



Competitive Cycling Skills



By the

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Endurance

Athlete

Sports

Team

BEAST



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Introduction

The paper presents bike-handling skills, techniques and exercises that will improve the competitiveness of triathlon and bicycle racers and help any cyclist ride better and safer.

Note: This material contains discussions of how to avoid what causes crashes and will prepare you on what to do should the situation arise. Do not become discouraged or alarmed by the discussions.

Cornering

Positioning/Technique

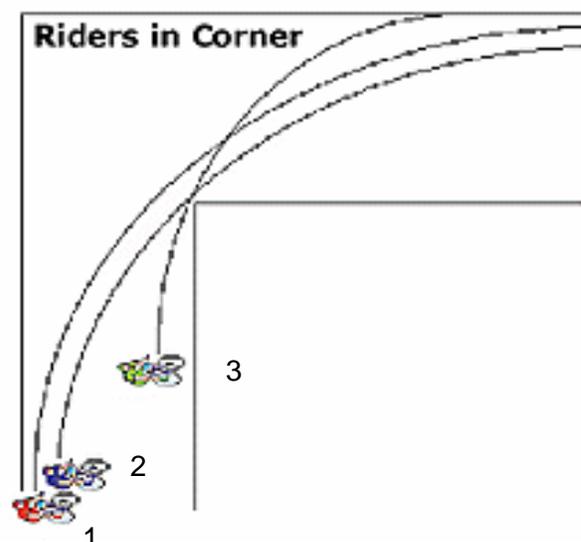
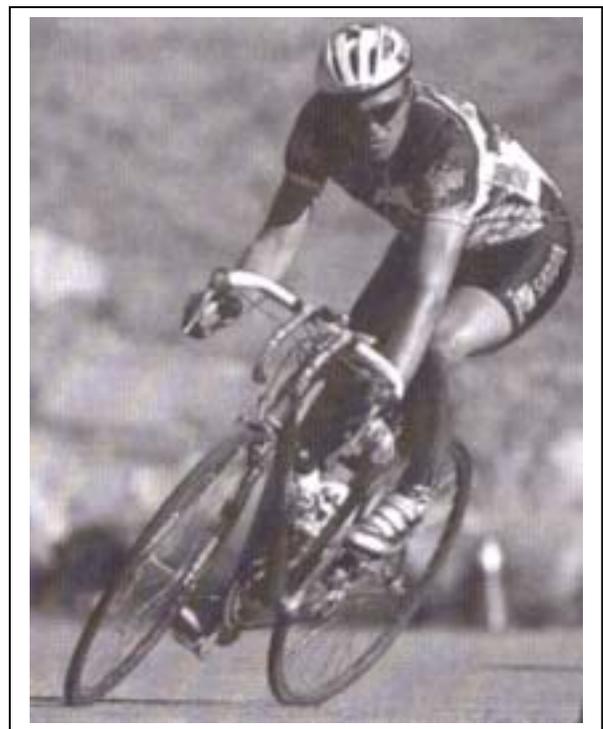
Note: the Positioning/Technique section applies more to criterium racing than triathlons. Triathlon courses usually have wide corners; consequently, the triathlete should stay in the aerodynamic position and pedal through the corners whenever possible. Criterium courses often have narrow corners that might prohibit pedaling through the corners. The remaining sections apply to both criterium and triathlons.

To aide in helping your tires bite the road, lean the bike into the corner by countersteering – pushing down (not forward) on the handlebar with your inside hand, for example, for a left turn, push down with the left hand. Position your butt on the rear of the saddle and stay low along the top tube. Do not lean your body into the turn.

Very important is to rotate your inside hip forward so that your inside knee goes against the top tube instead of pointing into the turn. Your pelvis will naturally push the saddle over and immediately angle the bike into the turn where you want it. Your inside arm will naturally straighten because you are twisting your upper body away from the turn. The above picture demonstrates the correct form.

Line through Corner

Take an outside, inside, outside line through a corner as demonstrated here by Bikers 1 and 2. Biker 3 is taking an inside, outside line and will likely crash and will certainly cause Bikers 1 and 2 much anguish if not take them out.



It is also important to keep a smooth arching line through the corner. Keep your body steady as bobbing and weaving will throw you off line.

Stay Relaxed

Tension causes you to straighten your arms and push away from the corner that causes your bike to pull towards the outside and you to lose control. Simply relax your grip around the handlebars allowing all the other muscles to relax. Before you commit to the corner, let your fingers hang until our upper arm muscles relax, then gently wrap your fingers back around the bars just tight enough to have a firm hold on the bars.

Clearing the Corner

As you approach a corner, clear it, that is, look far into the corner and at the road surface to see if there is anything that can cause you to crash. Look for irregularities in the road surface, sand, water, rocks, and other objects like approaching cars and bodies of racers who have crashed ahead of you. Your bike will naturally follow your eyes through the corner; so, focus on the line you will take through the corner.

Trouble in the Corner

First, understand what happens if you do not react right. Your bike will lose traction with the road and both you and the bike will suddenly go horizontal heading in a straight line toward the outside of the corner at high speed possibly taking out any racers in your path.

The proper reaction is to set the bike up in a straight line by slamming on your brakes to bring the bike to a stand still and back under control quickly. This sounds drastic but is the best thing to do when you have just had something happen that could cause you to crash. It keeps the bike under you and the riders on your outside will keep their bikes under them. It also permits riders enough time to straight line their bikes and grab their brakes if necessary, and keeps your bike reasonably under control.

Just as soon as you feel the bike start to go down, quickly kick your hips to the outside. This stops the cornering by straightening the bike up and brings you back on top of the bike with the wheels down. By straightening your bike, you will have more time to react to braking and most likely avoid taking down the first rider to your outside.

Pedaling through Corners

With today's pedals when you lean the bike over in a corner, there is considerable clearance between the road surface and the bottom of the pedal. This clearance allows you to pedal through most corners.

To gain the most advantage in a race, pedal through as many corners as you can, especially if you are going through the corner alone. Watch out for uneven road surfaces in the corners that create concave and convex undulations that can clip your pedal causing you to crash. Remember, to always Clear the Corner.

Good Reference

For a very good article on cornering, go to http://www.coachcarl.com/training_articles/cornering.htm

Climbing

Sitting or Standing

It is a personal preference. Some riders will spin a smaller gear and stay in the saddle on long hills; while on short hills, they will come out of the saddle and stand to maintain momentum then drop back into the seated position after cresting the hill. Regardless, it is best to alternate for at least a few strokes during the climb to change body position.

