FIRSTBEAT

NEW FEATURES ON GARMIN FENIX 5, FR935

FIRSTBEAT PHYSIOLOGICAL FEATURES IN NEW GARMIN PRODUCTS

Feature	fenix 5	FR935
Anaerobic Training Effect (new)	**X**	**X**
Aerobic Training Effect	X	X
Training load (new)	**X**	**X**
Training status (new)	**X**	**X**
Calories burned	X	X
VO2max	X	X
Performance condition	X	X
Lactate threshold	X	X
Functional Threshold Power (FTP)	X	X
Recovery Time Advisor	X	X
HRV Stress Test (3min Stress Score)	X	X

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AEROBIC & ANAEROBIC TRAINING EFFECT

The complete picture of your workout

TRAINING EFFECT

Key benefits:

Understand how different workouts influence your performance

Ensure that training activities match desired outcomes

Aerobic Training Effect

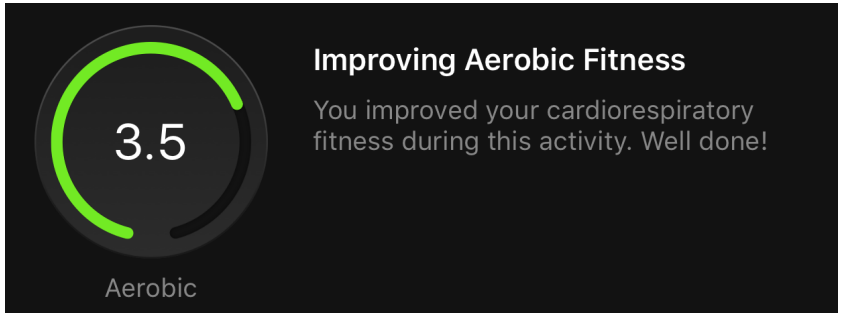
Reveals the benefit of the exercise to your aerobic fitness level (VO2max).

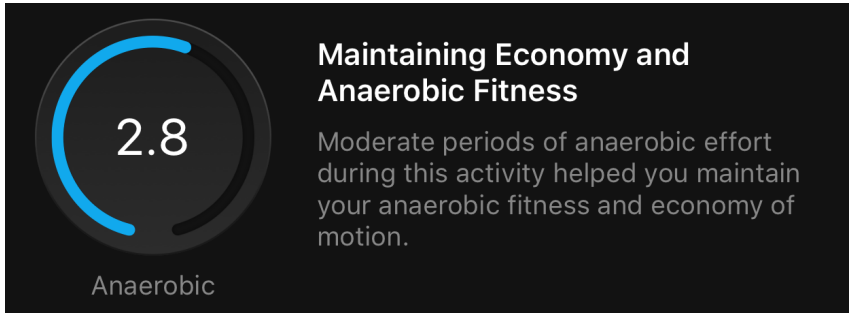
Best improved with steady paced, longer duration efforts below VO2max.

Anaerobic Training Effect

Reveals the benefit of the exercise for your ability to perform efforts at very high intensity.

Best improved with high intensity (above VO2max) interval training.





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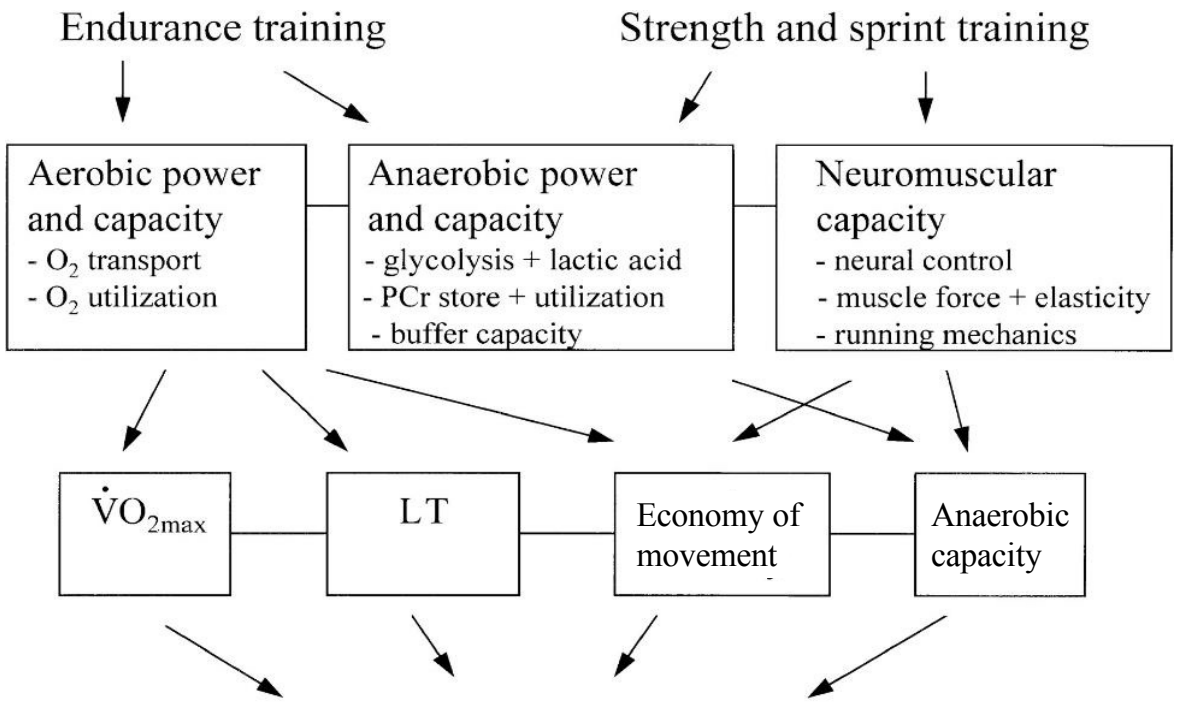
WHY TO MONITOR ANAEROBIC EFFECT OF TRAINING?



