

Energy systems in swimming

Optimize the way you train

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To perform a swim race you need:

ATP-CP

*Maximal speed
Sprint*



Glycolytic

*Lactic system
Lactic tolerance*

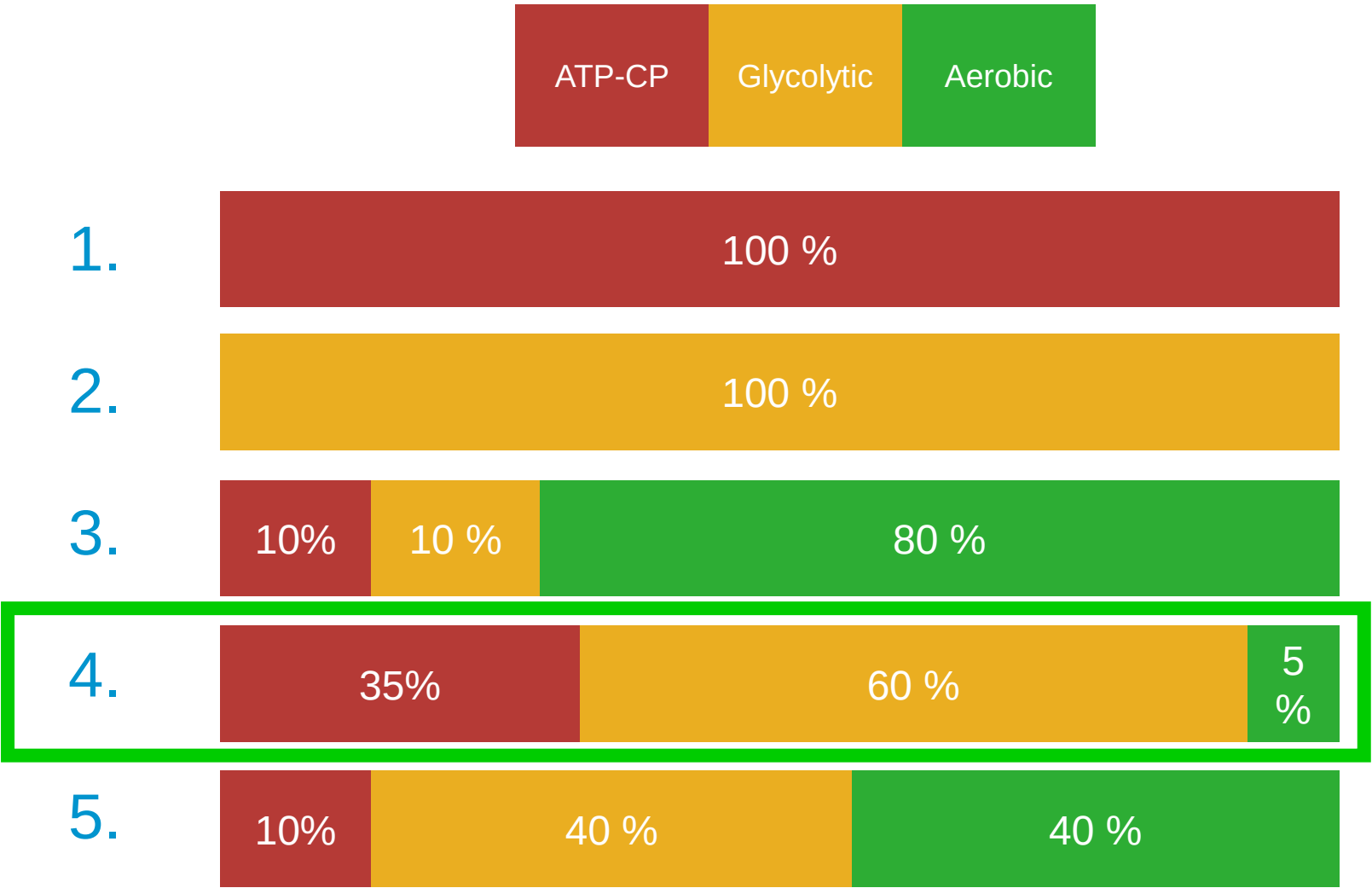


Aerobic

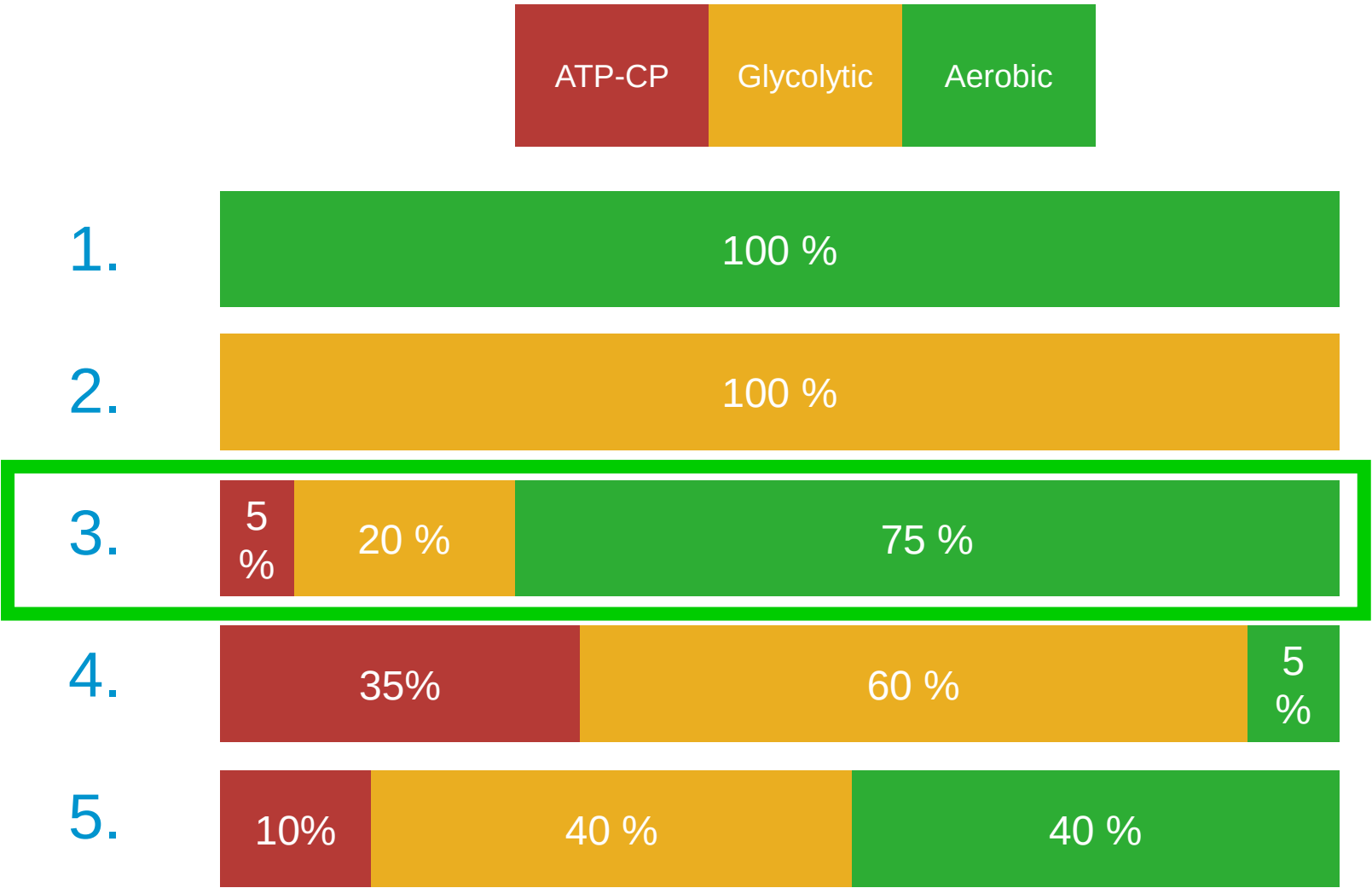
*VO₂max
Endurance*



What is the energy systems contribution to the 50 FR?



What is the energy systems contribution to the 400 FR?



Energy system contribution

1. 50 free



2. 100 fly



3. 200 IM



4. 400 free



5. 1500 free



To perform a swim race you need:

ATP-CP



0-7"

Sprint !!!



8-15"

25 m

Glycolytic



16-45"

50 m



46"-2 min

100 m
200 m

Aerobic



2-8 min

400 m
800 m



9 min –
++ hours

≥ 1500 m



Which types of efforts is the most appropriate to develop the ATP-CP system?

