

EUROPEAN FORCES SWIM LEAGUE



PERFORMANCE IN SWIMMING

David Van Deynse



PERFORMANCE-DEFINING COMPONENTS

- Technique
 - Condition
 - Psychological and mental strength
- **”Despite possessing a high level of physical conditioning, a swimmer that is not able to control or cope with the competitive pressure will never perform at his/her best, nor will he/she exhaust his/her conditioning potential.”**

Jan Olbrecht

PERFORMANCE-DEFINING COMPONENTS

Factors affecting competitive performance

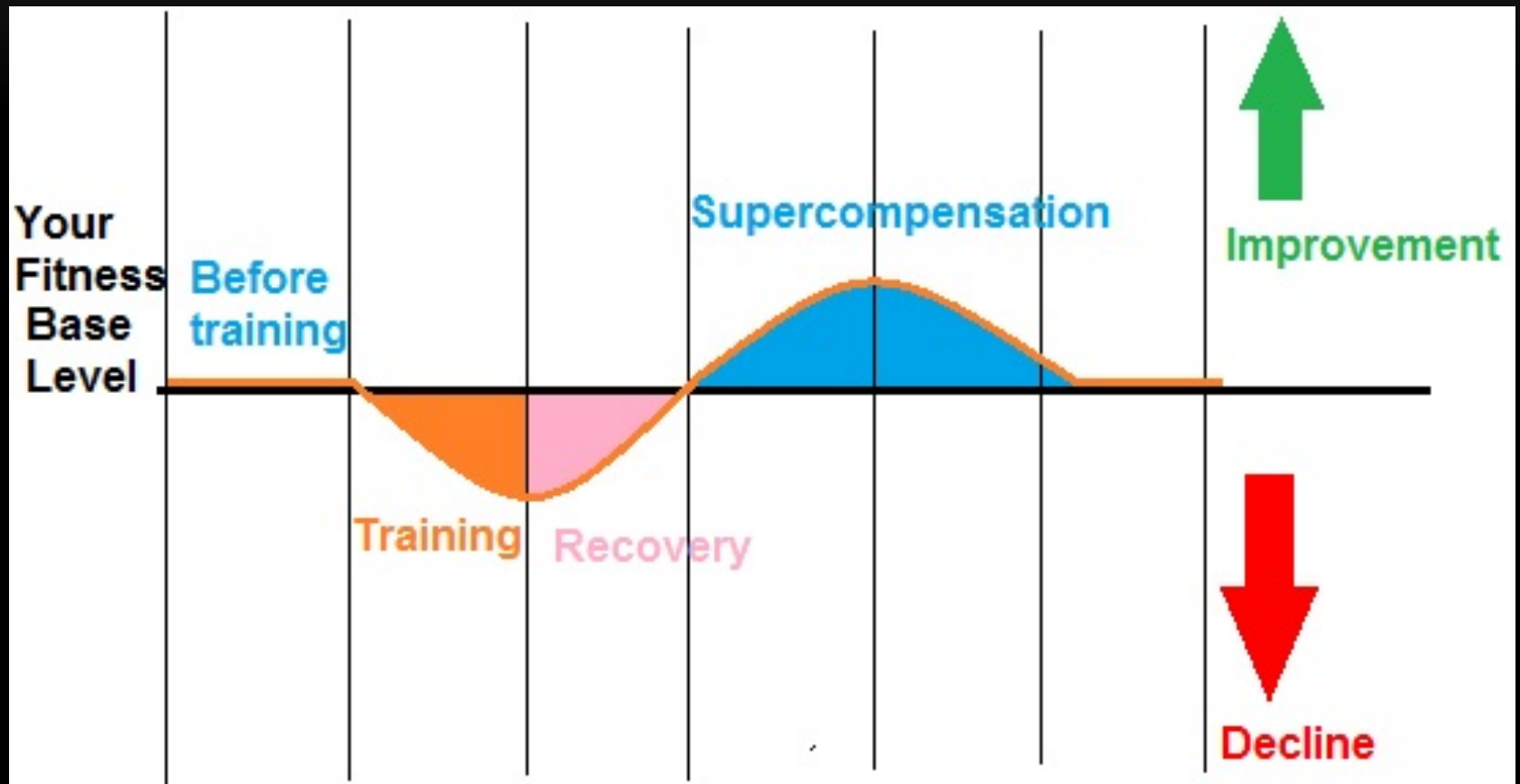
Technique	Physical Conditioning	Psychological Conditioning
Stroke technique, coordination Starts and turns ...	Aerobic conditioning (endurance) Anaerobic conditioning Flexibility and strength ...	Stress control Motivation ...
Speed		

Tab. 1 Competitive performance depends primarily on the status of these components.