Endurance performance

- For endurance performance, aerobic training is the most important…
- …but it is not only about VO2max and lactate threshold
- Speed, power, economy of movement and anaerobic capacity are important
- Improving these requires explosive training, e.g., high intensity intervals

Athletes need to be able to
measure and understand
all the effects of the workout
to make well-informed training decisions

Modified from Paavolainen et al Journal of Applied Physiology 1999

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TRAINING EFFECT: IMPORTANT NOTES

Aerobic TE

- Aerobic metabolism can be best impacted with steady paced efforts or long intervals (>3min) at moderate to hard intensity below VO2max
- These type activities produce aerobic TE
- Aerobic TE is the same TE that already existed in Garmin devices
- 19 different verbal phrases for detailed interpretation

Anaerobic TE

- Anaerobic metabolism can be best impacted with repeated high-intensity intervals of 10 to 120 seconds (above VO2max)
- These type of activities produce anaerobic TE.
- Anaerobic TE can be calculated using only HR. When available, running speed / cycling power can enhance the calculation by fine-tuning the identification of time spent above VO2max
- 16 different verbal phrases for anaerobic effect

Both anaerobic & aerobic TE

- Can provide feedback for any type of activity where HR is available
- Can be calculated using optical or ECG (chest belt) sensors.
- Feedback becomes increasingly personalized over time based on VO2max and training activity data.
- Both TE's are based on modeling of EPOC (excess post exercise oxygen consumption), which describes the general disturbance of homeostasis brought on by the activity.

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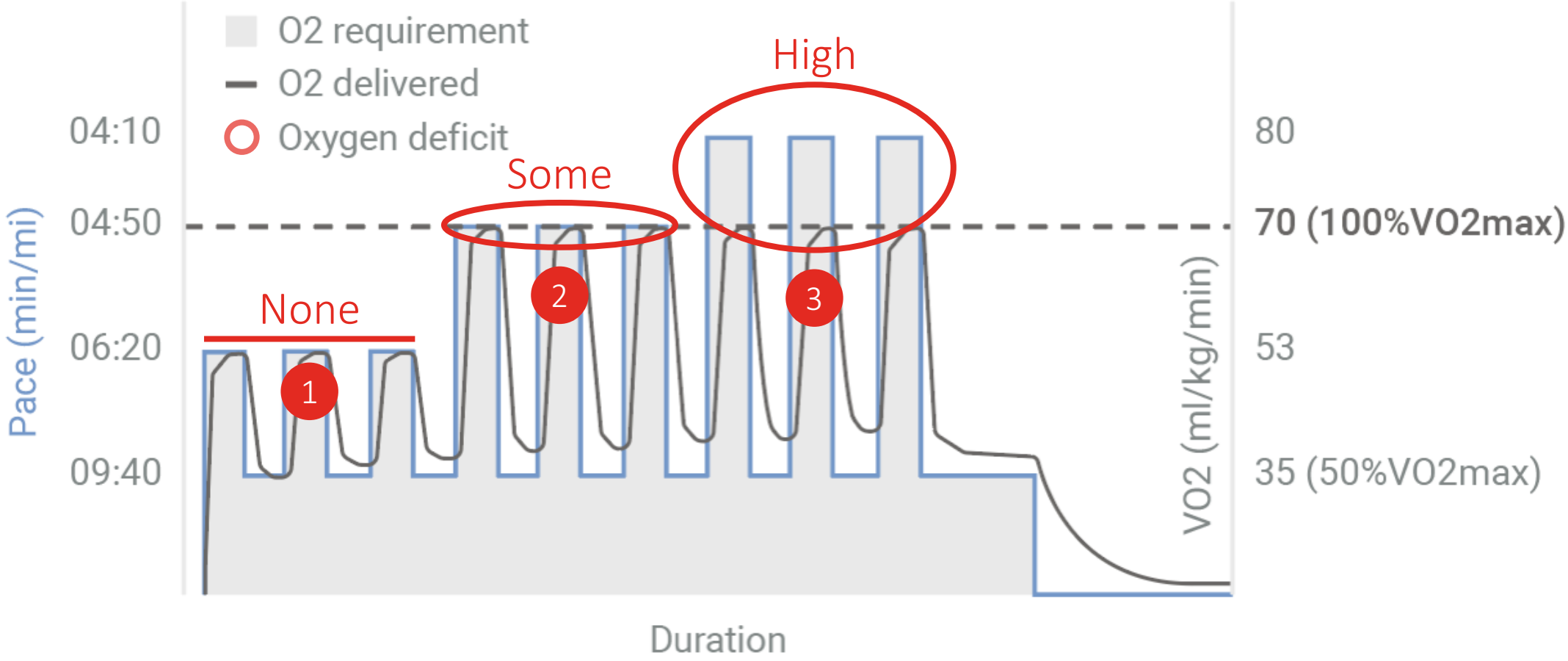
EXAMPLE: ANAEROBIC TE ACCUMULATION



