Keep it Real

In Your Indoor Cycling Classes!

This book is devoted to showing how cyclists can benefit from indoor cycling classes to improve their outdoor cycling performance.

By Jennifer Sage, CSCS, CPT

Master Instructor, IndoorCyclingAssociation.com

Praise for Keep it Real

From Tyler Hamilton, former professional road cyclist, 2003 Tour de France Stage Winner, 2004 Olympic Time Trial Champion, 2008 US National Champion. Tyler's father takes Spinning classes in the Boston area. Tyler told me some of the strange things they do in that class, moves that would hinder anyone's performance, *especially* a cyclist's. I sent him my book to pass on to his father, and Tyler read it and sent me this endorsement.

> *If you are a cyclist of any ability that rides indoors or in indoor cycling classes and are looking to improve, then you should take a look at this book. Spinning classes are great, however if your instructor isn't a cyclist, you may not be getting the most out of your workout. I believe if you follow the guidelines in this book, you will surely see better results. Jennifer's comments about what things you should avoid are very important. She obviously knows her physiology and biomechanics, and as a cyclist, she knows how to help you Keep it Real in your Spinning classes. I would recommend this book to all cyclists and Spinning instructors who are looking to be stronger out on the road.*

Other letters and comments received about Keep it Real:

> *Jennifer has taken her years of experience as a Spinning Master Instructor and combined it with her years riding outside to produce a simple and concise book on how to take the road inside. She takes the training needs of the outdoor rider and translates them into the dynamics of an indoor cycling class. For those not familiar with some of the training tools and techniques used by cyclists, she provides very straightforward and understandable explanations. Simple enough for the beginner; enough information for the intermediate; but not boring for the advanced rider. Jennifer explains what to look for (and more importantly what to avoid) in a class to ensure a safe ride that can meet all training needs. Written to transition an outdoor rider to an indoor participant, this book is also a must-read for any instructor.*
>
> *Stephen Grady, Vancouver, BC*
> *Cyclist and Indoor Cycling Instructor*

> *Jennifer's ebook is a must-buy guide for roadies wanting to make effective*

use of Spinning classes in their off-season training. We've all attended those "stereotypical" classes (described in her book) where you perform odd maneuvers such as pedaling backwards in a "hover" position or performing "freezes" to get the burn. Keep it Real shows how indoor classes can be fun and effective preparation for outdoor riding. The book has even inspired me to become a certified Spinning instructor so I can take the class i want by leading one!

Mark Newsome, http://ultracyclist.blogspot.com

Thank you Thank you for your book on indoor cycling. As an avid cyclist and Spinning instructor I feel like I am on an island all alone in trying to get students to Spin properly. The problem is compounded by instructors teaching that the faster you go the better. I just downloaded the book and printed it. As it was printing, I got more excited as the pages rolled off my printer. I can't wait to read the book and apply the principles. And yes, I have been doing things wrong!
Alan, Santa Ynez, CA

Keep it Real

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ABOUT THE AUTHOR

Jennifer Sage has been in the fitness industry since the early 1980s. She began teaching aerobics in college and graduated with a BS in Exercise Science in 1984. She has taught everything from high and low impact aerobics, Step, body sculpting, ski conditioning, core training and more. She's been a personal trainer since the mid 1990s, earning her CSCS (Certified Strength and Conditioning Specialist) as well as several other personal training certifications. In 1997 she was certified as a Spinning® instructor. Only a year later she became a Master Instructor (MI) for Mad Dogg Athletics on Team Spinning® International. In this role, she traveled around the country certifying Spinning® instructors, teaching continuing education courses, writing workshops and presenting at fitness conferences throughout North America.

After twelve years as one of their top Master Instructors, she resigned from the Spinning® program in 2009 to launch ICI/PRO, an online training program for indoor cycle instructors. That was the launching pad to establish the Indoor Cycling Association, the premier source for instructors who desire a higher level of knowledge and who want to learn more about proper training principles, biomechanics and exercise physiology as it applies to indoor cycling.

One of her missions has always been to keep indoor cycling true to outdoor riding, what she calls *"keeping it real.*" This is a challenge, because many instructors are not cyclists, and many of their students are not cyclists and they don't understand the importance of keeping classes specific to cycling. She wants to teach them that if it's not good for a cyclist to do certain things indoors, then it's also not good for the non-cycling population. The laws of physics and exercise science do not change from the outdoors to the indoors, nor do they change just because someone doesn't ride a bike. She's been on a "crusade" of sorts to teach instructors the dangers and ineffectiveness of crazy, aerobics-on-a-bike style of indoor cycling, and wrote a continuing education workshop for Mad Dogg Athletics called "Contraindications in Spinning®. (i.e. what NOT to do in a Spinning® class).

She also wrote the workshop for Spinning® called "Cadence, Heart Rate, and Class Design," which focuses on choosing cadences and resistance that make sense to outdoor riding, and their combined effect on intensity and heart rate.

Jennifer has been a cyclist since the early 1980s. In 1988 she rode her bike solo 2,500 miles around Europe and in 1990, 1,500 miles around New Zealand. In 1989, he began working for Travent International, a luxury bicycle tour company. Every year she returned to create, organize, and lead bicycle tours, gaining more and more knowledge of the best cycling in Europe.

She took a break to obtain her MBA from the American Graduate School of International Management, tried the corporate world, and then moved to Vail, Colorado, and became a ski instructor, personal trainer, and massage therapist. In 1998 she returned to leading bicycle tours. She led a VIP tour to the 1999 Tour de France with Greg Lemond, which included "backstage" access at arrival and departure towns, and a private helicopter that took the guests off Alpe d'Huez back to Grenoble. The group was able to ride up many of the many famous climbs of France, including Alpe d'Huez and Mont Ventoux.

In 2003 Jennifer started her own bicycle tour company, Viva Travels. After all these years doing it for someone else, it was time to go on her own. Viva Travels is a unique company, providing services that few other companies offer. Although she organizes guided tours, including to the Tour de France, her specialty is creating unique, custom self-guided tours. Her self-guided clients are provided with everything they need to know to do it on their own in total confidence.

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ABOUT THE TITLE OF THIS BOOK: *KEEP IT REAL*

On a bike tour in Burgundy back in the early 1990s, I happened across an amazing painted sign in the middle of the vineyards. It depicted a Roman scene of two men covered with vines carrying a vat of grapes, with the inscription *In Vino Veritas*, which is Latin for *"In wine there is truth."*

At the time I worked as a guide for a bicycle tour company based in Burgundy in France, and this became our mantra. When we weren't on tour, we would be riding our bikes in the vineyards of Beaune, Meursault, and Savigny, taking advantage of the many wine-tasting opportunities.

I turned the quote into *In Velo Veritas* because of our passion for cycling. *In Velo Veritas* means (sort of*): *In cycling there is truth*. I'm sure the Romans, if they had had bicycles back then, would have said the same thing! (**Velo* is actually Latin for *speed, swift,* but it means *bicycle* in French).

Now, 20 years later, I have a new translation for this "ancient" saying I made up. As an instructor intent on keeping indoor cycling **true** to outdoor riding, I now translate the phrase *In Velo Veritas* to mean: *Keep it Real!*

In cycling there is truth, so let's *Keep it Real* when riding indoors on a stationary bicycle!

Keep it Real

Please purchase your own copy of *Keep it Real* at www.keepitrealebook.com. If you would like information on becoming an affiliate to receive commissions for referring others, please contact me at info@indoorcyclingassociation.com.

INSTRUCTORS & PROGRAM DIRECTORS OF INDOOR CYCLING PROGRAMS:

This bears repeating (because so many copies have been distributed without permission). Please do not distribute this eBook to your peers or staff, either electronically or by making copies. Because I know that all indoor cycling instructors will benefit greatly by reading this book, and therefore so will their students, I will offer GROUP DISCOUNTS. If you are a group of 3 or more instructors, I will offer a discount for multiple copies. And if you have a large group of 10 or more, I will give you a substantial discount with multiple licenses for distribution. Please contact me at the email listed above.

Will I know if you copy or distribute *Keep it Real*? Maybe not….*but you will know*, and that is what counts.

Special Note to Instructors:

This book has been targeted to cyclists to teach them how to seek out and assess indoor cycling classes so that the classes they take will help them improve their fitness and performance when they ride outside. If you are an instructor who has many students who are not cyclists, or perhaps you are a student who is not a cyclist but has been referred to this ebook, know that everything written in this book also applies to non-cyclists! The laws of exercise science and biomechanics do not change from a cyclist to a non-cyclist. What is bad for a cyclist to do on an indoor bike, because it will hinder her performance, power output, proper technique and success, is also not good for a non-cyclist. Everyone, even someone who hasn't ridden a bicycle since a tricycle, will benefit from training like a cyclist does.

PART 1
INDOOR CYCLING AND THE COMMITTED CYCLIST - CAN IT WORK?

CHAPTER 1. TRAINING INDOORS

YOUR FIRST INDOOR CYCLING CLASS

As a road cyclist, it's important to continue your training in the winter months. This can become challenging, especially if you live where weather limits year-round cycling. Even if you live where it remains warm enough to ride during the winter, the shorter days of winter might limit your ability to ride before or after work. Cyclists who are constrained by a Monday-Friday work schedule who might only be able to ride outdoors on weekends, even in summer, will appreciate this information for those indoor cycling classes all year round.

Perhaps in the past you've set your bike up on a trainer in your basement and struggled through your workouts by yourself, forcing yourself to endure long hours in the saddle. I know how difficult it can be to get on that bike and be motivated to do your desired workout by yourself. Even with the use of training videos, or distractions like movies or a great sound system, it just gets old *by yourself,* and it's easier and more fun to be motivated by someone else and in a group environment.

So, maybe you decided to try a Spinning® class, or were dragged there by a friend or significant other. "C'mon! It's fun! It's a great workout! The music's great, you'll love it, I promise!"

I'm about to give you a description of a fictitious class, though it pains me to say they are actually more often like this than not. The following description of a class may or may not be similar to what you experienced in your first class. If it wasn't, you should be grateful to have found a good instructor, but I bet you have heard horror stories similar to the following. If your experience was anything close to the following, then not to worry, this book will give you all the answers on how to maximize your enjoyment and training in indoor cycling classes while staying away from common movements or techniques that will detract from your cycling training, or worse, injure you. After the first edition of Keep it Real, I received hundreds of emails or comments describing their first "Spinning" class, often very similar to the class described below. It is sad how rampant they still

are. Sigh… But even if I impact just a few instructors to change their misguided ways, I have succeeded!

Your friend convinces you to come to class, and you acquiesce and allow yourself to be taken to the club. You walk in the dimly lit room; the instructor is a very fit, muscle-bound, tall brunette, who strangely doesn't look much like a cyclist. She sports black capri tights instead of bike shorts, and a low-cut midriff sports bra. Her hair is pulled back tight. She has lipstick. She smiles at you. Let's call her Jane.

You wisely take a bike in the back row. The lights are dimmed, with black lights causing an eerie glow in the room. You can barely see your heart rate monitor. Soon, the class is pumping wildly to Beyoncé and Black Eyed Peas. Barely five minutes into the class, Jane screams into the microphone, "OK, it's time to get serious! Everybody stand up and sprint! C'mon, I wanna see those fast feet!"

The class stands up, speeding up their legs so quickly that you can barely see them, whirring around like the Road Runner being chased by Wile E. Coyote. The "sprint" goes on for over a minute. Riders are flopping all over the place, but they begin to whoop and holler with enjoyment. (You don't do it, because you know you aren't warmed up yet – how easily you could pull a muscle doing that!)

She then takes the class into a regimented sequence of movements; first push-ups on the handlebars, followed by a rhythmic "up down, pump twice, up down, pump twice," etc. These move into very fast rhythmic jumps in and out of the saddle. "If you want to make it harder," she yells, "don't sit all the way back down!" Out of curiosity, you try doing what she suggests, but immediately realize it's not a wise move when your back starts complaining, so you sit down as everyone else continues their erratic jumping. Jane's eyes catch yours disapprovingly.

Then the class is asked to stay standing for three minutes in an "isolate and freeze" position, not allowing the upper body to move at all. "Pretend that you have a glass of water on your head and you don't want to spill it," she says. "Stand tall like you're the Statue of Liberty!" In order to do this, riders have to perch themselves up on their fingertips; it looks like they've just had a manicure and are drying their nails.

This seems very foreign to you; you know you would never do this on your bike outside, but you're a little afraid not to obey her. Pretty soon, your knees start to hurt, followed by your low back. Then she asks you to lower your hips a few inches, "Go for the burn! Feel those quads!" she yells! Grunts and groans arise from the group, followed by a few "Yeah's". You hope Jane can't see well enough in the dark to notice that you've sat back down. Relief.

"It's time to climb," she announces. To a heavy beat of Shakira, you're told to put a lot of tension on the bike and stand up and climb a hill that's a "9 out of 10."

"Push your butt over the back of the seat and *hover*!" Curious, you try it. More pain in the back and the knees. You know you'd never climb like this outdoors—you probably wouldn't make it up the hill if you did. But from the hollers of the class, it's obvious that this is a favorite move. Jane is pushed so far back her arms are stretched out in front of her. She tells everyone it "activates the glutes more" but you know that just climbing the right way activates your glutes, so why risk the knee pain?

Next, a move she calls "Fore/aft"—four counts climbing with the butt pushed back, four counts forward leaning on the bars, and back and forth.

Jane gets off her bike and walks around the room, looking for a victim. She stands in front of a good-looking man, and says, "What's the matter Bob? Not into working hard today?" He looks sheepish. "C'mon, show me what you're made of!" and she reaches down and turns up his resistance knob for him, dramatically slowing down his cadence. "Much better!" And then to the class, in drill-sergeant fashion, she says, "Aren't you all here to work hard today? That's what you tell me, but I'm starting to wonder!"

Affirmations all around (otherwise they fear she'll do the same to them). Back on her bike, she says, "and now, our hill becomes a 10 out of 10!"

You notice that several riders in the class have so much resistance, they have to pull on the handlebars to turn the pedals, at best about 40 rpm. She gives them a thumbs-up.

Relief - the hill is over. It's time for more sprints. She announces that you're going to do five sprints of one minute each with a 30-second rest. In the "sprint"

segment, feet are spinning wildly, bodies are bouncing all over the place, but nobody seems like they are really doing the kind of "real" work that you know a true sprint entails; they're just spinning their feet like a weed-wacker. Nevertheless, students are huffing and puffing and grunting and groaning and whooping and hollering. By the third one, efforts have dramatically declined, and riders aren't able to maintain the high cadence of 120+ rpm that she's asking for (regulated by keeping time to the very fast-paced music).

Mercifully the class comes to an end. Some of the student's high-five Jane, and someone says, "Jane, you've outdone yourself! That was awesome!" In the locker room, more accolades, and comments about how that burn will stay with you for a few days if you "do it right."

You leave, shaking your head and rubbing your sore knees, vowing never to return…

OK, so I've painted a pretty grim picture of how some so-called "spin" classes are led. Granted, I used some of the worst stereotypes, but the sad part is that this type of class is actually quite common in clubs around the world and not showing any signs of getting better (don't believe me? I'll send you some YouTube video links or blog addresses with proof). I've heard of every single one of these moves, and many more even crazier movements and techniques from instructors as I traveled the country teaching certification courses. The worst I heard is called "Moon the moon", but I won't even go there…

Sometimes at instructor orientations when I worked for the Spinning® program, when I described the contraindicated and dangerous moves that are prevalent and that have no place in any indoor cycling class, the new instructors-to-be looked at me and said, "You've just taken away just about everything they do at my club! What's left?"

It doesn't have to be this way! I joke that these instructors who teach unsafe moves must get a commission from the local orthopedic doctors and chiropractors. But there are many, many excellent instructors out there who do know how to train properly, who know what a real "sprint" is, who understand threshold and aerobic base building, who care more about a safe and effective

workout than being the “most popular” instructor with the “hardest” classes, and who do know how to ride a bike properly and bring the outdoors indoors in their class profiles. These instructors know that even the non-cyclists in their classes deserve a solid and effective workout, devoid of the aerobics-on-a-bike fluff that does little for their fitness and only adds risk of injury.

WHAT YOU’LL LEARN FROM THIS EBOOK

It is possible to be a dedicated road cyclist or mountain biker and still have an enjoyable, safe, and *relevant* training session in an indoor cycling class. I will be giving you tips on how to look for the best programs, clubs, and instructors, and then how to judiciously select what you will and won’t do in the class, based on whether the task that the instructor is asking you to do will enhance or detract from your riding skills or performance.

You’ll learn the ways in which indoor bikes are similar to your road bike, and what skills you can improve by cycling indoors. You’ll also learn the ways in which these bikes are different, which will have implications on whether a training technique is effective or not.

As a long-time road cyclist and mountain biker, my preference is to be outdoors whenever I can. But I live high in the Rocky Mountains where there is a relatively short cycling season and I’m a self-confirmed wimp when it comes to riding in cold and wet or snowy weather. I am very grateful for the Spinning® program, which has provided me with an exceptional means for staying in cycling shape throughout the winter months. Indoor cycling classes can really work if you know what to avoid and what to focus on.

This eBook will help you do just that.

CHAPTER 2. WHY WOULD A CYCLIST CHOOSE TO RIDE INDOORS IN A CLASS ENVIRONMENT?

So why would you as a cyclist even consider joining a club to come ride a bike indoors? Why not just continue setting up your trainer in your basement or living room and hammering away? If that had been working for you in the past, I doubt you would be reading this eBook. You have a goal, and that is to continue your cycling training throughout the winter and to emerge in the spring with greater endurance and more strength on hills than you have had in the past, or at the very least, to minimize your loss of cycling fitness through the winter months. How is it possible that an indoor cycling class can help you achieve those goals better than riding a trainer?

Here are a few reasons…

TRAINERS ARE BORING AND NOT ALWAYS PRACTICAL

Face it. Putting your bike on a trainer and riding in your basement or living room can be about as exciting as a root canal. Sure, you can put on your favorite music or watch a movie and just "veg out," but doing this three to four times a week gets old fast. You will soon hit your "ennui threshold" and as a result, your adherence to your training program may soon plummet.

It's also not as easy for some people whose living arrangements aren't amenable to setting the bike up. Do you have plenty of space in your house or apartment? Does your trainer become a part of the furniture for the winter months, or do you have to reassemble and disassemble it every time you use it? If you have a family with young children, it may not be wise to keep it set up at all times. If you're single, then it may be a little easier.

How about the practicality of group rides on trainers? I've often thought about how wonderful it would be to get a group of cycling friends to come over with their trainers and bikes so we can do a group training session in my basement, but the logistics of doing this were simply overwhelming. If you are able to arrange this with your friends, consider yourself lucky.

CAMARADERIE

There is something to be said for the camaraderie in a group fitness class. You can get to know the instructor, and even share your training goals with him or her. If you're lucky and this trainer acts as a coach and not just an instructor barking out orders, then he or she will probably take an active interest in your goals and help you achieve them.

Friendships can be forged that turn into outdoor riding buddies once the warmer cycling season arrives. It's a great place for friends to gather to train together, or to meet new friends, or even find a new relationship with someone with similar interests! (*Don't laugh*—I met my husband in a Spinning® class! As a road cyclist, his original reason for attending my classes was that I kept them realistic to outdoor riding.)

MUSIC AND ENERGY

The above photo was taken at a four-hour Spinning class to raise money for a charitable event. The amazing energy of a ride like this cannot be described; it has to be experienced!

One of the most common reasons given for attending indoor cycling classes is the music and energy of the class. *It's just plain fun!* Music plays a huge role in indoor cycling classes. Music can set the tone of the workout; it can help set your tempo, especially on harder segments of the ride and on climbs. Some well-chosen music can even transport you to another place through its emotional quality.