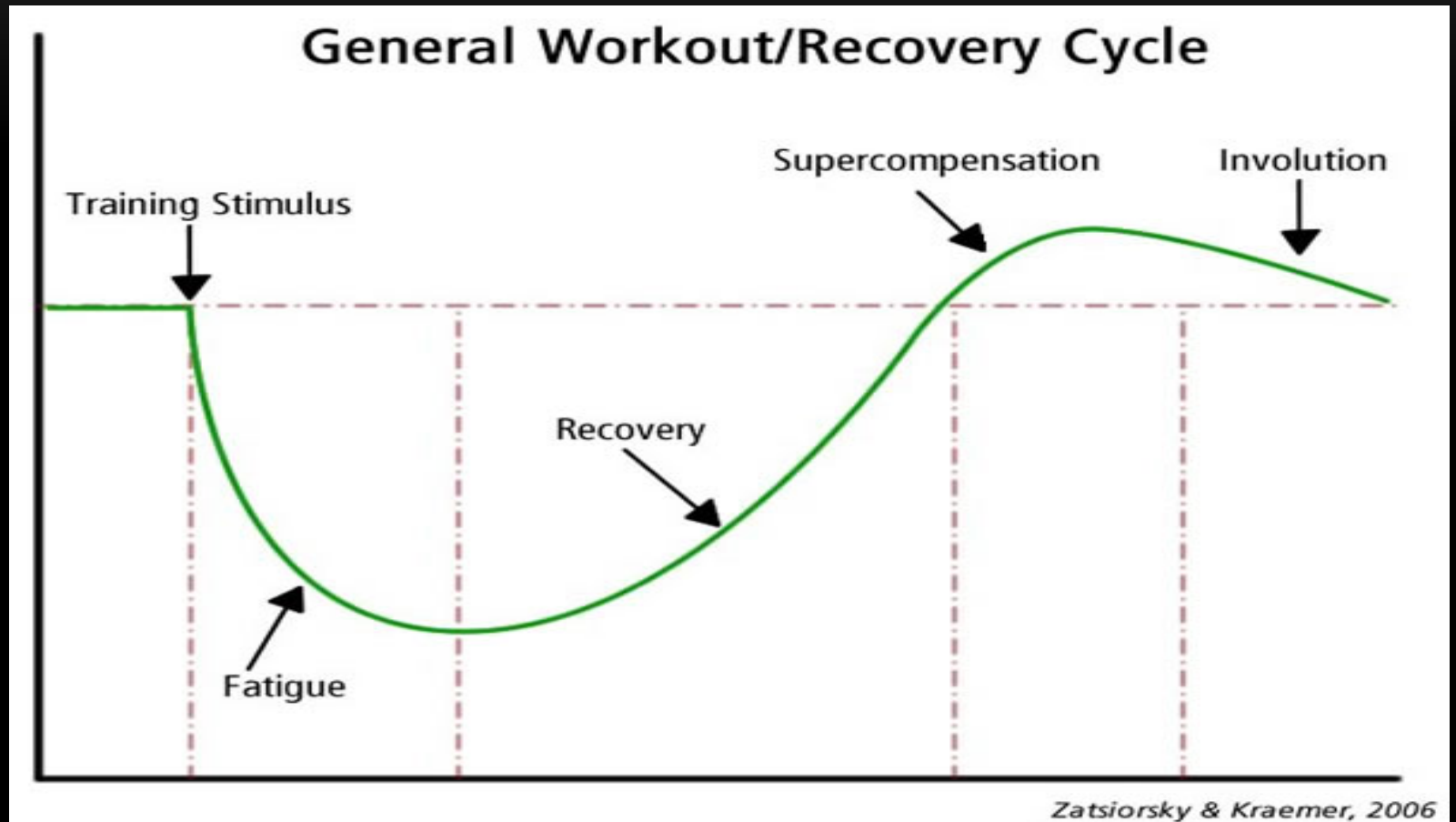
SUPER-COMPENSATION

- What is super-compensation?
 - Refers to the process of the body adapting to a progressive exercise program.
- The principle of super-compensation is described in 4 stages:
 - Stage 1: During Practice □ Swimmer gets tired □ performance drops
 - Stage 2: During (Active) Recovery □ start recovery phase □ performance rise
 - Stage 3: The Super-Compensation phase □ physical performance increases
 - Stage 4: No continuous training □ performance decline/involution!