1 Reps well below VO2max intensity
= No Anaerobic TE accumulation

2 Reps at VO2max intensity
= Some Anaerobic TE accumulation

3 Reps well above VO2max intensity
= High Anaerobic TE accumulation

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EXAMPLE WORKOUTS AND EXPECTED AEROBIC & ANAEROBIC TE

WORKOUT	EXPECTED AEROBIC TE & FEEDBACK	EXPECTED ANAEROBIC TE & FEEDBACK
Long slow distance	2.0-2.9 *Maintaining Aerobic Base*	Below 1.0 *No Anaerobic Benefit*
Steady pace close to lactate threshold	3.5 or higher *Improving Lactate Threshold*	Below 2.0 *Minor Anaerobic Benefit*
Lactate threshold intervals	3.0 or higher *Improving Lactate Threshold*	Below 3.0 *Maintaining Anaerobic Fitness*
Speed training 10 x 50m x 150-200%VO2max / 3min recovery	Below 2.0 *Minor Aerobic Benefit*	2.0-2.9 *Maintaining Fast Force production*
Extensive intervals 10 x 400m at 100-105%VO2max / 2min recovery	Below 4.0 *Improving Aerobic Fitness*	3.0-3.9 *Improving Economy and Anaerobic Base*
Intensive intervals 10 x 400m at 110-115%VO2max / 2-3min recovery	Below 4.0 *Improving Aerobic Fitness*	4.0 or higher *Highly Improving Anaerobic Fitness*
800m run race	2.0 or higher *Maintaining Aerobic Fitness*	2.5 or higher *Maintaining/Improving Anaerobic Fitness*
5K run race	3.5 or higher *Improving VO2max*	Below 2.0 *Minor anaerobic benefit*
10 run race	4.0 or higher *Highly improving VO2max / Overreaching*	Below 2.0 *Minor anaerobic benefit*

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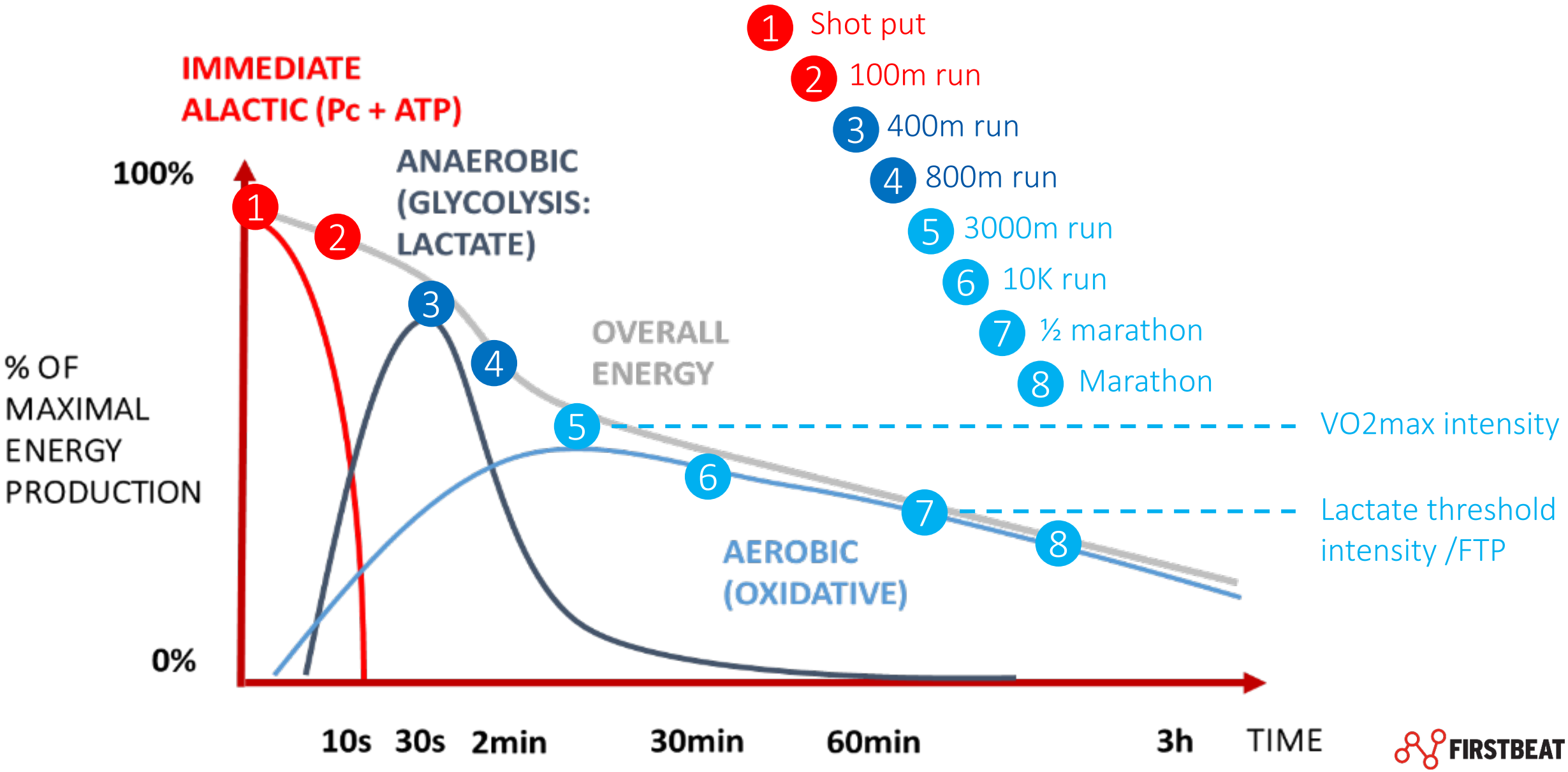
BACKGROUND PHYSIOLOGY: ENERGY FOR EXERCISE



