

Time Trialing

A time trial is a timed bicycling event. Time trials are almost always individual events. It's one rider against the clock. Often called the "race of truth," the time trial is often perceived as the ultimate test of a cyclist's ability.

In multi-day events, the individual time-trial stages are usually crucial to a rider's overall success.



CYCLE HANDOUT

Introduction

Riders are usually started at 30- to 60-second intervals.

A team time trial is a timed event for a group of riders. All riders on the team start at the same time. The time is determined after a specified number of members of the group finish.

No drafting is allowed except within a team. Common distances are 10 miles and 25 miles (40K) for individual events, and up to 100 km for team events. On the track, distances from 200 to 5,000 meters are standard. Special considerations apply to these events.

Almost all great bicycle racers have been great time trialists. Although time trials are a specific form of bicycle racing, the ability to time-trial is an important element in many mass-start bicycling events: The ability to maintain a solo or small break, the ability to bridge (leave one group and join another up the road), the ability to chase back to the pack after a flat tire or other mechanical problem, or the ability to solo to victory—all involve time-trial skills.

Time trialing is also the essential feature of other forms of racing. For example, mountain bike racing is essentially a time trial off-road. Ultra-distance cycling events, such as the Race Across America, are long individual time trials. The bike leg of a triathlon is a time trial.

Since pack skills are not required, time trialing is often an excellent place for new riders to assess their potential.

Whether a new rider or a seasoned veteran, time trialing is so important in bicycle racing that I'll discuss this aspect in detail.

Even if you are more interested in criteriums or road races, reading about how this bicycling discipline can be analyzed, dissected, and learned will serve as an example for other forms of racing.

Five Components of Time Trials

Time trials have five important aspects:

1. Physical requirements
2. Technique
3. Pre- and post-race preparation
4. Mental attitude
5. Equipment

Physical Ability

Strength

You need strength in your legs and buttocks for successful time trialing. Pushing a big gear for 1 hour is much different from racing a crit or riding a club ride for the same period of time. The gluteal (butt) muscles are used to a much greater extent. It is common for inexperienced time trialists to be sore in their gluts for days after a 40K TT. It is common for occasional time trialists to not be able to walk normally for several hours.

Practice time trialing in "the position" at full power to strengthen these muscles. Excellent time trialists never get out of the "aero" position on flat courses. Physical adaptation to this position requires that you ride in this position frequently.

Don't forget to stretch those gluts.

Aerobic Capacity

You need aerobic ability. You want to increase your anaerobic threshold. You can't increase your maximum heart rate—that's genetically determined. You are looking to increase the percentage of maximum heart rate you can sustain.

Fit time trialists generally ride at 92±2% of their maximum heart rate for 1 hour. This applies to events held at moderate temperatures and at sea level.

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Interval training is important in developing this ability. It is better to practice going 1 mile as fast as you can five times than it is to go 10 miles once. Intervals of 3 to 5 minutes serve the all-round road rider and time trialist very well.

Time trialists probably need sustained efforts of 20 minutes or so every week. These efforts can be achieved in races or group rides as well as individually on the road or stationary trainer.

Technique

Train Specifically

The techniques and bike-handling skills required to successfully pilot a front disc or three-spoke wheel and aerobars bars are specific to time trialing. Train specifically by practicing and riding in the aero position with the equipment you will use on race day.

Starting Gear

At the start, you normally have your chain in the big ring. You start in an easy cog, but not the easiest—or the chain angle will be extreme and your chain may skip with your start. If the chain angle is too great you also risk derailment if you pedal backwards to get your cranks positioned. Ride in your starting gear for at least a few hundred yards before the start to make sure you have shifted precisely into gear.

Set Your Watch

If you are using a stopwatch, set it off 1 minute before your start. This way you'll be able to time yourself but not have to reach for the start button of your watch when you should have both hands in the drops to launch off the start line.

Crank Position at the Start

With your hands in the drops, leg positioned for the first downstroke at 10 o'clock, and arms and wrists straight, squeeze your brakes and rise out of your saddle with a second or two to go, pull up with the pedals, remember to breathe, and you're off!

