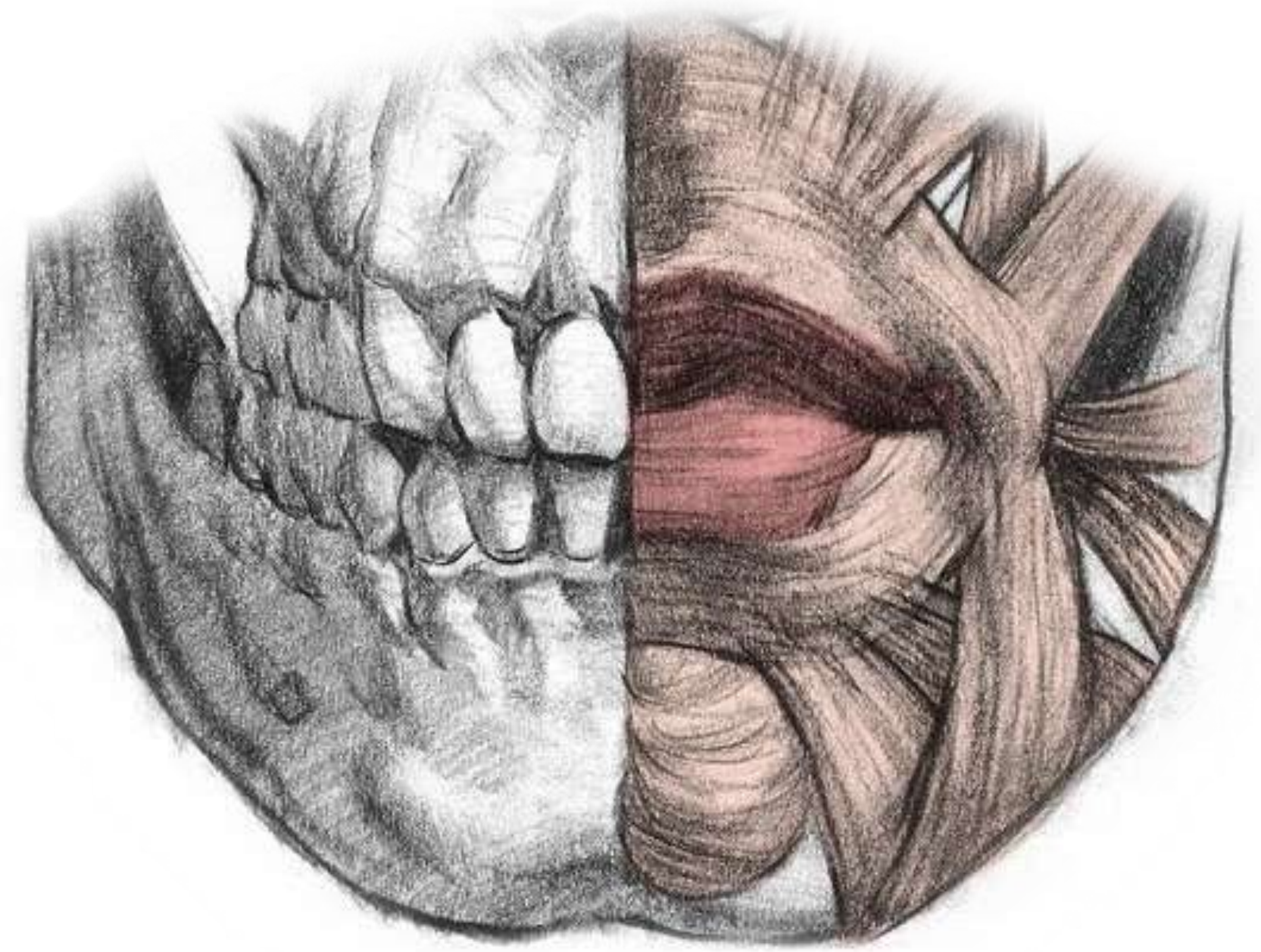
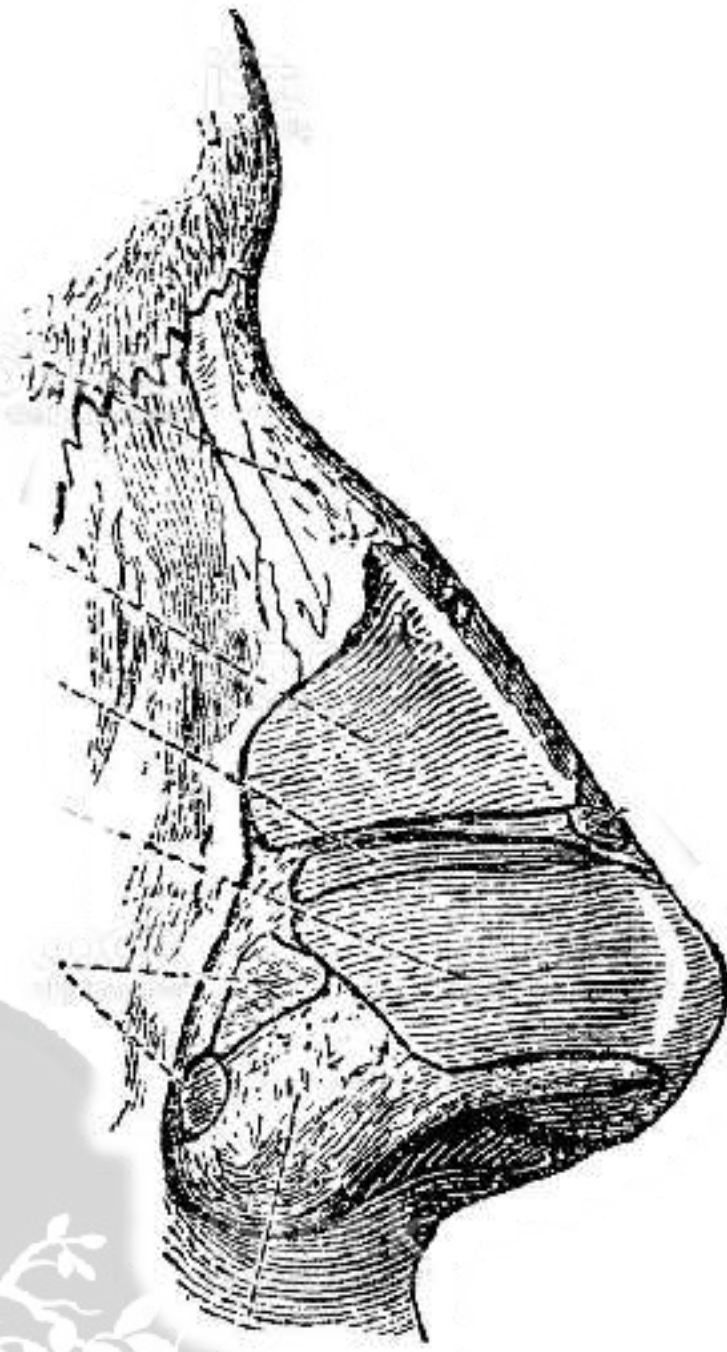
Hyperventilation Volontaire