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TRAINING LOAD

Train hard and smart

TRAINING LOAD

Training load

A single metric that reports the combined total load of your recent training activities.

Measures load from all sessions, both aerobic and anaerobic

Key benefit

See when your training efforts are optimal or if sessions are consistently too easy or hard

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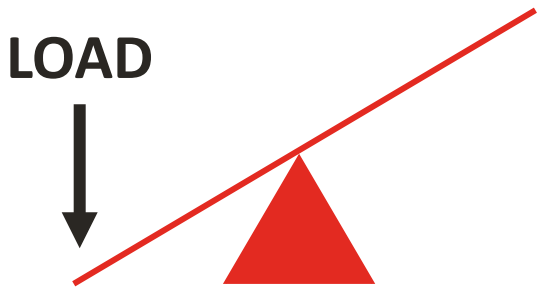
WHY MONITOR TRAINING LOAD?

- Workouts stimulate your body
- Between workouts your body recovers and adapts to better prepare for future efforts

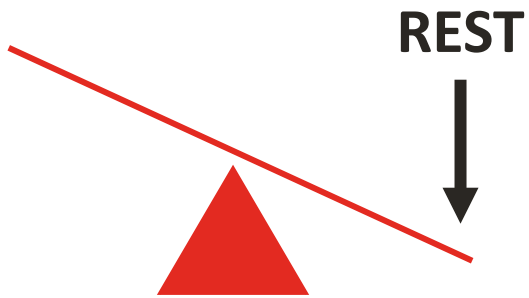
EXAMPLE A:



Consistently high loading does not allow recovery

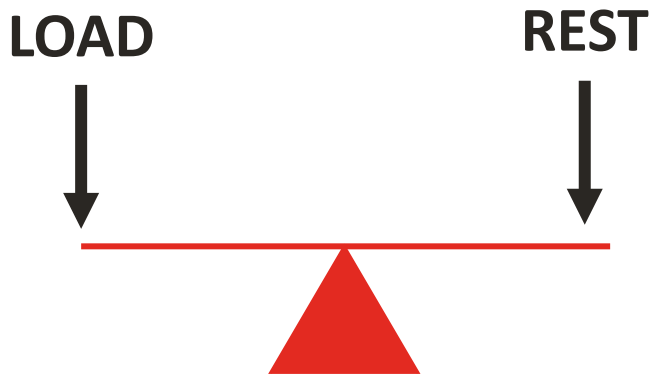
Fitness does not increase.

EXAMPLE B:



No workouts, no stimulus, no fitness level improvements

EXAMPLE C:



Optimal load via workouts

Optimal amounts of rest

Optimal fitness improvement

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TRAINING LOAD: IMPORTANT NOTES

Where does it apply?