The energy created by the music can hit a chord inside you and help you achieve your goals. Music can be very powerful!

If your instructor plays music you don't care for, maybe you can ask her if you can occasionally submit a song or two to be played. (Though if your tastes run to the extreme rap, punk, or heavy metal, this might not work in a group environment; it may be time to open your mind to other genres!)

MOTIVATION

A great instructor will provide motivation to help riders go beyond their self-perceived limitations. A good coach will also motivate riders to pull the reins when needed, to train at lower intensities, and to balance their workouts throughout their training week. But on days where you are meant to go hard, having a coach motivating you will help you achieve your desired intensity levels for those intervals or that threshold ride. Alone on your trainer, it's just not easy to motivate yourself to go hard.

Most classes are 50 to 60 minutes in length. In that time, you can get a phenomenal workout, often more than you can push yourself on your trainer. If you need a longer endurance workout, you may be able to come early or stay later if there aren't other classes scheduled on either side. If it's available, you may even decide to do two classes back to back, and get a taste of two instructors' styles and music.

A GREAT PLACE TO WORK ON FORM AND TECHNIQUE

Roadies: Indoor cycling classes are a great place to work on your relaxed riding form. Outdoors, you may be focused on traffic, the road surface, riding in a paceline, or paying attention to your riding buddies, and you may not give your technique enough mental focus. Indoors, spend as much time as possible committing a relaxed upper body to your subconscious. If you have a tendency to let your shoulders ride up towards your ears, indoors is where you can fix it. If your knees tend to fall to the outside as you ride, focus on changing that indoors.

You'll see that pedal stroke skills can be enhanced to a certain point as well. The fact that there is a flywheel with momentum helping to drive the pedals will limit this benefit, but I'll explain how you can improve your pedal stroke in your

classes if you pay attention to a realistic resistance and cadence that mimics outdoor gears and terrain.

ADHERENCE

Through the camaraderie, energy, and motivation described above, adherence to a training program will be increased. Anything that will improve your adherence is worth doing, isn't it? Having an "appointment" with a specified class on a specific day will greatly increase your chances of doing that activity.

It's so much easier to get distracted and put off a workout on your trainer at home. If you are coming home from work and plan to ride on your trainer at the same time as your kids are returning from school, dinner needs to be prepared, chores need to be done, the phone rings off the hook, and mayhem breaks out, you know the first thing to go is your own workout.

With your family squarely behind you, and with a fair trade for absenting yourself two or three early mornings or evenings a week, your indoor cycling class can become just like an appointment you must keep in your office. Studies have shown that when you treat your scheduled classes like any appointment at work and you schedule it and plan your day around it, your adherence to an event will greatly increase.

Of course, there are individuals who are extremely self-motivated. Bravo! If that's you, I wish I were more like you and could commit to getting on my trainer 3 to 5 times a week. And if that's you, then you probably don't need this eBook (except Part II will still be very helpful).

But then again, you are reading this book, so maybe your history shows that you haven't been as good as you'd like at riding your trainer throughout the winter, or there's a part of you looking for some extrinsic motivation to help you better meet your training goals this winter.

Welcome to the joys of indoor cycling classes!

CHAPTER 3. THE EVOLUTION OF SPINNING® AND INDOOR CYCLING

Let's discuss the roots of indoor cycling, its evolution, and what it has unfortunately evolved to in many clubs. We'll also discuss what makes a good IC (indoor cycling) program and a great instructor.

THE ORIGINS OF SPINNING®

Johnny Goldberg (known as Johnny G) started Spinning® in his garage in 1987 in Los Angeles. He was training for the Race Across America (RAAM) and wanted to spend more time with his pregnant wife while he was training. He took apart a stationary bike, laid it down over his road bike, and welded the pieces back together to mimic the same geometry of his road bike. He added a flywheel and created the original Spinner® bike prototype and started leading some training sessions in his garage for his close friends.

At the time, he was also a personal trainer and very charismatic individual, as well as a martial artist and music lover. Johnny realized the power of the mind-body experience from his martial arts training, and combined it with his cycling training, an element that helped to increase the popularity of his indoor rides. Soon, he had to build more and more bikes because the word spread quickly about this amazing new training method. People would call weeks in advance to get on the waiting list for a class.

The rest, as they say, is history.

Johnny G and his partner created Mad Dogg Athletics (MDA) and Spinning® in 1994, and contracted with Schwinn to manufacture their bikes. Spinning® first debuted at IHRSA (International Health and Racquet Sports Association) that same year. At first, most people thought it would be a fad and scoffed at the idea of riding a bike indoors. But within one year, there was competition, and you know you have a good thing when the competition arrives.

SPINNING® IS A BRAND

Many people do not realize that Spinning® is a brand. The words Spinning®, Spin®, and Spinner® are all branded trademarks. In order for an indoor cycling program to be called Spinning®, the club must sign a license agreement with Spin Fitness (formerly Mad Dogg Athletics), the owner of the Spinning® program. The license agreement is free, but in signing this agreement, the club agrees to adhere to the following: to hire instructors with a current Spinning® certification, to teach classes according to the Spinning® program manual, to only use the authorized Spinner® bicycles manufactured by Star Trac, and to abide by the trademark regulations.

If these conditions are not met, then the program cannot be called Spinning®. It must be called "Indoor Cycling," "Studio Cycling," or simply "Cycling" or "Cycle". Unfortunately, the term Spinning® has become generalized over the years, and it has become a generic term for *any* indoor cycling program, even ones that condone unsafe moves, have no basis in outdoor cycling, and ignore basic biomechanics and some of the most basic fitness tenets such as heart rate training.

Schwinn no longer manufactures the bicycles for MDA. The current manufacturer of the Spinner® bike (the only bike authorized under the Spinning® license agreement) since 2001 is Star Trac. Schwinn now makes their own bikes for their own indoor cycling program.

OTHER INDOOR CYCLING PROGRAMS

Many other indoor cycling programs have been created since the original Spinning® program emerged in 1994. Some are good from a cyclist's perspective, some aren't as focused on cycling.

After twelve-years with Spinning® as a Master Instructor since 1998 I resigned in September of 2009, I essentially became a "free agent" and now educate any indoor cycling instructor regardless of the bike or certification program. Though I believe the Spinning® program is a good basic program, they have not updated their science or programming in over a decade. A cyclist following the strict

Spinning® Energy Zones® and heart rate training may actually end up detraining, and is better off following the HR training guidelines in Part II of this eBook. An instructor who is hungry for knowledge must go outside of the Spinning® program for updated science and training principles. Even though Spinning's roots are from road cycling, that doesn't mean every Spinning® instructor is a cyclist or teaches like a cyclist, or for that matter, knows much about fitness and training. There are other excellent indoor cycling programs that utilize more updated training principles that are more closely aligned with an outdoor cyclist's goals. On the other hand, there are some programs I personally wouldn't recommend for anyone, cyclists or not.

Some of the other program/manufacturer names for indoor cycling you might encounter at your clubs are CycleOps, Schwinn Cycling, Lemond RevMaster, Cycle Reebok, Keiser, Les Mills RPM, Bally Reaction Cycling (a Schwinn affiliate), Heart Zones (Sally Edwards), Stage5 Cycling, Core Cycling (from Toronto), YMCA Indoor Cycling, and Tomahawk (a German company).

There is a new bike on the market that moves side-to-side. It's called RealRyder and I have to say that I was very skeptical when I first heard of it. But now, I give it a two thumbs-up. It requires core strength to keep the bike stable, which leads to a very realistic experience. After a couple of rides on this bike, I found I got a better workout, and it made me realize how easy it can seem on the standard indoor bike that goes nowhere. I recommend that you ride this bike at least two or three times before making a decision –it takes a little getting used to, but once you get the hang of it, it's hard to go back to an immobile stationary bike!

Some of these companies simply manufacture bicycles (such as Lemond), but most of the programs are aligned with a specific brand of indoor bike, such as Spinning®, Schwinn®, Keiser®, CycleOps® and Tomahawk®. There are a few recent programs that aren't married to a particular brand of bicycle and simply offer the education and training.

The programs I highly recommend:

Cycling Fusion: is a recent merger (late 2010) of Heart Zones Training and Stage5 Cycling (one of the best and most cycling specific programs available anywhere, created by a USA Cycling Coach and Cycling Team Manager).

Cycling Fusion has ambitious growth goals over the next few years – keep your eyes open for them in the near future. They aren't bike-specific but prefer to teach on bikes with power, such as the Keiser M3.

C.O.R.E Cycling (of Toronto, Canada): a rigorous and comprehensive cycling specific 2-day indoor cycling certification program. Also not bike specific.

CycleOps: both a bike manufacture and a program. The biggest advantage of CycleOps bikes is that they come equipped with Saris Power Tap power meters. Their education is led by Master Trainers with Exercise Physiology and coaching backgrounds, and a lot of real cycling experience. The disadvantage is that they have probably priced themselves out of most markets and are very exclusive. If you have access to these bikes, consider yourself very lucky.

With these certifications, you know you will get a true cycling experience without some of the fluff prevalent in many programs.

My own instructor training program launched spring of 2011 is called Indoor Cycling Association (www.indoorcyclingassociation.com) and is focused not on certification, but on continuing education and coaching for indoor cycling instructors. Our goal is to take what is taught in the outdoor world and apply it to indoor cycling, while at the same time ensuring that classes are still fun, entertaining, motivating and effective. (Please see Appendix D for more information).

Some programs are more designed around group fitness concepts and are not as based in road cycling. As an example, the Les Mills RPM program (which is very popular in Canada and gaining in popularity worldwide) has classes that are pre-choreographed by the company and instructors are required to teach *only* their choreographed rides to the music provided by the company. For me, I see limited application but I am probably not the best person to evaluate it, because I love creating my own profiles and using my own music, and helping instructors learn how to do the same. Therefore, I could never teach a canned program using the same music as other instructors. If you do take an RPM class, my only caution is to avoid the very high cadences they condone. Generally they avoid many of the silly contraindicated moves prevalent in many clubs.

Is there any one program that I would adamantly not recommend based on its teaching principles? Yes! Unfortunately they are growing fast and have lines out the door for their overly priced classes. It's called Soul Cycle of New York City (and now Miami). I hear they are expanding to numerous cities. Why don't I like them? Their menu includes 2 lb weights on the bike, or pulling on elastic bands suspended from the ceiling while riding. And pushups and crunches on the handlebars, and hovers and squats and one-arm dips….. Yes, all those things you would never do on a real bicycle and which detract from anyone's fitness or performance goals.

My hope is that you can take the suggestions from this book and apply them to whichever indoor cycling program to which you happen to have access (ok, maybe not Soul Cycle – they might kick you out).

These days, simply being a licensed Spinning® facility means little anymore. It is up to management to adhere to the license agreement and to oversee that the instructors are teaching safe classes. It is up to instructors to stay true to the program, and stay true to "real" road riding in their classes. When it comes down to it, it all depends on your instructor and his or her motivation to stay current, and also on his or her interest in riding a bicycle outside.

Someone who does not ride outside and teaches indoor cycling will often have less of an understanding of why proper cadence ranges and realistic resistance is important. This is not an absolute—I've met many excellent instructors who do not ride outside, but still attempt to *Keep it Real* indoors. I only wish they were more prevalent.

WHAT SHOULD A GOOD IC PROGRAM CONSIST OF?

When you learn what most certification programs consist of, it's hard to understand why so many instructors or clubs teach or condone such unorthodox and unsafe techniques. No *reputable* program that I know of (that has an 8-hour or longer certification) condones any of the aerobics-on-a-bike silliness that is described in Chapter 8.

My personal opinion is that there should be much more physiology, biomechanics and exercise science training principles in the mainstream programs such as Spinning®, Schwinn®, Keiser® and the like, but to be honest, it

is not very practical in a one-day certification. Cycling Fusion® is creating a series of certification levels that cover far more science, biomechanics, proper set-up, periodization, training principles and on-the-bike time than most programs; but the instructor must take three to four different levels of certification.

It would be preferable if there was a requirement that all indoor cycling instructors also have a basic group fitness or personal training certification, such as ACE (American Council on Exercise) or AFAA (Aerobics and Fitness Association of America) because it would ensure they had a little more knowledge of physiology. But few programs that I know of have this requirement, except CycleOps. Only Cycling Fusion suggests instructors also become USA Cycling Coaches.

A few programs do require the instructor to maintain their certification by obtaining continuing education credits every two years. However, this is not enforced by most programs or by any national standardized certifying agency, and is only very rarely enforced by club management and rarely adhered to by instructors. In indoor cycling, the is no national standardized certifying agency in the United States, so there are no standards or quality control. The Indoor Cycling Association has as its long-term goal to start this process, but that may take a few years.

THE INSTRUCTOR'S ROLE IN LEADING AN INDOOR CYCLING CLASS

An instructor of any group fitness class is taking on a very important role leading and motivating students to achieve potentially high intensities (and in some cases, *very high*). In my opinion, they should have an excellent knowledge of physiology and heart rate training. However, aside from the very basics taught in the certifications, many of them do not. Dare I say, too many instructors are not even certified. Many clubs and chains do not require much beyond the basics, or even care about the level of knowledge of their instructors. They just want bodies in the classes—*lots of them* (especially if there is an additional charge for classes above the membership).

Some instructors have told me that their management has told them never to talk about cadence or do any drills, at the risk of "confusing" or "boring" the students! There are some fitness chains that actually forbid instructors to teach using heart rate, believing that it complicates it too much for their members (I won't name names here, but I've heard this from some instructors who teach at facilities that are open all night long). I guess they think it keeps it simple for their members.

I believe this is a dangerous precedent; if the instructor knows little to nothing about heart rate or the intensity effects of this very cardiovascular activity, then how can they possibly understand how to safely and effectively guide their students to greater cardiovascular fitness? And, if students stay in the dark about this important component of their fitness, then they'll continue to take part in ineffective and even dangerous workouts.

An instructor who asks you to sprint for a minute doesn't know what he is talking about. An instructor who turns every class into a high-intensity anaerobic-fest is doing a great disservice to her students. And in my opinion, an instructor who looks like a deer in the headlights if you ask him a question about heart rates should be avoided at all costs.

Indoor cycling is different from other group fitness classes. Not everyone has to be the same level of fitness, and not everyone has to be doing the same things as the instructor or the other participants. This is one of the beauties of indoor cycling; the instructor isn't leading the group through a complicated set of choreography; instead he is challenging each rider to fulfill his or her own goals.

Therefore, I believe the role of an indoor cycling instructor is to be more of a coach than just an instructor leading the class. Indoor Cycling classes should be about *training* and not just *exercise*. This is true whether the student is a cyclist or not. I'll discuss this more in a moment.

QUALITIES OF A GOOD IC INSTRUCTOR

Although every instructor brings his own individual style to his classes, and different styles appeal to different participants, there are still some overriding salient characteristics that make up a good indoor cycling coach. The following

are the characteristics that I feel constitute an excellent indoor cycling coach and are what I looked for when I was program director at my club.

If your instructor has or does most of the following, then you are extremely lucky (and make sure to show your appreciation with a Christmas or birthday bonus—like a Starbucks card, because you know how much cyclists like coffee)!

- *has received and maintains a current IC certification*
- *attends continuing ed workshops and/or conferences to stay current and to get new ideas to stay fresh*
- *stays up to date on physiology and proper training principles—knows about aerobic vs anaerobic training, and how, when, and why to apply each one*
- *if she doesn't ride a bike outside, at least understands the needs of cyclists and the reasons why some cyclists may refrain from certain common indoor cycling movements (such as jumps or runs)*
- *teaches using heart rate and PE (Perceived Exertion)*
- *thinks of him/herself as a coach, and not just an instructor shouting out orders*
- *understands basic cycling biomechanics*
- *refrains from contraindicated movements and "aerobics-on-a-bike" like hovers, isolations, pushups, etc.*
- *never imposes a movement or position on a student if that student chooses not to participate*
- *never screams at students; instead of the drill-sergeant approach, uses other motivational techniques*
- *is not afraid to correct poor form, and is a stickler for proper set-up*
- *always rides with correct form and within the proper cadence ranges*
- *can teach off the bike if necessary*
- *offers options and modifications, both in intensity and mode*

- *preaches the importance of and encourages recovery the day after a hard training session*
- *plays a variety of music to appeal to different tastes; perhaps even asks students to bring in their favorite music*
- *changes profiles and playlists regularly*
- *treats the class as his students' workout, not his own (although there's nothing wrong with riding at the intensity of the students when appropriate)*
- *acknowledges every student during the class instead of just focusing on the front row or on friends*
- *takes an interest in students' goals*
- *is professional: arrives early, greets students at the start of class, doesn't end early, dresses appropriately, is available afterwards to answer questions*
- *uses a microphone to avoid yelling over the music (and to protect vocal chords)*

WHAT HAPPENED TO INDOOR CYCLING?

Why have some indoor cycling instructors or programs turned away from the safe concepts taught in their certifications? Is it the program's fault, or is it lack of standards in the industry? Is it the instructor? Or is it the club? If instructors have gone through this certification, and supposedly learned what is correct and incorrect, then how has it gotten so out of hand and turned into "aerobics-on-a-bike" in so many markets?

It may be caused primarily by instructors "re-inventing the wheel" or falling prey to the desires of the fitness market. The instructors get a piece of paper that says they are "certified" and enter the club environment, and it's as if they are thrown to the wolves. In order to find a regular class or to compete with long-time popular instructors and become popular themselves, they must often forget what they've been taught in orientation and start doing the crazy moves that the well-known "popular" instructors have been doing.

Sometimes they feel they have to give their students what they want, and the uneducated group-fitness population (who don't ride outside) often demands "harder," "faster," "kick-my-butt" classes every single time. Some instructors have the goal to be the favorite instructor at the club, which often means the one that makes you work so hard that you can barely move after class, or you feel like you're going to puke, or where the mark of a good class is when you leave a huge pool of sweat around the bike.

As a result, over the years certain moves began to appear in classes that were never taught in *most* indoor cycling certification curriculums (although some programs that aren't rooted in road riding actually taught some of these unorthodox moves in the past, many of which have since removed them from their programs). These are movements or techniques such as hovers, freezes/isolations, digs, squats, one-legged pedaling, pedaling backwards, push-ups, crunches, using weights or bands while riding, super-fast sprints with no resistance, and more. [See Chapter 8 for more information on what these are and how to avoid them.]

Some instructors who come from the group-fitness background take concepts from aerobics and group fitness classes and bring them into the indoor cycling room. They, and their students, feel it is too boring to sit in the saddle and ride and they want the distraction of constantly changing positions. Some unorthodox moves, like squats or hovers, cause a burning in the leg muscles, which is wrongly interpreted as a *good burn*. An uneducated population believes that these are indeed "good for them" and believe that harder is always better.

Additionally, almost anytime a "spinning" class is portrayed in the media, it is referred to as super-intense, or depicts participants practically dying on the bike or doing many of these unsafe moves. An example of this is how Spinning® has typically been depicted on the show *The Biggest Loser*. In November 2008, Jillian Michaels, the female trainer on the show with the kick-butt drill-sergeant approach, led a so-called Spinning® class with her participants on the official Spinner® bikes.

She took away their saddles (yes, *took them off the bikes*), and had her obese students leaning on their forearms. This made it virtually impossible to pedal with good form or to breath effectively. When they were allowed to sit in the

saddle, she slapped them on the legs to pedal faster and faster at cadences that made absolutely no sense, with little to no resistance, until they were practically beet-red. She had an absolute, total disregard for safety and appropriate technique or intensity. These are unsafe and improper techniques *for a fit rider*, much less an unfit, unhealthy person who is 100 pounds or more overweight!