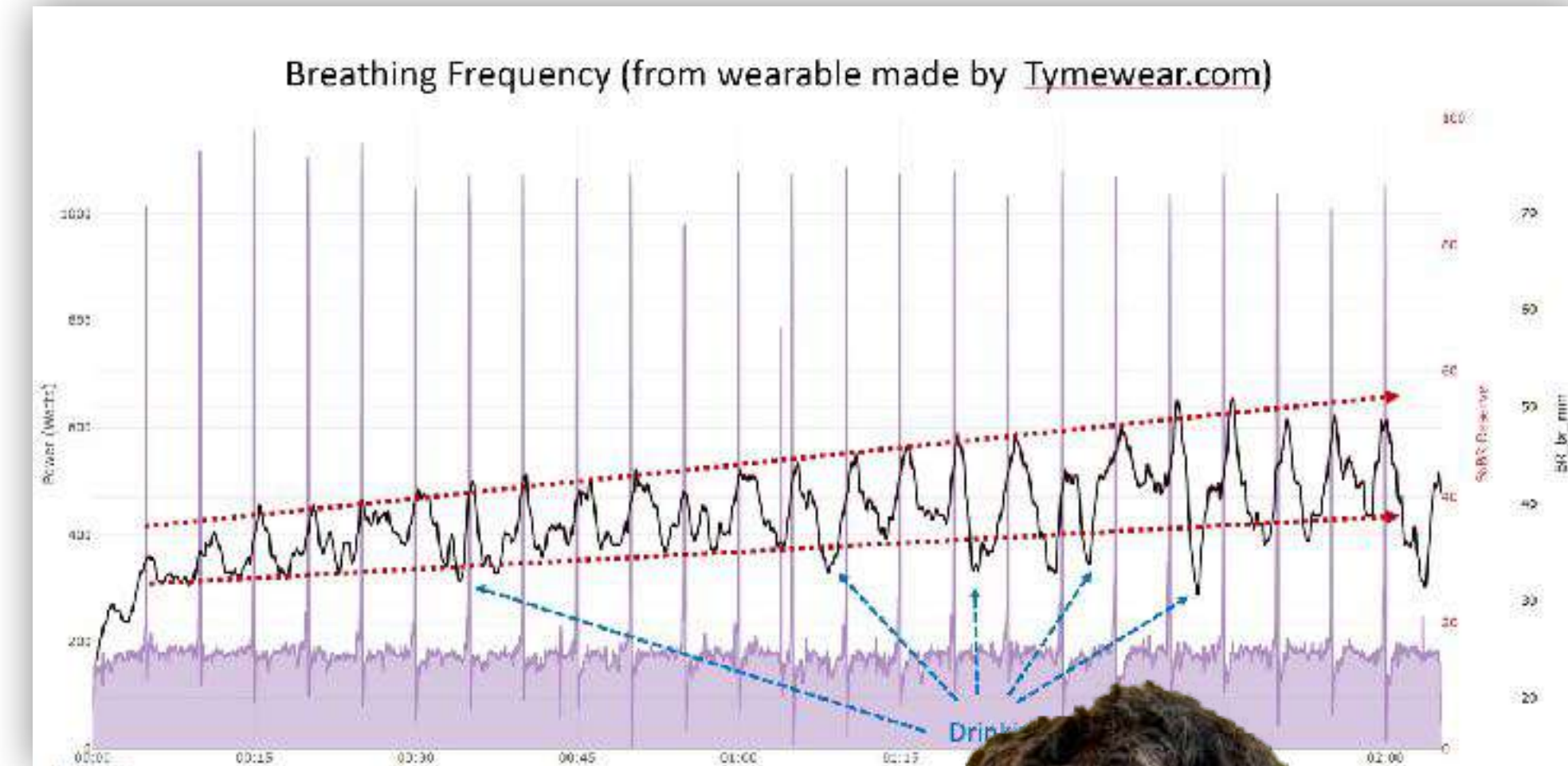
A faint, light gray background illustration is visible on the left side of the slide. It features a stylized representation of human lungs with branching bronchial structures. Above the lungs, a curved arc contains the text 'STRENGTH' and 'ANCE' in a sans-serif font, with a dot separating the two words.