Sitting conserves energy but may not let you keep the pace you need. You transfer more power to the pedal in the standing position. Stand during the difficult parts of the climb to keep up your momentum.

General Climbing Techniques

1. Spin at 65-90 rpm per minute for maximum efficiency.
2. Try spinning one gear higher in standing position than seated position.
3. Whether sitting or standing, keep your hands off the drops; otherwise, you will compress your diaphragm making it harder to breathe. Placing your hands on the top of the handlebar or on the brake hoods will enhance breathing.
4. Breathe deeply, steadily, and avoid taking short quick breaths.
5. When riding out of the saddle, stand up and place your body weight directly on the pedals.
6. Climbing out of the saddle takes more energy; however, it allows the body to eliminate more lactic acid.
7. Avoid hunching over as you fatigue. This is a very inefficient position.
8. When approaching a hill in a pack, try dropping to a gear you can spin at a 100-rpm or higher going into the hill. This will give your leg muscles a short break before the climb starts.
9. Remember, depending on the angle of ascent, the shortest distance through a curve on a climb may not be straight line. The shortest distance could be significantly steeper and cost you valuable momentum. Snake Alley is a good example of this.
10. In pack riding, ride hard to stay on the wheel in front of you. If you cannot, try to catch a wheel of the next bike as it moves by you and repeat the process until you are on a wheel.
11. In a pack, **do not** drop your wheel back as you move from the seated position to a climbing position. The natural tendency is to drop it back where it may end up in the front wheel of the bike behind you.

Attitude

A big part of riding hills is simply attitude. If you think you are ready to give up, do not just look at what is ahead. Look behind you and see just how far you have come. Also, focus on a few yards ahead and not all the way up the climb as that can be disheartening when you are hurting.

Remember even the best riders hurt on climbs. Don't let them break your spirit – keep a smile on your face.

Steep Climbing Techniques

Good technique is critical for climbing efficiently. The information below and the picture demonstrate how it is done.

Arms Bend elbows at between 60 and 70 degrees for steep, out-of-the-saddle climbs. Pull up on the bar with the arm that is on the same side as the leg on the down stroke. You will sway, but it makes the bike feel light on the front wheel and helps propel you forward.

Hands Place hands on the hoods when you climb out of the saddle. Relax fingers as clenching them wastes energy-and transmits a message to tighten up the whole body.

Chest Keep your chest upright and open for easier breathing and better balance. Keep your chest slightly behind the point where the stem clamps the handlebar.

Hips Align hips over the bottom bracket. This is the best position to use gravity to your advantage by letting your weight drop down onto the pedals and power you up the climb.

Knees Keep your knees close to the down tube to maximize the power of your quads on down strokes. If they stick out past your shoulders, you are wasting energy.

Abs Flex out your abs so the stomach muscles support the upper body, reducing energy-sapping stress from the back.



Climbing an 18% Grade

Maintaining a Smooth, Powerful Stroke

Steep climbs magnify sloppy pedaling. To get smoother strokes for out-of-the-saddle climbs, pull your down stroke leg up until you can push it over the top of the stroke. Imagine you are running over 2-foot-high barriers and bringing your leg up and around for the next step.

Descents

Not a Time to Coast

Although descents can be very nerve racking, you can win or lose some races on them. The Snake Alley Criterium is a good example. Although climbing the alley is tough, the racers who freewheel (no braking) the descent from the Public Library to Main Street usually finish the highest than those who brake.



If you constantly brake going into the corners on the descent and have to accelerate to get back in the pace line or the rear wheel

ahead, you will likely be dropped during the race. You are repeatedly wasting the energy you expend to get in the draft of the rider ahead of you. Eventually, this activity will take its toll and you will not have the energy to bridge the gap.

Always stay in the draft as long as possible until you feel you can either break away to stay or to win the sprint for the finish line.

Aggressive Descending Techniques

1. Keep hands on the drops if not in the lead position; otherwise, keep hands on handlebars spaced wide enough to maintain stability.
2. Place feet in the 3 o'clock and 9 o'clock positions.
3. Clamp top tube with knees to better stabilize bike.
4. Hold chest slightly above the handlebars.
5. Raise buttocks slightly off seat and use legs as shock absorbers.
6. In corners, follow the same techniques presented under the section, **Cornering**.
7. When riding in a pace line, follow the same techniques presented under the section, **Drafting in Pace Lines and Draft-Legal Racing**.

Pedaling Efficiency

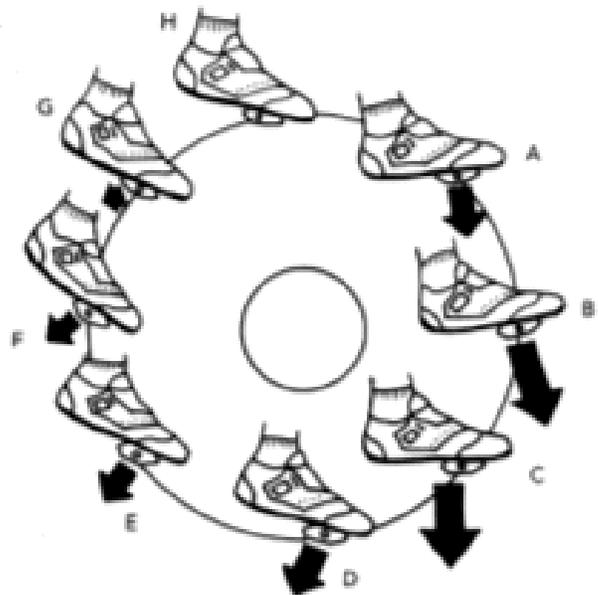
Pedaling efficiency is very important because it is valuable in all forms of cycling whether it is criteriums, time trials, triathlons, touring or just recreational cycling. You will go further in whatever time you have to ride if you use a smooth pedal stroke at the right cadence. The information below will help you achieve both and ride efficiently.

Pedaling in Circles

When most of us started riding a bicycle, the pedals had no toe straps or clip less systems. Consequently, we constantly pushed down on the pedals. Just pushing down is the natural motion; but not the most efficient.

Just pushing down, does not take advantage of the hamstring muscles of the leg opposite of the down stroke leg. In fact, that leg just becomes dead weight, consuming valuable energy as the down stroke leg has to lift it. Additionally, only pushing down tends to cause bouncing on the seat.

