

# WATTSVILLE



## WHY DO Intervals Work?

► The lung-busting periods of work in an interval session are short, and rest periods allow you to recover between

efforts, so you can spend more time riding hard than if you just tried to gun it for 60 minutes. And those hard efforts have benefits for almost every type of riding.

If you're looking to get faster over short distances like a town-line sprint, intervals work by targeting the muscle fibers you need for speed, says Michael Ross, MD, director of the Rothman Institute performance lab in Philadelphia, and author of *Maximum Performance for Cyclists*. You have two types of muscle fibers: slow twitch and fast twitch. When you're pedaling easy, you use your slow-twitch ones, which have plenty of endurance but generate less power and strength than their fast-twitch counterparts. If you want to improve your sprint, you need to strengthen your fast-twitch fibers. Performing short intervals—anything lasting from 1 to 3 minutes—is the best way to accomplish that.

To improve speed over longer distances, do intervals of four minutes or more, which will help boost your VO2 max, or the amount of oxygen your body can process, says Menachem Brodie, a cycling coach and owner of Human Vortex Training in Pittsburgh. "The more of the oxygen you bring in that you can use, the more work you can get done." Increase your VO2, and you'll be able to go harder for longer.

Hard, fast-pedaling efforts also train your body to get comfortable at a quicker cadence and help you raise your fitness baseline, so cruising with a group is easier, says Brodie.

Sounds pretty good, right? But before you join team "all intervals, all the time," know that too much hammering may lead to injury or overtraining, both of which can negatively impact performance or even keep you off the bike. Two interval sessions a week should be enough to see results.—AC Shilton

#### OK, ONE <mark>MORE T</mark>IME, EXPLAIN LACTATE THRESHOLD.

Lactate threshold is the point at which you cross over from low- to high-intensity exercise and start to accumulate lactate—an essential muscle fuel source-in your blood faster than you can use it. Scientists are still investigating why we shut down shortly after crossing that threshold. But we do know this: The harder we exercise, the more lactate we produce; and the fitter we get, the better we are at using it for energy. You can push that threshold higher through training: Structure your rides so that you're going hard (about 70 to 80 percent max effort) for 10 to 20 percent of the time.—Selene Yeager

#### HOW MUCH ENERGY DO YOU SAVE IN A DRAFT?

"For the rider directly behind the leader, energy savings vary from 17 to 30 percent," says Brodie. Things like overall speed, direction of the wind, and the size of the rider in front affect just how much free speed comes your way. For the most benefit, position yourself four or five places back from the leader. You'll save the maximum amount of energy in that spot, says Brodie. That's anywhere from 23 to 60 percent.—*A.C.S.* 

#### HOW CAN I CLIMB FASTER?

Improve your power-to-weight ratio. Up your wattage with high-intensity intervals: Twice a week, work 10 to 30 minutes of climbing (at about an 8 on a scale of 1 to 10 of perceived exertion) into your rides. To shed pounds without losing muscle mass, drop weight gradually [less than a pound per week] and stop if you feel consistently sluggish or cranky during workouts—it could be a sign that you're overdoing it.—A.C.S.

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HOW A HEADWIND AFFECTS YOUR SPEED // YOUR CURRENT SPEED + HEADWIND SPEED = HOW FAST YOU'D BE GOING WITH NO WIND



### WHY DOES THE BIG RING IN FRONT MAKE IT HARDER TO PEDAL, WHILE THE BIG COG IN BACK MAKES IT EASIER?

**▼** 

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► Any shift that causes more wheel rotations per pedal stroke will make it harder (and make you go faster, provided that you maintain the same cadence). When you shift into the big ring in front, you're pulling more chain per crank revolution—that causes more wheel rotations per pedal stroke, which requires more effort, says Nate Newton, road marketing technical coordinator at SRAM.