Concepts Complémentaires

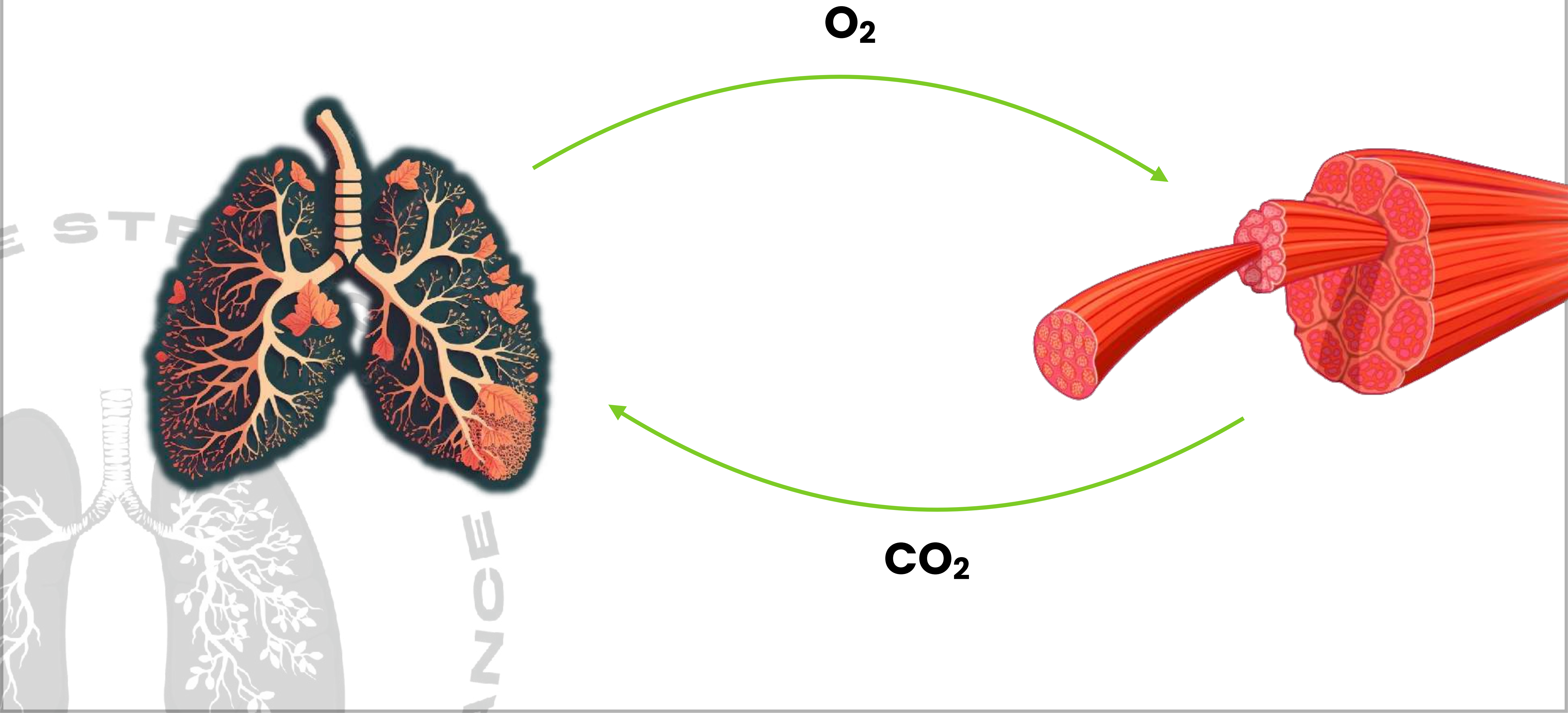
Respiration Nasale