Pacing

Accelerate to speed quickly, but not beyond your time trial threshold. You should be working near your threshold the entire event. It is a good idea to work a percent or two below your time trial threshold at the beginning, and then pick up your power a percent or two in the last half.

When you reach the finish, if you have a sprint left, you have not worked hard enough during the time trial.

On flat, windless courses, excellent time trialists have fairly equal splits for the first and last halves. If your time for the first half is slower than the second by more than 30 seconds, you probably did not warm up enough. If your second half is slower, you may have a problem with mental attitude, pacing, or endurance.

In practice, notice your heart rate and effort with about 3 miles to go. This is probably the heart rate and effort you should be riding from the beginning. Notice your effort more than your heart rate. Without a super warm-up it may take 5 to 10 minutes to achieve this cruising time trial threshold heart rate. With rare exceptions, do not exceed this level until the last 5 minutes or less of the race.

An exception to exceeding your threshold is a rolling or hilly course. It is reasonable to float a little before a climb and then slightly exceed your time trial threshold as you ascend to avoid losing momentum up a hill or roller. Floating doesn't mean you stop working. Do not let your heart rate drop more than 5 beats per minute. Slightly exceeding your time trial threshold does not mean sprinting—it means you may exceed your threshold by a maximum of 5 beats. No more!

Cadence

Optimal cadence is between 75 and 95 rpm for most riders under most circumstances.

Position

Position on the bike is the most important aerodynamic factor. Having your back flatter and head lower by as little as 5 millimeters may be more important than trick wheels.

In order to achieve good position, most riders need to move their saddles a little forward, raise them to compensate, and lengthen their effective stem length.

Head Up

Ride with your head up. It's safer. It's also more aerodynamic. Many riders erroneously believe that they are more aerodynamic with their heads down. Watch other riders. Notice that with the head looking down the back of the helmet pops up and the smooth transition of airflow across to the back is lost.

Aerobar Position

Priorities for positioning with aerobars are:

1. Elbows close together
2. Back flat
3. Chin tucked in, in line with wrists
4. Knee pedaling style close to top tube

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Look for the Fast Lane

Most roads have a “best place to ride.” In choosing where you are going to ride, consider safety, shortest line, and surface. The fastest place to ride is usually a couple of feet in from the edge of the lane—where the inside wheels of most cars have made the pavement a little bit smoother and a little bit faster.

Hugging the shoulder of the road may be the safest location only if there is a lot of traffic on the course. The shoulder usually has the most glass and other debris, making it the most likely place for a flat.

With an organized event, signs warn motorists of your presence and riding down the middle of the lane is not dangerous.

Practice Starts and Turnarounds

There is a certain amount of technique for the start and for the turn. Practicing five intervals with five starts and five turnarounds is recommended rather than a single longer effort as a way to build your physical ability and technique.

The turn is best performed asymmetrically. You want to save braking for the last moment. Slowly coasting into the turn wastes time. Ride a couple of meters beyond the turnaround along the right edge of the road. Make an acute turn and get back up to speed quickly. This method is slightly longer than a symmetric curve, but allows for better control of the bike and a quicker start back up to speed.

Legal Drafting

Vehicles passing you may provide momentary draft. There is nothing illegal about edging to the center of the road and slightly picking up the pace to momentarily draft them. Vehicles traveling toward you may slow you down. You may wish to move toward the gutter to avoid their headwind draft.

Dry Mouth

Dry mouth is a common problem for time trialists. Your mouth is dried by all that hard breathing. You can increase saliva flow by riding with your tongue touching the roof of your mouth.

Pre- & Post-Race Preparation

Tapering

Tapering before an important time trial usually involves reducing mileage, but not intensity, a

couple of weeks before the big event. Reduce mileage about one-third. Two days before the event I hardly ride at all. For out-of-town races, this is my travel day.

Ride the Course Ahead of Time

The pre-race ritual includes riding the course for familiarization. Ideally, you will ride the course the day before your event, at the same time as your event. This will allow you to judge wind, temperature, and other factors.