The same principles apply to the rear cassette, but they play out a little differently. One spin of the cassette equals one wheel rotation. That means that the cog that requires the least amount of chain to turn the wheel completely—the smallest cog gives you the most rotation per pedal stroke and is the toughest to pedal. As you shift to a bigger cog in the cassette, you're increasing the amount of chain needed to rotate the same distance. "This decreases the distance traveled per crank revolution, so the effort is lower," says Newton.—Jason Sumner

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![](_page_2_Picture_6.jpeg)

even than carbon fiber—and has a strength-to-weight ratio comparable to aluminum or steel. But magnesium is more prone to corrosion than those metals, says Scot Nicol, founder of Ibis Cycles. It's also not as stiff as other frame materials, so few builders use it.—Joe Lindsey

WHAT'S THE LIGHTEST

Magnesium. It's the secondlightest of all metals—lighter

FRAME MATERIAL?

#### HOW DOES A HELMET PROTECT MY HEAD?

Your lid's polycarbonate outer laver shields your scalp from abrasions, says Scott Junker, helmet product manager at Giro. It's designed to crack when hit. reducing the amount of force that makes it to your head. An inner layer of EPS foam crushes upon impact, slowing down your head enough to lessen your risk of skull fracture. Many newer helmets are built with a multidirectional impact protection system [MIPS], a thin piece of plastic inside the helmet that allows your head to slide slightly when struck at an angle. That movement can keep your brain from twisting inside your skull and getting injured, says Junker.—J.S.

#### WHICH GEAR RATIO SHOULD MY BIKE HAVE?

A standard chainring ratio (53-tooth big ring; 39-tooth small ring) is well suited for very fit riders who want a gear that's good for sprinting, or for those who live where it's mostly flat, says Newton. "But if you live in a hilly area, or your last bike had three chainrings and you used them all, then a compact (50/34) crank is the better choice." There is a Goldilocks option: the midcompact 52/36 combo. "A 52x11 is a good enough sprinting gear for most riders," says Newton, "and a 36-tooth chainring satisfies most climbing needs." -J.S.

# **HOW DEEP SHOULD MY AERO WHEELS BE?**

A wheel's depth is measured from the spot where the tire meets the rim, and each size has its benefits and drawbacks. Let this spectrum be your guide.—*Matt Phillips* 

![](_page_2_Picture_15.jpeg)

# LOOKING FOR THE BEST WHEEL FOR YOU?

FOR YOU? CHECK OUT THESE PICKS FROM OUR GEAR TEAM.

#### 20mm-30mm

BONTRAGER AEOLUS XXX TUBULAR 20mm, \$2,400

AMERICAN CLASSIC HURRICANE TUBELESS 24mm, \$700

ZIPP 202 FIRECREST CARBON CLINCHER 32mm, \$2,100

#### 50mm-60mm

CAMPAGNOLO BORA ULTRA 50 DISC 50mm, \$3,255

**ROLF PRIMA 58RSC** 58mm, \$1,300

HED STINGER 6 60mm, \$2,100

REYNOLDS STRIKE 62mm, \$1,800

#### 80mm-90mm

DT-SWISS ARC 110 DICUT 80 80mm, \$3,146

ZIPP 808 FIRECREST CARBON CLINCHER 82mm, \$2,400

BONTRAGER AEOLUS 9 90mm, \$2,600

**REYNOLDS RZR 92** 92mm, \$4,500 H

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## 99 👖 NUMBER OF PRINGLES A 175-POUND CYCLIST EARNS IN ONE HOUR OF CYCLING AT 15MPH

![](_page_3_Picture_3.jpeg)

### IF I LOSE 5 Pounds, How Much Faster Will I get?

► That depends on a number of variables, including terrain. "On the flats, simply losing five pounds won't have a huge impact, as you're looking at a time savings of roughly 10 to 15 seconds [for an hour-long ride]," says Menachem Brodie, a Pittsburgh-based cycling coach. "But for a hilly ride of the same length, we're looking at a savings of anywhere from 90 seconds to 2 minutes, should your power numbers stay the same."

That's assuming you didn't lose any power in the process of slimming down. "A rider's power output may suffer as a result of lost muscle mass," says Stephen Weller, head coach and owner of Bell Lap Coaching. "If power output drops along with lost weight, the rider will most likely ride at about the same speed as before."