Fréquence Respiratoire



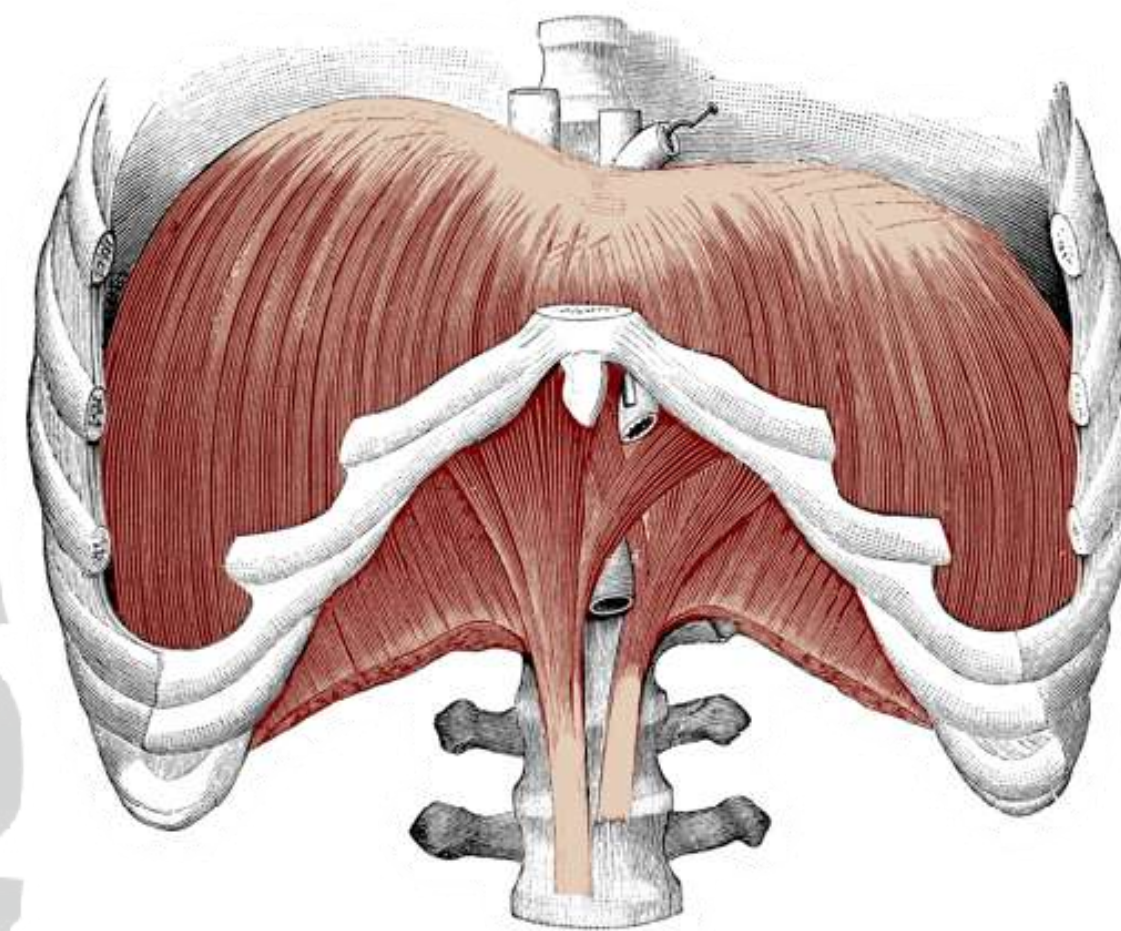