SUPER-COMPENSATION



SUPER-COMPENSATION

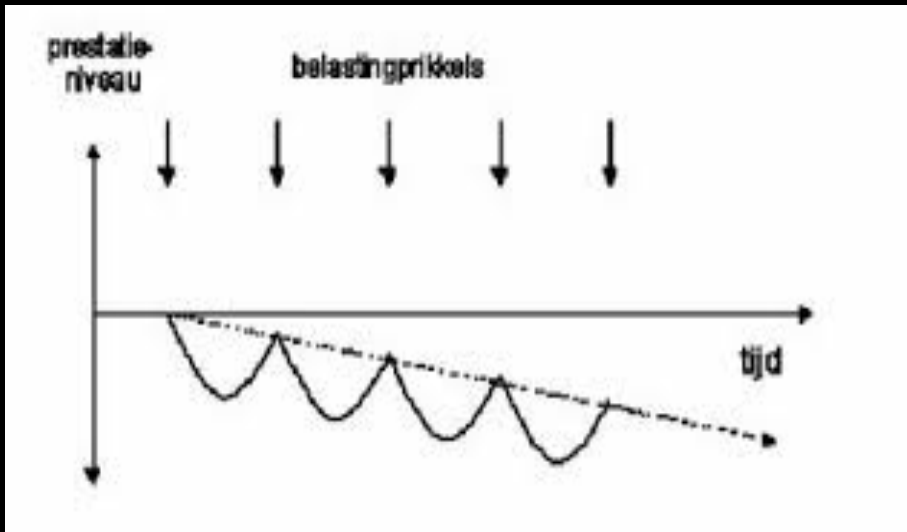


SUPER-COMPENSATION

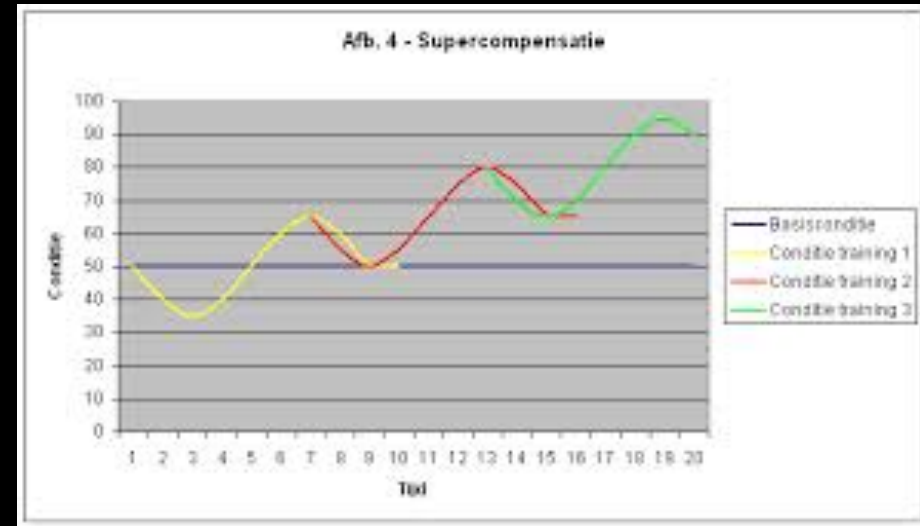
- What are the requirements for a successful super-compensation?
 - A healthy body: inflammations, overtraining, mental stress, ...
 - Adequate training intensity and –volume: Swimming long and hard enough
 - Sufficient (active) rest: otherwise our body can't come to supercompensation
- Strong conditioning + rested state of the swimmer will lead to shorter recovery times between different types of exercises to super-compensation!

SUPER-COMPENSATION

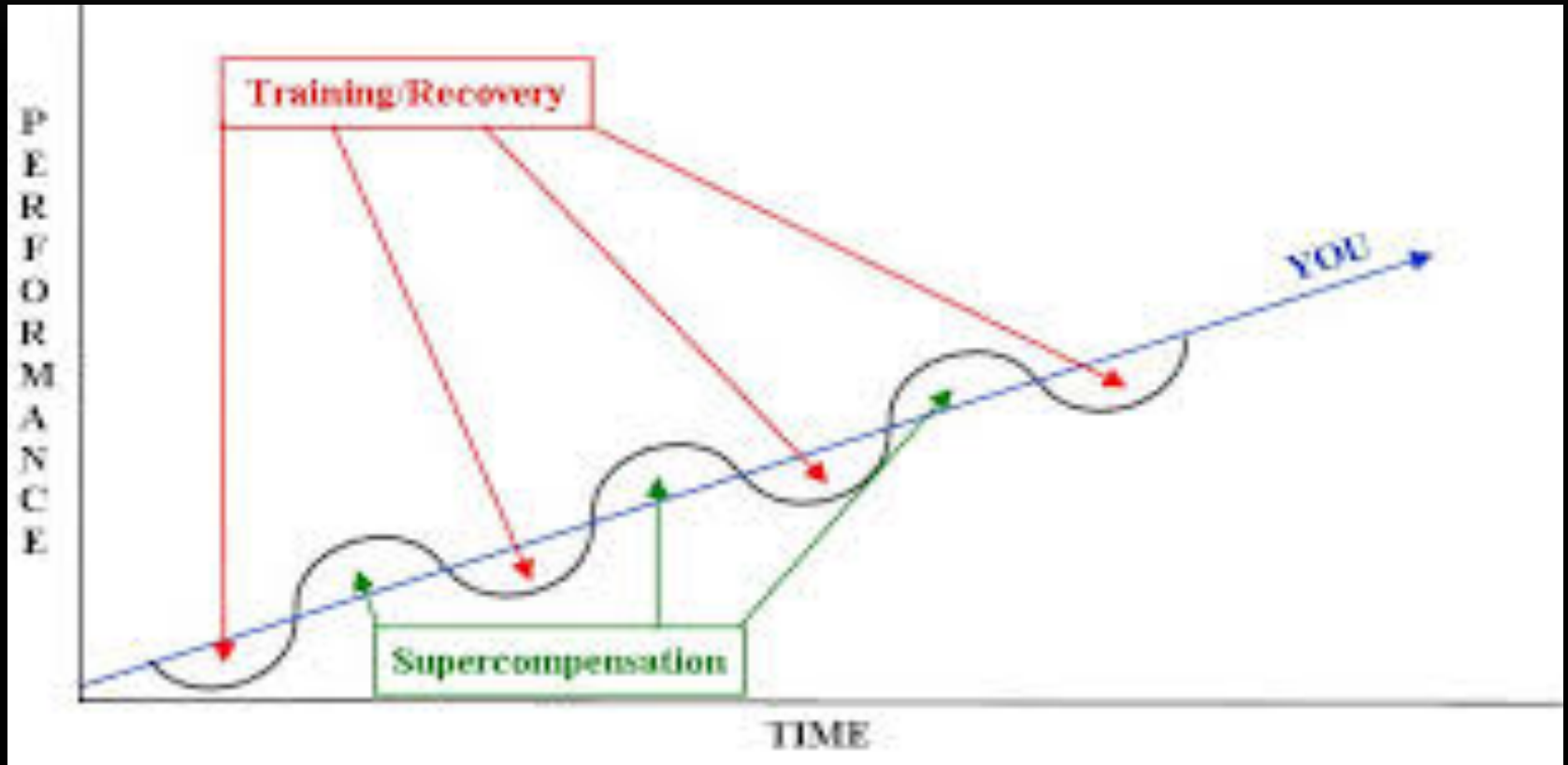
Proper or inaccurate 'rest'?