The result? Instructors across the country came into their classes the next day to questions from students asking why they can't train like Jillian on *The Biggest Loser*? Why don't we take the seats away? Why don't you push us like she does? One instructor told me a student, after hearing the explanations of why they don't do those things, actually asked him, "Well if you're so good, why aren't you on television?" It's sad to think that people actually think in this manner.

All of the above is the cause of the adulteration of safe, effective indoor cycling classes.

But don't despair, good instructors and programs are still out there!

It's up to you, the cyclist, to weed through the crazy stuff and stay true to road cycling or mountain biking. (And if by chance you are reading this and are not a cyclist, or are an instructor unfamiliar with cycling, every word of this applies to you as well!) My goal with this eBook is to tell you how to make sure your own experience indoors is safe, effective, and *very relevant* to your outdoor riding. This is the ultimate goal. You will be provided with the ammunition to make choices that are good for your cycling passion and to make sure the indoor technique won't detract from your outdoor riding, while also showing you the incredible benefits of a properly executed indoor cycling experience.

AUTHOR'S DISCLAIMER

This is not an eBook that is specific to the "Spinning®" program or any one particular indoor cycling program, but rather one directed at any cyclist (or indoor cycling instructor) who wants to improve performance using *any indoor cycling class*. From this point forward, I will refer to general indoor cycling as IC. Anytime I use the terms Spinning®, Spin®, or Spinner® (with a capital letter and registration mark) I am referring to the licensed program, or to something specific within that program, or to my history as a Master Instructor for Spinning®. I may use the term "spin" or "spinning" without caps, and in this case I am referring to the common cycling term of riding at a lower gear at a higher cadence.

CHAPTER 4. WHAT ARE THE DIFFERENCES BETWEEN YOUR ROAD BIKE AND AN INDOOR STATIONARY BIKE?

In this chapter we will look at the features of the most common indoor bikes that are similar to your road or mountain bike, and what features are different. Some of those differences will have an implication on whether a training technique is beneficial indoors or not. There are in fact situations when your road bike on an indoor trainer is more beneficial than riding an IC bike.

INDOOR BICYCLE OPTIONS AND FEATURES

The original Spinner® bike invented by Johnny G and manufactured by Schwinn was built using the same geometry of a standard road bike frame to mimic a road bike as much as possible, and to bring the experience of riding outdoors indoors. The current Star Trac Spinner® bike as well as the current Schwinn, because of their geometry, feel much more like a road bike than many of the indoor bicycle models out there, especially the ones that are v-shaped. The CycleOps indoor power bicycles are amazing. They have a flywheel in the rear, which gives them a similar look and feel to a road bike.

Most bicycles are chain-driven and it seems to be the industry standard. Some of the older models of some brands were belt-driven but have switched to chains (Reebok). Lemond RevMasters and some older models of Keiser bicycles are still belt-driven. You'll have to ride them to judge the difference.

Most indoor bicycles apply resistance to the flywheel by means of a brake pad that presses on the flywheel. The higher the pressure, the higher the resistance; consequently, the harder it is to pedal. Older models have caliper brakes that squeeze in from the side; however most manufacturers have moved to a single pad that pushes downward. This improves the wear and tear and has fewer maintenance issues.

A newer method of applying resistance has emerged using a magnetic eddy current (the Keiser M3 and the new Schwinn AC Performance). The Keiser has a lever for resistance with a range of 21 "gears" which actually gives them a very

smooth pedaling action. If you have a chance to ride the Keiser M3, I think you will be amazed at how smooth it feels.

The resistance of most brands is applied by turning a knob, which allows an infinite array of resistance—you simply dial in the gear you want. Some older models of some brands (Reebok) have a lever that clicks a certain resistance into place. In my opinion these older ones are frustrating because you can't control your own resistance as much as with a knob.

Of course, there is personal preference with indoor bicycles just as in any bicycle. More than anything, your enjoyment and success in an indoor cycling environment will come down to how well the club maintains the equipment, which is extremely variable from club to club, and to the quality and training of the instructors.

You may not have a choice of bikes because you simply need to ride the bikes at the nearest, most convenient facility. But if you do have a choice between two clubs with two different types of bikes, it would be wise to experience the bicycles first; ask if you can take a class or two for free or if you can come in and ride the bike on your own before joining.

Ask the club management how often they maintain the bikes (a quick look at the bikes will tell you if they're telling the truth). There's nothing worse than sweaty bikes that aren't cleaned after every use. Bikes that are not well maintained will rust quicker, they may squeak or grind as you pedal, the chains and bottom brackets will loosen easily, and you'll have an uneven, jerky pedaling motion. If you are a member in a club with poorly maintained bikes, make sure to put your foot down and demand that management take better care of them. After all, you are paying to take their indoor cycling classes!

USING POWER ON IC BIKES

If you have access to classes on bikes with power, you have an advantage; the use of power indoors will assist in improving your performance, and your chances of having a cycling-specific workout are increased. However, it may be quite a few years before indoor bikes with power take hold in this industry and become the norm.

The number of manufacturers of indoor bicycles that measure power is increasing but the high cost of these bikes will keep many clubs from purchasing them, especially as we emerge from a down economy that had a major impact on the fitness club industry. Many club owners aren't convinced the extra cost is worth it, especially if their markets are primarily fitness and not performance oriented. This is unfortunate, because not only do bikes with power improve the performance of the user (you, the cyclist) but they will also lead to much greater weight loss for the fitness participant.

The original power bike was created by a company called CycleOps (manufactured by Saris, the creator of the PowerTap for outdoor bicycles).

A few years later, the Keiser M3 was released. In early 2009, Schwinn launched a bike with power, but soon after, Schwinn went bankrupt, so the promotion and distribution of this bike was on hold until they were sold later that year. When their power bike was launched in 2010, there were so many problems with the power element, they had to stop production, and have only recently relaunched the power element. As of the release of this 3rd edition of Keep it Real, the Spinning® program is on the verge of launching its first bike with power at their World Spinning and Sports Conference, so I do not have any more information about this bike.

As of this writing, Keiser is the #1 manufacturer of bikes with power.

CycleOps uses the same technology as the PowerTap. It is a direct measurement of power, and thus, is the most accurate.

The Keiser M3 and the Schwinn AC Performance use a different technology and is an *estimate* of power. It is an algorithm based on a combination of the gear level and the cadence, not on the applied force to the pedal or bottom bracket.

It's not quite as reliable as the CycleOps; the difference can be as high as 20–40 watts from your own true power output. However, the estimate of power still has relevance when compared from training session to training session and gives you objective, consistent feedback, which is what is lacking from the standard indoor bicycle. I love teaching on the Keiser bikes with power, and have used it to help my students reach a much greater level of fitness and performance than they would have without the assistance of power, regardless of whether it is estimated or not.

Measuring power in indoor cycling classes is, unfortunately, a long way off from becoming the standard. However, keep your eyes open for a club near you that purchases bikes with power.

DIFFERENCES BETWEEN A ROAD BIKE AND AN INDOOR BICYCLE

Indoor bicycles are similar to outdoor bikes in some ways, and dissimilar in other ways. Some of the differences will have implications on how you might ride differently indoors than you would outdoors, and whether certain training techniques are beneficial. This is the same for *most* common brands of IC bikes, and includes the following:

- the frame doesn't flex or bend (except Real Ryder which I will discuss separately)
- a weighted flywheel uses inertia to help turn pedals (some models more than others)
- fixed gear
- your preferred cadence indoors will be higher than preferred cadence outdoors
- on most IC bikes, set-up can only partially replicate your set-up on your road bike (some better than others)

- difference in quality of the components—this is important when considering powerful cycling movements indoors

I'll cover each one of these in more detail, and explain how it may alter the way you ride indoors versus your form or technique outdoors.

THE FRAME DOESN'T FLEX OR BEND

Indoor stationary bikes are solid pieces of metal that don't go anywhere. Because the frame doesn't flex or bend, it doesn't absorb or dissipate energy like a bicycle outdoors.

As you pedal, you are creating energy that must be dissipated as you ride. Outdoors, this is done through the flexing of the bike frame and through any side-to-side motion as you are riding. Outdoors, you want to ride with as little upper body movement as possible because excessive upper body movement is wasted energy. Because of the bike flexion and movement, energy is released through the movement of the bike. As a result, the energy created by the legs doesn't get trapped in your own body and you don't feel it in your joints.

Conversely, if you try to keep your trunk and shoulders completely still on an indoor stationary bicycle as you ride seated in the saddle, you will soon notice that there is a stiffness to your riding that manifests itself as an ache in the neck, shoulders, and/or low back. This is because energy is trapped in the joints; the moment you relax and allow the trunk and shoulders to move slightly side to side, that stiffness and ache go away.

Mind you, it is not a contrived or rocking motion, nor is it a flopping motion; it's a subtle relaxed side-to-side movement in the shoulders and trunk. In the Spinning® Program, this upper body movement is referred to as a *Rhythm Release*, and it is intended to compensate for the lack of movement in the bike frame. That said, the original concept in the early days of Spinning® was actually an over-exaggerated movement in the upper body, both side-to-side and up-and-down. Some instructors morphed it into a kind of "push-up" matched to the rhythm of the music and pedal stroke. This is one of the reasons why "push-ups" became popular early on, and why they won't go away.

But no program (that I know of) condones them anymore. Push-ups while riding a bike are a dumb and ineffective idea. Dancing the shoulders around *too much* is unsafe and is a silly way to ride a bike.

There are some IC instructors who purposely ask you to "freeze" or "isolate" a muscle group as you ride, whether on a flat road or a climb, seated or standing. This quickly turns into a burning sensation in the muscles, and is often misinterpreted as a "good burn." I cover the reasons why this is incorrect in more detail in Chapter 8, but suffice it to say if an instructor asks you to freeze or isolate any part of your body as you are riding indoors, ignore the request and keep up the subtle upper body movement.

To see for yourself, try the following exercise on an indoor stationary bike. You'll soon see why a slight upper body movement is important.

- Ride seated at a cadence of around 90 rpm with moderate resistance.
- "Freeze" your shoulders and trunk, as if you were balancing a glass of water on your head and you didn't want to spill a drop.
- Notice the ache in various joints of the body: neck, back, shoulders, hips, even the knees.
- Now "unfreeze" and allow a subtle, gentle movement to happen in the shoulders. Any of the aforementioned aches should go away. Isn't this the way it should feel when you're riding?
- Try the same thing in a seated climb and a standing climb.

Outdoors, if the hill became steep enough to warrant a standing climb, you would rock your bike rhythmically side to side in an arc of about six inches depending on the hill and your desired speed. This allows you to gain leverage and it makes the best use of your weight as you stand.

Indoors, you obviously can't rock a stationary bike side to side when you stand. You must compensate for this by rocking your trunk slightly side to side*, at the maximum about six inches* (three inches to each side). This allows you to gain leverage while keeping the upper body relaxed and loose. "Freezing" in a standing climb causes pain in the shoulders, neck, back, and possibly the knees,

and reduces the amount of power you can apply to the pedals because of the lack of leverage.

This side-to-side movement often is taken to the extreme. You'll see some instructors literally pumping up and down and back and forth as they climb out of the saddle. Sometimes they come down so far as they pull on the handlebars, it appears like they will knock their teeth on the bars. You want to make sure you keep it realistic to what you would be doing if you were on your real bike. No need for an unexpected visit to the dentist or risking throwing out your back - tone it down!

WEIGHTED FLYWHEEL AND FIXED-GEAR SYSTEM

Depending on the brand and model of the indoor bicycle, flywheels can weigh as much as 38 to 48 pounds. When they are weighted on the rim, the resulting inertia provides for a smoother feel to your pedal stroke. The flywheel is attached to the pedals via a fixed-gear system, either using a standard bicycle chain or a belt. For most IC bicycles, the fixed gear means that once the flywheel is rotating, so are the pedals. In fact, the flywheel helps move the pedals. This effect is increased as the speed of the flywheel increases. (Both the Lemond and the Keiser bikes have flywheels that are not as heavy and this effect is slightly less on these bikes).

These inertial characteristics of the weighted flywheel allow indoor riders to "cheat," most often without knowing it. Have you ever heard someone say they ride three to four times a week but never seem to lose any weight or get any stronger? Now you know why.

The inertia of the weighted flywheel has enormous implications in cadence and resistance selection, and whether a participant is actually doing much of the work or not.

With just a little momentum, a rider can virtually spin her legs at 120 or more rpm without producing much real "work". You can see this simply by standing next to an IC bike with a heavy flywheel (such as Star Trac or Schwinn) and turning the pedal until it's rotating very quickly. When you let go and there's no resistance, it will take a long time for that pedal and flywheel to come to a stop. For riders with little to no resistance, it's a similar situation; it's as if they are

being ridden “by the bike” instead of “riding the bike.” They are simply strapped on for the ride.

The rider’s heart rate may still be elevated, but they aren’t performing any real work. Without a power meter to quantify how much output there is, many riders on IC bikes will never know what they are really doing (or not doing). Hopefully the following can explain this concept a little better.

The definition of “work” is **Power** (the amount of work being done by the rider) = **Force** (the amount of resistance) **X Velocity** (how fast the rider is pedaling, or rpm).

It’s the “force,” or resistance, that is often missing in indoor cycling.

I’ll relate a story from a certification class I taught quite a few years ago in Miami. I was discussing the concept of a “realistic” cadence that would mimic what one might encounter outdoors. I wanted them to ride at around 90 rpm on a flat road, and even had a metronome which beeped at the pre-set 90 times per minute. I held the metronome up to the microphone so they could follow the beat and pay close attention to what this cadence felt like in their legs.

Despite the metronome, one woman was still pedaling very, very fast (about 140 rpm). I stood next to her and coached her to add resistance in order to slow her legs down. Each time she turned the knob just a few millimeters. “More,” I said. “You’re still way too fast, you need more resistance”. After six or seven increases (she was obviously starting with zero resistance), she finally had enough resistance on the wheel to slow her legs down to around 90 rpm.

“There! That’s it!” I said.

You know what her response was? I can still remember how surprised I was to hear it, and this moment was like a revelation for me, as I finally understood why some instructors *just don’t get it*!

“Oh!” she replied, *“You mean a hill!”*

“No, it’s not a hill! It’s a flat road!” I responded, incredulous.

I tried to explain to the class that a flat road has resistance. Indoors, you should rarely if ever ride with *no* resistance, it just doesn’t make sense (unless you’re

cooling down perhaps and just "soft pedaling"). Outdoors, there is *always* resistance, no matter what you're doing.

This woman, who was about 20 pounds overweight, explained to me that she had been taking Spinning® classes about three times per week for the past few years, and *that's the way they did it in Miami*—super fast legs to fast Latin music. She asked if that's why she had never lost any weight.

What do you think the answer is? If she wasn't the one doing much of the work, how would her body burn the calories? How would her leg muscles be able to get stronger?

The problem is that fast-moving limbs may still cause an elevated heart rate and breathing response, even when there isn't much resistance or when power output is low, because pedaling faster exerts an increased demand for blood and oxygen to the muscles. Therefore, due to the elevated heart rate, riders often wrongly believe they are receiving a substantial training benefit. Furthermore, since heart rate monitors use heart rate to calculate calories burned (an unreliable method), these high heart rates also send the wrong message that a lot of calories were burned, when in fact they probably were not. A power meter would clearly show that not very many calories were actually consumed in turning those pedals quickly with no resistance.

In the case of this young woman from Miami, increasing the resistance and reducing the cadence will produce much greater results. She would actually most likely finally lose weight!

Outdoors if you jumped on your mountain bike in your granny gear on a flat road, when the bike didn't go very fast, you'd gear up, which is the outdoor equivalent to adding resistance indoors. Outdoors it's much more intuitive because either the bike moves forward quickly or it doesn't, and you respond by increasing the gear, which effectively slows your legs down. But on an indoor bike, you don't have the lack of forward movement to tell you that fast legs without a gear underneath them doesn't make sense.

Now, you as a cyclist may think you understand this, *but do you*? I've seen cyclists in my classes riding with very fast legs. Perhaps they think they're training their leg speed?

When there's little to no resistance, as mentioned before, the inertial characteristics of the flywheel pull the pedals (and hence, the legs) around. If your feet are being pulled around by the flywheel, then you also aren't getting the neural benefit of training leg speed (don't despair, you still can train leg speed to a certain extent if done properly. More on this in the following point, and in Chapter 7.) Furthermore, it won't provide the training benefit you're looking for; it would be like riding in your granny gear on a flat road—a child on a tricycle would go faster than you.

If all IC bikes had power meters, this dilemma would be instantly solved because riders would see quantitatively that it makes no sense to ride at high cadences with little to no resistance because their power output would be so low. In the absence of power meters, it is up to the instructor to coach a "real" resistance, or it's at least up to the participant to always make sure there is resistance on the wheel. This is what I call "*Keeping it Real*" (*In Vélo Veritas*). The solution is to truly understand what a "real" resistance would feel like. I always remind my class that "low resistance does not mean *no* resistance" and that a flat road always has resistance.

As you gain more experience with IC bicycles and classes, you'll discover how much resistance you need to add in order to accurately represent the road you're on. Don't be fooled by the flywheel and those fast legs!

On the Indoor Cycling Association website, I teach instructors to teach their students to "pretend" that they have power meters. This entails understanding some of the science of power and of pedaling a bicycle properly. (Check www.indoorcyclingassociation.com for more information)

PREFERRED CADENCE INDOORS IS HIGHER THAN PREFERRED CADENCE OUTDOORS

As a result of the weighted flywheel, you will find your average preferred cadence indoors to be anywhere from five to ten rpm higher than your average preferred cadence outdoors (for novice cyclists, this can be even higher).

With this in mind, can you improve your average outdoor cadence or pedal stroke technique with training on an indoor bicycle?

That's the $6 million question: "Do cadence or pedal-stroke drills work indoors with a weighted flywheel?"

I believe that as long as you comprehend the difference between pedaling outside and pedaling inside with a weighted flywheel, you can improve your pedal stroke and your average cadence…to a point. The "inertial characteristics" referred to above are reduced when resistance is applied, but not completely negated.

In other words, there will always exist some element of assistance from the flywheel. Nevertheless, most cyclists, especially novice and recreational cyclists, can probably still improve their pedal stroke technique and preferred cadence indoors with properly executed drills.

I know from my 13 years of teaching Spinning®, and only riding outdoors half the year (since I live in a ski area), that I have improved and maintained my average preferred cadence outdoors through my indoor training. But I am diligent about the amount of resistance I apply and spend a lot of time working on pedal-stroke drills and cadence drills. (I've included some of these drills in Chapter 13.)

Nevertheless, I believe that for a more advanced cyclist who wants to fine-tune pedal stroke and improve leg speed, it will be necessary to do one-legged drills and high-speed cadence drills on a road bike on a trainer. This will allow him to take advantage of the neural training of leg speed drills without the assistance of the flywheel. An indoor bike can only improve it to a certain extent. But this may only be necessary once per week, with the rest of the off-season training time spent in IC classes.

DIFFERENCE IN QUALITY OF COMPONENTS

Indoor bike manufacturers must find a balance between quality, affordability, and durability for the fitness market. Therefore, though the components are fairly heavy duty and designed for frequent usage, they are limited in how much force they can take. I am referring to the drive train, including pedals, crank arms, and bottom brackets.

What this implies is that you do not want to do high-power moves on an IC bike, such as "stomps", in which you start from a stand-still and stomp down on the

pedals quickly to build maximum power in the legs. This is especially true for a heavier individual. The metal in the crank arms or pedals may not stand up to the pressure and may shear off with the force. This is even more important if the bikes are older and if they are used with heavy frequency multiple times per day, and most especially if they are poorly maintained. You can imagine the injury potential if your crank or pedal broke in the middle of a forceful downward push.