Pedaling in circles utilizes both legs during the pedal stroke and eliminates the deadweight of the upstroke leg. You do this by acting as if you are trying to “scrape mud off the bottom of your shoe” as the foot reaches about the 6 o’clock position as shown in this figure of the Pedal Cycle starting at position D and continuing through E, where the heel rises slightly from F through G. At H, the “push over the top” phase begins where the foot feels like it is moving to the front of the shoe. At A, the powerful down stroke phase begins and continues through C.



Pedal Cycle

Important!

This pedal cycle engages the hamstrings and hip flexors to "de-weight" the up stroke pedal (E through G) so the down stroke leg (A through C) is **not** lifting the weight of the up stroke leg. Just lift enough to take the weight off - **do not pull up** with the hip flexor in an effort to apply more power to the pedals.

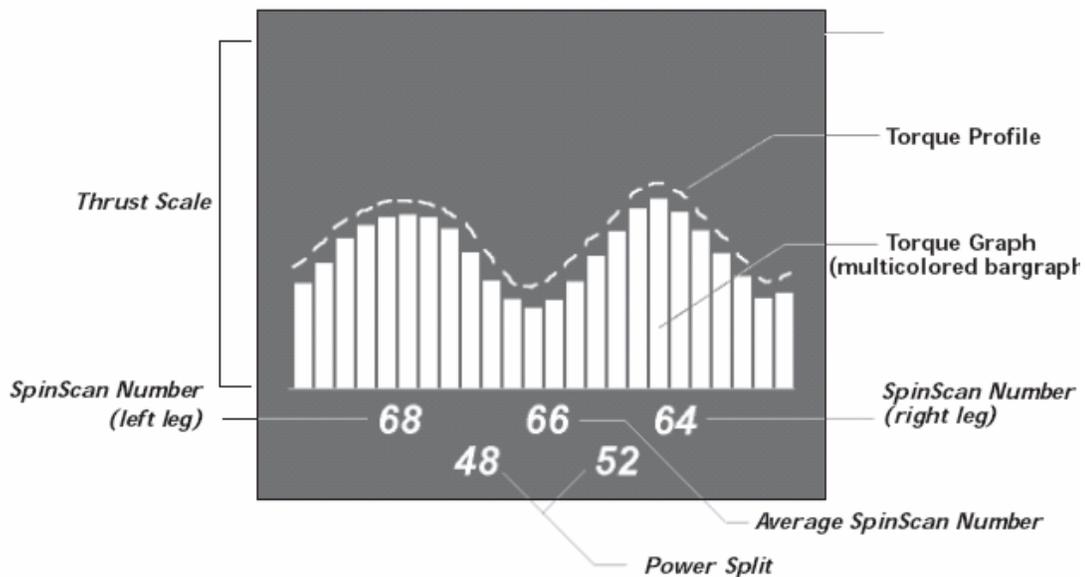
Doing so recruits a muscle not designed to produce much power. Often, the leg pulling up loses power as it tires during the upstroke and learns how to rest on the down stroke. Consequently, by training the upstroke leg you de-train the down stroke leg or the power phase – not what you want to do.

Drills that will improve de-weighting the upstroke leg are one-leg drills and high cadence drills. Close your eyes and focus on the stroke during these drills. The more efficient you pedal, the more the pedals will feel like they are featherweights and rotating on their own.

Competitive Cycling Skills

SpinScan™

Provides an accurate and objective means to measure pedal stroke efficiency. It is an exclusive feature of Computrainer - a computerized trainer system. SpinScan provides a multi-color torque graph, which represents one full 360-degree pedal revolution divided into 15-degree segments. It will identify "flat" or "dead" spots in the pedal stroke, that is, where you are not transferring optimal power to the pedals. SpinScan shows the torque in percent (average torque divided by the maximum torque times 100) each leg applies to the pedal.



If our muscles were able to produce equal torque through the full 360-degree pedal revolution, the spin scan number would be 100. While this is physically impossible, a very efficient transfer of power is a number between 70 and 90. SpinScan can also show how well each leg applies torque as it moves over top dead center (from H to A) in the Pedal Cycle figure above.

With SpinScan, you can accurately measure:

- Effects in changes in seat height and fore and aft positioning
- Relative strength of each leg
- How well you are de-weighting the upstroke leg

If you are interested in learning more about SpinScan, contact Michael Hunter.

Cadence

The tradeoff between oxygen consumption, stress on knees and energy consumption shows that maintaining an average cadence of 85-90 on flat terrain and 70-85 on grades are optimal for competitive cyclists. Moreover, in terms of equal power output supplied by the cyclist, a cadence of 60 RPM requires a 34% more of applied force to each push on the pedals, compared to a cadence of 90 RPM. This means a heavier load for muscles, tendons and lower limbs-lumbar joints. Further, a high pedaling cadence also improves the pumping function of skeletal muscles, the most important factor in defining systemic venous return of the blood to the heart. This peripheral pump plays a critical role in circulatory functional capacity; you can view it as a second heart.

For time trialing or non-drafting triathlons, the ideal cadence is closer to 85 rpm on flat terrain. This is because the seat is normally positioned further back on a time trialing bike than a normal road bike.

You want to practice pedaling in circles until it becomes an involuntary action.

Drills for Improving Pedaling Efficiency

- **Isolated Leg Drills - Single Leg.** On a stationary bike, such as a spinning bike, set the resistance slightly greater than freewheeling, pedal with both legs until you reach around 85 to 90 rpm (around 23 rpm in 15 seconds), then remove your left foot from the pedal. Keep pedaling with only the right leg for one minute. Be careful to keep the stroke smooth and to keep the pressure even throughout the stroke. Concentrate on pushing over the top and scraping the mud off at the bottom of the stroke. You should notice some momentum coming from the backside of the stroke and less pressure on your quads. Repeat with the left leg.
- **Isolated Leg Drills - Both Legs.** Using your bike (ideally on a trainer) or a spinning bike, reach a pedal of 90 rpm. Try to completely relax your left leg while pedaling only with your right leg for 30 seconds. Focus on trying to keep the pedal strokes even and smooth. **Do not bounce on the saddle.** Do not just push down with the right leg. Make your right foot spin evenly around in smooth circles, keeping the pressure as consistent as you can. Now pedal with both feet for 30 seconds and then relax the right leg for 30 seconds. Finally, pedal with both legs for 30 seconds.
- **Smooth Spinning.** Using your bike (ideally on a trainer) or a spinning bike, start spinning quickly at 100 rpm. Try to go up 5 rpm every 10 seconds: 105, 110, 115, etc. **Do not bounce in the saddle.** Concentrate on making those feet fly around in faster and faster, tight, little circles. At first, work to reach 115 rpm. Then, as you get better, go for 130+ rpm. See if you can eventually reach close to 150 rpm. The goal here is simply to spin as fast as possible while maintaining control over your pedaling. Remember do not bounce. If you start to, back off a little, before going faster. You really need a cadence monitor and clip less pedals for this exercise.