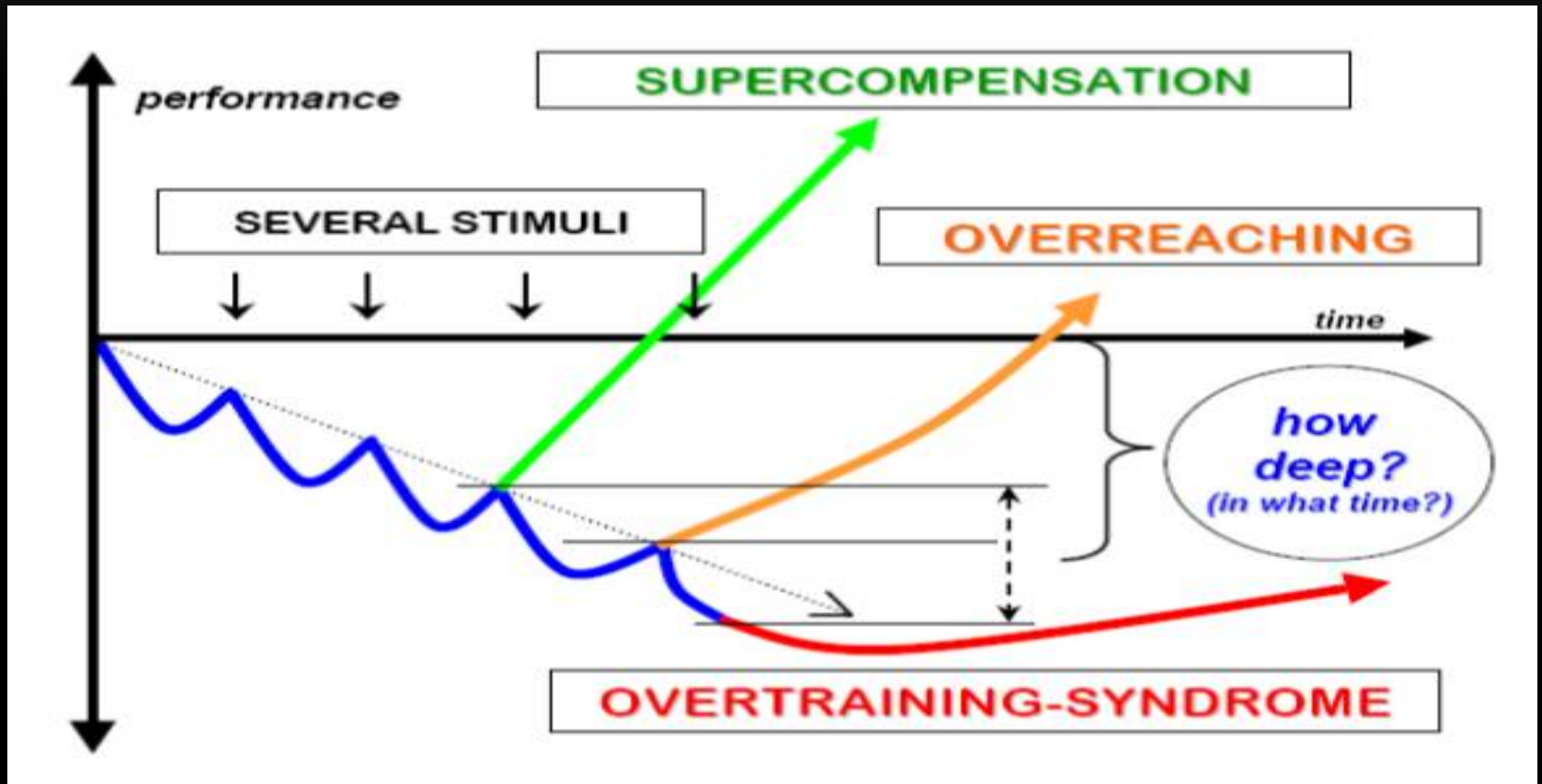
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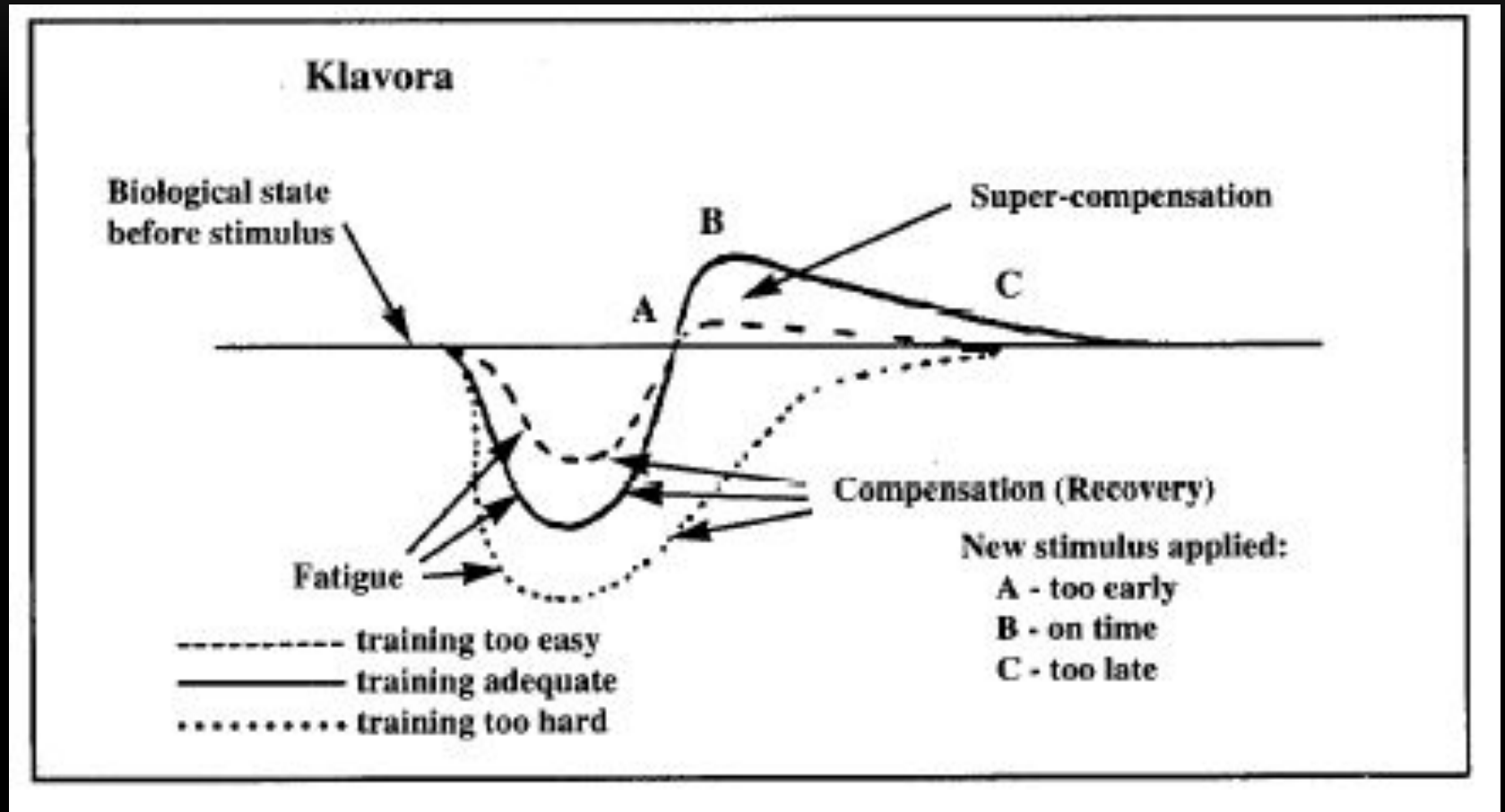
SUPER-COMPENSATION