ATP-CP

- A. Dive 15 m
- B. Dive 25 m with fins
- C. Dive 50 m
- D. Push 15 m
- E. Push 200 m

Which types of efforts is the most appropriate to develop the ATP-CP system?

ATP-CP

- A. Dive 15 m 
- B. Dive 25 m with fins 
- C. Dive 50 m
- D. Push 15 m 
- E. Push 200 m

How much rest should your coach leave between the 15 m dive efforts, to develop the ATP-CP system?

ATP-CP

- A. 10 sec
- B. 30 sec
- C. 1 min
- D. 2 min
- E. Enough for the next sprint to be as fast as the previous one

How much rest should your coach leave between the 15 m dive efforts, to develop the ATP-CP system?

ATP-CP

- A. 10 sec
- B. 30 sec
- C. 1 min
- D. 2 min**
- E. Enough for the next sprint to be as fast as the previous one**

How should you swim this set: 10 x 15 m dive on 2 min

ATP-CP

- A. Start as fast as possible from the first effort
- B. Pace yourself, so that the intensity increases from one effort to the next
- C. Pace yourself so that the intensity remains constant from one effort to the next
- D. Give 80% effort on all efforts

How should you swim this set: 10 x 15 m dive on 2 min

ATP-CP

- A. Start as fast as possible from the first effort**
- B. Pace yourself, so that the intensity increases from one effort to the next
- C. Pace yourself so that the intensity remains constant from one effort to the next
- D. Give 80% effort on all efforts

Training the energy systems

ATP-CP



Short-medium sprints
As fast as possible
Full rest between efforts



Glycolytic



Aerobic



Training the energy systems

Aerobic

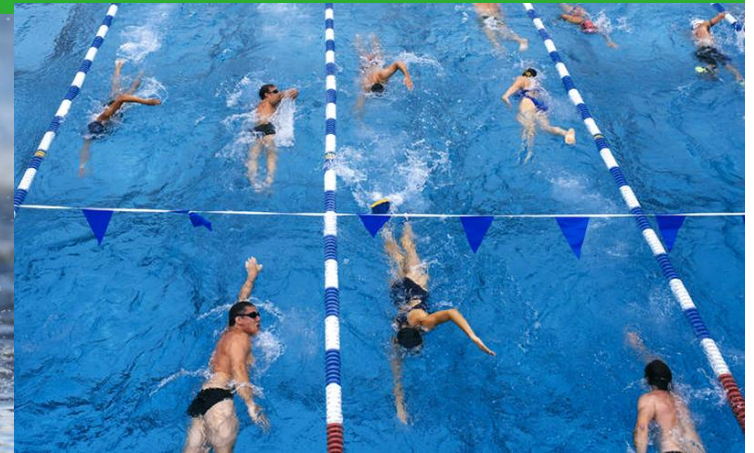
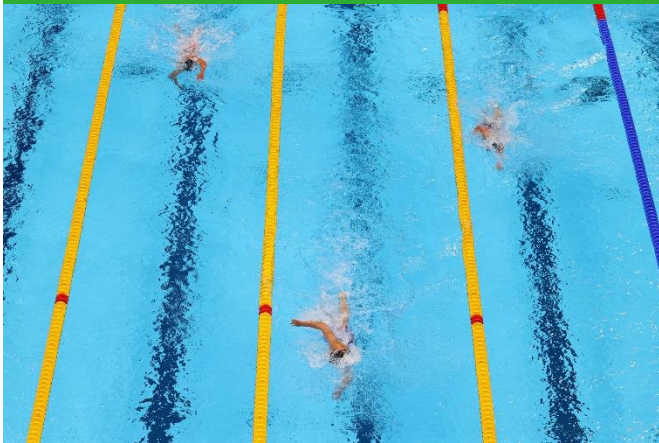


Maximal aerobic power
 VO_2max
Aerobic engine



Aerobic capacity
Maintaining a high
 $\% \text{VO}_2\text{max}$

Endurance training
Base endurance
Threshold training



Which ones of these sets are the most appropriate to develop VO_2max ?

Aerobic



- A. 4 x 20 x 25 m at 8/10 on 30 sec, 200 EZ between sets
- B. 3 x 10 x 50 m at 8/10 on 1 min, 200 EZ between sets
- C. 3 x 10 x 50 m on 1 min, best average
- D. 3 x 4 x 100 m at 400 pace, 30 sec rest, 200 EZ between sets
- E. 8 x 200 m at 7-8/10, 100 m at 3/10 on 5 min

Which ones of these sets are the most appropriate to develop VO_2max ?