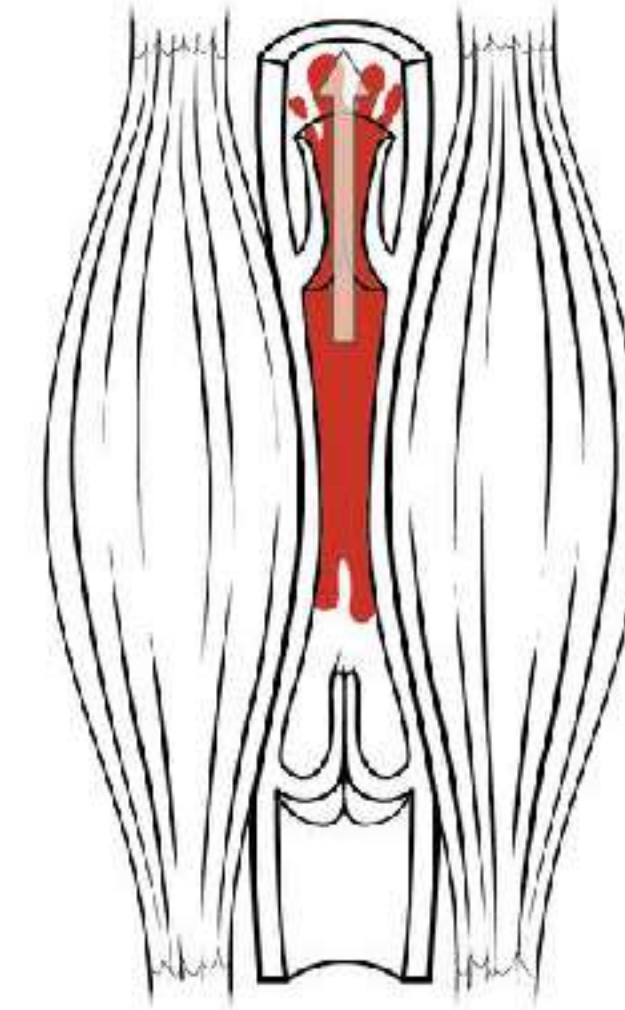
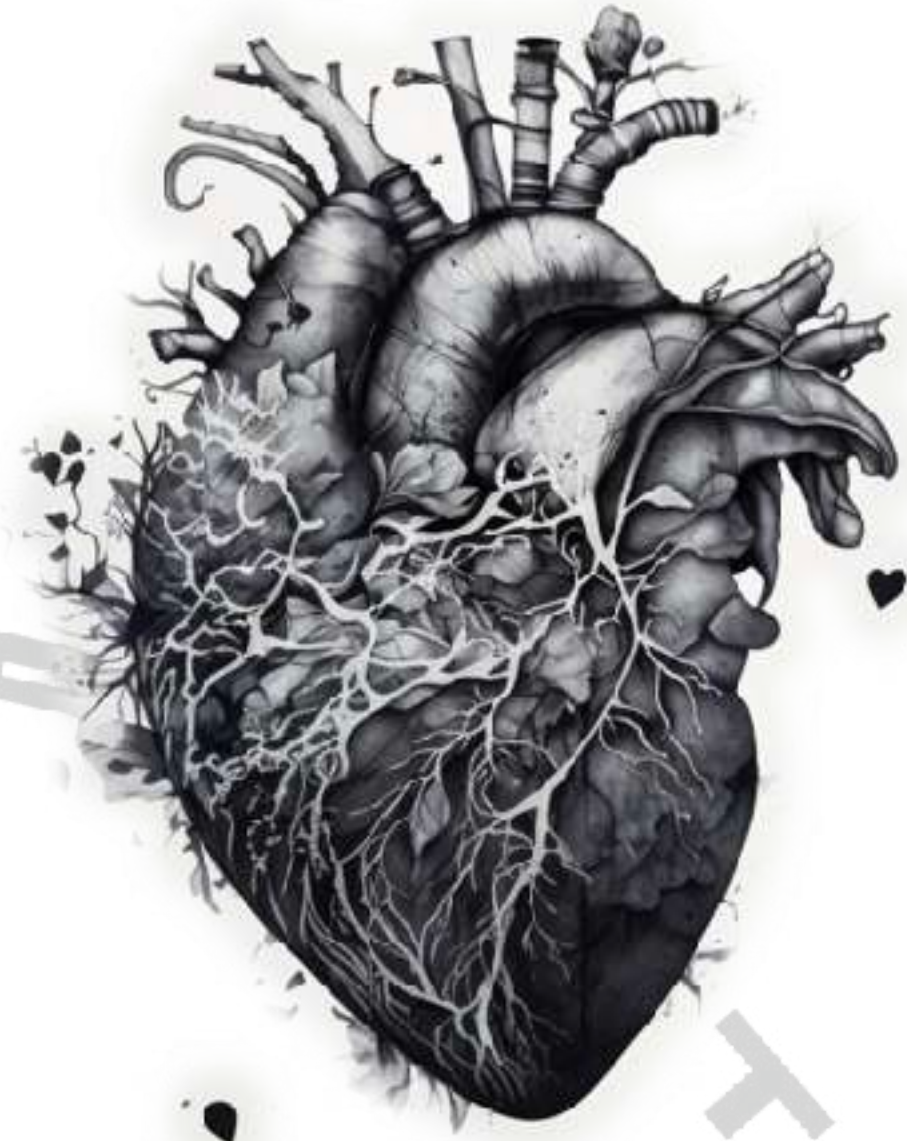
Effet de Bohr