SUPER-COMPENSATION



SUPER-COMPENSATION

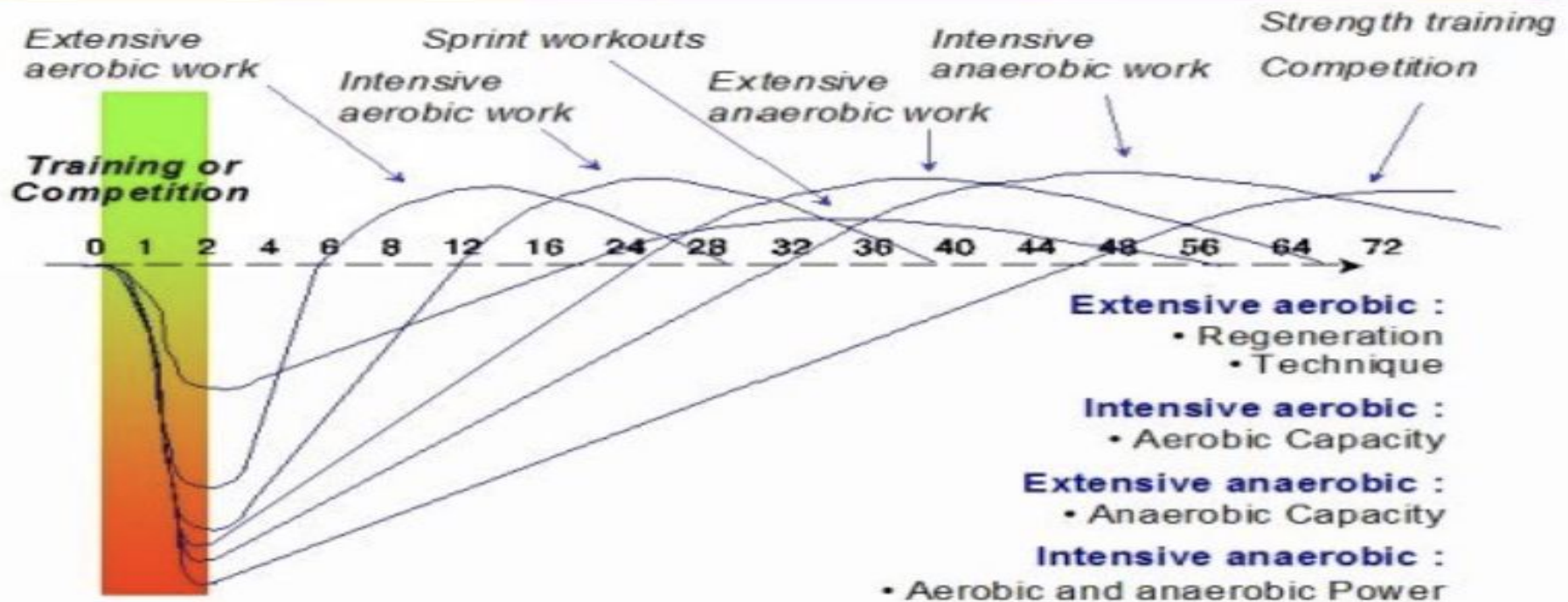


TIMING OF SUPER-COMPENSATION

- The time necessary for super-compensation depends on several factors:
 - Type & Duration of the workout
 - Conditioning level of the athlete
 - Recovery level of the athlete
- Swimmer has high conditioning level + well rested = short time to super-compensation
- Mental stress and fatigue will slow the process to super-compensation down
- Distinction between long and short sets of the same type in training. An intensive anaerobic set of 600m will require a longer time to super-compensation than a shorter set.