Aerobic



- A. 4 x 20 x 25 m at 8/10 on 30 sec, 200 EZ between sets
- B. 3 x 10 x 50 m at 8/10 on 1 min, 200 EZ between sets
- C. 3 x 10 x 50 m on 1 min, best average
- D. 3 x 4 x 100 m at 400 pace, 30 sec rest, 200 EZ between sets
- E. 8 x 200 m at 7-8/10, 100 m at 3/10 on 5 min

How should you swim this set: 3 x 10 x 50 m at 8/10 on 1 min

Aerobic



- A. Start as fast as possible from the first effort
- B. Pace yourself, so that the intensity increases from one effort to the next
- C. Pace yourself so that the intensity remains constant from one effort to the next
- D. Give 80% effort on all efforts

How should you swim this set: 3 x 10 x 50 m at 8/10 on 1 min

Aerobic 

- A. Start as fast as possible from the first effort
- B. Pace yourself, so that the intensity increases from one effort to the next
- C. Pace yourself so that the intensity remains constant from one effort to the next**
- D. Give 80% effort on all efforts

Training the energy systems

Aerobic



Maximal aerobic power
 VO_2max
Aerobic engine

Short to long intervals
10 s to 5 min
Effort:rest 2:1 to 1:3
400 to 800 m pace
Paced 8-10/10 effort



Aerobic capacity
Maintaining a high
% VO_2max

Long intervals
> 3 min
Short rest (> 3:1)
~1500 m pace
Paced 7-9/10 effort

Endurance training
Base endurance

Aerobic



**Your coach asks you to swim 500 m
in base endurance...**

**...how can you make sure you
stay in the right zone?**

1. Effort perception

Aerobic



Nothing	0
Very, very easy	1
Easy	2
Moderate	3
Somewhat hard	4
Hard	5
	6
Very hard	7
	8
	9
Maximum	10

"How hard did you work"

2. Heart rate



Aerobic



Energy system	Target HR	Max HR = 210	Max HR = 200	Max HR = 190	Max HR = 180
Aerobic capacity – base endurance	65-80% max HR	137-168	130-160	124-152	117-144

Max HR = 220 - age ... $\pm$ 20 bpm!!!

Testing your max HR

1. Step test (5 x 200 m, progressive effort)
2. HR at the end of a hard aerobic power set



Over 10 seconds, x 6



Training the energy systems

Aerobic



Maximal aerobic power
 VO_2max
Aerobic engine

Short to long intervals
10 s to 5 min
Effort:rest 2:1 to 1:3
400 to 800 m pace
Paced 8-10/10 effort



Aerobic capacity
Maintaining a high
% VO_2max

Long intervals
> 3 min
Short rest (> 3:1)
~1500 m pace
Paced 7-9/10 effort

Threshold training

Endurance training
Base endurance

2-4 / 10 effort
65-80% max HR
Longer sets
No rest or very short rest

Threshold training

Aerobic



Nothing 0
Very, very easy 1
Easy 2
Moderate 3
Somewhat hard 4

Hard 5

6

Very hard 7

8

9

Maximum 10

"How hard did you work"

Energy system	Target HR	Max HR = 210	Max HR = 200	Max HR = 190	Max HR = 180
Aerobic capacity – threshold training	81-90% max HR	169-190	161-180	153-171	145-162

What is the problem with threshold training?

Aerobic



- A. It burns too much fat
- B. It produces too much lactate
- C. It creates too much fatigue
- D. It decreases VO_2max

What is the problem with threshold training?

Aerobic



- A. It burns too much fat
- B. It produces too much lactate
- C. It creates too much fatigue**
- D. It decreases VO_2max