Preliminary Warm-up, 30 Minutes

You must start the time trial warmed up. It is not unreasonable to warm up for 1 hour.

Have two warm-ups. In the first, preliminary warm-up, ride to the start line and synchronize your watch to the official clock. Check and make sure the officials say they will start on time; if the competition is already in progress, make sure it is on schedule.

If competition is in progress note the length of time after officials call a rider to the line that that rider actually starts. In some time trials officials call riders 10 or more minutes before starting. You then know you don't necessarily have to come running when you hear your number called!

Ride away from the course and parked vehicles to find a suitable area for more intense work. Find a place close enough to be aware of what is going on, but secluded enough for concentration.

Perhaps take off a layer of clothing and drink a bottle of glucose water (e.g., sports drink or half-strength apple juice).

Preliminary Warm-up: Summary

- Easy—Heart rate less than 70% of maximum.
- Check start location.
- Check finish location.
- Check start times.
- Check schedule.
- Check official clock, synchronize computer/watch.
- Check time from “the call” to actual start.

Intense Warm-up, 30 Minutes

The most controlled and best warm-ups are on stationary trainers. This is vital if it is cold or raining.

Intensive warm-up includes several hard efforts. No sprints or jumps, however. No anaerobic efforts.

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A time-trial warm-up schedule is found below. The basis of the intense warm-up is three progressive intervals. Efforts last 3 to 9 minutes each.

If 9 minutes, use a progressively harder gear each three minutes, so the last 3 minutes of the three efforts will be as described below. Alternatively, use the same gear for the 9 minutes and increase cadence so that the last 3 minutes of the three efforts will end as described below.

The gear, heart rate and power percentages suggested below are approximate. The actual values will depend upon your trainer set-up and your physiology. Not all riders will be able to spin at a cadence of 120 rpm.

Heart rate will not reach the suggested levels until near the end of each interval. Don't try to get your heart rate up to the suggested level as soon as you begin each interval—you will be working too hard.

The cadence suggestions below are for road time trialists. Mountain bikers: use a cadence about 10 rpm less.

1. The first effort at cadence of about 90 rpm, workload about 85% race pace, heart rate to 75-80% of max at the end of the interval (e.g. based on a max of 183, target a heart rate of 137-147 bpm). Use a gear or two easier than race-pace gearing.

Common error: Again, this is heart rate at the *end* of interval. If effort is constant heart rate will rise. If you try to get to target heart rate too quickly, this implies that your effort level is too great. Don't try to get to target heart rate too quickly!

3 minutes easy riding.

2. The second effort at cadence of about 90 rpm, workload about race pace, heart rate to 80-90% of max at the end of the interval (e.g. based on a max of 183, target a heart rate of 146-156 bpm). Use race-pace gearing.

3 minutes easy riding.

3. The third effort at cadence of about 100 rpm, workload at race pace, heart rate to 85-90% of max at the end of the interval (e.g. based on a max of 183, target a heart rate of 155 to 165 bpm). Use a gear easier than race pace gearing.

3 minutes easy riding.

Easy riding to race start.

Intense Warm-up—30 to 45 Minutes

Time	Gear	RPM	Power		Notes
			HR % Max	% Race	
1 min	39/23	60	60	20	Omit if short warm-up
1	39/23	65	60	20	Omit if short warm-up
1	39/23	70	60	20	Omit if short warm-up
1	39/23	75	60	20	Omit if short warm-up
1	39/23	80	65	25	Omit if short warm-up
1	39/23	85	65	25	Omit if short warm-up
1	39/23	90	65	25	
1	39/23	95	65	25	
1	39/23	100	65	25	
1	39/23	105	70	30	
1	39/23	110	70	30	
1	39/23	115	75	35	
1	39/23	120	75	35	
3	Rest				
3 min	53/21	90	70	50	Omit if short warm-up
3	53/19	90	75	75	Omit if short warm-up
3	53/17	90	80	85	HR, Power< Race
3	Rest				
3 min	53/17	90	75	85	Omit if short warm-up
3	53/16	90	85	90-95	Omit if short warm-up
3	53/15	90	90	100	Race HR and Power
3	Rest				
3 min	53/21	100	70	75	Omit if short warm-up
3	53/19	100	80	85	Omit if short warm-up
3	53/17	100	90	100	Cadence> Race
3	Rest				

Ergogenic Aids

Pre-race warm-up may include a some caffeine about 1 hour before the start. Controlled studies evaluating the use of caffeine before time trials is lacking, but anecdotal evidence supports its use. After warm-up, have a few ounces of fluid at the start line.