- Training Load accounts for all monitored activities where HR data is available
- Accounts for both aerobic and anaerobic workouts
- VO2max and training histories are used to reveal your personalized optimal Training Load

Technical

- Requires a stable VO2max estimate established over the course of a few runs / rides
- Reports total physiological impact (EPOC) of all workouts recorded during the past 7-day rolling window

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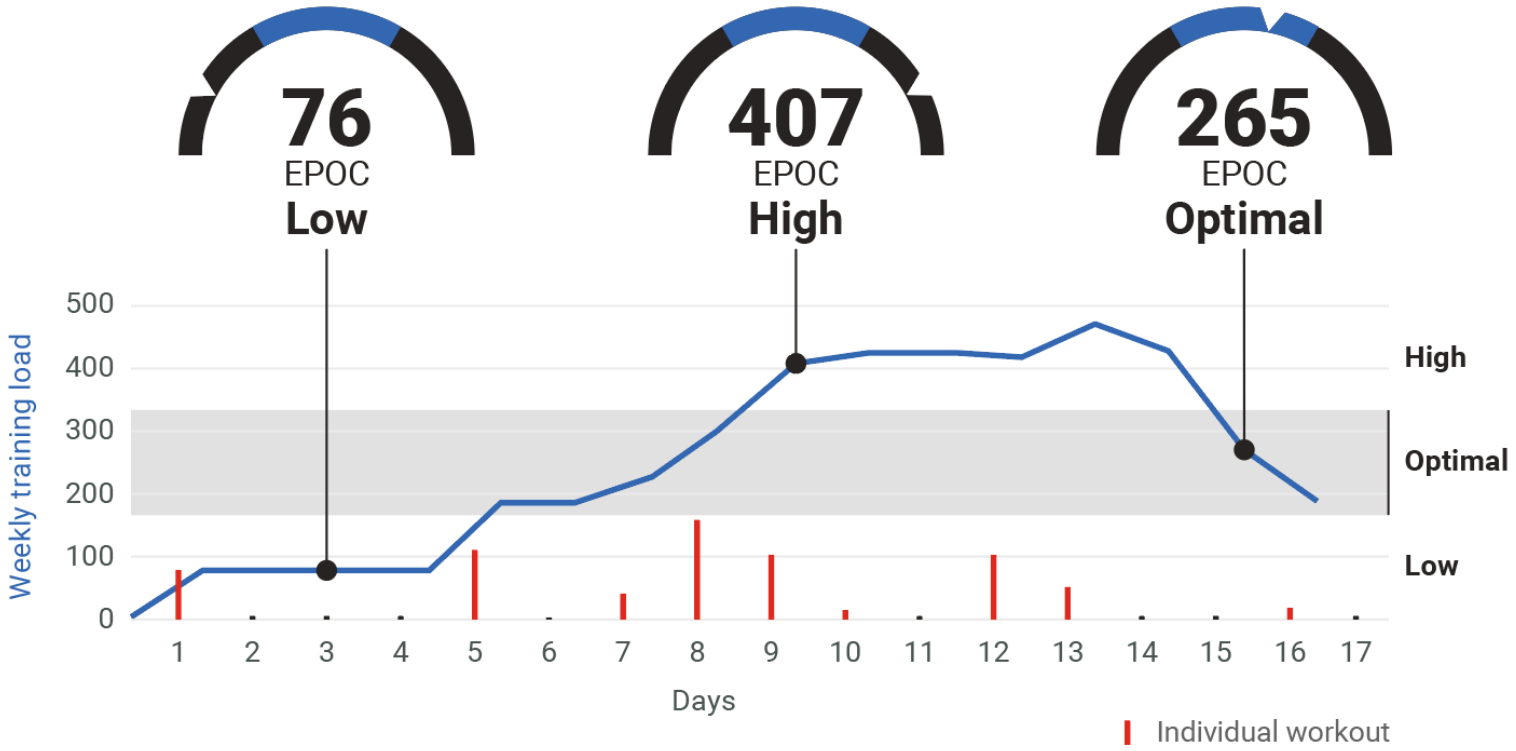
TRAINING LOAD EXAMPLE



- Optimal Training load range is personal:
  More fit and trained will have higher requirement for optimal range, and vice versa
- Optimal range is adjusted automatically in the background

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Know your

TRAINING STATUS

Coach yourself effectively

TRAINING STATUS

Training Status

Objective analysis of your recent training load and fitness level

Tells you how effectively your body is responding to training

Key benefit

Know your current Training Status and plan future training smarter…

…and continue improving your fitness level

Your Training Status can be:

Detraining – Recovery – Maintaining – Productive – Peaking – Overreaching – Unproductive – No status

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TRAINING PLANNING: WHY KNOWING CURRENT STATUS IS IMPORTANT?

Training planning is simple in theory…

…but difficult in practice

Typical problems

- Is training productive or not?
- Are you overtrained or undertrained?
- Why performance plateaus, decreases?
- No variation in training, too monotonous?
- Other life stress, illness, injury?
- How and when to plan recovery periods?
- Is recovery sufficient to peak performance?