Spinning classes provide an excellent opportunity to improve you pedaling stroke.

Competitive Cycling Skills

Here is another set of isolated leg drills. Do these with your bike on a trainer.

| Isolated Leg Drills | | | | |
|---|----------|---------|-------------|---------------------|
| Warm up with at least 20 minutes of easy two-leg pedaling | | | | |
| Workout 1 | | | | |
| Chainring | Rear Cog | Cadence | Time (mins) | Leg(s) |
| 39 | 17 | 40-60 | 2 | Left |
| 39 | 17 | 40-60 | 2 | Right |
| 39 | 17 | 80-100 | 2 | Both, easy spin |
| 39 | 17 | 80-90 | 2 | Left |
| 39 | 17 | 80-90 | 2 | Right |
| 39 | 17 | 80-100 | 2 | Both, easy spin |
| Workout 2 | | | | |
| Chainring | Rear Cog | Cadence | Time (mins) | Leg(s) |
| 53 | 15 | 40-60 | 5 | Left |
| 53 | 15 | 40-60 | 5 | Right |
| 53 | 15 | 80-100 | 5 | Both |
| Workout 3 | | | | |
| Chainring | Rear Cog | Cadence | Time (mins) | Leg(s) |
| 39 | 17 | 80-100 | 3 | Left |
| 39 | 17 | 80-100 | 3 | Right |
| 53 | 13 | 40-60 | 3 | Both, pedaling hard |
| 39 | 19 | 80-100 | 3 | Both, easy spin |

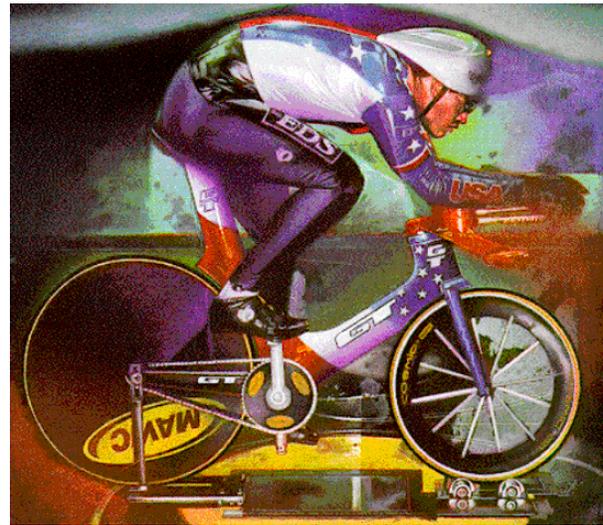
Time Trialing

Many cyclists call draft illegal Time Trialing the “Race of Truth” because the cyclist alone has to overcome the affects of air resistance. The time trial, or bike portion of the triathlon, in relative terms to the swim and run, is the normally the longest portion by far. Consequently, it provides the most opportunity to separate a triathlete from the other competitors. Often, the time trial has been the turning point in many stage races like the Tour de France.

For the reasons explained below, riding in an aerodynamic position is the critical factor in time trialing.

Significance of Aerodynamics

Aerodynamic drag consumes approximately 75% of the power you produce on your bike. Anything you can do to reduce this drag will give you a competitive advantage. How significant can it be? The table below shows why triathletes and time trialists must try to be as aerodynamic as possible while competing. How aerodynamic you are can certainly affect the place you finish - often separated by a matter of seconds.



The information in this table is from various studies and shows the potential savings in time while going 30 mph over a 40K (24.8 miles) distance. Whether riding at a 30 mph pace or 22 mph, the savings over 25 miles, is still significant; and more significant as the distance increases.

Handlebars (Reference: Cobb, Vision Tech)

| From: | To: | Savings: |
|----------------|----------------------|--------------------|
| Drop Bars | Integrated Aero bars | 2 - 4 Minutes |
| Drops/clip-ons | Integrated Aero bars | 15 secs - 1 Minute |

Clothing (Reference: Rainer Pivitt)

| From: | To: | Savings: |
|-----------------|-----------------|------------|
| Shorts & Jersey | Skin Suit | 29 seconds |
| --- | Add Shoe Covers | 13 Seconds |

Wheels (Reference: Cobb)

| From: | To: | Savings: |
|-----------------------------|----------------------|---------------|
| "Box Style" 32 spoke wheels | Deep front/disc rear | 2 - 3 Minutes |
| Deep front/rear | Deep front/disc rear | 30 Seconds |

Frame (Reference: Cobb, Martin/Cervelo)

| From: | To: | Savings: |
|--------------|---|---------------------|
| Round tubing | Airfoil chainstays, down/seat tube & post | 30 secs - 2 Minutes |

Fork (Reference: Oval Concepts, Cobb, Bunce)

| From: | To: | Savings: |
|-----------------|----------------|------------|
| Round tube fork | Oval Jetstream | 35 seconds |
| Round tube fork | Ouzo Pro Aero | 30 seconds |
| Round tube fork | Hotta | 30 seconds |

Helmet (Reference: Cobb)

| From: | To: | Savings: |
|----------------------|---------------------------------------|-----------------|
| Standard road helmet | L.G. Prologue | 30 seconds |
| Standard road helmet | Standard road helmet, tape over vents | 10 - 30 seconds |

Riding Aerodynamically

There are four critical positions on the bike you must maintain during the time trial to maximize your competitiveness:

- Keeping your knees in toward the top tube
- Keeping your elbows within the width of your chest
- Tilting your pelvis in so you maintain a straight to slightly bent back
- Keeping your head tilted down so that your helmet maintains an aerodynamic position

Knees In

Keeping your knees as close to the top tube as you can reduces drag, minimizes injuring the vastus medialis – the muscle just above the kneecap that good cyclists develop and allows you to apply more torque on the down stroke.



Knees In - Reduced Drag



Knees Out - Increased Drag

Competitive Cycling Skills

Always pay attention to what your knees tell you. The relationship of the ankle, knee and hip can restrict how close your knees can ride to the top tube comfortably.

Elbows In

The more your elbows ride outside the width of your chest, the more drag you will experience. Therefore, adjust your aerobars so your forearms and elbows are as close together as possible without compressing the lungs and full breaths.



Elbows In - Reduced Drag



Elbows Out - Increased Drag

When riding without aerobars, position your hands on the top of the handlebars so they keep your elbows within the chest area. Another aerodynamic technique is to lay your forearms on the top of the handlebars about three inches from the stem. This simulates using aerobars and works well for short distances. Rubber or cork handlebar tape will improve comfort of this position.



