Advanced Training with Power

eBook | Tim Cusick & Kevin Williams

Introduction

The Power of Data

At the core of power training is a simple *system of using basic, quantified data (watts) to develop and track a training strategy* that focuses on measurable results. As you go through the process of learning more about power training and gain more and more data, however, you quickly learn that there can be so much more. This eBook outlines the process of a more advanced approach to training with power through the *use of WKO5 and the Power Duration Model* with the goal of helping you improve your training with data.

Why Advanced Training with Power?

Why invest the time of learning to improve your knowledge and process of power training with advanced data and analytics? The answer is simple: *to improve your odds of success through better decision making.*

The science of data is the science of decision making

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Individualized training recognizes the unique physiology of the individual athlete and allows for specific, highly-focused diagnostic analysis, training prescription, and individualized performance analytics to improve training efficiency and effectiveness.

Individualize your Training

The Principle of Individualization in Sports Training

The principle of individualization dictates that sports training should be *adjusted according to the age, gender, rate of progress, and previous skill development of the individual*. The goal of individualization is to capitalize on strengths while minimizing existing skill deficiencies.

It is widely accepted in the endurance sports community that *individualization in training stimulus will create optimal performance outcomes*.

Measuring individual physiological information and applying it properly is the only way to truly individualize and differentiate training responses, yet true individualization of training prescription is rarely carried out by coaches or self-coached athletes. *If physiological information is unknown about a certain athlete, the coach makes the best guess, which may result in impaired performances.*

Individualization of Training with the Power Duration Model

Individualized training recognizes the unique physiology of the individual athlete and allows for *specific, highly-focused diagnostic analysis, training prescription, and individualized performance analytics to improve training efficiency and effectiveness.*

- Physiological Modeling
    - Phenotype
    - Pmax
    - Functional Reserve Capacity
    - Modeled Functional Threshold Power
    - Time to Exhaustion
    - Stamina

- Superior strength and limiter analysis

- Specific workout prescription targets for both time and intensity

- Physiological response comparison and tracking

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Watch the full webinar on Individualizing Your Training with WKO5

Training Individualization

Using **exercising athletes** to better understand their physiology…

ANALYTICS

INDIVIDUAL SPECIFIC SOLUTIONS

…and using **their physiology** to improve training results through **individualization and specificity**.

The Power Duration Model

Introduction

How do we achieve the individualization of training? The Power Duration Model.