To lose weight and still crush, take it slow. "A safe weight-loss rate is about one-half to three-quarters of a pound each week and should never exceed 1 pound a week, as this can cause a decrease in training quality or a loss in muscle mass," says Brodie. So if you want to drop five pounds, give yourself at least eight weeks.—A.C.S.

### HOW MANY OUNCES OF WATER YOU NEED PER HOUR

BELOW 75 DEGREES = YOUR WEIGHT IN POUNDS X .15

ABOVE 75 DEGREES = Your Weight in Pounds X .18

### WHAT DO GELS HAVE THAT CANDY DOESN'T?

Candy provides energy from simple carbohydrates—sugar. That gives you a burst of energy followed by a rapid crash—less than ideal for long rides. Gels are formulated with complex carbs like maltodextrin, which keep you fueled for longer, says Roxanne Vogel, a registered dietitian in Berkeley, California. Ingredients like caffeine and muscle-building amino acids also give gels a leg up on candy.—*Riley Missel* 

### WHAT ARE ELECTROLYTES AND WHY DO I NEED THEM?

Electrolytes are minerals (namely sodium, potassium, magnesium, chloride, and calcium) that conduct the electrical impulses that help your muscles contract. We lose electrolytes when we sweat. If your levels are slightly low, you won't see much of a performance decrease. But if they drop drastically, you risk hyponatremia, a rare but sometimes fatal condition where low levels of sodium in the blood cause the brain to swell. Supplement your intake if you'll be riding for more than an hour on a hot day—drinks like Nuun are a good choice.-A.C.S.

#### CAN I RIDE HARD ON A LOW-CARB DIET?

It depends on what you're training for. Fat adaptationoptimizing your body to rely more on stored fat than stored carbsmay work for athletes training for all-day events that require a slow pace (think century riders). But for people competing in shorter, high-intensity events, like a cyclocross race, low-carbohydrate diets reduce how much power you can put out, says Patrick Wilson, PhD, RD, assistant professor of human movement sciences at Old Dominion University in Norfolk, Virginia. The vast majority of studies on this topic agree: If you want to go fast for a short period of time, carbs are the way to go.—A.C.S.

![](_page_4_Picture_1.jpeg)

## HOW Does a BIKE **STAY UPRIGHT?**

tion has preoccupied mathematicians and physicists since the 1890s. Here's what we do know. By design, a bicycle

Scientists still can't

say for sure. The ques-

wants to stay upright: If you hop off a bike

while it's in motion, it will continue to roll along on two wheels, as if by magic. As it slows, the front wheel will turn in the direction it's falling, in a last-ditch effort to keep it upright. There's complex interaction among multiple design elements that allows this to happen.

In 2011, a team of researchers from the Netherlands and the US published a paper in Science, explaining that the gyroscopic action of the front wheel, the bike's trail, and the mass of the front assembly all play roles in a

bicycle's stability.

Trail refers to the distance between the bike's steering axis-imagine a straight line that goes through your bike's steerer tube to the ground—and the point where the front tire contacts the ground. The longer the trail, the more stable the bike. The spinning front wheel, meanwhile, acts as a gyroscope, which means its angular momentum resists efforts to push it off balance.

But when the aforementioned researchers built a special bike that virtually eliminated both trail and the gyroscopic effect, the bike still stayed upright, suggesting that there are other factors involved. For example, the mass of the bike's steering assembly, including the bar, fork, stem, and headset, will guide the bike toward the direction of a fall, which can allow it to correct. Why this happens is not perfectly understood, but it's essential to a bicycle's stability.-J.See

#### HOW LONG SHOULD I PULL AT THE FRONT **OF A PACELINE?**

Everyone likes to be a hero, but wearing yourself out by pulling for too long often means being unceremoniously spit out the back. "Get into a rhythm with a paceline where the front rider pulls for only a minute or two," says Nadia Sullivan, a senior coach with FasCat Coaching. If you can't stay at the front for a full minute without slowing down, don't be shy about taking a shorter pull. Make sure to keep the speed constant when you get to the front—surging ahead can cause gaps in the paceline. As the group speeds up, riders typically take shorter pulls at the front because the effort is greater.—J.See