Forearms on Handlebars

Tilting the Pelvis

While using aerobars, tilting the pelvis places the back in an aerodynamic position and can make it easier to spin the pedals. To test the latter, sit on a stationary bike or set your bike on a trainer, then spin without and with the tilt. You should find the tilt to provide a notable advantage.



Pelvic Tilt



No Pelvic Tilt

Keep Head in Aerodynamic Position

Whether or not you are using aerobars, it is important to keep the helmet in an aerodynamic position. This means as you move down position on the aerobars, you must jut your chin out away from the chest. Your eyes are at the top of their vertical range. This position minimizes drag because it minimizes the amount of the helmet's frontal area as it moves through the air.



Head Up - Reduces Drag



Head Down - Increases Drag

Other Helpful Techniques to Improve Aerodynamics

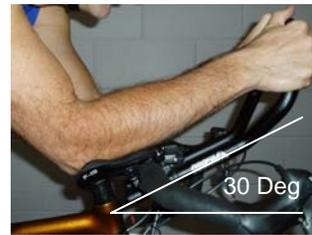
- Use diaphragm breathing, where you breathe in through your nose to fill the diaphragm as much as possible; then, purse lips and exhale quickly and completely. You want to breathe in as much oxygen as possible at all times. To practice diaphragm breathing, lie on your back on the floor with a book on your stomach. Breathe in slowly and fully expand your diaphragm, not your chest. The book should move toward the ceiling on the inhale and sink towards the floor on the exhale.
- Use switch-side breathing, where you learn to breathe during different parts of the pedal stroke. Likely, if you are right-handed, you probably breathe out when the right pedal starts the down stroke. An easy way to change this pattern of same-side breathing is simply to take an extra long out breath every 5 to 10 pedal strokes.

Competitive Cycling Skills

- Keep jersey zipped up.
- For better aerodynamics and hydration, use a water bottle. Wind tunnel tests prove that water bottles on the down and seat tubes produce less drag than those placed behind the seat. A water bottle on the frame provides an advantage particularly with strong side winds. One explanation is that the water bottle provides a "sail effect" that acts to reduce drag.
- Water bottles also produce less drag than water aeropaks, such as a Camelbak, strapped on your back. However, if you use a water aeropak, place it under your jersey.
- Determine the best angle to the aerobars by time trialing the same course, and on a calm day and similar temperature and humidity conditions.



Handlebar 15 Deg Tilt



Handlebar 30 Deg Tilt

Learning to Ride Aerodynamically

Stay in the aerodynamic position at all times. When you come out of it, you increase drag that zaps valuable energy and slows you down. Riding aerodynamically requires conditioning; otherwise, you will find yourself out of position during much of the event.

The best way to condition your body for time trialing and improve your times is to practice time trials. Perform this conditioning schedule twice a week.

| Week Number | 1 st Interval (mins) | Rest Interval (mins) | 2 nd Interval (mins) |
|-------------|---------------------------------|----------------------|---------------------------------|
| 1 | 10 | 20 | 10 |
| 2 | 13 | 20 | 13 |
| 3 | 16 | 20 | 16 |
| 4 | 18 | 10 | 18 |
| 5 | 21 | 10 | 21 |
| 6 | 24 | 10 | 24 |
| 7 | 27 | 10 | 27 |
| 8 | 30 | 10 | 30 |
| 9 | 33 | 10 | 33 |
| 10 | 33 | 5 | 33 |

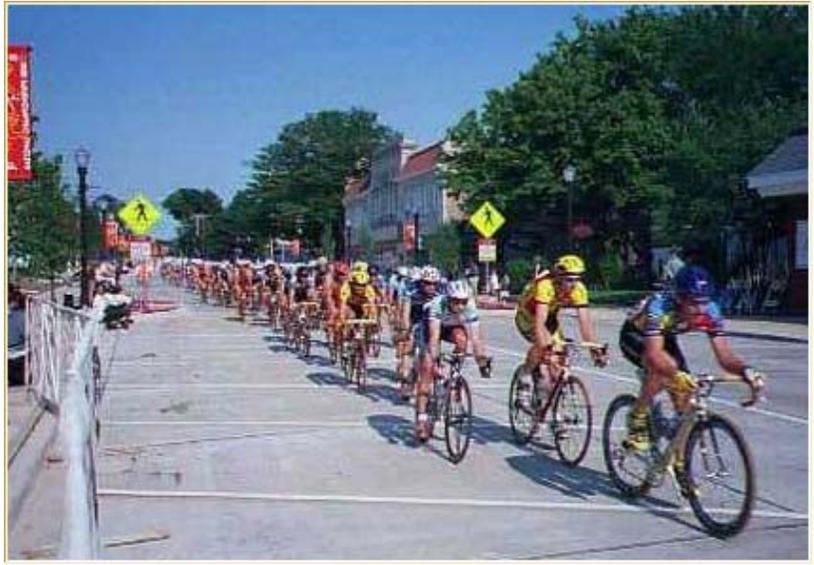
Be sure to practice all the techniques discussed above while executing this schedule

Drafting in Pace Lines and Draft-Legal Racing

Drafting can reduce energy consumption by up to 40%! That is why it is a very popular and efficient way to ride.

Starting Out

1. If you are new to drafting, first find a rider you know that can ride a steady, smooth line and ask if he will help you. Start by riding so your front wheel is about two feet behind the rider's rear wheel. Then, as you get more confident, narrow the distance down to where you are eventually riding about six to eight inches from the rear wheel.



2. Stay in the draft area that is directly behind the rear wheel and, depending upon the wind, always ride on either side or but **never** directly behind the rider's rear wheel.
3. Different groups may have different approaches to drafting. Consequently, ask at the beginning of the ride, then start at the back of the pack and observe how they move through the rotation.

Taking over the Lead Position as the Lead Rider Drops Off

1. Follow the rider in front of you in the draft area until he signals he is pulling off. Normally, while keeping his hands on the handlebars, the rider will flick his fingers out to show he is ready to pull off and to what side.
2. The rider will move to the signaled side and drop back until he is in the draft of the last rider in the pace line. You move straight up taking over the lead position.
3. When you are ready to drop off, follow 1. above. How long you pull depends on your conditioning. However, regardless of how strong you are, you should **always** try to conserve your energy by not pulling any longer than one to three minutes.