The *mathematical model of the power-duration relationship implemented in WKO is conceptually and statistically robust,* and it provides precise, unbiased estimates of key parameters reflecting important physiological determinants of performance. As such, *it provides a sound foundation upon which other calculations can be based, resulting in a more individualized, and hence optimized*, approach to power-based training.
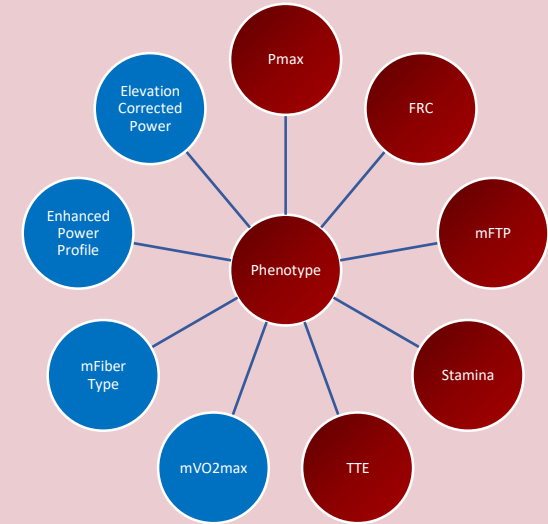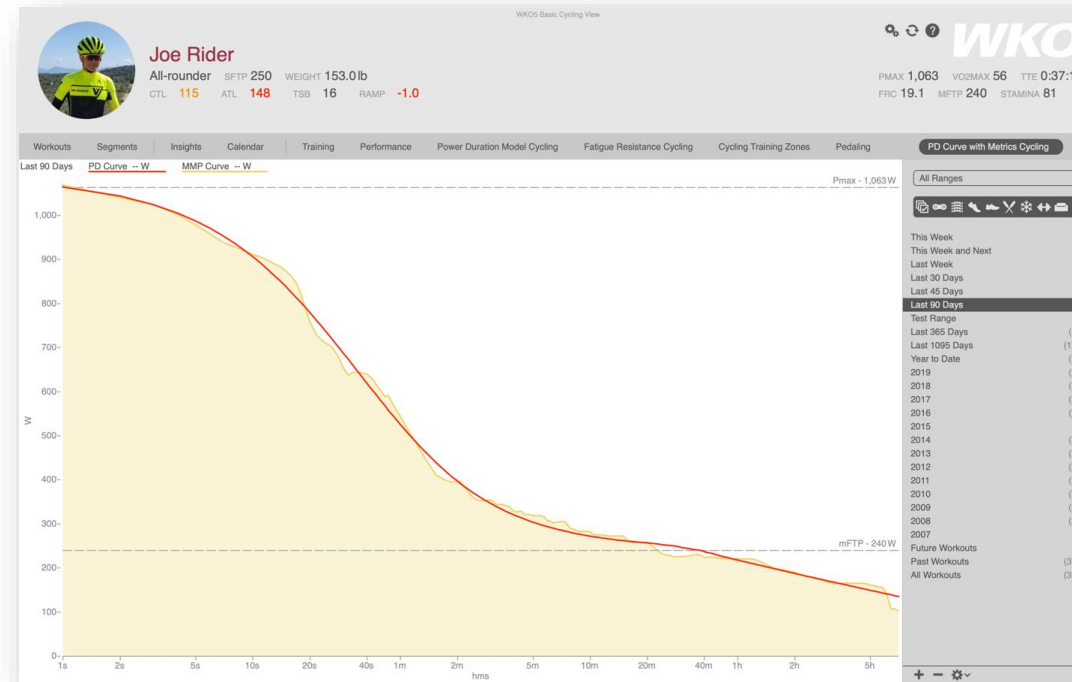
The mathematical model of the power-duration relationship implemented in WKO is conceptually and statistically robust and provides precise, unbiased estimates of key parameters reflective of important physiological determinants of performance. As such, it provides a sound foundation upon which other calculations can be based, resulting in a more individualized, and hence optimized, approach to power-based training.
-Dr. Andrew Coggan

Want to learn more about the Power Duration Model?
Download the eBook here.

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The Power Duration Process

The Steps of Power Training

Step 1: Power Duration Curve Testing Protocols

Step 2: Use WKO to Better Understand your Strengths and Limiters

Step 3: Establish Your Training Targets

Step 4: Design your Training Strategy with WKO

Step 5: Build "Smart" Workouts

Step 6: Monitor your Training with WKO

Process Overview

The power duration training process is a *series of steps that needs to be followed systematically* to produce results, but though the process is rigid, there is a fluidity to the modality of each step.
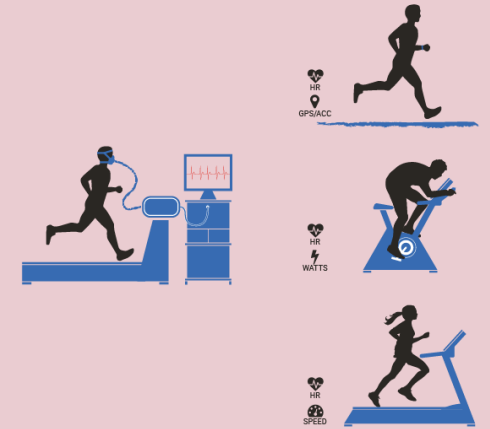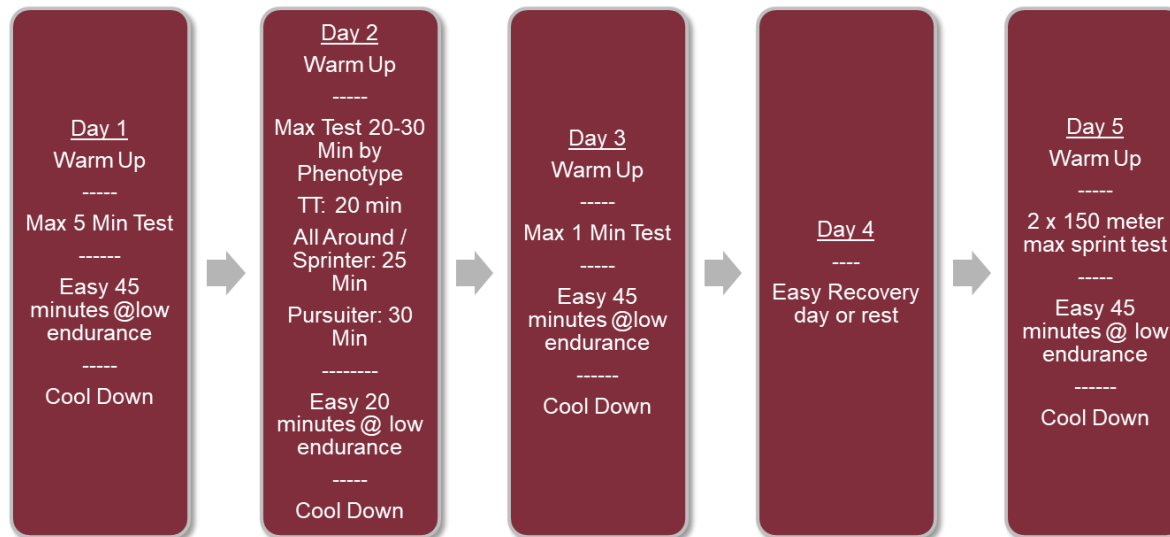
Keys to success:

- *Initial baseline testing* supported by ongoing unstructured testing every 30-60 days

- Utilization of *iLevels and Optimized Intervals* to determine work intensity and duration

- Someone has to do the work

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Check out this short video describing the benefits of Power Duration Training

Step 1: Baseline Test

Testing Protocol

To properly establish your season baseline Power Duration Model (PDM), it is *imperative that you complete an initial series of max effort testing.* Once this is completed, no additional formal testing is needed.

Day 1	Day 2	Day 3	Day 4	Day 5
Warm Up	Warm Up	Warm Up		Warm Up
-----	-----	-----	-----	-----
Max 5 Min Test	Max Test 20-30 Min by Phenotype	Max 1 Min Test	Easy Recovery day or rest	2 x 150 meter max sprint test
------	TT: 20 min	-----		-----
Easy 45 minutes @low endurance	All Around / Sprinter: 25 Min	Easy 45 minutes @low endurance		Easy 45 minutes @ low endurance
-----	Pursuiter: 30 Min	------		------
Cool Down	--------	Cool Down		Cool Down
	Easy 20 minutes @ low endurance			

	Cool Down			

Baseline testing helps us understand the athlete's individual physiology.

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Watch this short video on Power Duration testing

Power Duration Curve Post Test
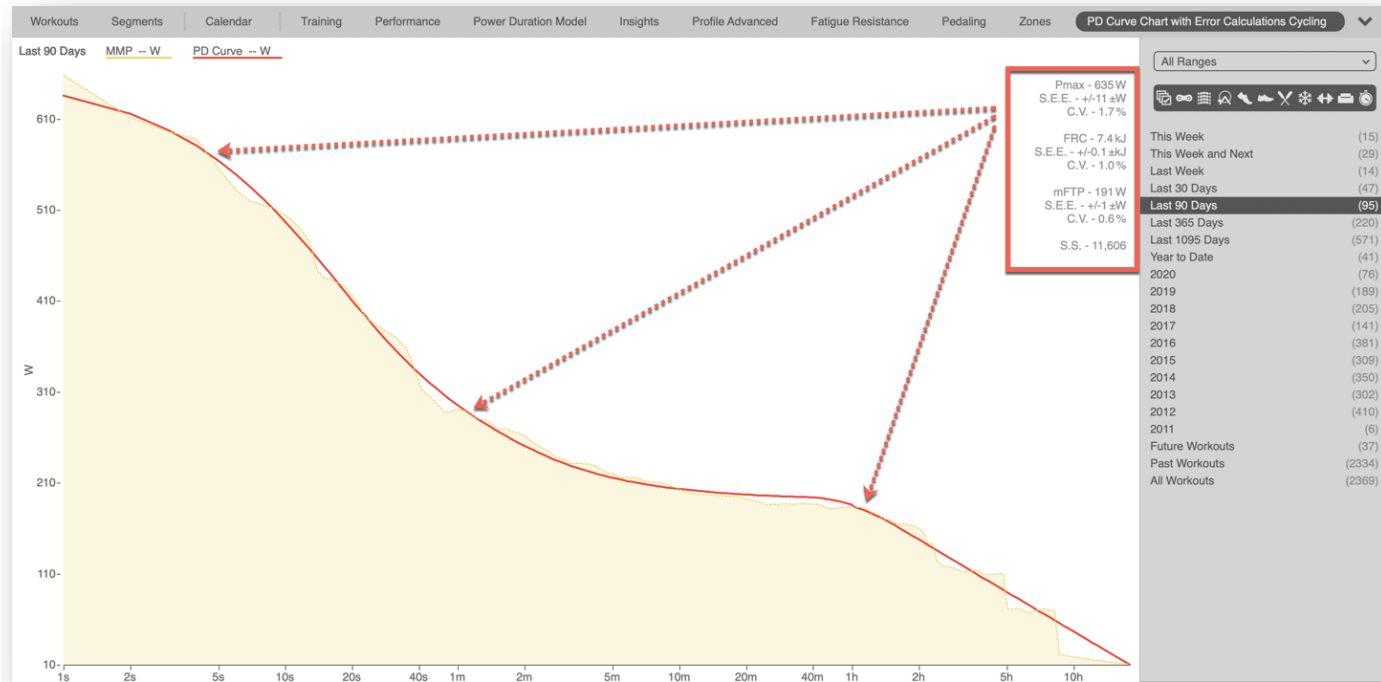

A Clean Curve

The Power Duration Model is *based on your mean max power (MMP) data, therefore requiring some maximal efforts to properly calculate.* WKO supplies several charts to help measure your curves accuracy.

- Check out the "PD Curve Chart with Error Calculations" pictured here

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Watch this full webinar on Demystifying the Power Duration Curve

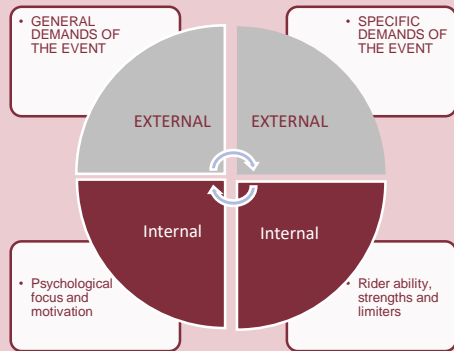# Ongoing Testing
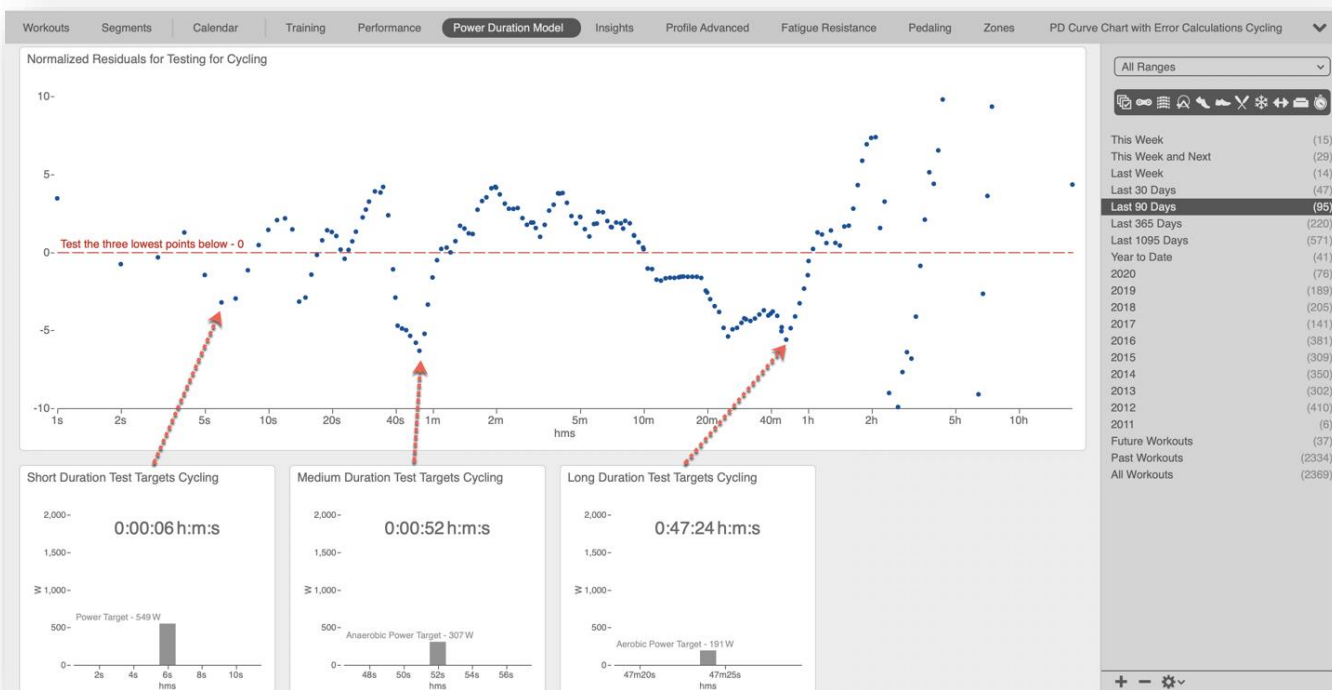
Unstructured Testing