Helper at the Start

Ideally you'll have a helper near the line to give you a half bottle of water or dilute carbohydrate solution. You'll be able to leave your warm-up jacket or other items with your helper without having to search for your car parked some distance from the line.

Post-Race Immediate Help

Post-race preparation includes instructing your helper to be located several hundred meters beyond the finish line to hand you a warming jacket, sponge or face cloth, two bottles of fluids, and some low-fat carbohydrate food.

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Post-Race Headache Recovery

With a full 40K effort, post-time-trial headache is common. After cleaning up back in your room, have something more to eat and perhaps a few acetaminophen, ibuprofen, or aspirin. You may wish only to spin and ride briefly a day or two after a hard 40K time trial. It may take a week to recover completely from your effort.

Evaluate Performance

After your time trial, evaluate your performance. Consider the contents of this section and see where you did well and where you might improve.

Mental Attitude

By establishing a pre- and post-race ritual as just discussed, you will be more mentally focused and relaxed. Focus, without undue anxiety, improves performance.

The Difference May Be Mental

The mind is important. Riders of equal strength do not ride the same times. Some riders finish a time trial too fresh and able to ride more. Others are totally exhausted and need to recover. The ability to go your hardest and know that you are pushing absolutely as hard as you can requires experience and the motivation to perform. It's common to hear riders say they are not tired enough and could have ridden harder.

- Visualization techniques can help.
- A cycling computer or heart-rate monitor helps some riders.
- Set yourself attainable goals and keep track of your progress.
- At least monthly time-trial practice allows you to learn your limits.

Mental Tricks

- Count as you stroke. Count odd numbers or half reps so that you alternate left and right leg emphasis with your counting. Counting each stroke of my left and right legs, I personally like counting in reps of 5, with slightly extra force on the 1st and 3rd counts.
- Ask yourself if you can go harder. Go harder.
- Notice the regularity of your breathing. A short while after you start you'll find you are taking a breath for every so many pedal strokes. Breathe just a little faster. Your pedal strokes will go a little faster to keep the rhythm.

- Don't think about how bad you feel. Think instead about how good it feels to be working hard, how regular your breathing is. See yourself posting your goal time, visualize yourself being patted on the back or getting your reward.

Equipment

Equipment May Matter

If you are gauging your progress, rating yourself against yourself, you can ride the same equipment month after month and the fancy stuff doesn't really matter. The aero stuff matters most for those who are racing against others, not themselves.

An aero bike all tricked-out isn't a priority for a 25-year-old male who rides 10 miles in 35 minutes. Money need not be invested as much as time in training. For a 65-year-old woman with that time, like Margaret Nolan, aero equipment is crucial to being the best in the country.

Purists Don't Ride as Fast

Some "purists" decry the cost of special time-trial equipment. The fact is most of the equipment is not much costlier than bicycling gear in general, and if you want to be competitive, you need the tools of the trade.

Time-trial with and without equipment. See the difference. When you become competitive, it makes no sense to put considerable effort into training, expense into travel, and sacrifice in free time and income from work only to go several minutes slower than you would with the right equipment.

Don't Ride New Equipment on Race Day

Riders frequently make the error of using new equipment for the first time in competition. Riders get excited about the possibility of going faster with the latest gizmo and purchase or borrow equipment just before a race. Since some equipment is specialized, riders often save it for race day, only to encounter small problems during the race. Although time-trial equipment is vital, leave time to test equipment thoroughly under race conditions before competition.

Use the aero stuff, yes, but rely on the tried-and-true and test your equipment well in advance. Before a time trial be sure to test your equipment with full power and speed. Problems such as chain-freewheel incompatibility or an insufficiently tightened skewer may not surface with less than full effort.