Taking over the Lead Position Intentionally

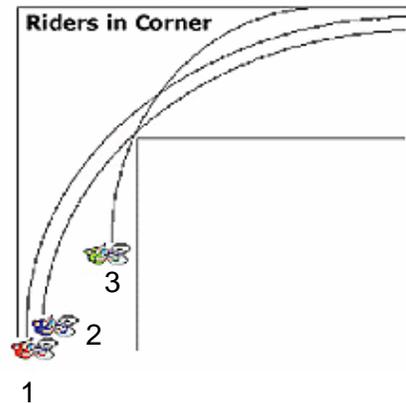
1. Sometimes, you may want to take over the lead position from the lead rider. Therefore, advance up the draft side until you think you have cleared the lead rider and only then move over in front of the rider. **Do not turn around and look back to make sure you have cleared the riders front wheel as this can**

cause you to swerve. The rider you are overtaking has the responsibility to watch where your rear wheel is.

2. Sometimes you may have to tap the rider's hip to indicate you are coming around and on what side.

Cornering in a Pace Line

1. Take an outside, inside, outside line through a corner as demonstrated here by Bikers 1 and 2. Biker 3 is taking an inside, outside line that is not good.
2. Take a line that will allow you to maintain a parallel line with other bikers. See Bikers 1 and 2. The line Biker 3 is taking will likely cause him to crash and will certainly cause Bikers 1 and 2 much anguish if not take them down.
3. It is also important to keep a smooth arching line through the corner. Keep your body steady as bobbing and weaving will throw you off line.



Important Do's and Don'ts in a Pace Line

1. Do **always** wear a helmet and it is wise to wear riding gloves.
2. Do keep your hands near the brakes at all times so you can respond quickly to sudden changes in the road or the bike in front of you.
3. Don't keep your hands on aero bars if you have them.
4. Do **always** stay in the draft area that is behind the rear wheel and, depending upon the wind, can be on either side but **never** directly behind the rider's rear wheel.
5. Do use a hand signal to indicate when and to which side you are pulling off the front.
6. Don't take longer than one to three minute pulls at the front in order to conserve your energy for multiple pulls and staying in the pace line. Skip a rotation if you have to.
7. Do signal road debris and hazards by flicking the arm and hand on the side of the bike where the hazards lie.
8. Do avoid sudden braking or swerving as the riders behind will not have much time to react and makes for a scary pace line.
9. Do look down the road and not just stare at the wheel in front of you.
10. Do be prepared to touch, bump or someone tapping you.
11. Don't overreact or panic if bumped; doing so is a sure way to cause a crash.
12. Don't half-wheel, that is, overlap the rear wheel ahead of you. If the rider makes a sudden change in direction, you may not react quickly enough, hit the rear wheel, crash and likely take many other riders with you.
13. Do ride as a single unit. Go through intersections together and obey the traffic laws.
14. Don't attempt a break away using a traffic light, a violation of riding etiquette.
15. Do your part to maintain a straight, steady and smooth pace line.
16. Don't accelerate as you take over the lead position. If you want to increase the pace do it gradually **after** you are in the lead position. Constantly accelerating will break up the pace line and can cause "yo-yoing" of the pace line that is scary, wastes energy and can cause crashes.

Competitive Cycling Skills

17. Do listen for warnings like "Braking" or "Accelerating".
18. Don't look back if there is a wreck behind you. You could cause the next one. Be prepared to accelerate. Leaders will often breakaway during the chaos of an accident as those behind have to slow.
19. Do try to roll into a ball and get as small as possible if you crash to minimize injury and coming bikes hitting you.
20. Don't stick out your arm to break the fall as it is a sure way to break your collar bone.
21. Do as much as you can to stay in the pace line for it will take up to 40% more energy to ride alone. If you lose it, ride steady, hydrate, and catch the next drafting group coming along to try and get back in the lead pace line.
22. Don't drop your wheel **back** as you move from the seated position to a climbing position on a climb. The natural tendency is to drop it back where it may end up in the front wheel of the bike behind you.

Good Reference

For a good reference covering the many aspects of riding in a pace line go to http://www.inlandempirecycling.com/Cycling/group_riding_and_pace_lines.htm#_Toc48401233 .

Competitive Cycling Skills

Energy Drinks & Gels

Find below a list of electrolyte drinks, recovery drinks, energy bars and gels. These products are helpful and legal for enhancing performance. However, consider these cautions as you use these products:

- Experiment during training to find out what works best for you
- Do not change what you have been using just before a race
- Find out ahead of the race what drink the promoters will provide before and during the race and try some during training to see how it works for you

| Fluid/Electrolyte Drinks | | | | | |
|-------------------------------------|------------------|-------------------|---------------------|-------------|----------------|
| PRODUCT | CALORIES | CARBOHYDRATES (G) | CARBO CONCENTRATION | SODIUM (MG) | |
| Accelerade | 105 | 19.5 | 8% | 142.5 | |
| Cytomax | 50 | 10 | 4% | 50 | |
| Gatorade | 50 | 12 | 5% | 110 | |
| GPUSH | 25 | 6 | 2.5% | 170 | |
| GU2O | 50 | 13 | 6% | 120 | |
| PowerBar PERFORM | 60 | 16 | 7% | 110 | |
| Shaklee Performance | 100 | 25 | 10% | 115 | |
| SoBe Sports System | 70 | 19 | 8% | 70 | |
| Ultima Replenisher | 20 | 5 | 2% | 25 | |
| XLR8 | 50 | 12 | 5% | 40 | |
| Recovery/Replenishment Drinks | | | | | |
| PRODUCT | SERVING SIZE | CALORIES | CARBOHYDRATES (G) | PROTEIN (G) | FAT (G) |
| Boost | 8 oz can | 240 | 33 | 15 | 6 |
| EnduroxR4 | 2 scoops/12oz | 280 | 53 | 14 | 1.5 |
| Metabolol Endurance | 2 scoops/12oz | 200 | 24 | 14 | 5 |
| Shaklee Physique | 4 scoops/8oz | 210 | 38 | 14 | 0 |
| Sustained Energy | 3 scoops/8-12oz | 334 | 73 | 10.5 | 0 |
| UltraFuel | 2 scoops/16oz | 400 | 100 | 0 | 0 |
| Nutritional Analysis of Energy Bars | | | | | |
| PRODUCT | CALORIES | PROTEIN (G) | CARBOHYDRATES (G) | FAT (G) | FIBER (G) |
| PR Ironman Bar | 230 | 16 (28%) | 23 (40%) | 8 (32%) | 0 |
| Met-Rx Food Bar | 340 | 27 (32%) | 50 (59%) | 4 (9%) | 0 |
| Power Bar | 230 | 10 (16%) | 45 (78%) | 2.5 (4%) | 5 |
| UltraFuel | 230 | 15 (26%) | 42 (73%) | 0 | 2 |
| Tiger Sport | 230 | 11 (19%) | 40 (70%) | 2 (11%) | 0 |
| Energia | 230 | 10 (17%) | 42 (73%) | 2.5 (10%) | 7 |
| Steel Bar | 380 | 16 (17%) | 68 (71%) | 5 (12%) | 1 |
| Creatine Crunch | 240 | 11 (18%) | 41 (68%) | 5 (14%) | 0 |
| Gatorade Energy Bar | 250 | 6 (9%) | 46 (74%) | 5 (18%) | 1 |
| Gels | | | | | |
| PRODUCT | SERVING SIZE (G) | CALORIES | CARBOHYDRATES (G) | SODIUM (MG) | POTASSIUM (MG) |
| Crank Sports e-Gel | 55 | 150 | 37 | 220 | 80 |
| GU Sports Gel | 32 | 100 | 25 | 45 | 35 |
| PowerGel | 41 | 110 | 26 | 40 | 40 |
| Clif Shot | 32 | 100 | 24 | 50 | 50 |