TIMING OF SUPER-COMPENSATION

Timing of Super-Compensation

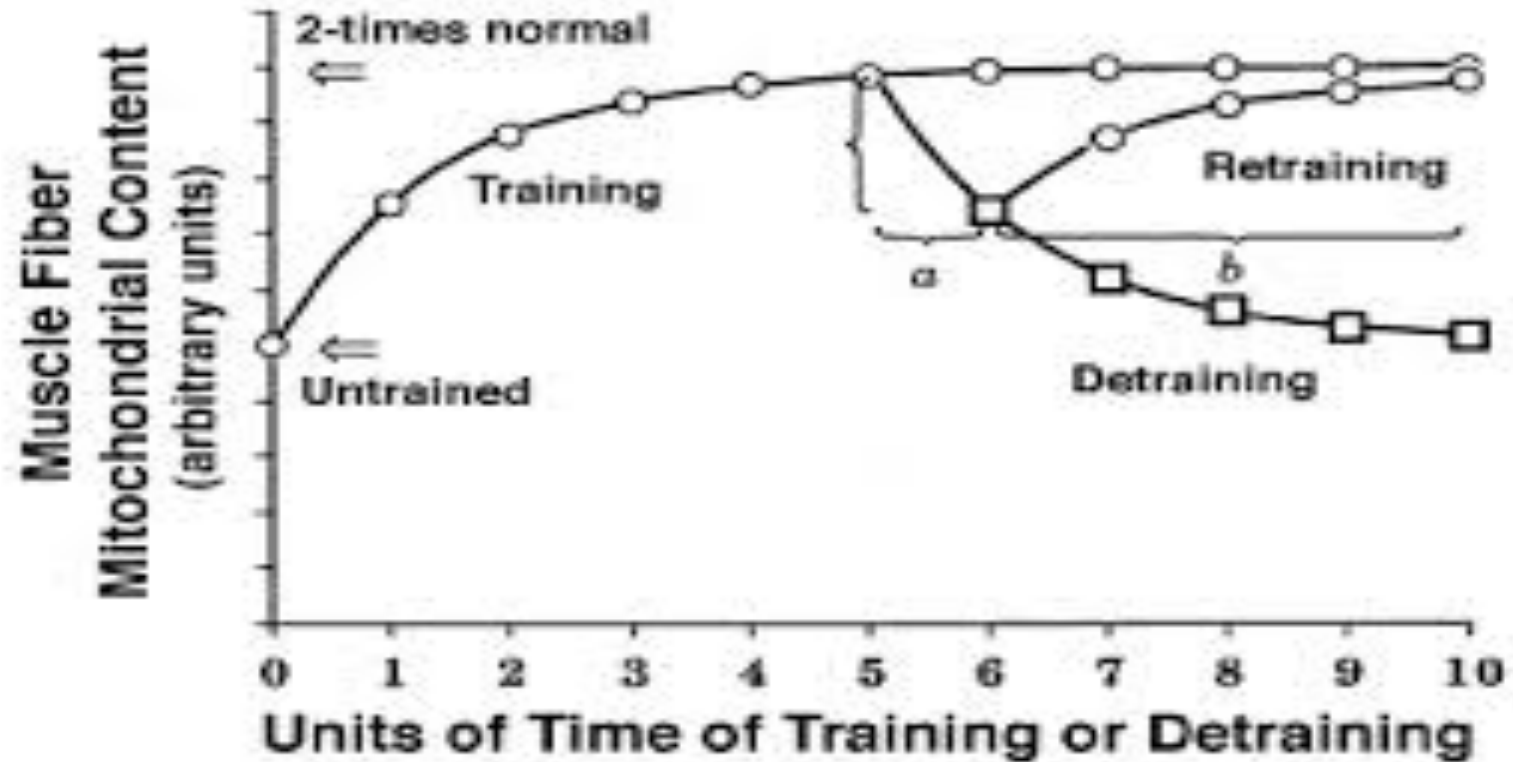


Training types	Extensive Endurance	Intensive Endurance	Sprints/ Short Sets	Extensive Anaerobic Training	Extensive Strength Training	Intensive Anaerobic Training	Intensive/ Strength Training/ Competition
From	8	24	30	36	40	40	48
To	12	30	40	48	60	60	72

DETRAINING - RETRAINING

- What is detraining?
 - This is when the athlete stops training and the process where he loses the acquired adjustments very fast starts.
- What does this mean?
 - For example this means that the amount of acquired mitochondrien (determines the aerobic capacity) of 5 weeks training will be half lost in 1 week detraining
- What is retraining?
 - This is when the athlete after detraining again starts with training .
- What does this mean?
 - Only after 4 weeks of retraining will you get back to the level you had before the 1 week detraining.

DETRAINING - RETRAINING



CONCLUSION

- It's obvious that regularity in training is very important for a continuous progression of the condition over multiple years.
- Coaches – swimmer – parents ☐ We all work together to improve!