So please, if maximizing your power is your goal, save these high power moves for the springtime on your bicycle outdoors!

CHAPTER 5. PROPER SET-UP INDOORS

INDOOR SET-UP CAN ONLY PARTIALLY REPLICATE YOUR SET-UP ON YOUR ROAD BIKE

You know how important your set-up is outdoors. Many cyclists have spent a lot of time, and sometimes a lot of money making sure their set-up on their road bikes is perfect. It is just as essential indoors, though most indoor bikes cannot replicate your road bike set-up exactly.

It is for this reason that the aero position is NOT recommended for anyone, even those who ride in an aero position outdoors. (See Chapter 8.)

On most older IC bikes, saddle and handlebar height are set using pop pins in holes in the seat or handlebar post that are ½ to ¾ inches apart, which means you cannot fine-tune your adjustments. In most newer models the holes are set closer together, allowing a little better adjustment. Pop pins are used by most manufacturers for safety and ease of set-up for the general population. There are a few brands with sliding seat posts with infinite set-up positions for seat height, but the risk is that the general public may not tighten it enough and the seat will slide down while the student is riding, risking injury.

However, some models have seat sliders that allow an infinite array of positions for fore/aft position of the saddle. This, fortunately, does allow you to fine-tune your knee position over the pedal spindle.

Indoors, handlebar height is not as important because aerodynamics is not an issue. Furthermore, because of the added confusion to the average non-cyclist student, most IC bike manufacturers decided not to include a fore/aft adjustment for the handlebars. Lemond and RealRyder bikes do have this adjustment (and newer Keiser models in 2011 will have fore-aft adjustments), but to be honest, few instructors know how to set the handlebars correctly, and even fewer students know where to slide the handlebars in relation to their legs. This added adjustment probably leads to more mis-adjustments than it helps to alleviate.

For optimal set-up, you will need a partner and a plumb line. The latter can be a fishing weight, heavy nut, or large washer tied to a 24-inch piece of string.

The following is the proper technique for the most optimal set-up on an indoor bike.

1. SADDLE HEIGHT

Begin by moving the saddle to the center of the fore/aft slider, so that any adjustments you make later will not be drastic.

To get a rough idea of saddle height, stand with your hip close to the saddle and raise the seat post so the top of the hipbone is level with the top of the saddle. One way to check this is to lay your thumb on top of the iliac crest (the upper ridge of the hip bone) and with the hand parallel to the floor, rest the palm on the highest part of the saddle.

Next, while seated on the bike and with your hands on the handlebars (which for starters should be about saddle height), place the heel of one foot on the pedal, with the center of the heel in the center of the pedal and the sole of the foot parallel to the floor. Position the crank arms so they are almost vertical, but parallel to the seat tube—this is about one to two inches forward of bottom-dead-center. (This is the furthest point from your hip in the pedal stroke, where your knee will be in its most extended position).

In this position, the extended knee should be completely straight but not hyperextended, with the pelvis level. If you have to rock the pelvis to reach the pedal, it's too high. If the knee has some play in it, it's too low; raise it up one and try again.

Once you have found the correct height with a straight knee, then place your foot in the cleats (or in the toe clips, making sure the ball of the foot is resting on top of the pedal spindle). There should now be a slight bend in the knee, corresponding to 25–35 degrees when the leg is in the extended position, with cranks parallel to the seat tube.

2. FORE/AFT: KOPS (KNEE OVER PEDAL SPINDLE)

With your shoes clipped in, bring the crank arms parallel to the ground, with the front foot at the 3:00 position and foot parallel to the ground as well (don't drop

your heel). Your partner should kneel down next to your pedal to see that the crank arms are perfectly parallel and that your feet are level.

You should also ensure that you are sitting with the seat bones on the widest part of the saddle, where you will ride most of the time, and that both hands are on the handlebars during this adjustment. If you do this adjustment several times and it is different each time, it is usually because seat position has changed on the saddle.

Have your partner place the plumb line string at the tibial tuberosity (the bump just below the knee cap). Let the weight fall straight down to the top of the shoe. The tibial tuberosity is where the patellar tendon attaches to the tibia and is where the force of the quadriceps muscles is directed (this is why it is essential to get this position correct).

The weight should intersect the pedal spindle. To be sure, you can tip the knee in slightly, letting the weight fall to the inside of the foot, making it easier to see if it intersects the spindle. If it is too far forward, move the seat back by the same amount; if it's too far back, move the seat forward.

VERY IMPORTANT: This set-up is assuming that all the saddles have been installed on the rails in the same spot. You never know if the maintenance person who originally set up the bikes in the gym had a clue about where the saddles should be on the rails. If you get yourself really dialed in on one bicycle to where you feel you are as close to your road bike set-up as possible, it might behoove you to arrive to class early to always get the same bike. Otherwise, it might be a good idea to carry your plumb line with you if you end up with a bike that has a saddle that is obviously installed on the rails in a different spot.

3. HANDLEBAR HEIGHT

For a cyclist, the goal is to mimic your road bike handlebar height as much as possible, erring on the side of too high if you find that your normal position would be between two pop-pin holes. If after a few classes you feel any tension or ache in the upper back, shoulders, or neck, try raising the handlebars.

For shorter cyclists who have difficulty reaching the handlebars (on models without a handlebar fore/aft adjustment), simply raising the handlebars on most models of bikes (Star Trac, Schwinn etc) brings the bars a little bit closer. Because there are no aerodynamic issues indoors, this raised position should have no adverse affects on your riding.

Riding in a very upright position, as one might do on a beach cruiser, will prevent you from applying the correct force to the pedals. This is fine for the non-cyclist or average fitness participant, or for a rider with a disability or temporary injury that requires raised handlebars (back, neck or shoulder issues), but for a cyclist with performance goals, place the handlebars as close to where you ride outside as possible, which is probably at least level with the saddle. A more aggressive cycling position will have handlebars lower than the saddle but this requires good flexibility. If you prefer riding here, just be sure this does not pull the lower back into a rounded position.

One note about the Keiser bikes. They have a design flaw that makes it challenging to set up shorter riders with short arms. When the handlebars are raised, since the “fork” angles away from the bike’s center, they are also pushed further away. For riders with shorter arms or trunks, this means that to have the handlebars closer, they also must be lowered, which can exacerbate any neck or shoulder issues. (This disadvantage with set-up should be alleviated with their new 2011 models which will have fore-aft adjustments, but that doesn’t help you if you are a short rider on the Keisers now).

CHAPTER 6. MOVEMENTS USED IN INDOOR CYCLING CLASSES

In reality there are only two "positions" on a bicycle. Either you are seated in the saddle or you are standing. Everything else you do is a variation of these two. You vary your speed or power output by making changes in gear and cadence as well as by changing the terrain.

When you think about it, the same rule applies (or should apply) indoors. However, indoor cycling programs have a plethora of "movements". If you are going to attend indoor cycling classes, it's important to know what movements are typically used in these classes. I'll describe here the positions and movements use in a Spinning® class (since they were the first to develop them), but know that most of these movements are also used in many other programs, though some may have a different name.

I'll also describe each movement's relation to outdoor riding, why it's applicable or not applicable to your training for outdoor riding, and how you can decide whether to perform the movement or not when taking a class. There are only a few of the "acceptable" movements that might have questionable application to your outdoor riding (i.e. runs and jumps), though there are many "contraindicated" popular moves or positions (i.e., unsafe movements) invented by instructors that everyone, cyclist or not, should stay far away from when riding indoors. Those will be covered in the next chapter.

Spinning has five "core" movements and four "advanced" movements. That's a lot! The core movements are seated flat, standing flat, jumps, seated climb and standing climb. The advanced movements are running with resistance, jumps on a hill, seated sprint and sprinting on a hill.

No wonder instructors seem to think they must constantly be changing positions in class; Spinning® has given them these nine different movements, they feel they've got to use them all in every profile.

SEATED FLAT

This is the most common position used in IC, and it's also where we spend most of our time on a road or mountain bike. *It's where you ride*, and is the single most important position in cycling, but you would never know that judging from many IC classes, some of which spend as little time as possible seated in the saddle.

This is where you should spend the bulk of your time when using IC to train for your outdoor rides. It's where you should ride at the beginning and the end of class to warm up and cool down. It's where most of your technique improvement takes place, such as pedal stroke and cadence. Since this is the most common riding position, many of the form elements of a seated flat discussed below are applicable to the other positions while riding.

PROPER FORM IN THE SADDLE

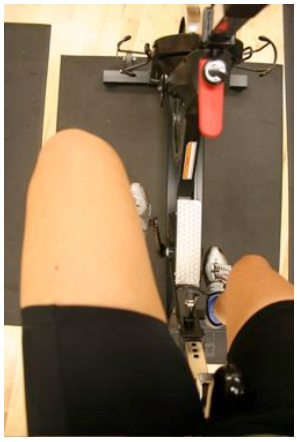
Seat bones should be on the widest part of the saddle. Shoulders are relaxed and away from the ears (towards the ribs). Elbows are slightly bent, wrists relaxed, fingers not gripping the handlebars. A common error both outdoors and indoors is to ride with the elbows locked, resting the weight of the upper body on the stacked arm bones. Indoors is a good place to get rid of this tendency. Of course, you won't hit any potholes indoors so you won't have the physical reminder that this is unwise, but you can constantly remind yourself (or hopefully the instructor will be reminding the class) to soften the elbows.

KNEE POSITION

Your knees should be positioned directly over the second toe. Notice the knee position in the photo at the right; there's far too much air between the bike and the knees. If you're the type of rider that has the very common tendency to let the knees fall to the outside when riding outdoors, then IC classes are an excellent place to fix this bad habit. There are several good visual checks to help you know if your knees are properly positioned. These apply to any

movement, but a seated flat is the best place to perfect it.

The first is to look down at your feet as you're pedaling. When your knee is in the up position, it should hide your foot from your view for half of the pedal stroke (photo on left). If it isn't, then your knees are too far out to the side, even by just a very small amount (photo on right). Notice how you can see the foot throughout the entire pedal stroke.



As your knee rises on the upstroke, aim it towards the inner third of the handlebars, whether seated or standing, riding a flat or a hill. If they are pointing more towards the outside of the handlebars, then you can be sure knee alignment is off. Another check is to make sure you feel the nose of the saddle touching the inner thighs.

Tight ITBs (iliotibial bands) can lead to misaligned knees when pedaling. The IT band is the sheath of tissue running vertically on the lateral side of the leg. It extends from the TFL muscle (tensor fascia latae) near the gluteus medius at the hip, and attaches to the upper lateral side of the tibia, crossing the knee joint. Tight IT bands are a common cause of knee pain. When seated, the ITB pulls the knees outward. Cyclists have chronically tight IT bands due to riding in a flexed position for hours at a time. If yours are tight, there are several good stretches you can do. Ask a physical therapist, a personal trainer, or a massage therapist for good IT band stretches.

If your knees (or sometimes just one knee) always fall to the outside no matter how much you try to fix it, then it could be an anatomical issue, which may require a physical therapist to help overcome, if it is in fact possible to change. It could be due to a leg-length discrepancy or a misalignment deep in the hip joint.

It could also be your cleat position. Double check to make sure your cleat position is centered properly. Your toes should be directed straight ahead on the pedal. If your feet point slightly outward when clipped in, this could also cause

the knees to fall outward. If you are unable to determine whether your cleats are positioned correctly, your LBS may be able to help with this.

FOOT POSITION

Instructors are taught to cue a flat foot as you pedal on a flat road. As you may know, good cyclists have a slight toe drop through the bottom part of the pedal stroke; this is because it's more efficient to push the pedal than it is to drag it. However, many non-cyclists tend to pedal with their toes pointed down throughout the entire pedal stroke. I'm sure you've noticed this with novice cyclists outside. Pointing the toes down requires a contraction of the calf muscles through the entire pedal stroke and can lead to muscle cramps.

Since the majority of indoor cycling students are not outdoor cyclists, you can see why it's better for the instructors to cue a flat foot than a toe drop at the bottom—novices almost always tend to over-exaggerate. As a cyclist, you will develop your own efficient foot position as you pedal. Don't try to force a dropped toe at the bottom; let it happen naturally.

HAND POSITION

The Spinning® program allows two hand positions for a seated flat. The first is what they call "Hand Position 1" (HP1) with hands touching or cupped in the center of the bars. They claim it is the aero position pulled in for safety and comfort. I personally never bought into this position and only originally used HP1 because I was "supposed" to as a presenter. For you as a cyclist (or even for non-cyclists), don't do it! It has no relation to how you ride outside.

The second "acceptable" hand position is what Spinning® calls "HP2," with your fingers wrapped around the handlebars. This is where you're going to ride for most of your time on an indoor bicycle and it's where you ride outdoors much of the time.

Many road riders like to place their hands on the outside, just

past the bend of the handlebars. It's very strange that it is not an "official" hand position in Spinning® (they refer to it as HP2.5). You may still find instructors who ask you not to ride here; most other IC programs don't care. I never understood why this should be a "forbidden" hand position, as it is where I personally ride my road bike most of the time.

Many riders allow their hands to slide too far forward, ending up in a stretched-out position with the hands on the bar ends while seated. On your road bike with your hands on your hoods, your arms are not as extended as they would be on an indoor bike all the way on the bar ends. On your hoods, you are only an inch or two forward from riding on the outside of the bend of the bars.

How do you know where to put your hands? Try to keep a 90 degree angle at your shoulder when your hands are on the handlebars. You can see in the photo below that the angle of the upper arm to the trunk is well over 90 degrees and is therefore too stretched out.

There is a lot of real estate between the bar ends and the part of the handlebars closest to you, so riders are tempted to use it. However, for all but the very tall person, riding seated with the hands past the middle of the handlebars, especially all the way out on the bar ends, is akin to riding a bicycle that has a top tube or stem that is far too long for you. If you've ever ridden a bike that is too big for you, you know how uncomfortable that overstretched position is. Nor is it an effective way to ride. Riding seated with the hands on the bar ends is uncomfortable and ineffective, unless you are very tall with long arms (as in, 6'4" or more).

For some reason, this extended hand position is a common indoors while seated. Perhaps the instructors promoting this are not real cyclists? Being overly stretched out like this can lead to potential neck and shoulder pain. Because of the over-flexion at the hips, breathing muscles are often compromised, and the knees are often forced out to the side. This is especially true if the rider is of short stature, has a large waistline, and/or is inflexible in the hamstrings, glutes,

or low back. Tight hamstrings will pull the spine out of a proper lumbar position, risking back pain and injury. I'll discuss this a little more in Chapter 8 under unsafe indoor cycling positions.

The takeaway is to place your hands where you are comfortable riding, simulating your outdoor riding position(s) as much as possible, as long as you don't find yourself overly stretched forward past 90 degrees. Change hand positions as needed to avoid discomfort or numbness. Don't let an instructor yell at you to put your hands in a certain place you know is ineffective.

CADENCE

Cadence indoors is potentially very different than outdoors. It is such an important topic that I have given it its own chapter, following this one.

STANDING FLAT

This movement in indoor cycling is often called a "run" or a "jog." It is not something you would do for long periods outdoors, but indoors it provides a means for increasing intensity and most importantly to provide variety and get students out of the saddle. As mentioned before, the majority of indoor cycling students are not outdoor riders, so IC programs must find a way to keep their interest by adding variety while still keeping it safe. These students do not see the reason for sitting in the saddle for long periods—in fact, many wouldn't come if they have to sit for long. "Runs" and "jumps" are staples of these non-cycling IC students.

I don't like the term "standing flat" because it has led to riders thinking resistance must be low if it's a flat road, so as a result they flop around with the resistance too low. When you stand up, you now have gravity and body weight in your favor – you must increase the resistance when standing otherwise your feet will bottom-out. But I also don't' like the term "run". Even just the terminology of "running" on the bike has added to the prevalence of circus tricks in so many classes worldwide. Are we running or biking? Better to just say "stand up".

WOULD A CYCLIST RIDE LIKE THIS?

As a road cyclist, you can decide whether or not you want to stand up for long on a flat road. It does give you a chance to stretch your legs and take a saddle break, and it helps break the monotony of long periods in the saddle but as stated above, outdoors you wouldn't stand for extended periods while pedaling, past 30 or 40 seconds (and more likely much less). However, as a cyclist, I bet when you stand up on this so-called flat road, you probably understand to add enough resistance to feel like you're on a small hill.

On the other hand, I had a student in my class not long ago who was visiting from New York. He said he was a Spinning® instructor and that he was also a competitive cyclist. He definitely looked like a cyclist in his team kit, but he stood up in a "run" almost the entire class. I just didn't get it. I do not think that's how he rides his bike when he's training or racing!

I don't use a *standing flat* as a separate movement anymore in my classes; since I left Spinning®, I've taken it out of my vocabulary. Now, if we're on a flat road, and my students need a break, or we're going to do some out of the saddle surges, it simply becomes an out of the saddle surge (with resistance). If I'm taking a class where the instructor is changing positions from seated to standing flats or jumps frequently, I'll sit down for most of it.

PROPER FORM

With that in mind, there is a "proper" and an "improper" way to get out of the saddle on a so-called flat road. First of all, as stated above, add enough resistance to feel like a moderate hill, and move your hands to the side (I'll talk about hands in a moment). This way you won't waste energy by bouncing around and you can keep the connection with the drive train.

When standing, maintain about the same hip angle as you have while seated. In other words, don't "unfold" as you stand up, as in the photo at right.

Doing this usually requires you to perch yourself up on your fingertips – but if you've taken many Spinning® classes, you've probably seen this often. Many misinformed instructors will actually coach this upright position on the fingertips—I've even heard it referred to as the "Statue of Liberty". It looks more like you're trying to dry your fingernail polish. There is simply no reason to stand completely upright when riding; in fact, it leads to a choppy pedal stroke with an overly pronounced, side-to-side downstroke. Riders doing this look like they are on a pogo stick.

HAND POSITION

The problem with the Spinning® "standing flat" movement is that they teach that your hands should be in HP2 (close to you). Outdoors if you stand up on a moving bicycle your hands will intuitively move to the outside of the handlebars. This serves two purposes – it allows you to stabilize the moving bike and it puts your hands in a more biomechanically correct position relative to your more upright body. You're not going to injure yourself with your hands in HP2, but it's not very cycling specific and you'll find it's less comfortable on the wrists than on the sides.

Try it! Stand up on an indoor bike with your hands in both positions. Chances are, you'll agree that moving your hands to the outside of the handlebars makes far more sense and is more realistic to road riding.

CADENCE

What doesn't make sense from a cycling perspective is to "run" with a high cadence for long periods (more than a few seconds). The acceptable Spinning® cadence range (according to their manual) for a standing flat is 80–110 rpm, but this is silly. You would never pedal that fast (over 90-100rpm) outdoors on a flat road for an extended period of time (longer than 10-15 seconds), unless you are sprinting (in the Spinning® manual that is a separate movement). If you are going to stand up on a flat road indoors at a moderate intensity for longer than 10-15 seconds, a far more realistic cadence is closer to 70-80 rpm. (Well, actually, outdoors if you were just standing up to stretch the legs or take a brief saddle break you probably would just coast, but that's not possible indoors). There is no

cycling-related reason to spin the legs at high cadences while standing except when accelerating briefly for a sprint or jumping out of the saddle for a breakaway. If you're going to work on leg-speed drills, do it seated so you actually see some cycling specificity in the activity.

If your instructor is doing high-speed runs, it's not going to help you much with your cycling, so you can choose to stand for a while at the cadence you find comfortable, or choose to sit that one out.

COMMON ERRORS IN A STANDING FLAT

Novice riders will put much of their weight on the handlebars in a standing position. This is because they haven't developed the strength in their legs to support themselves as they pedal, even for short periods. Make sure you are not leaning on the handlebars.