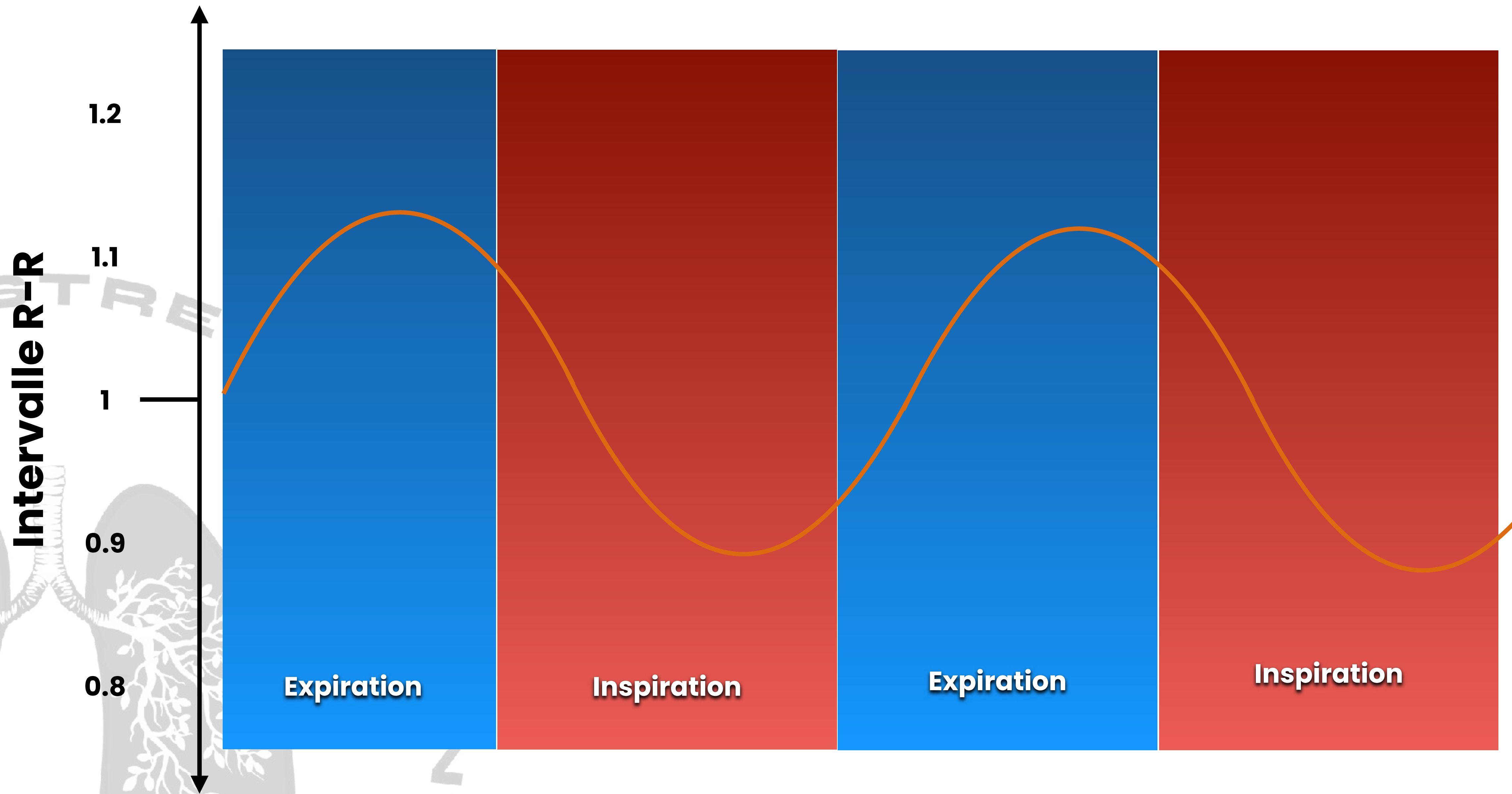
Effet de Bohr



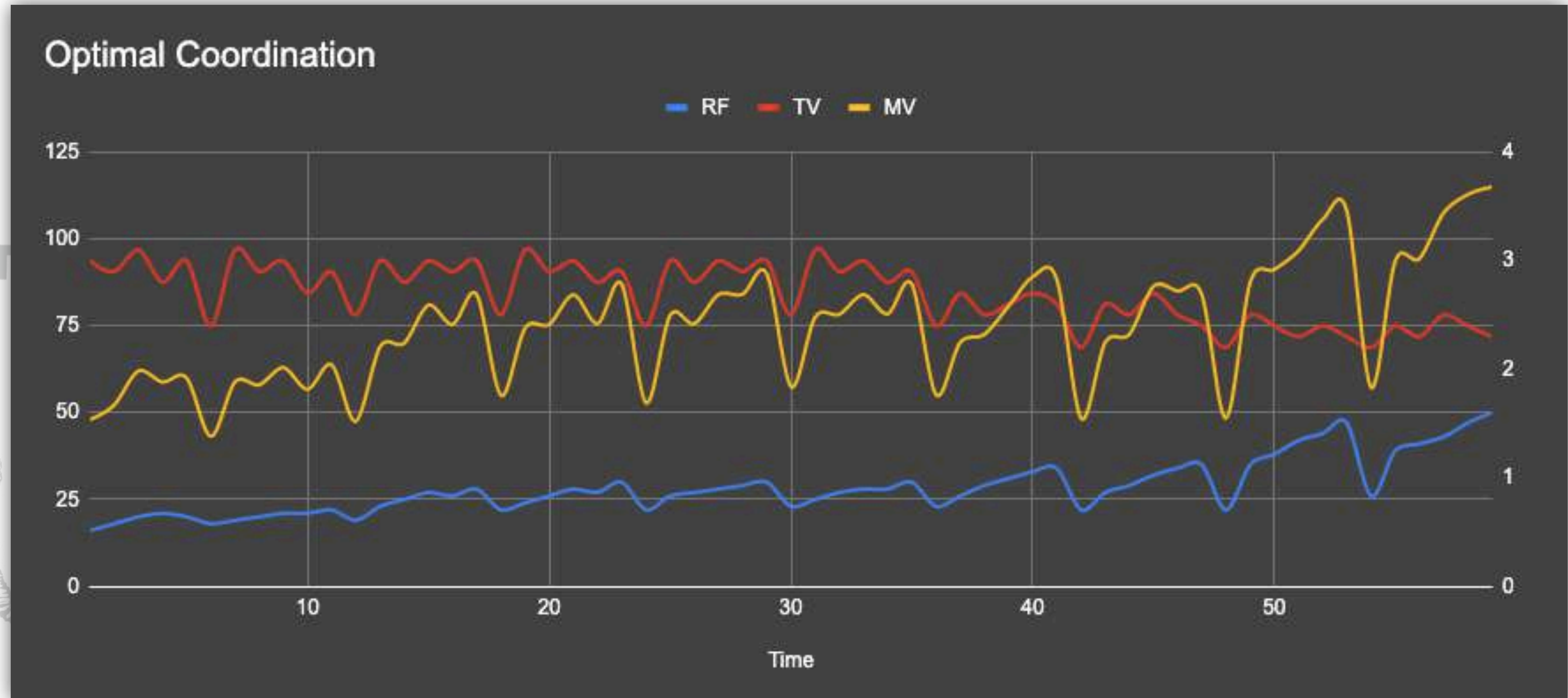
3 Pompes



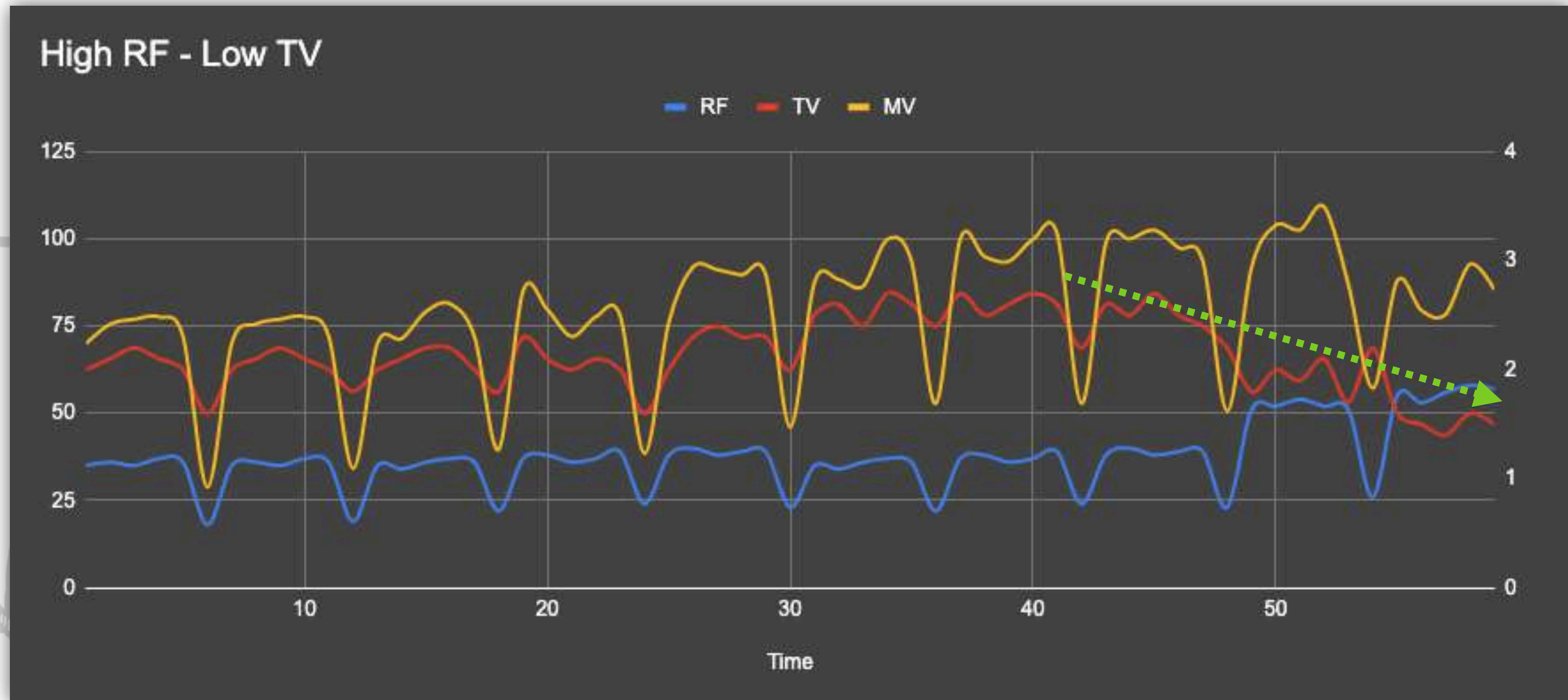
Arythmie Sinusale Respiratoire



Coordination Active



Coordination Active



Évaluation P41

Respiratory Coordination			
Respiratory Frequency	15	54	A
	min	max	