Important training decisions should be based on measured results – not just instincts

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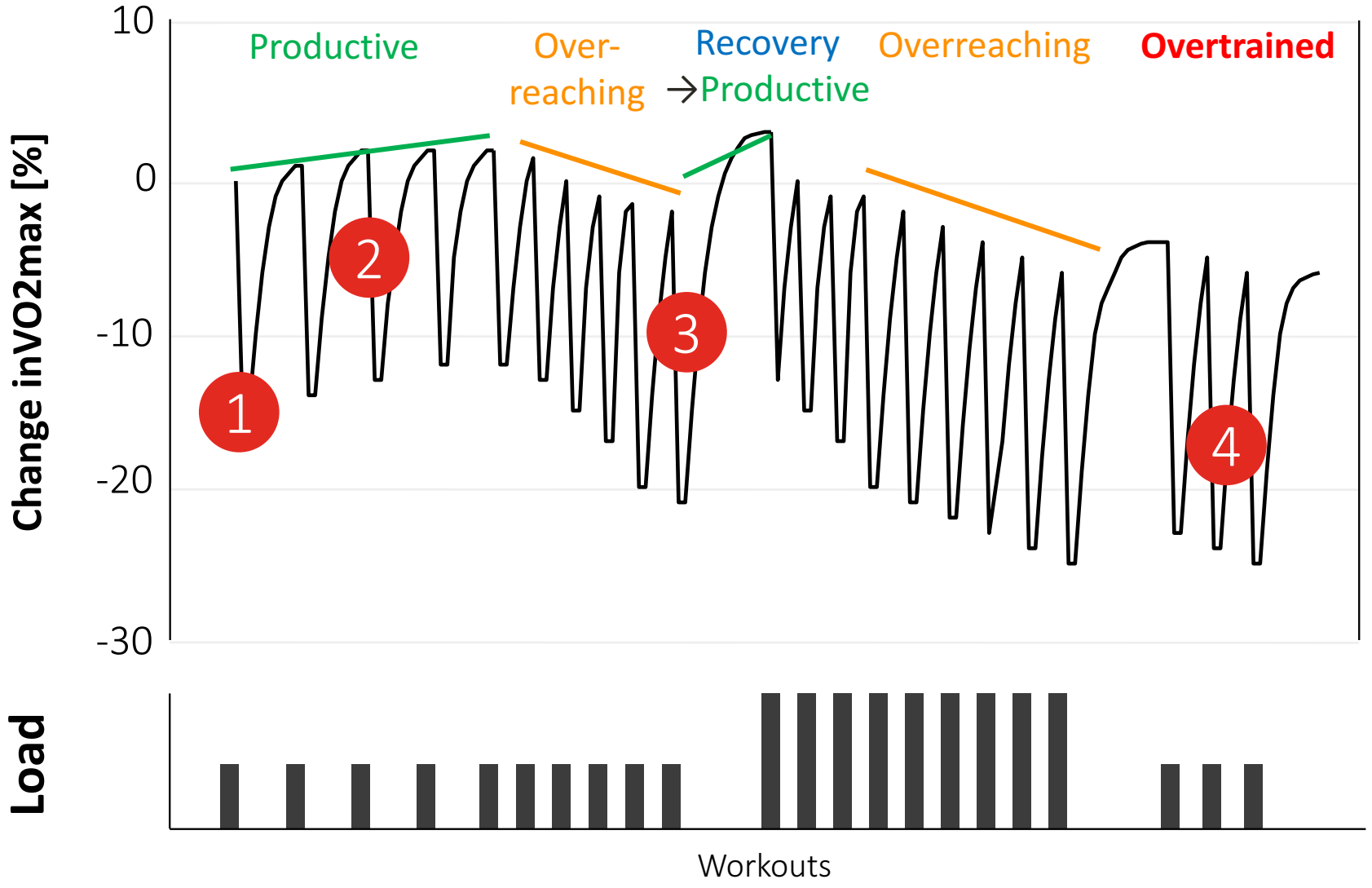
SUPERCOMPENSATION THEORY OF TRAINING



1. Each workout temporarily decreases performance (fatigue)
2. Performance increases occur during recovery
3. Trained athletes need bigger impacts to improve through overreaching
4. High prolonged loading with insufficient recovery may lead overtraining