One cue I'll provide to help avoid the leaning on the hands, is to imagine you have water balloons under your hands. You may squish them a little bit, but don't pop them by leaning on them.

The greater trochanter of the hip (the bony protrusion on the lateral side of the head of the femur) should be positioned directly over the bottom bracket. In this manner, you are neither leaning forward nor pushing the hips back. You are balanced over the pedals so you can maintain a smooth, consistent and round pedal stroke. In this position, novice riders will often have a very heavy downstroke and slight hesitation at top and bottom dead center of the pedal stroke. To improve pedal stroke, try to eliminate any hesitation at any point in the circle.

I mentioned the tendency for instructors to "unfold" in the standing position. One way you can tell you're doing this is if you have to perch yourself up on your fingertips when standing. I once knew an instructor who would place her first two knuckles on the handlebars and use these to support her as she stood up—I dubbed it the "cloven hooves". I'd look around the class and see students copying her. Just because your instructor does something silly, doesn't mean you have to!

One way to know you're in the correct position is to feel the saddle lightly brushing the back of the legs. If you don't feel it, you're probably too "upright." On the other hand, you don't want to push your butt back over the saddle as many instructors will have you do in the unsafe movement known as "hovers".

JUMPS

As you probably know, a jump is a specific movement in cycling used to start an attack, to break away from a group, to close a gap, or on a mountain bike, to power up and over a steep uphill or get over a log or rocky section.

Some indoor cycling programs refer to these as "lifts" or "combinations." Whatever the term, the true outdoor "jump" has been altered slightly in IC classes to be used as a drill. I believe jumps have gotten out of hand in most IC classes, but I do know that they are popular and can be fun for many indoor riders. Use your discretion if you decide to jump with the rest of the class for an entire song or two.

WOULD A CYCLIST DO THESE?

Some cyclists suggest that, "I don't rise out of the saddle rhythmically on my bike, so why should I do it indoors?" On one hand I agree, but I also have come to see jumps as a useful and fun drill indoors. If you think of them as a drill, you might accept them a little more. Take volleyball or tennis drills, for example. In order to improve one's ability to spike the ball, a volleyball player will stand near a wall and "pepper" the ball against the wall in a very rhythmic manner, over and over and over to improve reaction time and precision. This is not how you play volleyball, but it improves one aspect of your game.

Jumps in indoor cycling are similar to that concept. True, it's not how you *ride a bike outside*, but it can improve your short burst power output, or help improve your ability to react to an increased resistance in a smooth, controlled manner.

One thing is for certain; they can raise the heart rate, and are a great tool for intervals. Especially when performed to the beat of music, they are just plain fun for many IC enthusiasts. For non-cyclists, jumps provide the excitement and

variety needed to keep them coming back to class. The fewer the road cyclists in a class, the more likely you are to see jumps.

I rarely do flat road jumps in my classes, but when I do, they usually serve a specific purpose—to amp up the legs and get an anaerobic burn, to use as a drill in intervals, or to provide a little distraction if I see the attention of a predominantly non-cycling class start to wane.

As a road cyclist, you can decide to forego the jumps if you feel it detracts from your road riding. But if you want to have a little fun, as long as you follow the technique guidelines below, why not jump a little? If you avoid the crazy "popcorn" jumps and make sure you have good resistance on the bike, and limit them to an occasional class, they shouldn't hurt you or your cycling.

PROPER FORM FOR FLAT ROAD JUMPS

There are proper ways and improper ways to perform jumps in IC classes. Also, there are two specific techniques, each with different outcomes. One technique is much more similar to how jumps are used on a road bike (and what I recommend for you).

Because you will have body weight to add to the force on the pedals, you must always add more resistance than you had while seated—otherwise your legs will flail against too little resistance and the pedal stroke will be jerky. One of the biggest causes of poor form during jumps is too little resistance.

Jumps should always be performed in a controlled manner, so that you're not flopping in and out of the saddle. When you stand up out of the saddle, do not *unfold* completely into an upright vertical position—the angle of the hips stays about the same as when seated, simply rising forward out of the saddle. Instead of pulling with the hands or jerking yourself out of the saddle, try to lift with the legs. It is the legs after all, and not the arms or upper body, that you're working.

On the other hand, do not pull yourself too far forward over the handlebars when you stand. In the standing position, your weight should stay centered over the bottom bracket. This smaller range of motion helps to limit the "flopping" while also protecting the back.

For best results, as stated in the section on standing flats, keep your hands on the sides of the handlebars near the curve. This takes pressure off the wrist when you stand and allows you to better stabilize yourself. Keeping the hands in the Spinning® HP2 (with the hands close to you) while jumping is less cycling specific, internally rotates the upper arm and is a stress to the wrists. You need to be able to stabilize yourself as you stand.

There are two methods of performing jumps. Both are more fun when done to the beat of the music to help set the pace; this is one of the more fun aspects of IC classes. There is nothing wrong with using the music to empower riders to maintain a rhythm in jumps; it's only when the beat is too fast that it becomes a problem.

CONSTANT CADENCE JUMPS

The first jumping method is the most prevalent in IC classes, yet they are the *least cycling specific*. In these jumps, the goal is to maintain the same cadence throughout the movement, rhythmically moving from a seated position to a standing position and back. (See what I mean about there being only two real "movements" in cycling – seated or standing?) Fairly fit riders should be able to perform these without a huge anaerobic burn, as long as the movement is smooth and controlled. Instructors may do them as a 2-count, 4-count, 8-count, or even 16-count rhythm (using the beat of the music). I usually only do 8-count jumps or longer, as the quicker ones can lead to poor form. When I am instructing a class, I always to encourage my riders to find their own rhythm and don't force them to stay with me for every jump. Chances are, most of them do, but it's nice to know you don't have to.

For novice riders, jumps are very difficult and can be very anaerobic. Instructors should watch new/unfit riders and cue them to stay seated if they find it too difficult. Fit riders however, can maintain jumps like these for long periods, even as long as 10+ minutes. In fact, it's not unheard of for instructors to challenge riders with 1,000 jumps in one class! *But just because you can, doesn't mean you should.* It's nothing I would ever do in class because I simply don't see the cycling specificity. But if your instructor likes to jump and so do you, then jump away with good form. As long as it's not done frequently and you can do them

without reducing your power output, you shouldn't take anything away from your cycling training.

INCREASING CADENCE JUMPS (POWER JUMPS)

The second, and more difficult method of performing jumps is actually more akin to how they are used in road cycling or mountain biking. When you rise out of the saddle (with an added gear), increase the cadence of the legs momentarily, powering them up to overcome the increased resistance. As you sit back down, the leg speed returns to the starting cadence, and if needed, you can back the resistance to where it was. The increase in leg speed is fleeting, but enough to powerfully engage the fast-twitch muscle fibers and call on the anaerobic system to provide energy.

These are very hard. A few of these in a row, perhaps one every 8 or 16 beats (using the music), and you will no doubt feel the burn in the legs. Ten to twenty of these in a row as a work interval can raise the heart rate to levels well above threshold. With a good recovery in between sets, I suggest two to four sets of these to mimic the power requirements of a challenging mountain bike ride or for roadies, this would be a good drill for attacks or criterium training.

It's not possible to do 500 or 100 or even 50 of these in a row! If you can, you aren't doing them right.

Now let's talk about the improper, and unfortunately *way too common*, ways to perform jumps.

THE "WRONG" WAY TO JUMP

Far too many instructors jump at a *very fast* pace, sometimes in an attempt to keep pace with the fast bpm of the music. These are referred to as "popcorn jumps" and they are highly contraindicated. If you cannot sit down completely or stand up completely during the movement, the jumps are too fast, and will serve no purpose but to put you at great risk and detract from your ability to have any semblance of a smooth pedal stroke. As well, because of the lack of control and the inability to maintain a constant and smooth pedal stroke, your power output will be reduced which takes away from your performance improvement

potential. For non-cyclists who aren't interested in "performance improvement", this translates to a reduced caloric burn – despite the fact that heart rate is high.

Another faux pas with jumping is when the instructor asks riders not to sit down completely. This requires a deceleration in the back muscles, which puts your back at risk for injury. They also cause an interruption in a smooth pedal stroke, so you have to ask yourself, what is the purpose? If any instructor asks you to do these, either run out of the class, or ignore him and sit tight in the saddle.

SEATED CLIMB

If you want to improve your outdoor climbing abilities, this is the position that you'll become very familiar with indoors. I've done two-hour seated climbs in Spin classes and at conferences. It's a fantastic way to prepare for your favorite climbs outdoors. I've even had some clients on my bicycle tours do most of their preparation for a tour that included a climb up Alpe d'Huez and numerous other famous cols, with indoor cycling classes. In the months preceding the tour, they paid particular attention to long, seated climbs indoors.

ADDING RESISTANCE

There are some things to consider when adding resistance indoors – it's not always as simple as clicking to a higher gear outdoors. In an IC class, a hill is simulated by turning the resistance knob to the right, pushing the brake pad into the flywheel (or on some bikes, with a lever). Some models use a magnetic resistance instead of a brake pad. Either way, as resistance is increased, it becomes harder to turn the pedals. Every model of bike is just a little different, and every bike within a club's indoor cycling room is a little different. For those models with brake pads, they can wear unevenly, or one bike may have more use than another in the same studio. Because of this, one turn of the resistance knob is not always the same on every bike. As you get used to riding the bikes in your studio or gym, you'll be able to adjust how much resistance you need to apply to simulate an easy, moderate or more difficult hill. You may even develop a preference for a certain bike because of the way it feels as resistance is increased.

HOW INSTRUCTORS DESCRIBE RESISTANCE

No matter the type of resistance knob, instructors should not cue a hill by asking riders to turn the knob a specific number of turns or ride at a specific level, because everyone is starting from a different place, everyone has different abilities, and as mentioned above, each bike wears differently. On a bike with a knob, for one person a whole turn might not feel like much at all, but for another person on another bike, it might feel like Mount Everest. If your instructor says "add a full turn" you are better off ignoring that and adding just as much as you feel you need to ride the terrain desired.

If there is a resistance lever with numbers (such as the Keiser bike with 21 levels), cueing resistance by requiring everyone to ride the exact same level of resistance would be similar to asking everyone in the weight room to pick up 20lb dumbbells to do their shoulder presses regardless of whether the person weighs 100 pounds or 250 pounds, and regardless of fitness level, age or gender. It's silly and dangerous.

Some instructors like to use a scale of 1-10 to indicate resistance. I realize that this simplifies things for students and that there are benefits to a scale. But there aren't only 10 different "grades" of resistance. Some instructors might say a flat is from 1-5 and a climb is from 6-10, but this is overly simplified. Others might use a 1-10 for a flat and another 1-10 for a climb. It can be confusing if the scale is too large, such as telling the class to "find a hill that is an 11 on a scale of 20". Too many students rely so much on scales that they can't seem to ride without one.

Furthermore, using a 1-10 scale to indicate the severity of a hill can be additionally confusing when you are also using a 1-10 or 6-20 RPE scale (Rate of Perceived Exertion). RPE and hill difficulty are not the same thing. You can be riding at an RPE of 7/10 (which corresponds to an exertion of "very hard") at a fast cadence on a very flat road, nowhere near a hill. (More in Chapter 9 on RPE).

A preferable method for cueing any kind of terrain, especially a hill, is to give a verbal description of the road the instructor wants the class to ride, with an intensity guideline (heart rate and/or perceived exertion) and perhaps a cadence range, and let each rider find what level of resistance creates that road for them.

In this manner, different riders of different abilities may all be at slightly different resistances (or levels on the Keiser bikes), all at a cadence of 75rpm and all working at an appropriate level of intensity for them.

That is the way an indoor cycling class should be taught – allowing for each person's individual abilities, fitness, experience, age and gender.

As a cyclist, it's probably easier for you to conceptualize what a hill feels like than a non-cyclist, because you've climbed outside. You know how to find a hill that allows you to ride a certain cadence (say 60-65 rpm, or perhaps a faster tempo of 75-80rpm), and then use your intensity to help fine-tune that hill. Outdoors, if you started breathing too hard, then you'd shift down; that is, if you had another gear. If you were already in your lowest gear, you'd probably slow down your legs if you had a long way to go on that hill. If it was short (a minute or two) then you could handle the breathlessness.

Indoors, treat your "hill" in a similar manner. Find a resistance that allows you to ride a certain cadence range, knowing that a slower cadence while climbing focuses more on muscular endurance and force application and that a higher cadence focuses more on the aerobic system (more on the physiology of climbing in Chapter 7). Once you select your cadence, then fine-tune that resistance. If it takes you above your desired intensity for the length of hill that you are supposed to ride, then lower the resistance a little bit. On the other hand, if you aren't working hard enough at that specific cadence, then raise the resistance a little bit. It's that simple! You'd be surprised how confusing this is for the non-cyclist!

The following are a few examples of how a hill can be cued by intensity or description of how it feels:

- Add on enough resistance to simulate a mild hill, feeling the road turn upwards underneath you. Feel the hill push back against the feet as you pedal.
- Add enough resistance to slow your legs down to about 65 rpm, while maintaining an intensity just below your threshold.
- Staying seated, we're going to add on a little more resistance every minute, simulating an increasingly harder hill. There will be four increases; make sure you leave room for the final one while still remaining at or below your threshold.

- Our hill is now becoming quite difficult, with perceived exertion at a 7–8 on the scale of 10. Stay seated as long as you can, we'll be getting out of the saddle on an upcoming switchback.

WHY STAY SEATED?

As a cyclist, you know the importance of sitting deep in the saddle during a long climb. In fact, most cyclists are more efficient climbing in the saddle than out of the saddle, because body weight is supported and less energy is wasted. It's too bad that many IC instructors don't realize this and perform most of their climbs in a standing position.

The point here is to love your saddle! Try to sit down while climbing much more than you stand. I live in Colorado, and every year, a group of us go to ride Independence Pass out of Aspen the weekend before Memorial Day. The road is cleared of snow and debris and isn't open to cars until the following weekend. It's fabulously beautiful and not too difficult a climb, but being early season, it is definitely a challenge. It's 18 miles long, with a grade of 4%–6% for much of the climb, and 7%–9% for the final two miles. Most cyclists I know ride it in 2-3 hours, and most tell me they probably only stand up for 5-10 minutes that entire time.

Whether a climb takes you less than two hours or over three hours, you will be sitting in the saddle for 80%–99% of the climb unless you are racing up this hill in an all-out battle (or training to race up that hill in an all-out battle). Seated in the saddle is where you will develop your strength and muscular endurance and efficient climbing pedal stroke.

Bring the outdoors indoors and spend more time climbing seated in an IC class than you do out of the saddle. Your instructor may not understand this, but that's OK.

This is not to say do not stand up on a hill. Standing is fun, and it is out of the saddle where you develop your power. We'll discuss that in a moment.

PROPER FORM WHILE SEATED

- Relax the upper body—it's often a tight upper body that detracts from your ability to comfortably make it up your hills outdoors. Indoors is a great place to resolve this habit.
- When the resistance (steepness) is on the high side, sit back in the saddle slightly to increase your leverage. Not a lot—just one-fourth to one-half inch or so. You'll feel an increased ability to use your hamstrings across the bottom of the pedal stroke and increased leverage for the glutes on the downstroke.

CADENCE

Your cadence on a hill is related to your choice of resistance to simulate that hill, and is very important to any climbing movement. Most indoor cycling programs suggest a climbing cadence range of 60–80 rpm. That is a good range for the average IC student, but stronger and skilled cyclists can pedal slower to build strength and faster to improve muscular endurance. At some point however, depending on the skill and fitness of the rider, faster cadences on "climbs" indoors cease to become "climbs" and turn into very short high intensity efforts or sprints. See Chapter 7 for reasons to pedal slower or faster on a hill.

STANDING CLIMB

WHY STAND?

Why do you get out of the saddle on a hill outdoors? There are many reasons. You may stand up to overcome the higher resistance of an increasing grade; you do this because you need more power, and standing up adds your body weight to the equation and gives you more leverage on the pedals. If the hill is a constant grade and you just need a break from sitting or to stretch the legs or back, you would most likely shift up a gear as you stand so the added body weight has more resistance to push against. Finally, you would stand up to surge and increase your speed (in most cases, shifting up). In a competitive situation, either a real one or imagined, you'll stand to attack or breakaway from a group of riders

or to close the gap of the rider in front of you (shifting up to do so). And of course, you'll probably stand to celebrate arriving at the top with a hard push the final few hundred yards, probably shifting up to do so, unless it is very steep that last push.

But the key point to remember is that most of the time when you stand, the *hill has either become steeper or you make it harder by shifting up*.

Remember this when climbing indoors, because your non-cyclist instructor may not cue to add resistance when you stand. When transitioning from a seated to a standing climb, unless you are already pushing a pretty hard hill in the saddle, you will most likely need to increase the resistance. It probably seems like common sense to a cyclist reading this, but to many IC instructors and participants, it isn't all that common.

UPPER BODY MOVEMENT WHILE STANDING

Earlier, I explained the differences between riding a solid stationary bike indoors and riding your bike outside. This is most evident in a standing climb. Outdoors, you can rock your bike from side to side as you climb a steep hill while you push the handlebars side to side, allowing you to gain leverage against the pedals on the opposite side. Your upper body actually remains fairly still relevant to the hill, and the bike moves underneath you.

An indoor bike cannot be rocked underneath you, so you must compensate for this by ***gently*** rocking your trunk and shoulders side to side as you climb. It's neither exaggerated nor contrived. You might increase the motion a little bit in a hard push to the top of a hill, but you would never go so far as flexing downward and pulling your face towards the handlebars (as you might see some instructors and students do).

CADENCE AND RESISTANCE

How much you move your body while climbing indoors is directly related to your cadence and resistance choice. If you must contort the body by pulling so hard on the handlebars in order to turn the pedals, and your cadence has dropped below 50rpm, then you simply have *way too much* resistance for your body's strength at that time. Turn your hill down; it won't do you any good as a cyclist

(or a non-cyclist for that matter) to push a big gear uphill. It's like a guy going in to the weight room and picking up dumbbells that are much too heavy for him to lift and having to rely on momentum to curl them. Maybe he thinks someone might be impressed because he can "curl" that weight, but regardless of what it does for his ego, it doesn't help his strength if he has to resort to momentum. The same thing goes for climbing on a bike with far too much resistance. Leave the ego out of it; your back will love you for it and your legs will get stronger without the excessive strain. Not to mention that it will be much more relevant to your outdoor cycling – there are rarely any situations where your cadence drops below 50 rpm. On a road bike if one had to pedal that slow most cyclists would ride to the closest bike shop and have new gears installed in order to save the knees and back. On a mountain bike one may encounter very slow grinds for a few seconds at a time, but an indoor cycling class is not the place to train this – the risk is too high for the rest of your body.

PROPER FORM IN A STANDING CLIMB INDOORS

- greater trochanter of the hip positioned directly above the bottom bracket.
- the saddle should lightly graze the back of the legs/backside
- the knee of the extended leg should remain slightly bent when the foot is at the bottom of the pedal stroke (extending the knee is a common error with novice cyclists and non-cyclists)
- hands on or near the bar ends to allow the gluteus muscles to work properly. When your hands are in close to the body, you are too upright and your hips are not flexed enough to optimize the use of the gluteus muscles.
- elbows slightly bent
- back is flat, avoiding any rounding of the low back
- slight upper body movement side to side and up and down
- keep the head in alignment with the spine

Photo: Good form in a standing climb: saddle just touching the back of the legs, arms soft, back straight, upper body relaxed with shoulders down, head in alignment with the spine.