Over the course of the season or cycle, a coach can *utilize unstructured testing formats to maintain an accurate Power Duration Curve*. Use the Power Duration Curve charts in WKO to compare the Power Duration Curve (the red line) to the mean max power curve (yellow dotted line), looking for areas where the mean max power line dips below the Power Duration Curve.

For a more specific target, *use the Normalized Residuals for Testing chart* pictured here. Once identified, select the short, medium, and longer points to test.

- Blend the tests into your workouts. *Remember, testing is training, and training is testing.*

- Review this testing format weekly and build it into training as part of maintenance thinking. *All tests should be in the same cycle, but not necessarily the same day or even the same week.*

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At the core of good planning is a deeper understanding of the athlete's ability.
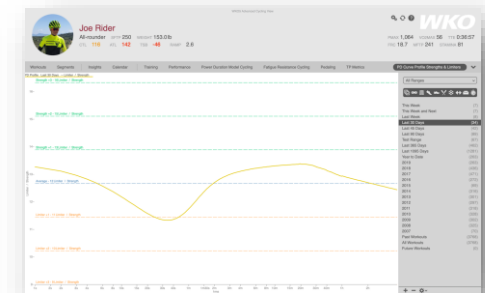
Step 2: Determine Strengths and Limiters

Ability of the Rider

Once your Power Duration Model testing is complete, you can use the data gained to better *determine the ability of the rider with four specific charts*:
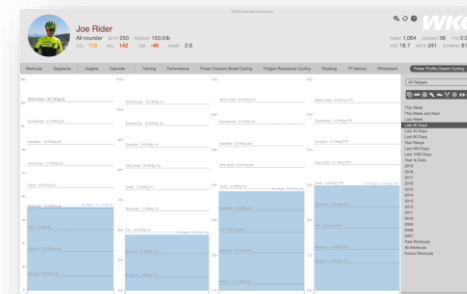
- Power Duration Profile

- Power Profile Classic

- PD Curve Profile Strengths and Limiters

- Against World Class Power Duration Comparison

Power Duration Profile

PD Curve Profile Strengths and Limiters

Power Profile Classic

Against World Class Power Duration Comparison

Watch this short video on strengths and limiters

Step 3: Establish Your Training Levels

WKO iLevels

With the introduction of *iLevels in WKO*, athletes are now able to optimize their training levels to their own unique physiology and daily fitness. These new training levels work by *blending modeled functional threshold power (mFTP) and modeled power duration data to track with athletes' actual capabilities and ensure that training targets (power and time) are optimized to produce maximal results.*

Power vs Duration

One of the challenges of the Coggan classic training zones is that interval timeframes are fixed,

based on the desired physiological response. This idea is carried over into iLevels *while recognizing and recommending a range of interval times that represent time-in-zone targets* for intervals.