Training the energy systems

ATP-CP



Short-medium sprints
As fast as possible
Full rest between efforts



Glycolytic



Aerobic



Short to medium
intervals
8-10/10 effort

Base endurance
Threshold training
Long intervals



Training the energy systems

ATP-CP



Short-medium sprints
As fast as possible
Full rest between efforts



Glycolytic



50m-100m-200m race pace
15m to 100m bouts
1:4 to 1:12 effort rest



Aerobic



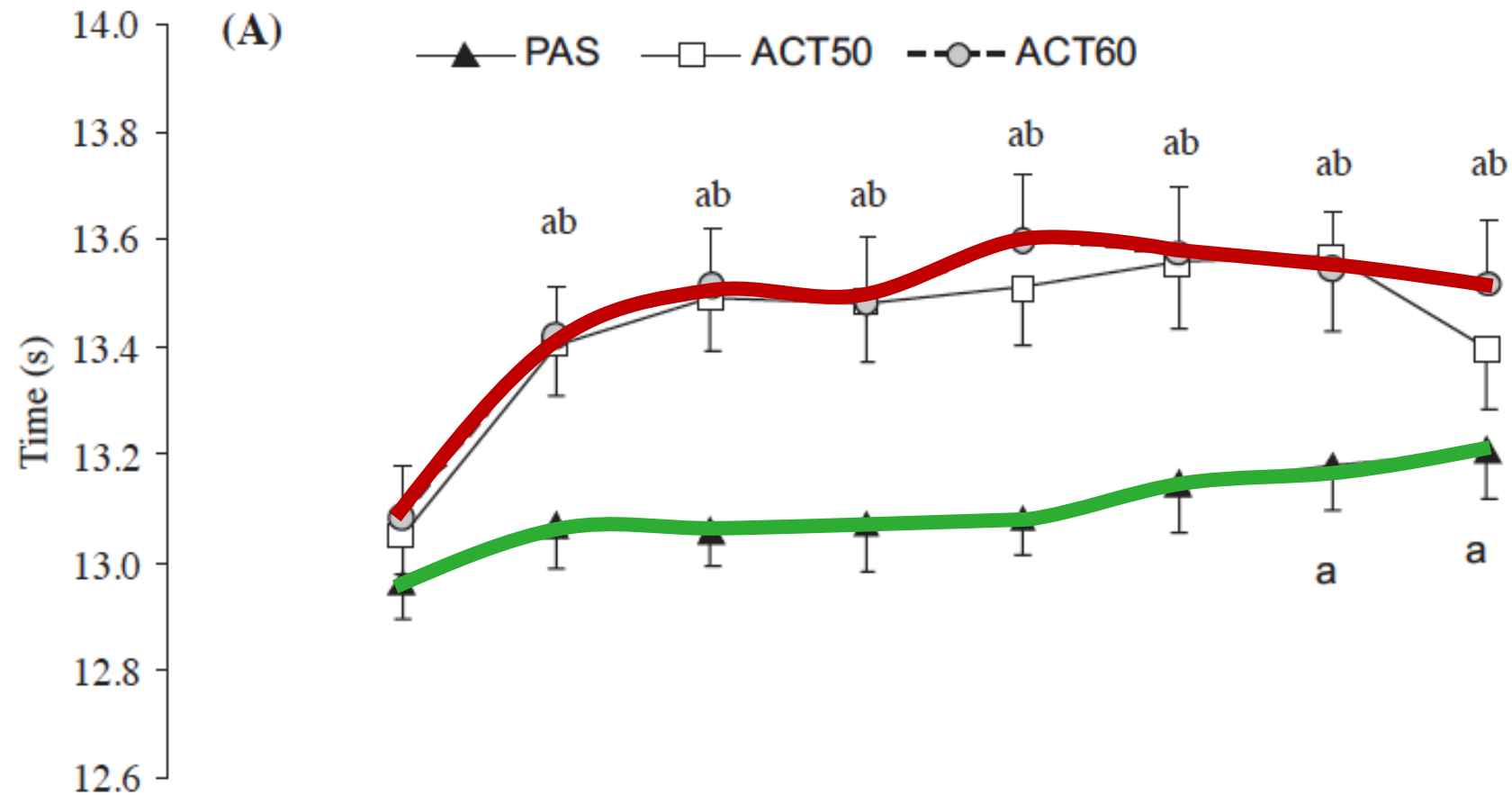
Short to medium intervals 8-10/10 effort	Base endurance Threshold training Long intervals
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Active or passive rest?

Glycolytic

Swimming: 8 x 25 m sprints



Training the energy systems

ATP-CP



POWER!!!

Glycolytic



PACE

Aerobic



CONSTANT CONTROL



A high-angle, close-up view of a swimming pool's surface. The water is a vibrant blue, and several parallel lanes are visible, separated by dark blue lane lines. White floats are attached to these lines, creating a rhythmic pattern of white and dark blue dots. The perspective is looking down the length of the pool, with the lines converging towards the top of the frame.

Thank you!

Any questions around how you can
improve your training?