Tidal Volume	2.2	2.3	A
	max L	Optimal L	
Volume / Domain	A	B	A
	Moderate	Heavy	

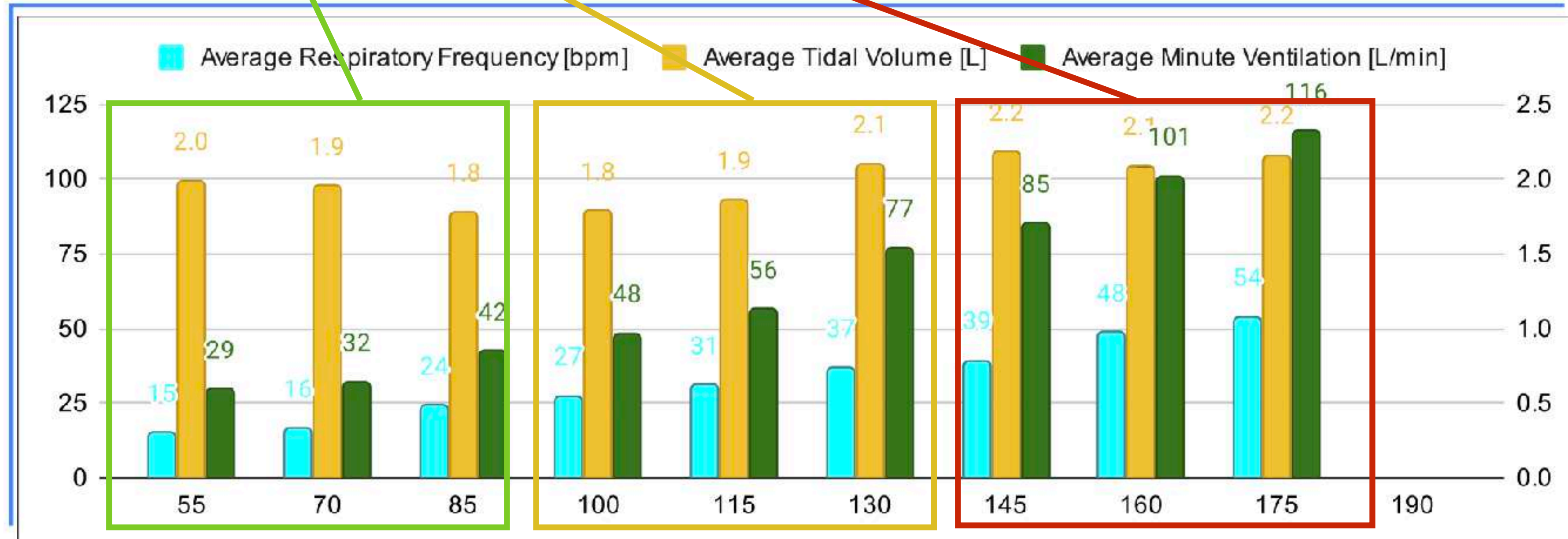
Explanations

Respiratory Frequency should ideally be between 15 and 45 breaths per minute (depending on the intensity of the effort). Ideal **Tidal Volume** (Volume / Respiration) is >70% of your expiratory power. **Volume / Domain** describes your ability to maintain a high tidal volume throughout the intensity spectrum.

Interpretation



Good coordination overall! Good usage of volume throughout the test. Clear hyperventilation at the end of the test, could benefit from training the respiratory system in isolation.



Questions?