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TYPES OF TRAINING

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AEROBIC & ANAEROBIC CAPACITY

- Aerobic Capacity
 - Increase of maximale oxygen uptake ($\text{VO}_2\text{-Max}$)
- Anaerobic Capacity
 - Increase of the maximal glycolytic rate
 - Also called Maximal Lactate Production Capacity

AEROBIC & ANAEROBIC POWER

- Aerobic Power
 - Maximize the use of the Maximal Oxygen Uptake (% $\dot{V}O_2$ -max) during competition efforts
- Anaerobic Power
 - Maximize the use of the Maximal Glycolytic Rate (% $\dot{V}L_{max}$) during competition efforts

TYPES OF TRAINING

Classification of Training Exercises

	Aerobic Capacity (Endurance Cap.=AEC)		Anaerobic Capacity (=ANC)		Aerobic Power (=AEP)		Anaerobic Power (=ANP)	
Type of swimmer	S	L	S	L	(S) M	L	S	M (L)
Volume*	Long	Very High	Moderate	Low**	110-90% Comp. distance		110-90% Comp. distance	
Interval	Short (100-300m)	Long (300-800m)	Very Short (25-75m)		Short progresses to Long (50-100m) => (100-300m)		Short (25-100m)	
Intensity *	Extensive <u>alternated</u> with <u>intensive and short</u> <u>intervals</u> in the same or next training session		Nearly all-out	All-out	Race Pace or somewhat faster		All-out	
Rest	(40-20s)	Short (20-10s)	Long (>= 2x swim time) (35s-1:30min)		Short progress. to Very Short (45-30s) => (10-20s)		Short (10-20s)	
	8x100m R=20s 1, 3 fast	6x500m R=20s 1, 2 (50fast/50slow)	6x(3x50m) R=1:20min P/3	3x(2x25m, 1x50m) all-out after 25m R=30s after 50m R=90s	5x75m R=45s to 3x125m R=15s	12x100m R=30s to 5x300m R=20s	Brokens / Comp. Test 4x50m R=10s 25+50+25+50m R=5-10s	

*depends on conditioning level

Sprint and technique are not in this classification

** has been changed vs previous publication, see text

Adapted: J. Olbrecht: Schwimmen, Lernen und Optimieren 1994

AEROBIC CAPACITY TRAINING

- This type of exercise lays the basis for the swimmer's conditioning
 - Not only essential for the long distance swimmer but also for the sprinter
 - It will thus, take up the largest part of the base training period
 - During the competition training period these workouts will be performed less frequently and at a lower intensity
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AEROBIC CAPACITY TRAINING

Checklist for the aerobic capacity exercises:

- High volume (for sprinters, the intervals and the total distance of the workouts are generally shorter than for long distance swimmers)
- Low intensity during the major part of the exercise but “spiced” with some intensive bouts at the beginning of the workout
- Little rest between the intervals

EXPERIENCE HAS TAUGHT US THAT WE CAN COMBINE SHORT INTENSIVE REPEATS WITH LONG EXTENSIVE WORKOUTS IN 2 WAYS:

- **Type 1:**
 - Both the intensive and extensive work take place during the same training unit
 - The intensive bouts mostly in the beginning of the exercise and the extensive part at the end
 - = “extensive tail” at LA1 or even slower
 - Drills, relaxation exercises or technique **DO NOT** belong to the extensive tail
 - The total volume of the set varies from 600 to 2800 m
 - The “extensive tail” takes up from 2/3 to 5/6 of the whole set
- **Type 2:**
 - Extensive work happens in the training unit that follows the intensive one
 - Such an intensive session may contain a long anaerobic capacity workout, an aerobic or anaerobic power set or may be a competition

TYPE 1

- Both the intensive and extensive work take place during the same training unit

$(2 \times 100 \text{ m}) + (2 \times 150 \text{ m}) + (2 \times 250 \text{ m}) + (1 \times 400 \text{ m})$ total: 1400 m

- rest after 100 and 150 m = 20 sec; after 250 m = 45 sec
- 1st 100 m progressively faster each 25 m, 2nd 100 m at LA1
(LA1 means that the pace will generate a level of 1 mmol/l lactate, see also fig. 56 ③)
- 1st 150 m 25 fast/25 easy
- The 250 m and 400 m are at a very slow pace - LA1

TYPE 2

- Short intensive and long extensive swims are distributed over 2 training units with the extensive work following the intensive work

Day 1: *main part 1* (anaerobic capacity exercise)

3 x (4 x 50 m) start every 1:15 total: 600 m

- 4 x 50 m odd repeats = as fast as possible and free stroke frequency (stroke rate)
even repeats = as fast as possible but 3 strokes/50 m less than in odd repeats
- 1st set = Fly / 2nd set = best stroke / 3rd set = Freestyle

main part 2 (intensive aerobic set)

4 x 400 m Freestyle total: 1600 m

- rest = 30 sec
- Odd repetitions at LA4; even repetitions at LA2 (LA4 and LA2 means that the pace will generate a level of 4 mmol/l and 2 mmol/l lactate respectively)

Day 2: main part

4 x 800 m Freestyle total: 3200 m

- rest = 1 min
- each interval at LA1

ANAEROBIC CAPACITY TRAINING

- Increasing the capacity to break down carbohydrates anaerobically
 - Plays an important part in the base training period and, to a smaller extent, in the competition training period
 - These exercises are inserted into the first half of the training session
 - This type of workout lays the basis for the tough anaerobic power work
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ANAEROBIC CAPACITY TRAINING

Checklist for the anaerobic capacity exercises:

- Short intervals (25-50 m)
- Each repetition must be swum somewhat slower than maximum pace for swimmers with a high anaerobic capacity, and at maximal speed for swimmers with a low anaerobic capacity
- The rest must be at least as long as the exertion time span, preferably, even 2 times the exertion time
- Contrary to all other types of training, passive rest is better than active rest

ANAEROBIC CAPACITY TRAINING

A trick to control the intensity of the anaerobic capacity sets is to insert an allout sprint early in the set:

- If the time of this sprint is more than 1.5 sec/50 m faster than the previous repetitions then the previous repeats were too slow and the remaining reps have to be swum faster
- If the time of this sprint is less than 1 sec/50 m faster than the previous repetitions then the previous swims were too fast and the remaining reps have to be swum slightly slower