COMMON FORM ERRORS INDOORS IN A STANDING CLIMB:

- excessive upper body movement, flopping side to side
- excessive flexion at the hips, with overly bent elbows
- extending the knees at the bottom part of the pedal stroke (legs too straight)
- hips too far forward, leaning on the hands and relying on body weight to push the increased resistance (this is a form of cheating!)
- hips pushed back over the saddle—also known as a "hover"
- rounding the back
- dropping the head, with chin resting on the chest (quite common, but do this outside and you'll become road kill!)

RAISING THE FRONT END OF THE BIKE?

When you are riding your road bike at home on a trainer, propping up the front wheel on a few phone books will mimic an outdoor climb more closely. Indoors on a stationary bike, this is NOT a good idea. It is not possible to create a stable platform with these bikes, so any potential benefit is negated by the heightened risks.

RUNNING WITH RESISTANCE

This is a Spinning® move that is like a standing flat but on a hill. You stand up against a higher resistance, leaving the hands on the bars in front of you (their "HP2). It is differentiated from a standing climb position which moves the hands out on the bar ends. It's confusing for cyclists who wonder why you wouldn't just do a standing climb.

My question – why does this have to be a separate "movement"? You're on a hill and you're standing…why not just climb the regular and efficient way by moving your hands further out on the handlebars to stabilize and allow leverage? Outdoors, there is no reason why I would leave my hands in front of me when I stand. Not only is it more stable, but it's also more comfortable on the wrists to move the hands to the outside of the handlebars or to the hoods.

The only time you might leave the hands on the bars in front of you outdoors is on a mountain bike that does not have bar ends. A mountain biker may choose not to add bar ends in order to not hook them on branches if trails are densely tree-lined. However, mountain bike handlebars are wider, and the wider grip allows for more stability and leverage when you stand. You cannot move the hands laterally indoors.

So my suggestion, if your instructor is Spinning® certified and insists on this "Running With Resistance" movement, just stand up and do a regular standing climb with your hands on the bar ends.

JUMPS ON A HILL

Although I'm not a huge proponent of jumps on a flat road (the way you find them used in most IC classes), I do enjoy jumps on a hill. Not because they

replicate something you'd do outdoors, but simply because you can get lost in the rhythm of these slower jumps against a high resistance. I call them the "Zen" movement, and encourage my students to "zone in" rather than "zone out" as we do these.

The idea is to transition from a seated climb to a standing climb rhythmically with the music. These are slower than flat road jumps, both in leg speed (cadence range 55–80 rpm) and in timing of the jumps (4-, 8-, 16-, or 32-count, using the beat of the music to indicate when you rise and sit down). When I do jumps on a hill in my classes, I'll put on a long song, say 8–10 minutes with the perfect climbing beat, and jump throughout the entire song, challenging my students to perfect their form so they can stay below their threshold intensity.

Outdoors I may not rhythmically come in and out of the saddle on a climb like this, but there are certainly moments where I will stand up fairly regularly for short periods to keep up my momentum on a steep part of a climb, or to break the monotony of a long climb. Indoors, jumps on a hill allow the time to go by quicker when you stay focused on the movement. It's a great distraction, without taking away anything from your outdoor cycling. In my opinion, jumps on a hill are one of those things about IC classes that make indoor riding more interesting and less tedious.

Cyclists may decide not to do jumps on a hill, and instead, choose to stay seated, or standing, as the class transitions from one to the other. Or you may choose to lengthen the jumps if the rhythmic aspect of it seems foreign (or too "group-fitness-like") to you.

Some instructors might refer to jumps on a hill as simulating switchbacks, where you stand up on the hairpin turn and sit down on the straightaway of the climb. Personally, I don't coach my switchbacks rhythmically as in jumps on a hill. In my other life as a bicycle tour operator, I take (or send) people to climb Alpe d'Huez in the French Alpes, with its 21 switchbacks over 8 miles. These switchbacks don't happen "rhythmically" at set distances. When I do an Alpe d'Huez simulation ride, I will throw a switchback in every 2–3 minutes and have the class stand up for 30–45 seconds as we come out of the curve. But I don't call those "jumps." It's just a standing climb in between longer periods of seated climbing.

SPRINTS

WHAT IS A TRUE SPRINT?

This is the "movement" that is the most misunderstood by indoor cycling instructors, especially those who are not cyclists, and those who have never trained in track, swimming, or other high-intensity, shorter-duration sports which might use sprints in training and competition. Let's start by describing what a "sprint" really is, followed by what it is not.

A sprint is an example of *explosive power*. It is an all-out effort with the aim of getting from point A to point B before someone else does. It's a very, very challenging movement, probably the most intense effort someone may do in cycling. An effort of this intensity draws its energy from the ATP-CP system, a completely anaerobic system that is readily available for an immediate effort, but one in which there is only enough ATP (the molecule that supplies the energy for muscular contraction) to last for 8-20 seconds or so. After it's depleted, you simply cannot continue any further at that intensity. In order to go again at anywhere close to that intensity, you must allow the body time to replenish the ATP, which can take as long as 2–4 minutes.

This is why someone running the 100-meter event in the Olympics does so at speeds far greater than any other event. A 100m run is almost 100% anaerobic, and the record is slightly under 10 seconds, about the limit of the ATP-CP system. In the 200m, 400m, 800m, etc. events, the speed attained is less, and the relative contribution from aerobic and anaerobic contribution changes as the distance increases. This is true for track, swimming, cycling, etc. One might sprint at the finish of any of these races, but to do so anywhere but the final push to the finish line would mean not celebrating a victory in that race. You might have accelerations and short intense surges of increased effort mid-way, as in a criterium or road race, but that true "sprinting" effort is reserved for the finish line.

In the Tour de France, when it comes down to a bunch sprint finish, you'll see the sprinting specialists tucking behind their lead-out riders, waiting for that last second to make their move. Or, if it comes down to two riders approaching the finish line, they will play cat and mouse, almost taunting the other to make their

move first. These riders all know that the one who goes first is very likely *not the one* to cross the finish line first—that's how quickly the ATP-CP energy system is depleted. A true sprint usually comes down to milliseconds between first and second place.

In cycling, a sprint requires a high gear and maximum power. Eddy Merckx coined the term "He who pushes the biggest gear the fastest wins." So in an indoor situation, to mimic a true sprint, you must dial in enough resistance to require that you come out of the saddle to overcome that resistance. Then you drive the legs against that gear, increasing leg speed to 100–120 rpm or slightly greater, then sit down and push hard! You have about 8–10 seconds available once you sit down, *and that's it.*

Sprints can be used at the end of a simulated "race" or they can be done in intervals. In intervals, they usually require a recovery that is 4–10 times longer than the effort.

WHAT A SPRINT IS NOT

It is not a super-high cadence move, with legs blurring around at 140 rpm at low resistance, *but this is probably the most common application of "sprints" in IC classes*. Among many participants, it is often the most popular move. These participants are not getting much benefit out of their so-called sprint effort; so don't play along with them!

A sprint is also not a one-minute high-intensity effort. That would simply be called a one-minute high-intensity effort, or surge if you prefer to call it that, utilizing a different energy system (See Chapter 10). It's not just semantics; it is what it is!

It is also not something to be treated lightly. Some instructors will incorporate "sprints" in every class. Don't do it. Some instructors will throw a sprint in haphazardly into their profiles. Don't do it. Sprints have very specific objectives, and are not for everyone. As a cyclist, know why you are sprinting. If you are truly a competitive cyclist, maybe you should reserve your "sprinting" training for when you are out on your road bike.

CORRECT FORM WHEN SPRINTING

Instructors should indicate exactly when a sprint is coming in an IC class so riders are fully prepared. They should also regularly train the riders to sprint properly. When it's time to sprint, increase the gear enough to require that you come out of the saddle to overcome the added resistance. But the load must be there before you stand – you cannot stand up powerfully against too low of a resistance and expect to be able to dial it in in time. You'll lose power, but more importantly, the body will not be supported and riders can potentially injure themselves.

Once loaded, stand up and power up the leg speed to a maximum of around 110 rpm (120 rpm for *skilled cyclists*). It should take a couple of seconds to raise the leg speed; if it happens immediately, you probably don't have enough resistance. The upper body will rock side-to-side somewhat to compensate for the fact that you cannot rock your bike underneath you, allowing you to apply leverage to your pedals (similar to a standing climb but much faster).

Once the leg speed reaches 110-120 rpm, sit down in the saddle and drive the legs. Once seated, you should not be able to maintain this effort for longer than 10-20 seconds before there is a steep decline in output. Because of the lag in heart rate response for high intensity efforts above threshold, heart rate is not a good indicator of sprinting effort. By the time you are finished with your sprint, only then might the heart rate rise; therefore you should use your perceived exertion to judge your performance. Perceived exertion should be *very, very hard*. If you are wishing the sprint were over after only 10 seconds, you did it correctly!

THAT is a sprint.

FLAT ROAD SPRINTS VS SPRINTS ON A HILL

A flat road sprint requires an addition of resistance that may simulate a climb (or a high gear), and you use the power in the legs to overcome that resistance, and build the leg speed. You can also sprint on a hill, but it requires even more resistance. Some programs (including the Spinning® program) have a so-called "seated sprint on a hill" in their repertoire. This doesn't make much sense from a cycling perspective; if you were riding outside and wanted to beat someone to

the top of a hill, you probably would stand up to overcome both the resistance of that hill plus any additional gear you might have added to increase your speed. If you sat down while sprinting on that hill, you surely would lose your momentum – and the race.

Just like flat road sprints, sprinting on a hill wouldn't last longer than 10–15 seconds. Perceived exertion will be at "very, very hard" and lactate production and the resulting burn in the legs will be maximized. You would not want to do many of these. If you do…once again, you probably didn't do them with enough resistance!

CHAPTER 7. CADENCE AND RESISTANCE INDOORS: *KEEP IT REAL!*

SELECTING CADENCE AND RESISTANCE ON A FLAT ROAD

Your cadence outdoors on a flat road is probably somewhere between 80 and 100 rpm. More experienced cyclists generally select a higher cadence than novice cyclists. Indoors, you want to ride with a cadence that simulates what you would do outdoors. One of the biggest problems with so many IC classes is out-of-control cadences with insufficient resistance.

The Spinning® program dictates a cadence range on flat roads of 80–110 rpm; a few other programs use 75–120 rpm. I would suggest that cadences that are above 100 rpm, on up to 120 rpm, be limited for use when performing leg-speed drills, and only when the rider truly understands and knows how to control the effects of the flywheel.

These suggested cadence ranges aren't pulled out of a hat. They are based on studies of optimal cadence ranges for a wide range of cyclists (Burke, Serious Cycling, p. 185). But you should also know that there is no black and white cadence range. Every rider has individual preferences which may be linked to muscle fiber-type distribution (and hence, genetics), and suggested ranges are just that – ranges.

However, any instructor who drives students to ride with what I call "roadrunner" legs does not understand the biomechanics of pedaling, nor do they understand the mechanics of the indoor fixed-gear bicycle. It does not make any sense to spin your legs faster than 120 rpm indoors because of the weighted flywheel. Indoors, your goal should be to try to reproduce your preferred outdoor cadence as much as possible, with occasional efforts to expand your comfort zone of acceptable cadences, using leg speed and technique drills.

Non-cyclist students should follow the lead of cyclists and utilize cadences that make sense to outdoor riding even if they don't ride outside. There is a reason for these ranges – efficiency and effectiveness! If it doesn't make sense for a cyclist, it also doesn't make sense for a non-cyclist.

The lower limit of 80 rpm is also realistic to outdoor riding. If you are pedaling slower than 80 rpm on a so-called flat road with lower resistance, you are either "dogging it" and aren't looking for a workout, or you are taking a break, or you might was well be on a hill. Of course, riding a hill is perfectly fine if that's your goal…but if your goal is to work on flat road cadence and leg speed, you're missing the objective. If your preferred cadence on your bike outdoors is below 80 rpm on a flat road, IC classes are a great way to improve your pedaling speed and technique from 80-100rpm.

By sticking to these approximate cadence parameters, it is much easier for the rider to select an appropriate resistance indoors that simulates a real road outside. This is a method I call "solving for X." You have two known variables; the first one is your desired intensity and the second one is the cadence parameters for the road you plan on riding (flat or hill). You simply dial in the unknown variable *the resistance*, which allows you to maintain the two known variables.

For example, suppose your desired intensity is a solid aerobic tempo pace. Your road is flat, so you select a cadence that mimics your preferred cadence outdoors, let's say 90 rpm. The next step is to dial in the resistance that equals what a real flat road feels like ***at that cadence*** *and* ***at that intensity***. By "solving for X" you select an appropriate "gear." Using this thought process, you can see that it should now be impossible to ride at an unrealistically low resistance indoors, because you would realize that you'd never reach your desired intensity!

Now suppose you want to simulate a headwind on this flat road while maintaining the same intensity. You reduce your cadence to about 80 rpm. You would therefore have to increase the resistance just enough to maintain the desired intensity.

This is how instructors can help their students *Keep it Real* when selecting cadence and resistance.

SELECTING CADENCE AND RESISTANCE WHILE CLIMBING

Studies of skilled cyclists have shown that the most efficient and common cadence while climbing is 60–80 rpm (Burke, Serious Cycling, p. 185). These are the ranges preached in the Spinning® program, and most programs that I know of also have similar ranges, give or take a few rpm.

I have heard the response many times that "Lance Armstrong rides a hill at 90-100 rpm, why can't we? Isn't it better to climb at a faster cadence?" First, Lance Armstrong is not a mere mortal, and no matter how strong a cyclist you probably are, if you were on the hill that he's on in the gear he's in, you would not be pedaling at 90, 80, or probably even 70 rpm. You'd probably be begging for mercy and turning around!

But in reality, it's much more than that. Indoors, if Lance were on a bike next to you and you were both at 90 rpm, yes, he'd probably have more resistance than you. Riding at 90 rpm on a "climb" indoors won't make your legs stronger for a real hill if you have to use lower resistance indoors in order to maintain that cadence - unless of course, you are truly a king of the mountains with incredible power to weight ratio and are entertaining a contract with a professional bike team.

For most of us mere cycling mortals, "spinning" your legs uphill at a cadence higher than about 85rpm doesn't make much sense *indoors* on a stationary bike because *there's no way to know what gear you're in*. Think about it. Indoors, we're only "simulating" a climb. We don't have a way to measure percent grade, the effects of gravity, or gear choices other than the simple resistance knob pressing a pad down on the flywheel (or a magnet).

If you prefer using your granny gear with faster cadences outdoors, riding a "hill" indoors at high cadences only means you don't have enough resistance to simulate a hill. There is no granny gear indoors! I repeat, *there is no granny gear indoors*. If you're pedaling at 90 rpm on a hill, one of two things is happening. The most likely situation is that you're *not really on a hill* of any significant grade. Therefore, you won't get the benefits that this type of hill training will offer you, i.e., being a stronger climber outdoors (or indoors for that matter).

The other possibility if you're climbing at 90+ rpm indoors is that yes, you do have enough resistance to simulate a steep hill, but you are pushing very hard and may only last at that pace for a short time. Not a very smart choice if your hill is a long one, but this is fine for shorter climbs of a minute or two, or for that final push to the top on a long climb.

High cadence climbs indoors up to about 85 rpm are excellent ways to increase your muscular endurance on climbs, but it takes a lot of work and technique

drills on the part of the instructor to make sure students are doing it properly and with good form. Higher cadence climbs indoors are likely to take the heart rate significantly higher – to threshold and above.

HOW SLOW IS TOO SLOW?

Why the lower limit of 60 rpm? While I agree this lower limit is probably a good limit for standard non-cyclist students, stronger cyclists who understand good pedaling technique and know not to pull on the handlebars to push a huge gear can certainly do drills at a slower cadence and higher resistance. But they would be just that – drills. The cadence police won't get you if you're riding at 55 rpm, but you better be doing it with really good form. As mentioned above, the cadence ranges are not black and white, but the gray areas on either side of the range are for the exceptions, not the norm.

Outdoors, your goal is to become a relaxed and smooth climber while increasing your strength and muscular endurance on the climbs. If you are seated and the hill becomes steeper, you might shift down if that's available to you. If it isn't (because you are already in your lowest gear), you'd stand up for the added leverage. If that doesn't work and you truly have to contort yourself to continue, you'd probably avoid that hill in the future until you got stronger.

Here's a story that relates to this discussion. A few years ago I took a friend, Carlos, on one of his first mountain bike rides out of Vail, Colorado. He was a ski instructor from Argentina and had moved there for the skiing, but stayed in the summer. Carlos was a nice guy, but kind of a machismo-type.

We were on a dirt road, a moderate climb of about 30 minutes before we would reach the single track. I noticed that Carlos was breathing hard and really pulling on his handlebars, his cadence was very slow and he was seriously mashing the pedals. Then I noticed he was in his big chain ring. "Carlos, what are you doing in your big chain ring?" I asked. He looked at me like I was crazy for asking and said, "I want to get a good leg workout!"

"But Carlos, you don't know what's ahead. You might want to back it off a bit," I said as I spun my legs in my middle chain ring and low gear. Well, he opted for the "quad workout." A half hour later, on the steep uphill single track, he was crying in pain (or was he crying out from a deflated ego?) as I smoked him on

the rest of that ride. Later, he even was gracious enough to say, “You’re right, I should have listened to you!”

This wouldn’t be you, would it? You would have shifted down, right? Unfortunately, this is what you see in many IC classes, where riders put on far too much resistance to get that “super leg workout”.

Back to that example of weight lifters performing biceps curls with too high a weight. To curl the weight, they have to arch their backs and throw their hips forward in order to gain momentum to get the weight past the sticking point (usually 90 degrees). In doing so, not only do they risk low-back injury, they are missing out on increasing the strength in their biceps through a vital range of motion—from the extended arm position to about 90 degrees. This is ego getting in the way of proper form and technique.

Strength is highly specific, including range of motion. Just because you can “curl” 50-pound dumbbells with momentum, doesn’t mean you are truly that strong. You’re missing out on that first quadrant in your elbow’s range of motion because momentum is doing the work, not you. Better to pick a weight that challenges you but that you can curl with *good form* throughout the entire range of motion.

In cycling, the same thing applies. If you cannot climb that hill outdoors without contorting the body or using your body weight and gravity while pulling on the handlebars, then you would shift down. If you were already in your lower gear, and this was something you encountered often, then you’d either buy a new bike with lower gears, or take your bike to your LBS and have a compact or triple chain ring installed. Machismo of this manner doesn’t make you a better climber, and it also has no place in an indoor cycling class.

If increasing strength while climbing is your goal, when riding indoors, *choose the highest resistance that you can maintain with excellent form*, at a cadence that doesn’t drop below 55rpm (50rpm if you are really strong), while still staying within the desired intensity.

FEAR OF RESISTANCE

This is not an issue with most cyclists (I hope) but I am bringing it up here so you can understand the thinking of some non-cycling students in IC classes. Some riders – usually women - are afraid of adding much resistance because they think that it will increase the size of their legs. This is one reason why they often pedal at higher, ineffective cadences with low resistance even when "climbing."

This is an unfounded fear for several reasons. First, as you know, the largest thighs in the peloton are the power athletes, the sprinters, who race at incredibly high leg speeds in high gears for very short periods of time. The longer, leaner legs on the podium belong to the climbers!

Also, coming to a one-hour IC class two to five days a week will not increase the size of the thighs significantly. You would have to put in many, many miles, and what is more likely to happen with training is leg definition, not huge thighs. That is something we as cyclists look forward to, right?

In my opinion, there is nothing more attractive than a strong cyclist's calves and quads!

CHAPTER 8. UNSAFE (BUT POPULAR) MOVEMENTS AND TECHNIQUES IN INDOOR CYCLING

I've referred to several movements in IC as being "contraindicated." The term "contraindication" is used by doctors, physical therapists, clinicians, and personal trainers to indicate movements or activities that should be avoided by the individual in question.