#### WHAT'S THE FASTEST SOMEONE HAS **RIDDEN UNDER THEIR OWN POWER?**

The International Human-Powered Vehicle Association keeps tabs on the world's fastest human efforts. It reports that on September 17, 2016, aerospace engineer and AeroVelo cofounder Todd Reichert pedaled a fully enclosed, aerodynamic speedbike a record 89.59mph in Battle Mountain, Nevada, Shaped like a missile, the AeroVelo Eta sped along on two wheels, propelled by a giant chainring and Reichert's legs-just like the bicycles we know and love, but much, much faster.—J.See

![](_page_4_Picture_14.jpeg)

1 // Start on a slight downhill. 2 // Lean back and do two quick pedal strokes, starting with your nondominant foot. 3 // On the second pedal stroke, pull up on the bar, keeping your arms straight. Use your body weight to pitch yourself backward. 4 // Tilt back until you find the balance point on your bike, where you're neither tipping forward nor falling back. 5 // Add some flair! Wave to fans-with both hands. Cross the finish line of a major European Classic. Wheelie up the Alpe d'Huez. Finish with a mouthful of gummy bears.—R.M.

![](_page_5_Picture_0.jpeg)

![](_page_5_Picture_1.jpeg)

▶ Show up to a group ride and you'll find socks in every color, with lengths extending to mid-calf and beyond. "I think tall socks are best for racing, because they protect the ankle," says Alison Tetrick of Cylance Pro Cycling. "But let's be honest, they just look better." A larger canvas means more space to express your personal style

and mood. "Do I need a pop of color today?" says Tetrick. "Or do I need to stay black, serious, and race ready?" Don Powell, the founder of Panache Cyclewear in Boulder, Colorado, prefers high socks because they remind him of the wrapping on racehorses' legs. "It makes me think of speed," he says. When it comes to sock height,

how tall is too tall? Some riders have begun embracing knee-high socks, which can offer protection for your legs while mountain biking or extra compression, but may not be ideal for hot days. Maybe it's time for the short, white socks cycling great Fausto Coppi wore in the 1940s and '50s to make a comeback.—J.See

# WHY EXPENSIVE **JERSEY**

While riding is still awesome in a \$5 T-shirt, spending more gets you primo features like these

![](_page_5_Picture_7.jpeg)

long-ride funk

down sweat, so high-end

![](_page_5_Picture_10.jpeg)

ing as possible. The fabric

ness for generations. Lock-

![](_page_5_Picture_13.jpeg)

and sleeves without

grippers Ergonomically designed

**Consis**tent fit 6 the same brand last season? You can buy one that it'll be the same ers pay close attention to website.—*R.M.* 

# **8 CYCLING DEFINITIONS IN 10 WORDS OR LESS**

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	Everest's elevation (29,029 feet)—in one day. <b>3. GLYCOGEN</b> Unburned carbs stored in your liver and muscles [not fat].	Everest's elevation 4. LUFT A cycling   (29,029 feet)—in cap's gravity-   one day. defying position   high atop the head.   Unburned carbs stored in your liver   and muscles How much brake-   [not fat]. lever pull is	Everest's elevation 4. LUFT A cycling translated into   (29,029 feet)—in cap's gravity- actual braking.   one day. defying position high atop the 6. SIT IN Draft for   3. GLYCOGEN head. survival, avoiding   Unburned carbs wind at all costs.   stored in your liver 5. MODULATION   and muscles How much brake-   [not fat]. lever pull is

![](_page_5_Picture_20.jpeg)

![](_page_5_Picture_22.jpeg)

to fit and move with the

Pockets that don't sag Go fill 'em up. These pock-

![](_page_5_Picture_28.jpeg)

great snack.

YARD SALE aving a trail of uff when crashg—pump, sunasses, etc.