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Freewheel Selection

You need a straight block. You don't want to find yourself with a gear choice that is too hard or too easy. Get a 11/12/13/14/15/16/17/x/x/x 8- to 10-speed. Choose your chain rings to match your ability.

Chain Ring Selection

The standard big chain ring for the standard road bike has 53 teeth. Most of us leave well enough alone. If you are a lot faster or a lot slower than average, or a time trialist specialist, replace the standard with the custom using the following guidelines:

On a flat, windless course, if you ride a 60-minute 40K TT (slow for senior elite men) you may wish to change to a 50-tooth ring. For every 1 to 2 minutes of difference, change your chain ring size by one tooth. Ride 63 minutes? Use a 48 ring. Ride 55 minutes? Use a 53 ring. Riding a tandem in 48 minutes? You need a 58. If there is wind or a downhill you need more gear.

Be Prepared with a Big Gear

You must be adequately geared. You don't want to be coasting downhill or spinning 120 rpm with a terrific tailwind. Since time trials are often held in rural areas, away from traffic congestion, they usually have some wind. Be prepared! I have ridden several 40K time trials in less than 20 minutes in one direction and more than 40 in the other. The fastest time trialists in this country push a 55/12 on windless courses. I have ridden time trials with a terrific tailwind, where even a massive 60/11 has not been enough.

Position First

The biggest piece of aerodynamic machinery is your body. *Position on the bike* is the most important aerodynamic factor.

Aerodynamic Equipment

Fast wheels, aero-bars, an aero-helmet, and a skinsuit are the most important wind-cheaters.

Remove your pump and spare tire bag. If you get a flat you don't stand a chance. If it is a flat course, you don't need an inner chain ring or a front shift lever. Removing the front derailleur, however, risks derailment.

For time trials under an hour, you don't need a water bottle or its cage. Usually you are working too hard to get the fluid down, or don't want to take the time to drink. Riding with a water bottle is not only a weight and aerodynamic error, it is a distraction.

Aero V-shaped rims are faster than box rims. Fewer spokes are faster than many. Too few spokes risks wheel failure and handling instability. Bladed and radial front spokes have modest advantages if the wheel is well built.

Narrow tires, at most 3 millimeters wider than the rim, are faster than wider tires. Flimsy narrow tires risk punctures for heavy riders.

Disc wheels are faster than almost all other types of wheels. On the front, they are very difficult to control. Heavy solid wheels are a disadvantage on uphill time trials. Wheel covers don't work. Some three-spoked wheels may be faster than discs in crosswinds.

There's a knack to pinning on numbers to minimize their aerodynamic resistance. Alone at a race, use your car's steering wheel to give shape to and support your jersey or skinsuit. An advanced attachment method is to use a spray adhesive, such as 3M's ReMount or Super 77, to perfectly position and adhere your number.

Mechanical and Road Resistance

Lubrication is vital. A well-lubricated chain can save half a minute over a poorly maintained one. A loose chain helps reduce chain friction; a very loose chain risks derailment.

Some riders use oil in their bearings, instead of grease, and if the bearings are sealed, remove the seals. I am not sure messing with your bearings is a good idea. There is a difference between bearing friction on the bike stand and friction with load. I am not sure using oil accomplishes anything.

Wheels are not weight balanced—the valve stem hole and valve stem unbalance most wheels. When allowed to move freely, from the heavier side up, they oscillate until the heavier side is down. Wheels should oscillate at least seven times when clamped by their quick releases or bolts either on the bike or in a truing stand. Many hub bearing binding problems are uncovered only when under the load of quick release or bolted tension. Testing the freedom of your wheel bearings must be done under load.

Tires that can take higher pressures and are pumped to 160–180 pounds lower road resistance. This means using sew-ups.

Longer cranks can be more efficient for straight time trials.

Weight is of little importance in steady speed, flat time trials. If the course has hills or is rolling, weight becomes a factor to consider. On an uphill time trial, every pound can be worth 20 seconds in every hour of the event. **AB**