But what contraindications really means in indoor cycling is the following:

Just Don't Do It!!

Let's take a look at some of the most common form of unsafe yet popular movements and techniques in IC classes. Chapter 3 discussed the source of these moves. The preceding chapters discussed the basic movements and techniques used in IC classes and gave you information as to whether they may or may not be appropriate for your specific cycling training, though they are not considered unsafe in general.

The movements/positions in this chapter, on the other hand, are unsafe and/or ineffective for anyone, fit or unfit, healthy or injured, cyclist or non-cyclist. Some are purely "fluff" and while they may not risk injuring you, they serve no other purpose than distraction and detract from proper pedaling. Some are purely based in "ego" and have no other purpose than to show off (to whom, I'm not sure). Others can truly risk pain and injury to joints and muscles.

Some of these moves or techniques I have already referred to throughout this book, but I will restate them here as a compendium of what not to do. Note that this list will never be complete, because instructors are "inventing" new things all the time.

In their defense, some instructors simply haven't yet learned that these movements are unsafe or without merit. Other "popular" instructors have taught them that these moves will make them more popular. Their students are also ignorant about the efficacy of these movements and often ask for them.

As mentioned before, the biggest reason why these are so popular is that so many instructors bring the group fitness mentality where constant distraction is the

norm, into their cycling classes. They believe (perhaps rightly) that their students will be bored by just "cycling."

What can you do as a participant when you encounter these moves?

Just ride the bike!

And then send the link for this eBook to your instructor or club manager!

UNSAFE MOVES IN INDOOR CYCLING

ISOLATIONS OR "FREEZES"

This is when a rider holds the body still and holds the abdominals tight, often in a standing flat (run) or standing climb, and eliminates all upper body movement. Or, an instructor might ask the class to isolate a certain part of the body such as the shoulders or hips. This movement (or lack of it) often causes a "burn" in the quads, glutes, and/or shoulders. Students misinterpret this "burn" as an effective workout for that part of the body, but the discomforts far exceed any perceived benefit. In actuality, there is no benefit, *no one will get stronger, faster, leaner or better in any way by doing this.*

Holding the body still on an indoor bike is inefficient and doesn't allow for a smooth pedal stroke or fluidity in the upper body. The biggest reason to avoid this move, however, is that there is a high potential for discomfort to the joints (knees, back, neck).

SUCKING THE ABS IN

Often in conjunction with isolations or simply on its own, some instructors will ask students to "suck in the abs." This probably emanates from their training in weight lifting or other group fitness classes like kickboxing, where it is important to engage the core strongly before making any movements. However, for a cardiovascular activity such as riding a bicycle (indoors or out) where you need all the oxygen you can get, holding in the abdominals goes against everything athletes are taught about proper and deep diaphragmatic breathing.

When you view elite cyclists from the side, their bellies often appear distended, sometimes touching their thighs. It's not because they had too many cheeseburgers…elite cyclists have extremely low body fat. It's because they have learned how important deep belly breathing is to increase oxygen saturation of the blood. When you inhale by expanding the belly and not just by raising the shoulders, as most people do, it allows the diaphragm to be pulled downward, so that the lungs can expand and fill with O^2, improving oxygen exchange with the blood. When you hold the abs in tight, it constricts the respiratory muscles along the ribcage and including the diaphragm, limiting this oxygen exchange.

Some instructors suggest that doing this helps core stability, but believe me, you will not injure the spine when riding a bike by *not* sucking in the abs. You will engage the core muscles necessary to protect your spine, because the core is more than just the abdominals. A strong core is essential for pain-free cycling, but cyclists must train their core muscles outside of class, and sucking in the abs or doing any "core training" on the bike will not help their cycling one bit.

SQUATS

This is one that irks me the most. While in a standing position, students are asked to lower the body into a squat position while pedaling, and then to "freeze."

This is an incredibly unsafe movement, causing a tremendous amount of pressure in the knee joint. Think about how a safely executed squat is done in the gym. Educated exercisers know not to squat any deeper than a 90-degree angle to avoid knee injuries, and they would probably do only 8–15 reps. Studies have shown that at 60 degrees, the force in the knee joint is one times the body weight, but at 90 degrees (which is a deeper squat than at 60 degrees—note that 0 degrees is full extension) the force is three times the body weight, a huge difference. You can only imagine what the force is when you drop to a squat deeper than 90 degrees.

If you lower the hips while standing on a bike, your body weight is pushing downward with gravity, but you also have the force coming upwards from below into the knee, pushed by the fast-moving pedal upwards through the tibia into the patello-femoral joint. This force is coming fast, up to 80–100 times per minute depending on the rider's cadence. You can see from the photo at right, with the hips lowered, the angle of the knee is extreme, risking damage to the cartilage, ligaments, menisci, and especially the patellar tendon.

Why do instructors and students do this? They love that "burning" in the quads and think it's doing them some good! But in reality, the burning is caused by muscular inefficiency. This move does not improve leg strength in any way.

A good analogy is to climb a flight of stairs without extending the legs as you ascended. It doesn't take long before your quads are burning, but would you think it's good for you and do it on purpose in the name of fitness, even if there was obvious pressure in the knees? Of course not, it would hurt too much! Instead, you would climb those stairs in the most efficient way possible, allowing the leg to extend naturally, carrying you up the stairs without pain.

So why do it on a bike?

HOVERS

Instructors will sometimes ask riders to push the hips back over the back of the saddle, without touching the saddle. The thinking is that this simulates a mountain biking position when descending. Some also claim that it engages the glutes more.

Indoors, while pedaling in this position, it is impossible to maintain a proper pedal stroke with the hips pushed back. The glutes and hamstrings are in an awkward position, rendering them less powerful or efficient on the power phase of the pedal stroke. Normally at the 3:00 position in the pedal stroke (where the most force is transferred to the pedal) the knee joint should be directly above the

pedal axel for optimal force application and biomechanical effectiveness. But in a hover, the knee joint is behind the pedal axel, making the transfer of force less effective. The recovery phase of the pedal stroke is also ineffective as there is no way to properly unweight the pedals on the upstroke.

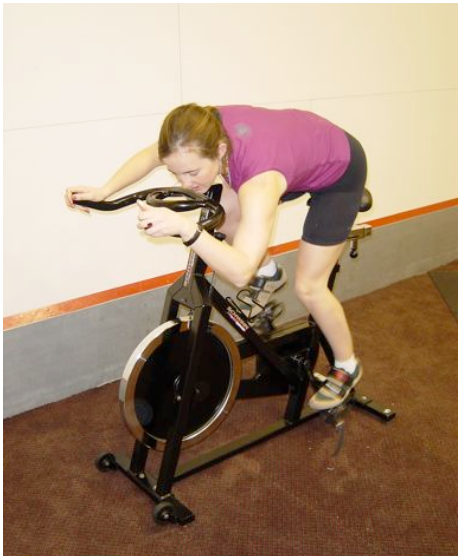
In this very awkward position where the knee joint is loaded improperly, the knee ligaments are stressed, and the back is hyper extended, placing the spinal and sacral ligaments and extensor muscles under stress. The hip is hyper flexed, reducing breathing efficiency and forcing the knees outward on less flexible riders. Outstretched arms cause shoulder and neck discomfort in many riders. Additionally, because of all of the above, this position does not allow for fluid movement while pedaling so if power output could be measured, you would see a drop in power during a hover. And that counters what the actual aim should be for both cyclists and non-cyclists alike – aiming for a higher overall average power output.

That's a lot of bad stuff going on in the body, but hovers are so popular! This position has absolutely no benefit to anyone indoors; it doesn't make you stronger, faster, or better at doing anything, and the risk is high. It also doesn't serve to increase one's skill on a mountain bike. If you were descending single track and maneuvering around obstacles outdoors, you would not be pedaling. Also, you would shift the bike underneath you to find your balance. In order to improve this particular technical skill, you must ride outside and experience it firsthand. Doing a hover indoors won't help you master this in any way.

A stationary indoor bike will not simulate this maneuver, not even the new indoor bikes such as the X-Bike or RealRyder, which allow movement in the handlebars or the body of the bike. Nothing can replace the skill development and balance of riding a mountain bike on single track.

When your instructor asks for a hover, just say NO!

EXCESSIVE UPPER BODY MOVEMENT



This can take many forms: push-ups, crunches, "figure eights" (where the rider moves the shoulders in a figure eight), "four corners" (in which the rider moves the shoulders in a square or rectangular pattern), twists, shoulder drops, "bows," "cornering" (pretending to turn a corner), etc.

All of these movements place the upper body in a disadvantageous and awkward position relative to the lower body. The legs are moving quickly in a linear circle powered by a fixed-geared pedaling system; when you move the body laterally or rotationally on top of this pedaling motion, there is great risk to both the joints and soft tissue of the back, shoulders, hips and neck. In short, you can pull your back out and buy yourself a visit to the chiropractor, or worse, an orthopedic doctor.

Furthermore, there are no strengthening benefits to moves like crunches or push-ups on the bike, so your pectorals and abdominals will not get stronger. You must have a resistance to achieve a training benefit with push-ups or crunches—and this isn't possible while riding a bike. Don't believe me? While you are sitting reading this, try a few "crunches" in a seated position. See what I mean? You're not engaging the abdominals in a meaningful way.

The same applies to pushups. Is there a table in front of you as you read this? While sitting, put your hands on the table and do a few "pushups". I can hear you laughing from here! But I am sorry to say that there are some new (and very popular and expensive) indoor cycling programs coming out that profess to work the upper body by doing pushups and crunches while riding. They're selling you snake oil if you believe that.

These movements are nothing more than "aerobics-on-a-bike" invented by instructors who feel the need to provide constant distraction. They serve no other purpose, are biomechanically inefficient, and detract from your ability to turn the pedals properly, while providing a high level of risk.

THE AERO POSITION

The aero position includes riding with the hands on the bar ends or resting the forearms on the handlebars.

This position can cause back pain due to the increased flexion in the spine and increased extension at the neck (especially if you have to look up to see the instructor). The hamstrings and glutes literally pull the lumbar curve out of the back. The low back is not stabilized and the vertebrae and musculature are at risk when the lumbar curve is reduced or eliminated. Muscles have an optimum length at which they are most powerful and this pulls them out of their optimal range.

For many riders, especially those with smaller frames or who have inflexible hamstrings, glutes, or low back, or who have a large girth, this position also forces the knees out laterally. Consequently, the knee joint does not track properly. The upper body is held rigid and the desired fluid rhythm in the upper body is almost impossible, resulting in tension and pain in the neck and shoulders. Because of the excessive trunk flexion, the respiratory muscles and diaphragm cannot work effectively, limiting breathing capacity.

Elite cyclists and triathletes may ride on aero bars outdoors, but they are most likely on custom-fitted bikes. Also, time trial and triathlon bicycles have a steeper geometry, in which the seat tube is more vertical than a standard road bike frame, pushing the rider more forward, opening the hip pocket and allowing the shoulders to be positioned directly over the elbows in an aero position. In a standard geometry road bike or any indoor cycling bike, the geometry is not designed to ride on aerobars. This is because the more relaxed geometry puts the rider's hips further back, and the shoulders cannot sit directly above the elbows. This also closes the hip pocket (i.e. excessive flexion at the hip), which impinges breathing, and stresses the shoulders.

When I was writing the *Cadence and Heart Rate Training* workshop for Mad Dogg Athletics and Spinning® a few years ago, I worked closely with Joe Friel

who acted as a consultant to the project. Although Joe's experience is with cyclists and triathletes and he has little experience with the indoor cycling world, I asked him about riding in an aero position like this. He was adamant that he would never advise any rider to ride in an aero position that wasn't his or her specific set-up. There was too much risk.

So even if you are a triathlete who must ride in the aero position, and even if you are tall and flexible, an IC class is not the time to train there! These bikes cannot be custom fitted to each rider like your road or triathlon bike can, and therefore it is not recommended that anyone, elite cyclist or not, ride in this position. This is one of those times where if acclimating yourself to the aero position is your goal, you will need to get on your trainer at home to get used to your own aero position on your own bike.

RIDING WITH A LOWERED OR WITH NO SADDLE

I knew a woman who owned a Spinning® studio in southern California. She told me she used to get calls from people asking if they had any "advanced" Spinning® classes. She asked what they meant by "advanced" and the answer would often be, "You know, the ones where they take the seats away!"

This technique is absolutely ridiculous and serves no other purpose than to stroke the ego of the rider and/or instructor. I'd like to think that most cyclists realize that this would never be done outside, and therefore is silly to do indoors. But a few year's ago, someone sent me a link to an article in an Ohio paper highlighting a man who was training for the climb up Mount Washington in New Hampshire, one of the hardest climbs in the United States. His training regimen? Taking away his saddle in Spinning® classes at his club, and riding for hours in this manner! They had a photo of him riding with the saddle resting on the floor next to the bike.

This, a *supposed* cyclist (although they did describe him as a new cyclist)!

One of the most important principles of training is the principle of *specificity of exercise*. Specificity refers to the fact that you must train the way you will use your muscles in your chosen event. This means you ride a bike to train for riding a bike. It also means you train the same energy system that you will use in your event; a marathoner will train the aerobic system and threshold, a sprinter will

train the anaerobic system. It also refers to the angle of the joint, and the speed of movement in your particular event.

Anyone who has climbed a long hill outdoors knows that you must sit for most of it because this is where you are most efficient. You'll save your standing climb for when power is needed.

So why would you train standing for hours at a time when your event will require you to sit? This is antithetical to sound training, but it shows you that common sense isn't always very common.

Beats me. I wrote a comment to the Ohio newspaper after reading this article and suggested he get a new trainer, someone who might actually help him succeed in the ride, improve his performance, and get him to sit in the saddle and ride correctly!

Some instructors will instead simply lower the saddle, and then ask everyone not to sit completely down in the saddle. In a way, this is even more dangerous, because riders can fatigue and may resort to sitting in a lowered saddle where a lot of damage can be done. This position forces the knees into hyper flexion, stressing the joint (note the knees in the photo, and imagine them turning at 70-90X per minute in this overly flexed and stressed position).

Or, students may compromise their form by resting their forearms on the handlebars when they fatigue, potentially straining the back or locking out the knee (possible ACL injury) and removing any possibility of a smooth pedal stroke.

Riding without a saddle will not make you a better climber, it won't make you stronger, and it won't improve your form. Sitting in the saddle and increasing your leg strength and muscular endurance *will* make you a better climber. When you need to stand up and increase your power, then stand up! No need to "prove" to anyone that you can do it forever by taking the saddle away.

Can you tell that this one movement gets my goat practically more than any other? I hate it when ego rules in an indoor cycling class.

So when Jillian Michaels, the personal trainer on the TV show *The Biggest Loser*, took away the saddles of her purple-faced, unfit, unhealthy, very overweight participants on national TV, requiring them to lean on their handlebars and beg for mercy, in front of a million viewers in November of 2008, I lost it! I wrote an open letter to Jillian in my blog begging her to get certified. Check it out: http://funhogspins.blogspot.com and click on "contraindications" under Labels. That one blog post has received more attention than all my others combined. Even almost four years later it is amongst the highest on my blog post states list.

POPCORN JUMPS

These are wild and crazy jumps, where the riders have no chance to achieve either the standing position or the seated position because they're moving so quickly. They're called "popcorn" jumps because, well, that's what they resemble! The instructor gets caught up with the fast beat of the music, and forces riders to stand and sit on every beat.

Some instructors may even ask riders not to completely sit down in the saddle, but this requires a deceleration in the back muscles, almost guaranteeing a back injury.

I don't need to tell you why these are bad for you – by now you can imagine. *Just don't do it!*

ONE-LEGGED PEDALING

An effective technique for fine-tuning your pedal stroke as a cyclist is to put your road bike on a trainer, take one foot out of your cleats and prop your leg up on a nearby stool, and work one leg at a time through the pedal stroke. If you have ever tried it, you know that it is not at all easy, especially to smoothly guide the pedal over the top and through the bottom. The first few (or dozen!) times you try this, there is usually a lot of clunking going on. You also feel a great amount of fatigue, and usually can only manage a minute or two before having to change legs.

The goal of this training technique is to work the neural abilities of the leg muscles, training them to fire earlier in the pedal stroke. This is an excellent means of improving the smoothness of the pedal stroke and to help increase leg speed.

On an indoor, fixed-gear bicycle with a heavy flywheel, this neuromuscular benefit is lost. When you try it on an indoor bike, you'll find that it is actually very easy to do, especially over the top and through the bottom. This is due to the assistance of the flywheel. Sure, if you add more resistance, you'll feel fatigue, but you won't get the neural benefit. So why do it, especially if it has risks?

In a class situation, there is no way to provide a stool/bench for each rider. So what do you do with the other leg? Hold it out to the side? Imagine how quickly you will fatigue in that leg, taking away your concentration from the other leg that you're supposedly focusing on (but that really needs no focus because it's being pulled through the hard part anyway).

I've heard that some prop the wayward foot up on the center console of the bike. Yikes! First of all, your sitting position is now all scrunched up so how can you pedal properly anyway? But more important, that pedal is going around very quickly, and if you remember, it's not a free wheel, so if it hits you, it's not stopping! Ten years ago an instructor at our club had an SPD cleat that slipped out of the pedal. The pedal then came around with full force into her calf, to the tune of 18 stitches in the emergency room. I wouldn't fiddle around with a fast moving pedal!

I think you're starting to see a pattern here. What do you do if there's high risk for injury (or any risk at all) when there's no benefit to the movement?

Abstain!

PEDALING BACKWARDS

There is a therapeutic benefit to walking backwards. Physical therapists and doctors may ask a patient with a knee injury to walk backwards slowly on a treadmill (usually on a slight uphill) because it unloads the knee while allowing the movement. It wouldn't give you much of a cardio workout, though, but that is not the goal.

Similarly, after knee surgery, a physical therapist might put a patient on an indoor bike and have her pedal very slowly in both directions. After my own knee surgery in 1992, I could barely exceed about 10 rpm during therapy. The only purpose was to gain range of motion and help avoid scar tissue. It would never be done quickly or with much resistance.

There is no therapeutic benefit to pedaling backwards in a class. In fact it loads the knee joint in an awkward position. If you were to do it with any resistance to speak of, you are loading the joint when the knee is behind you, at the 9:00 position. Think of the angle of the knee at this point.

Furthermore, the flywheel pulls the foot around, potentially hyperextending the knee on the backside (which has now become the "downstroke") of the pedal stroke.

There's no benefit. Pedal correctly in the right direction. If your instructor asks you to do it, laugh.

EXCESSIVE CADENCE

I've already referred to this several times but will briefly reiterate it here.

Similar to the one-legged pedaling, on a bike with a weighted flywheel you won't get the same neuromuscular benefit of spinning at high cadences that you will get on your road bike set up on your trainer.

If you had a power meter attached to your bike, you would easily see that you weren't achieving any power training benefits either. In order to move the bicycle forward outside, you must have force *and* cadence. Indoors, if you rode at cadences of 120+ rpm, you would obtain much greater benefits by adding a gear (resistance) and slowing down the legs. Anything over 110 rpm (or 120 rpm for skilled cyclists) is unproductive.

EXCESSIVE RESISTANCE

I've referred to this before as well so pardon any repetition. Similar to lifting a dumbbell that is too heavy for you and having to use momentum to lift it, you don't want to add on so much resistance that you have to contort the body in order to turn the pedals. It's a huge strain on the back, and is not specific enough

to your outdoor riding. Simply put, you would not do this outdoors. You would shift down, slow down, or stay away from that hill until you gained the strength. Or, you would change the gears on your bike.