Power vs Fitness

Since the iLevels system is driven by the power duration curve and modeled FTP, *training levels will automatically update with any changes (even micro changes) in performance and fitness* to ensure accurate interval targets as athletes train and de-train.
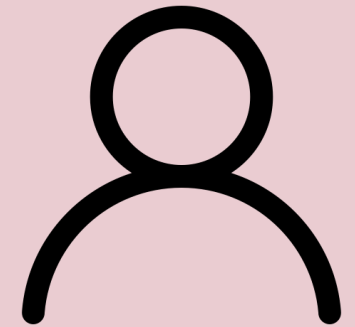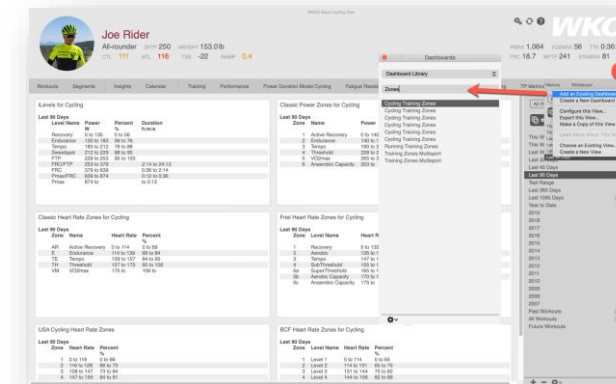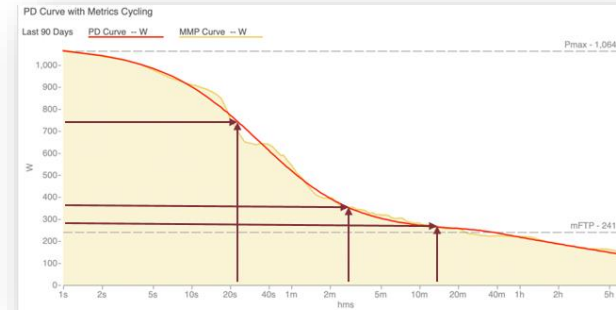
Each athlete is unique. Though there are similarities in training intensities, individualization is the key to peak success.

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Watch a short video on training targets

Step 4: Establish a Training Strategy with WKO

Integrative/ Functional Ability	Magnitude of ↑ with short-term training (i.e., weeks to months)	Magnitude of *add'l* ↑ with long-term training (i.e., months to years)	Physiological "cost"
VO_2max	15-25%	0-10% (?)	++/+++
Lactate threshold	30-45%	20-30% (?)	+/++
Efficiency	0-5%	0-5% (???)	++/+++
Neuromuscular power	15-25%	10-20% (???)	+/++
Anaerobic capacity	15-25%	0-10% (???)	+++/++++

Chart by Dr. Andrew Coggan

Training Strategy

Now that we know an athlete's abilities, strengths, limiters, and more, *we need to have a plan.* A plan is defined as "a plan of action or policy designed to achieve a major or overall aim."

The training strategy defines the path to the desired adaptations.

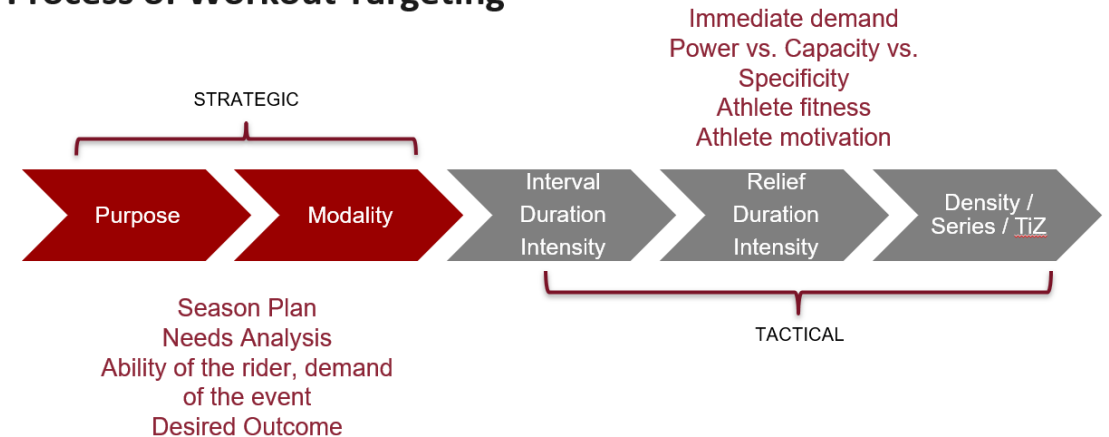Watch a short video on building your training strategy

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Step 5: Build "Smart" Workouts

Building Better Workouts

One of the core advantages of individualizing your training with WKO is specific training tools that allow you to *build workouts targeted to your specific physiology,* focused on maximizing results. These elements include:

- Individualized Training Levels (iLevels)

- Optimized Intervals

- Power Duration Curve Targeting

The goal of each workout is optimal adaptation for the least fatigue.