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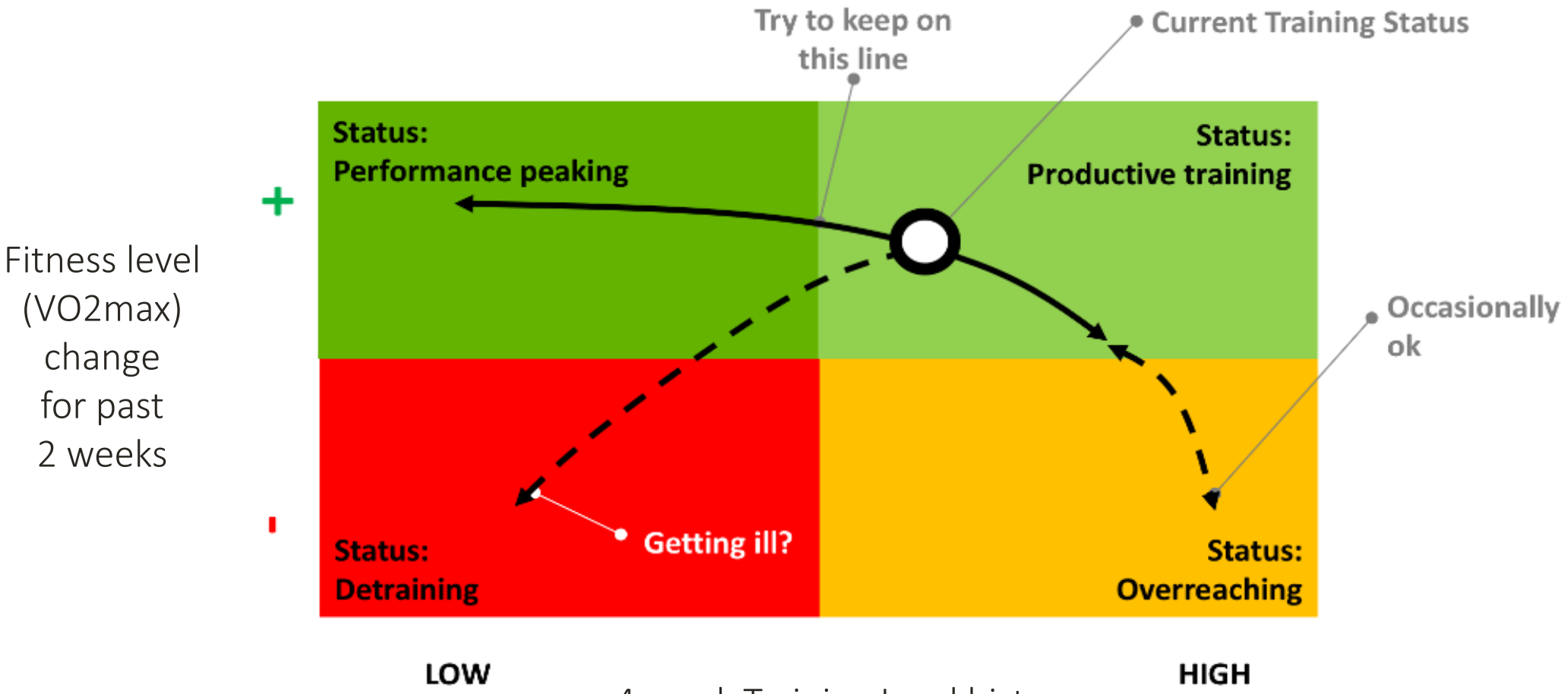
TRAINING STATUS BACKGROUND

Ultimately, only measured changes in fitness level can tell if training is productive or not. That's why we need to measure



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TRAINING STATUS: IMPORTANT NOTES

Where does it apply?

- All workouts in all sports with HR are accounted for Training Status
- Fitness level trend taken from runs/rides with VO2max estimate
- Minimum of two such runs/rides with VO2max estimate during past 14 days is required to calculate your Training Status

Technical

- Requires one week of training with two runs/rides producing VO2max estimate
- Available with optical HR
- For mixed running/riding, VO2max trend is based on the dominant sport with most VO2max estimates