Strengthening Exercises to Improve Cycling Competitiveness

The exercises shown below will help you strengthen these muscle groups that are very important for spinning, climbing, sprinting and time trailing:

- Glutes/Thighs
- Calves
- Hamstrings

Frequency

- During the season, perform the sets and repetitions at least 1-2 times every two weeks.
- During the off-season, perform them 1-2 times a week.
- During the two months before the season, perform them 2-3 times a week.

Equipment Used

You can find the machines shown in the illustrations at a fitness center or YM/YWCA.

Glutes/Thighs

Single Leg Extension

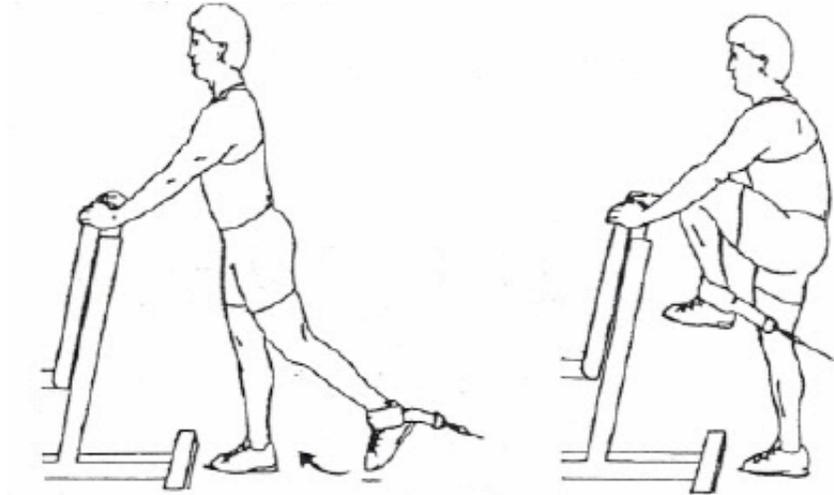


Equipment: Quad

Method: Perform with either leg in isolation. Straighten leg to locked position, keeping foot flexed toward knee.

Workout: Do 2 sets and 10 repetitions.

Hip/Glute Flexion

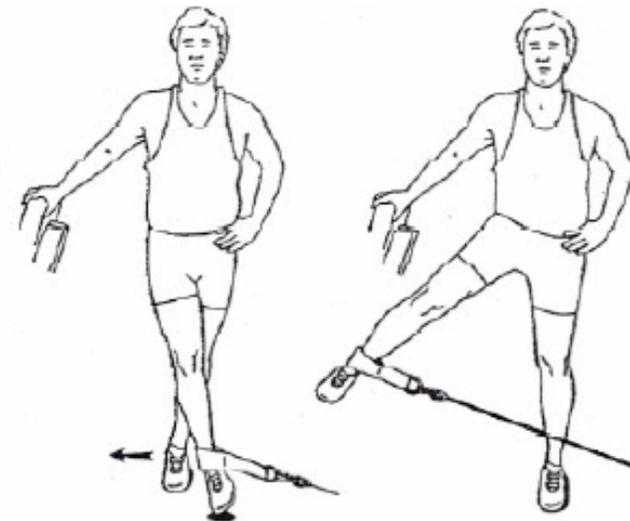


Equipment: Cable

Method: Perform with either leg in isolation. Holding support, bring knee forward and up as high as possible.

Workout: Do 2 sets and 10 repetitions.

Leg Abduction



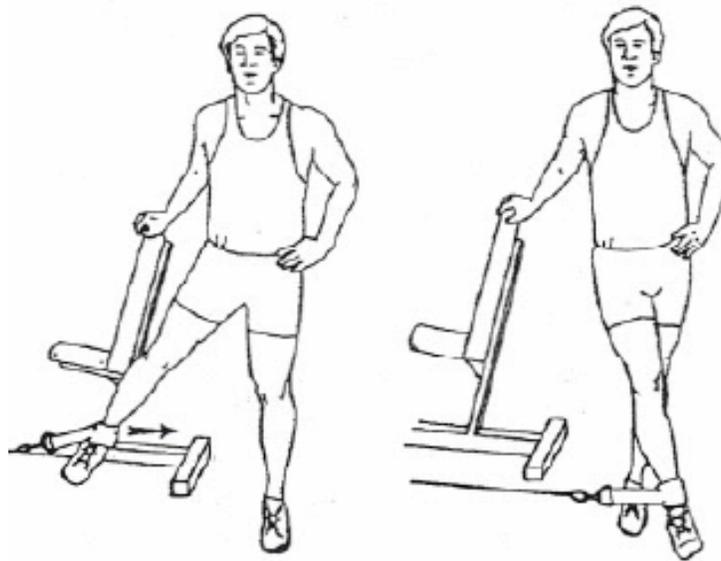
Equipment: Cable

Method: Perform with either leg in isolation. Holding support, sweep leg outward away from body.

Workout: Do 2 sets and 10 repetitions.

Competitive Cycling Skills

Leg Adduction



Equipment: Cable

Method: Perform with either leg in isolation. Holding support, sweep leg inward across body.

Workout: Do 2 sets and 10 repetitions.