ANAEROBIC CAPACITY TRAINING

- Are usually swum in the best stroke
- Can be improved by training, but takes a long time (1-2 years or even more)
- Are compatible with frequency training (stroke rate training)
- Can be used as the “spice” for the endurance capacity training

Example *

2 x (4 x 25 m)

total: 200 m

- rest = 20 sec
- 1st series best stroke / 2nd series Freestyle

Example ** (for a 400 m IM swimmer)

4 x (5 x 50 m) start every 1:15

total: 1000 m

- series 1: Fly / 2: Back / 3: Breast / 4: Freestyle

ANAEROBIC CAPACITY TRAINING

A good anaerobic capacity is thus important:

- For sprinters, to be able to swim fast on short distances
- For long distance swimmers, but to a lesser extent, to be able to accelerate at different times during long distance events and to better tolerate huge training loads.
- Lactate tests after long distance races revealed considerably higher lactate values for World class swimmers than for swimmers of a regional or even national level. This proves, for one thing, that anaerobic capacity is important even for long distance swimmers and also that this anaerobic capacity will in the end make the difference between winning and losing

AEROBIC POWER TRAINING

- Maximizing the use of one's aerobic capacity
- This type of exercise is necessary to complete the training work. During the pre-competition training period and it should be swum in the main stroke
- For 100 and 200 m races, this type of training is not a must, but for races longer than 200 m it is an absolutely essential part of the pre-competition training period
- Not more than ½ times per week. Need a long recovery period. Results not to be expected within 3 weeks. Start this type of training at least 6 weeks before the important competition

AEROBIC POWER TRAINING

Checklist for the aerobic power exercises:

- Stay around the competition distance (for a 400 m swimmer the workout may be 500 m long and be repeated 2 or 3 times)
- The rest is always short (5 to 15 sec) and the repeat distance is adjusted to enable the swimmer to maintain competition speed or just a little bit faster
- As the swimmer gets closer to the competition, the coach will make these swim sets progressively harder by shortening the rest in proportion to the repeat distance.
- **Example:** in the beginning an aerobic power series consists mainly of 50 and 100 m intervals with 15 sec rest. In the following weeks the athlete swims longer intervals (100 and 200 m) but with the same or less rest

AEROBIC POWER TRAINING

- Aerobic power training tends to drive both the aerobic and anaerobic capacities lower if the majority of the remaining training swims are not slow
- It is, therefore, very important to insert extra regeneration work in a training week in which aerobic power sets have been planned

Example *

3 x (100 m + 50 m) total: 450 m

- rest = 15 sec after 100 m
- rest = 10 sec after the 50 m interval
- intensity = competition time (CT) for 400 m

Example **

week 1: 5 x (100 m + 2 x 50 m) total: 1000 m

- rest = 10 sec
- intensity = competition time (CT) for 800 m

week 2: 3 x (100 m + 200 m + 50 m) total: 1050 m

- rest = 10 sec; 5 sec after 50 m
- intensity = CT for 800 m

ANAEROBIC POWER TRAINING

- Maximizing the use of one's anaerobic capacity
 - This type of exercise is also used in the competition training period
 - The anaerobic training at the end of the base training period is meant to increase the ability to produce more lactate
 - The anaerobic power training in the competition training period is a.o. used to toughen the swimmer against acidosis. This adaptation can be completed quite quickly (2 weeks)
 - The full effect will be reached after 4 weeks focused on the anaerobic power training followed by 2 to 3 weeks of tapering
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ANAEROBIC POWER TRAINING

Checklist for the aerobic power exercises:

- Maximum swim speed (starting with the first repetition)
- Short repeat distances; these must allow a maximum swim speed
- Very little rest (5 to 10 sec depending on the interval used - 25 or 50 m)

The total distance of an anaerobic power set is very low (125 to 250 m). For top level swimmers, the volume can be increased to 600 m but should then be split in sets of 100 to 200 m with 10 to 20 min rest between each set.

ANAEROBIC POWER TRAINING

- Training sets with repeat distances longer than 50 m and swum at maximum speed with a lot of rest (e.g. 4 x 100 m max., Rest = 10 min) can also be classified as anaerobic power training
- Anaerobic power sets should be:
 - executed with shorter intervals (max. 75 m) and / or
 - reserved only for very good swimmers (sprinters and Sr. National qualifiers)
- An alternative for this type of exercise is to enter the swimmer in a local competition and let him/her swim 3 or 4 100 m events. This may be a greater motivation for the swimmer.

PARADOXICAL TRAINING EFFECTS

- The 4 workout classes induce specific conditioning adaptations according to the principle of super-compensation. This super-compensation can only be reached if the workouts are completed in the **adequate volume**, with the **right intensity** and at the **right moment**..

Type of Exercise		Main Class Effect	Time for Effect	Undesired Effects	Advisable Dose	
					Maximal Frequency* (max. distance per set)	Base Training Period
C A P A C I T Y	Aerobic	↑VO ₂ max	At least 8 weeks. Will be longer the better VO ₂ max	↓Anaerobic Power ↓Aerobic Power ↑Anaerobic Capacity		
	Anaerobic	↑VLamax	At least 18 weeks. Will be longer the weaker VLamax	↓Aerobic Power		
P O W E R	Aerobic	↑%-use VO ₂ max ①	About 3 - 7 weeks. 3 for weak and 7 for strong VLamax	↓Anaerobic Capacity ↓Aerobic Capacity		
	Anaerobic	↑%-use VLamax ②	About 2-6 weeks. 2 for weak and 6 for strong VLamax	↓Anaerobic Capacity ↓Aerobic Capacity		

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**THANK YOU FOR YOUR
ATTENTION!**