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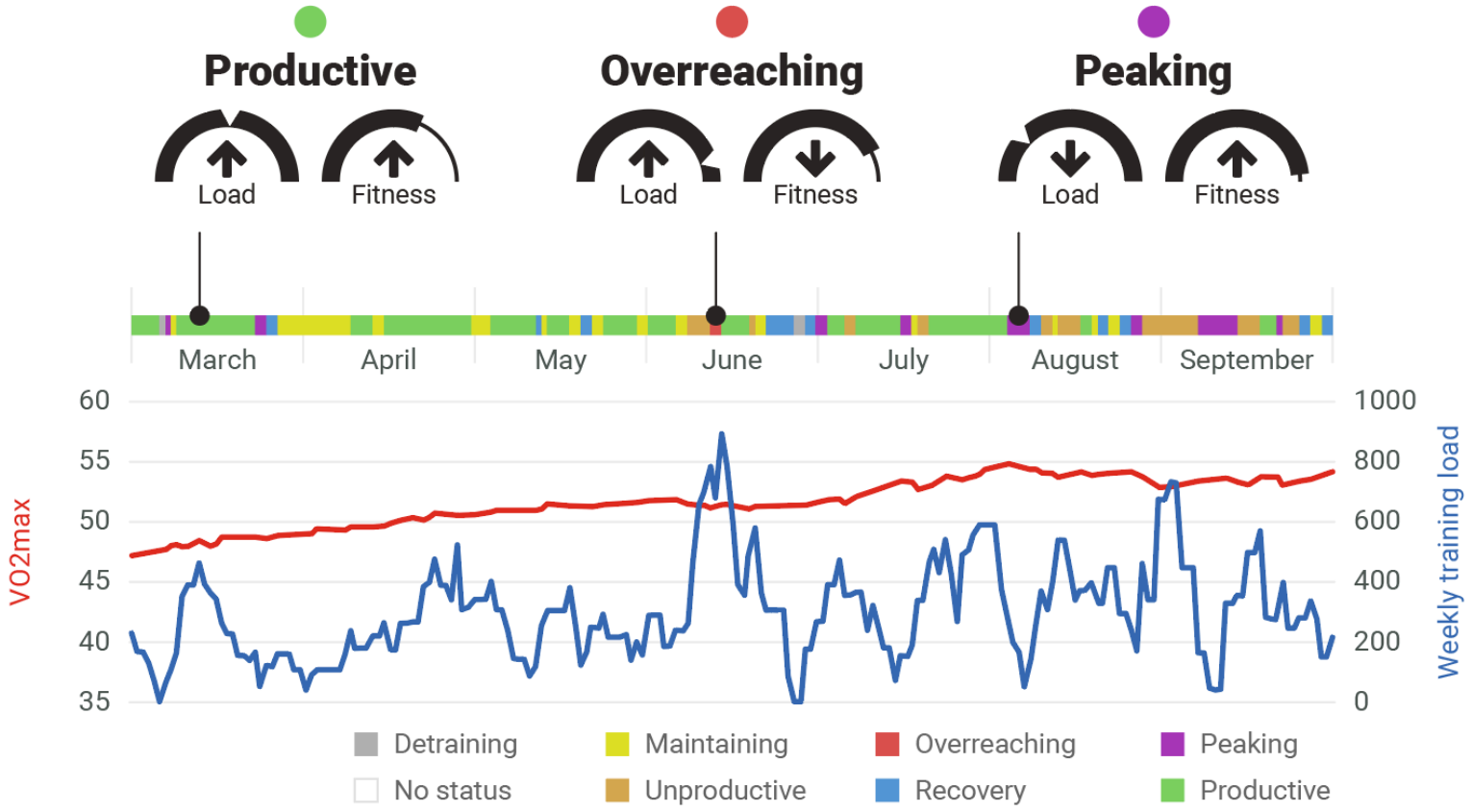
TRAINING STATUS EXAMPLE



- Optimal Training Load + Increase in fitness
  = *Productive*
- High Training load + decrease in fitness
  = *Overreaching*
- Decreasing Training load after a higher load + increase in fitness
  = *Peaking*

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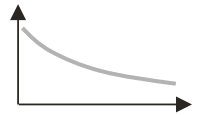
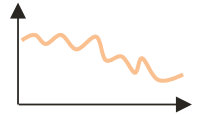
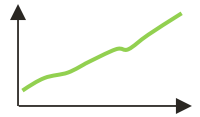
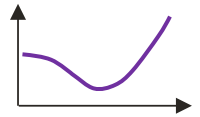
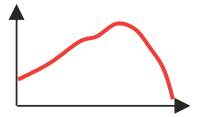
STATUS	DESCRIPTION	FITNESS	ACTION
Detraining	Detraining occurs when you are training much less than usual for a week or more, and it is affecting your fitness level.		You can try increasing your training load to see improvement.
Unproductive	Your training load is at a good level, but your fitness is decreasing. Your body may be struggling to recover.		You should pay attention to your overall health including stress, nutrition, and rest.
Productive	Your current training load is moving your fitness level and performance in the right direction.		It is important to plan recovery periods into your training to maintain your fitness level.
Peaking	Peaking means that you are in ideal race condition. Your recently reduced training load is allowing your body to recover and fully compensate for earlier training.		You should plan ahead, since this peak state can only be maintained for a short time.
Maintaining	Your current training load is enough to maintain your fitness level.		To see improvement, try adding more variety to your workouts or increasing your training volume.
Overreaching	Your training load is very high and counterproductive. Your body needs a rest.		You should give yourself time to recover by adding lighter training to your schedule.
Recovery	Your lighter training load is allowing your body to recover, which is essential during extended periods of hard training.		You can return to a higher training load when you feel ready.
No status	The device needs one or two weeks of training history, including activities with VO2 max. results from running or cycling, to determine your training status.		

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ABOUT FIRSTBEAT

Firstbeat is the leading provider of physiological analytics for sports and well-being. We transform heartbeat data into personalized information on exercise, stress and recovery.

Hundreds of elite sports teams, wellness professionals, and millions of consumers worldwide trust Firstbeat to enhance performance and well-being.

FIRSTBEAT

Firstbeat has developed revolutionary analytics technology that creates a digital model of user's physiology through advanced modelling of heart function and heart rate variability (HRV).

The background of Firstbeat is in exercise and physiological sciences and our products are based on physiology research.

Read more:

- Consumer products that we power: www.firstbeat.com/en/consumer-products/
- Science background of the technology, white papers and more: www.firstbeat.com/en/science-and-physiology/