2 Wall Sit

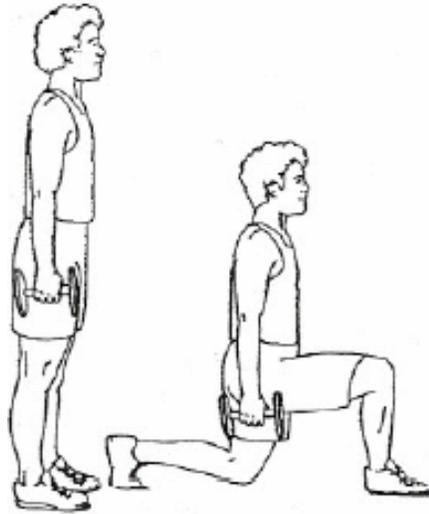


Method: Back against wall, slide down so knees are at 90° angle. Hold 20-25 seconds.

Workout: Do 2 sets and 10 repetitions

Competitive Cycling Skills

Lunge Forward

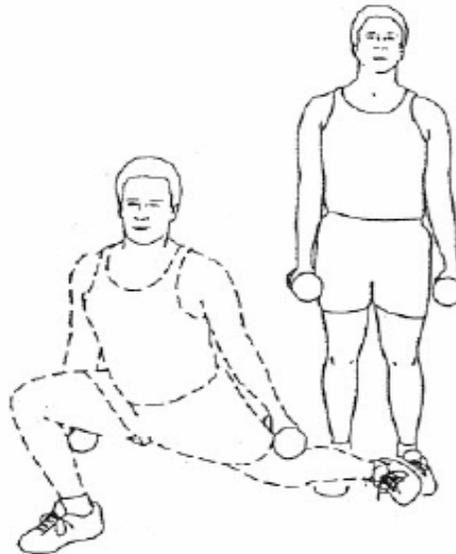


Equipment: Dumbbells

Method: Legs shoulder width apart, head up, back straight, step forward bending same leg until thigh is parallel to floor. Alternate legs and keep upper leg 90° angle, particular not to pass toe.

Workout: Do 2 sets and 10 repetitions.

Lunge Side



Equipment: Dumbbells

Method: Legs shoulder width apart, head up, back straight, step forward bending same leg until thigh is parallel to floor. Alternate legs and keep upper leg 90° angle, particular not to pass toe.

Workout: Do 2 sets and 10 repetitions.

Step-Up

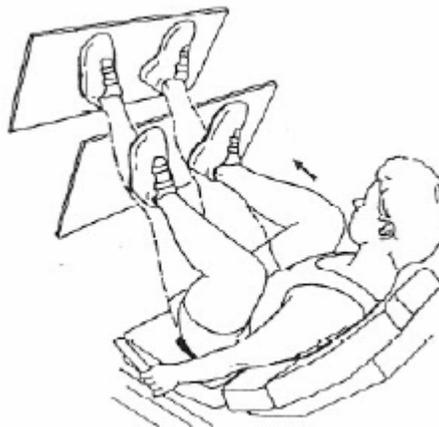


Equipment: Dumbbells

Method: Head up, back straight, step up on box, bringing other leg up toward chest. Alternate step-up leg.

Workout: Do 2 sets and 10 repetitions.

Leg Press



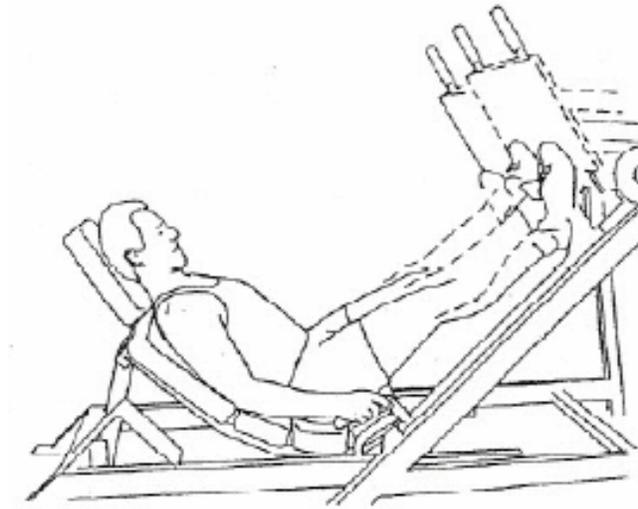
Equipment: Incline Leg Press

Method: Position feet width of bike pedals and toes pointed forward to slightly inward, then press forward until legs are just short of locked knee position. In the press position, do not let legs go less than 90°.

Workout: Do 2 sets and 10 repetitions.

Competitive Cycling Skills

Calves

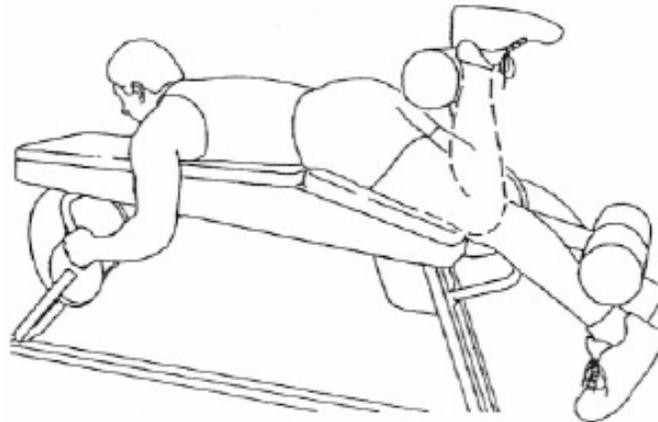


Equipment: Incline Leg Press

Method: With legs extended, flex ankles and stretch calves by pressing toes as far forward as possible.

Workout: Do 2 sets and 10 repetitions.

Hamstrings



Equipment: Leg Curl

Method: Perform with either leg in isolation. Bring heel as close to buttocks as possible, keeping foot flexed toward knee.

Workout: Do 2 sets and 10 repetitions

Works Consulted

Bike Racing 101 by Kendra Wenzel and Rene` Wenzel

Serious Cycling by Edmund Burke

The Lance Armstrong Performance Program by Lance Armstrong and Chris Carmichael

Road Racing by Bernard Hinault and Claude Genzling

The Triathlete's Training Bible by Joe Friel

Coach Carl, http://www.coachcarl.com/training_articles/cornering.htm

Cobb, <http://www.timetrial.org/aerodynamics.htm>

Ferrari, <http://www.53x12.com/do/show?page=article&id=15>

Weiss, <http://bicycling.about.com/cs/skills/a/pedalcircles.htm>

Training Techniques for Cyclists by Bicycling Magazine

Material compiled and written by Michael Hunter, USAT Level I Coach