Process of Workout Targeting

STRATEGIC

| Purpose | Modality | Interval Duration Intensity | Relief Duration Intensity | Density / Series / TiZ |

Season Plan
Needs Analysis
Ability of the rider, demand of the event
Desired Outcome

Immediate demand
Power vs. Capacity vs. Specificity
Athlete fitness
Athlete motivation

TACTICAL

Watch a short video on building smart workouts

Step 6: Monitor Your Training with WKO

Training Content and Load

With a training strategy developed and smart workouts being implemented, we need to develop *specific training and analytics t*o ensure progress toward the desired results. Areas to measure are:

- Compliance

- Performance Management

- Time in Zones
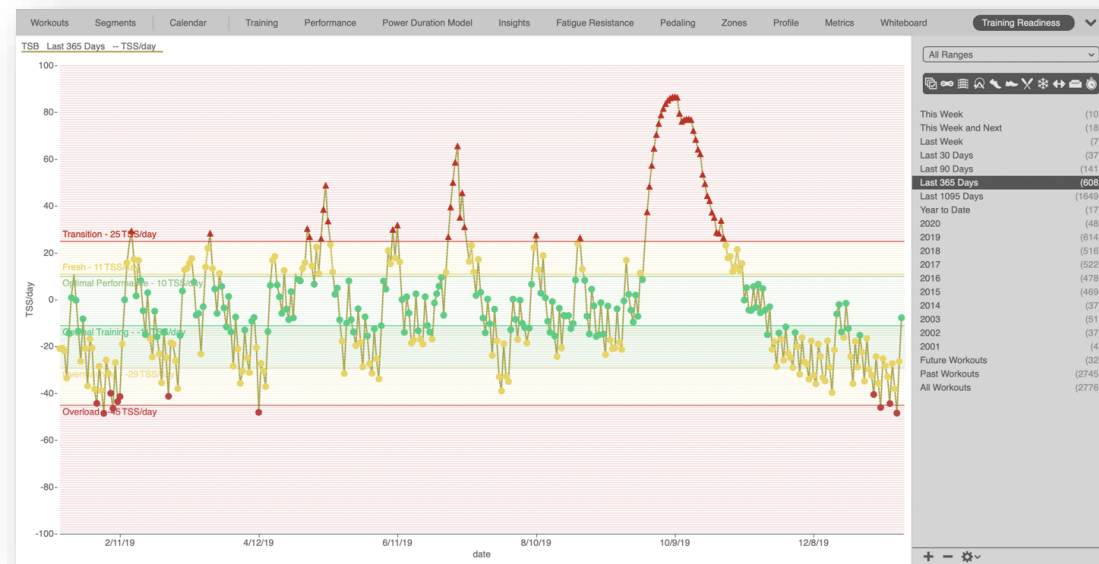
Monitoring and tweaking your training is one of the keys to achieving peak performance.

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Watch a short video on monitoring your training

Bringing it All Together

The Art and Science of Coaching

Endurance sport coaching relies more and more on the use of data and therefore data science. This has been a *positive for the sport and has enhanced the ability to achieve athletic performance success*, but coaches need to be careful to remember that data science supports the art of coaching but does not replace it.

Artificial Intelligence (AI) is a tool to help all coaches and self-coached athletes better *deal with data analysis and utilization, but the reality is that coaches must still master the art of using this data* in their everyday coaching.

Key Resources

[Learn the Basics of WKO](): Short video tutorials

[Individualize Your Training](): Video definitions of power duration metrics

[Training and Coaching with WKO](): Series of videos demonstrating how to use WKO5 in training and coaching

[Track and Improve Performance with WKO](): A video guide to the ultimate season review

[Create Custom Analytics and Charts in WKO5](): Video tutorials on building charts

[WKO Webinars](): View all our recorded WKO5 webinars

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