#### SHOULD I OFFER TO HELP A STRANGER FIX A FLAT TIRE?

Of course! Just make sure your ask is friendly, not patronizing: "Do you have all the tools you need?" is a great way to offer assistance without sounding like you're judging the stranded rider's mechanical prowess. If the person says they're fine, keep rolling and don't hover. Above all, don't be this quy, says BICYCLING associate digital editor Caitlin Giddings: "The last time I had a flat on a busy trail, I was replacing the tube with the swiftness of a former bike messenger. A man swung by and asked if I needed anything, ignored my cheerful 'No, thank you,' and continued to barrage me with questions. ('You have your levers? You have a pump? You have a spare tube? You searched the tire for glass?'] It was distracting and insultinq—and it made me feel more irritated than thankful." —Taylor Rojek

#### CYCLING-CAP BRIM: **UP OR DOWN?**

Why not both? Cycling caps are the arm warmers of headgear: They help you deal with changing conditions as well as moods. Each style has its advantages. Up Pros: increased field of vision in the drops; projects an air of jaunty insouciance. Con: less effective in a rainstorm. **Down** Pros: reduced sun glare; shows the world how focused you are. Con: "Oh \$%^&! A squirrel!"—J.See

#### IS IT OKAY TO DRAFT A RIDER I DON'T KNOW?

Don't ask us-ask them.

### HOW STRONG OF A CLIMBER DO YOU HAVE TO BE TO WIN THE TOUR DE FRANCE?

► There are two benchmarks that keen racewatchers follow: VAM and watts per kilogram, also known as a rider's power-to-weight ratio. VAM is an acronym for the Italian *velocità ascensionale media*, which means average climbing speed. It's a measure of elevation gain expressed in vertical meters climbed per hour. VAM depends on factors like a climb's steepness; it's tough to compare efforts from two different climbs.

The other metric—watts per kilogram of body weight—is more closely watched, because environmental factors play a lesser role. In both cases, the measurements are most meaningful on summit finishes that take top riders 30 minutes or more (which means we're measuring a rider's peak output at threshold). So what's it take to win? A lot.

On major climbs at the 2016 Tour, the top riders produced VAM ranging from 1,500 to 1,650 meters per hour—that's almost half a vertical meter per second (a well-trained amateur rider is more likely to achieve somewhere around 1,000 m/h). Watts per kg has fluctuated over the years. Lance Armstrong, at the height of cycling's doping era, is said to have produced as many as 7 w/kg on long climbs. Today, riders pump out quite a bit less. An analysis by Mike Puchowicz, a doctor and coach in Mesa, Arizona, who does performance modeling, suggests that top riders' sustained power outputs for long climbs in the Tour during the past eight years have ranged from 5.5 to 6.3 w/kg. By contrast, a well-trained amateur racer might be able to manage 4 w/kg, while a recreational rider might gasp his or her way to 2.5 w/kg.—J.L.

![](_page_6_Picture_6.jpeg)

### HOW CAN YOU TELL IF A BREAKAWAY WILL SURVIVE?

It's tough to say-the teams in the peloton have various motivations to chase, let the break go, or even slow down, says Cannondale-Drapac directeur sportif Tom Southam. But you can make an educated quess: Chapatte's law (named for former pro racer and TV broadcaster Robert Chapatte) states that a breakaway rider needs 60 seconds for every 10 kilometers left in the race to stay away. It's not always accurate, but that uncertainty is what makes bike racing so entertaining.—J.S.

#### HOW WAS CYCLOCROSS INVENTED?

According to the new book Rainbows in the Mud: Inside the Intoxicating World of Cyclocross by Paul Maunder, the sport traces its roots to the late 19th century, when a French soldier started riding his bike "crosscountry in order to keep up with the horse-bound general he was supposed to be looking after." Soon whole battalions of French troops were being trained to ride bicycles off road. Military training morphed into sport, and France held its first cyclocross national championship in 1902, with Belgium following suit in 1910 and the US in 1963.—*J.S.* 

#### WHAT WAS THE FIRST-EVER BIKE RACE?

It's tough to pin down, says David Herlihy, author of Bicycle: The History. While newspapers of the era contain accounts of earlier, more informal races, the most common citation is a May 31, 1868 race of 1,200 meters in the Parisian suburb of Saint-Cloud, won by Irishman James Moore. The claim is questionable, because Moore's field wasn't the first to race that day. Still, Herlihy argues that the four heats at Saint-Cloud were the first legitimate races, thanks to the fact that they were preannounced as a competition and awarded prizes.-J.L.