If your goal is to increase your climbing strength on steeper grades, find the highest resistance that you can handle with proper form at a cadence around 55–60 rpm. That means no contorting the upper body, no twisting, no excessively pronounced downstroke. It's OK to pull on the handlebars like you might on a hill outside, just don't exaggerate the movement.

USING WEIGHTS OR BANDS

I don't think any cyclists would participate in a class where the instructor pulled out weights or bands to do an upper body workout while pedaling. But just in case you were tempted, here are the reasons why it's not a clever thing to do…

You're here to get the cardiovascular, endurance, and strength benefits of riding a bike. You want to place all your focus on relaxing your upper body, smoothing out your pedal stroke, and improving your form in order that these skills will transfer to when you actually do get on your road bike in the spring.

So why would you take your focus away by doing something silly?

More importantly, do you think you're going to get much upper body benefit from those weights or bands while you're pedaling? Chances are you won't be lifting the weight you would lift in the weight room, so what challenge will it be to the muscle? And as a personal trainer, when working the upper body, I require my clients to place all their attention on proper form and on breathing techniques when lifting weights. How can you do that when you're trying to pedal correctly?

Basically, both activities (the pedaling and the attempt at building upper body strength) will be compromised if done at the same time, so neither is achieving its goal. Better to ride the bike when you're riding the bike, and work on upper body strength in the weight room before or after your ride. Soul Cycle of New York City is fast gaining ground as the new "trend" in indoor cycling classes because they "train" the upper body while cycling. I hope they die a quick death because it is dangerous and ineffective, and invalidates the legitimacy of this industry and this incredible method of training indoors.

PART II
TRAINING TO IMPROVE PERFORMANCE

CHAPTER 9. MEASURING INTENSITY INDOORS

Being able to measure how hard you are working can be confusing and difficult. There are several ways in which to do this outdoors. You can use power output, speed, perceived exertion, or heart rate. Some of these work well for measuring intensity indoors, some do not.

POWER

Measuring power is the crème de la crème of quantifying intensity. Power meters are now widely available for outdoor riding, though they are still prohibitively expensive for widespread usage. In the IC arena, there is only one company (as of this writing) that provides a true measurement of power (CycleOps) and a few others that provide an estimate of power - Keiser and Schwinn. As of this writing, more companies are working on this, some should have bikes with power in the next year or two.

If you are lucky enough to have access to IC classes that utilize power, especially a facility with CycleOps bikes, then it's worth it to go out of your way to attend these classes. (To find the nearest facility with CycleOps, go to www.cycleops.com.)

However, as stated before, the use of power meters in indoor cycling is not widespread. Hopefully, this will change in the next three to five years, but in the meantime, I won't be talking about this method of determining output in this eBook.

SPEED

Outdoors, speed is easily measured, but even then, it is not an accurate measure of output as a determinant of workload. You can ride side by side with Lance Armstrong at a speed of 25 mph, but unless you have a pro-license you will probably be working at a far higher intensity than Lance.

Indoors, speed is not measured with any accuracy. You may encounter some clubs that have a cadence computer on their bikes. Star Trac makes a cadence computer for the Spinner® bike, and Lemond makes the RevMaster Pilot® for their bikes. Though the cadence and heart rate readout of these computers are excellent features and make the computers worthwhile, you should know that the distance-traveled feature (which by extension is an estimate for speed) is a rather spurious measurement.

Distance is solely based on the number of revolutions of the flywheel multiplied by the circumference of the flywheel, which is tied into the cadence. Each bike manufacturer has a different factor that is used to determine the flywheel revolutions as compared to the pedal revolution. (For example, instead of a 1:1 flywheel revolution to crank-arm revolution, it might be 1:1.25). But, these computers have no way of taking into consideration gears or terrain. Outdoors, it's fairly obvious that two people traveling at the same cadence over the same amount of time will cover different distances at different speeds if they are in different gears.

Indoors, on the other hand, two people can be working at the same consistent cadence, but one might have more resistance than the other, which could signify either a higher gear or a hill (and hence, a lower gear). It's confusing to compare it to the outside, because in the first instance, a higher gear on a flat road, we could surmise that he would travel faster and further. But if it was the same cadence on a hill, we could surmise that he wouldn't travel as far or as fast. The indoor bike computer however, will register that they all traveled the same distance, and therefore rode at the same speed.

You can see why indoor distance traveled or speed cannot accurately represent outdoor distance traveled or speed.

RATE OF PERCEIVED EXERTION

Perceived exertion is how hard you feel your body is working. It is based on the physical sensations a person experiences during physical activity, including increased heart rate, increased respiration, increased sweating, and muscle fatigue. Although this is a subjective measure, a person's exertion rating may provide a fairly good estimate of the actual heart rate during physical activity.

RPE is an excellent tool for cyclists and for use in IC classes, and is best used in conjunction with heart rate monitoring. There are two common scales in use by many instructors, indicated on the following page.

The 6–20 scale was developed by Gunnar Borg (a Swedish exercise physiologist). It was originally developed to correlate with heart rate by a factor of 10. For example, an RPE of 14 would mean a heart rate of around 140. However, due to the large variation in heart rates, this correlation is minimal, but the scale is still relevant.

Borg's 6–20 scale for RPE

6 No exertion at all
7 Extremely light
8
9 Very light—walking slowly at a comfortable pace
10
11 Light
12
13 Somewhat hard—you feel tired but can continue for a long while (century pace)
14
15 Hard – the highest sustainable effort you can maintain for 20-30 minutes (60 minutes for elite athletes)
16
17 Very hard—you are very fatigued, breathless
18
19 Extremely hard—you cannot continue for long at this pace
20 Maximal exertion

In 1986, the American College of Sports Medicine revised it to a 0–10 scale.

0–10 Rating of Perceived Exertion Scale

0 Nothing at all
0.5 Very, very weak
1 Very weak
2 Weak
3 Moderate
4 Somewhat strong
5 Strong
6
7 Very strong
8
9
10 Very, very strong

HEART RATE

Heart rate monitoring has widespread usage in gyms across the country, as well as with trainers, coaches, and many endurance athletes. It is an important component of measuring performance improvements and keeping tabs on daily efforts. The advantages of using heart rate monitors are that they are inexpensive and very portable and provide valuable data as to the state of one's body during exercise. But it is also important to understand the limitations with using heart rate to gauge intensity.

Heart rate during exercise can be influenced by many factors external to the actual effort, such as recent illness or infection, lack of sleep, altitude, heat, humidity, stress, dehydration, hyper hydration, acute overreaching and overtraining, caffeine, and drugs, such as beta blockers or antihistamines. Most of these variables will alter heart rate for a given workload by increasing it (such as stress, heat, caffeine, overtraining). Some of these variables will actually suppress it (such as beta blockers and overtraining or acute overreaching).

Moreover, heart rate responds relatively slowly to a given work effort or changes in intensity; it may be as many as 30 seconds or more before the increased effort will reflect an increase in heart rate. For this reason, heart rate cannot be used to regulate the intensity of shorter efforts such as intervals aimed at improving anaerobic capacity or neuromuscular power sprints.

Finally, heart rate is not a direct determinant of performance; rather it is a symptom of the effort. One can say that power output is the stimulus, heart rate is the response. Another way to look at it is thinking of your heart rate as the "cost" of doing business, or putting out that effort.

Even despite these limitations, heart rate monitoring is the next best choice to measuring intensity and can provide valuable information about your training and progress. Some of these limitations can be overcome by combining the use of RPE with heart rate monitoring.

The benefit of using a heart rate monitor on a regular basis is that when something appears odd with one's heart rate for a given workload, the athlete can interpret the information as needed. For example, suppose the prescribed training session calls for high-intensity VO2 max intervals well above LT. Suppose a

rider notices that for some reason her heart rate doesn't rise to levels she can normally attain for that amount of effort, yet her RPE is elevated as if she had indeed achieved the higher heart rate.

[Remember that it is a *perceived* amount of work on an indoor bike because on these bikes there isn't a way to measure output. However, when you ride an IC bike often, you know from experience the average intensity that a particular cadence against a certain amount of resistance will generally elicit.]

If on this certain day, this athlete cannot attain the heart rates she typically reaches, it is most likely a message that her body is not ready for that level of effort that day. It could be for a variety of reasons; an oncoming infection or illness, excessive stress, or most likely, the fact that the body has not had enough recovery from the previous hard workout(s). The astute athlete will interpret this as a sign to slow down or take a recovery day and refrain from the higher intensity intervals.

The uneducated athlete will try even harder to raise her heart rate and become frustrated at the results (and then she will wonder why she always seems to have low energy, or frequently gets sick, becomes irritable for no reason, or many other symptoms of overtraining). I am sure many of us have been there; we see a suppressed heart rate and wrongly interpret it as, "What's wrong with me? I thought I was in shape! I must not be trying hard enough, so I have to push harder!"

[Note: I am speaking from experience, having been a much more anal and driven athlete back in my early mountain biking racing days, and pushing myself harder when I felt tired or my HR didn't go up like it was supposed to. As a result, I most likely never even knew what my true potential was. I wish I knew then what I know now. Hindsight is 20/20. Make sure you have excellent foresight!]

The ignorant athlete in this situation, meaning the one not even wearing a heart rate monitor to measure intensity, will have no idea what's happening, and will continue to slog through the workout as if his heart rate is achieving the prescribed levels above LT, because his perceived exertion will still be elevated. In actuality, this workout will not achieve the performance goals desired, *but he won't know it.* He will most likely be in the same boat as the uneducated athlete;

potential overtraining, unrealized performance goals, frequently falling ill, low energy levels, etc.

The takeaway message: bring your heart rate monitor to class at all times!

CHAPTER 10. EXERCISE PHYSIOLOGY

THE BODY'S TRAINABLE ENERGY SYSTEMS

Before we discuss zone methodology and heart rate training, let's take a quick look at the energy systems in the body that can be improved with proper training. This is a very brief description of exercise physiology. For more information on heart rate training and physiology as it relates to cyclists, I recommend some of the resources listed at the end of this book.

Muscles need energy to contract. The energy that is used by the muscles is called ATP (adenosine tri-phosphate) and is created from the food that you ingest, primarily carbohydrates and fat and to a much lesser extent, protein. There are three energy systems that produce the energy needed for the work being performed. These are the aerobic pathway and two anaerobic pathways, the lactate system and the ATP-CP system.

The technical definition of the term aerobic means "with oxygen" and the term anaerobic means "without oxygen." You will see how important oxygen is to the creation of energy for endurance events.

THE AEROBIC SYSTEM

The aerobic system, also known as the oxygen system (or by physiologists as mitochondrial respiration), uses oxygen to produce ATP from fats and carbohydrates. It takes place in the mitochondria of the muscle cells, known as the "power house" of the cell. It is the only energy system that can use fat as a fuel source. Since fat is plentiful and readily available, the aerobic system is very efficient and can last for long periods.

The body stores one to two thousand calories as carbohydrate, but even the leanest athlete will have many, many thousands of fat calories available. Carbohydrate will always run out before fat, therefore fat is the fuel of choice for longer distances. Aerobic metabolism is relatively sluggish in getting started, but is used for steady state activities of long durations of 20 minutes or more.

The aerobic system is utilized for moderate intensities below the lactate threshold. Oxygen must be in plentiful supply in order for this system to operate

effectively. As intensity rises, and sufficient O^2 is no longer available, the body must augment its need for additional ATP by increasing its reliance on anaerobic glycolysis.

Improving your body's ability to tap into this efficient system is one of the most important means of increasing your endurance. A cyclist's ability to ride for long periods is partially related to muscle fiber type distribution, but mostly to how finely tuned the aerobic system is. The good news is that everyone, no matter the primary muscle fiber type, can dramatically improve his aerobic system with proper training.

ATP-CP

This is the immediate anaerobic energy system that kicks in at the outset of any activity, allowing the other energy systems to begin processing their ATP. It uses high-energy phosphates for energy (CP is *creatine phosphate*). This is also the system used for all-out or explosive efforts, such as sprints or power moves. The body stores only enough ATP-CP to last for 8–15 seconds (maybe 20 seconds for some highly trained athletes). Some of the ATP is regenerated very quickly, but it can take as long as four minutes to replenish all that has been utilized if the activity was intense, which explains why longer relative recoveries are required in between high-intensity sprint intervals.

As your effort continues past 15 seconds, anaerobic glycolysis takes over to provide the necessary ATP for continued muscle contraction.

The longer your event, the less you will need to train this system. If you are a cyclist who focuses on half- or full-century rides, or a half- or full-ironman triathlete, then you won't need to address this energy system much, if at all. If you are a mountain biker, a sprint specialist, or if you compete in criterium races, then you will have to devote some of your training to these short, very high-intensity efforts to fine-tune this system.

THE LACTATE SYSTEM

This system is also known as anaerobic glycolysis. It produces ATP from the breakdown of carbohydrate in the absence of oxygen. It is far less efficient than the aerobic system, but can provide ATP to the working muscles very quickly. Because carbohydrates are stored in the body in limited amounts, the athlete runs the risk of depleting stored carbohydrates, and thus, running out of energy. This is why it is important to learn how to spare glycogen (the storage form of glucose in the muscles) until it is needed for higher intensity efforts. This is done by training your aerobic system properly, so you won't dig deeply into carbohydrate stores until necessary.

When the demand for ATP increases with higher intensity, the body can no longer meet the demand through aerobic means, and begins to rely more heavily on anaerobic glycolysis.

Two byproducts of glycolysis are CO^2 and lactate. One of the signs that your body has increased its reliance on anaerobic metabolism is when your breathing rate increases significantly. This happens because CO^2 is the trigger to the breathing muscles to increase respiration. Increased breathing rate is an important element in defining your RPE, allowing you to gauge whether your intensity has gone too far into anaerobic ranges.

Lactate has gotten a bad rap over the years, but it is not really the "bad boy" of exercise that it has been made out to be. In fact, lactate actually helps retard the burning sensation in the muscles that one feels above lactate threshold. The actual cause of the burning sensation (referred to in the lab as acidosis) is the buildup of hydrogen ions (H^+) that result in the breaking down of ATP (a positively charged ion is also called a proton). As the demands of high-intensity exercise increase, protons begin to accumulate in the muscle, decreasing the pH of the blood, resulting in acidosis. We feel this as the muscle burn.

Lactate is a marker for increased acidosis, which is why it was previously thought to be the cause of the burn. In reality, it simply increases at the same rate as the H^+ and helps to neutralize the acidity caused by the excess protons. Lactate itself is an excellent source of fuel and is re-absorbed into the aerobic system and used to create energy. As a matter of fact, your heart muscle thrives on lactate.

The point where lactate cannot be reabsorbed as fast as it is produced is known as the lactate threshold. Above this point, there is a limited amount of time available to the athlete until the muscles must slow down or stop the activity, because there is a concomitant increase in H^+ ions, which interfere with muscle contraction. Below this point, the contribution from aerobic metabolism is at its peak, and the contribution from anaerobic metabolism has not reached a point where byproducts will begin to slow you down.

You can see why it is helpful to know where this "point" is. When you do, you can train around it, and plan a training program aimed at increasing your threshold.

Knowing your threshold is the key to improved performance, as well as improved fitness and weight loss.

CHAPTER 11. HEART RATE TRAINING AND LACTATE THRESHOLD

In most IC programs that do encourage heart rate training, you'll encounter fairly similar zone methodologies, although there are some slight differences. Let's look at the different methods commonly used and then discuss the best method for cyclists with goals of increasing endurance, climbing abilities, and other performance goals.

COMMON TRAINING ZONE METHODOLOGIES USED IN INDOOR CYCLING

In the fitness industry and indoor cycling, it is most common to use maximum heart rate (MHR) to determine training zones. This method has many limitations, especially for cyclists and endurance athletes interested in accurately measuring and improving performance.

Let's first look at the ways in which many IC programs define their training zones.

The Spinning® Program has five Energy Zones, which not only give intensity parameters, but also define the terrain and profile of the class. Note that the highest suggested intensity is 92%MHR, which I believe is an artificial ceiling, which I will discuss in more detail a little later.

The Spinning Energy Zones® are:

Recovery Energy Zone® 50%–65% MHR
Endurance Energy Zone® 65%–75% MHR (mostly flat road riding)
Strength Energy Zone® 75%–85% MHR (hill climbing)
Interval EZ® 65%–92% MHR
Race Day EZ® 80%–92% MHR (time trial or field test effort)

Schwinn has four training zones, based on intuitive feeling (RPE) and not MHR (bravo to Schwinn). The idea was to take the six-zone method used by coaches in

endurance sports, but take away the top and bottom zone for the average fitness enthusiast.

These Schwinn zones are:
Zone 1: easy (warm-up, recovery)
Zone 2: comfortable but challenging, steady aerobic pace
Zone 3: challenging and uncomfortable, race pace (threshold)
Zone 4: breathless; not maximum but winded

Other common zone methodologies are similar to the following used by Sally Edwards of Heart Zones Training:

Z1: "Healthy Heart Zone" 50%–60% MHR
Z2: "Fitness Zone" 60%–70% MHR
Z3: "Aerobic Zone" 70%–80% MHR
Z4: "Anaerobic Zone" 80%–90% MHR
Z5: "Red-line" Zone 90%–100% MHR

A word of caution when attending IC classes and following heart rate guidelines given by the instructor: It's common to find instructors who only have a cursory knowledge of heart rate training, and they may be spewing out memorized data from a manual that is geared toward the average fitness enthusiasts and not towards athletes or individuals who have a deeper knowledge of and interest in their training zones and performance goals (like you).

Though there are many instructors around the world who are well trained in physiology and have an excellent knowledge of heart rate training, many know nothing and do little to change that (i.e. they never attend continuing ed courses). There are many who still say lactic acid is what makes you sore the next day, or who think the formula "220 – age" is a reliable way to estimate your maximum heart rate. The wrong information can lead you down the wrong path. Find out your instructors' certification and level of training if you plan on following their heart rate guidelines. Know your source before relying on him or her.

Better yet, know these heart rate guidelines in this eBook, and refer your instructor to *Keep it Real*!

Now we will discuss the myth of the *heart rate maximum* that is perpetuated by the fitness industry and its practitioners.

THE MAXIMUM HEART RATE MYTH

The fitness industry is unfortunately "stuck" on the concept of using age to determine max heart rate; you'll find that the bogus formula of 220 – Age = Max Heart Rate (MHR) is ubiquitous. Every cardio machine and every heart rate monitor that asks you for your age is using that formula to determine your maximum heart rate, and then prescribe training zones based on that number. You're no better off than if you closed your eyes and threw a dart at the maximum heart rate chart.

Studies have shown that maximum heart rate does not correlate well with age, and that it doesn't necessarily decline by one beat on your birthday every year. That being said, a 70-year-old person most likely will not be able to achieve the same peak heart rate that she could achieve when she was younger. There are a variety of reasons for this, not the least of which is simple unwillingness to push to those levels of intensity out of fear or out of discomfort with exertion. Nevertheless, as long as one maintains fitness, MHR shouldn't decline by much with age.

Where did the formula come from? The story goes that two cardiologists were asked to speak on maximum heart rate at a conference. They performed a regression analysis on some data and came up with a suggestion that maximum heart rate declines with age based on the idea that the fetal heart rate is 220 (or 226 for females, which was a later adaptation). It turns out it has little scientific basis [Kolata, 2003]. This formula of 220 – age was never intended by its original authors to be a universal formula; rather it was intended to prescribe a safe exercise level for patients in cardiac rehab and was based on a limited sample of unfit subjects.

But somehow, it has stuck. The formula can be off by as much as 20–40 beats in either direction, and it may apply to perhaps only 30% of the population.

Yet it is everywhere.

In my years of personal training, teaching indoor cycling, coaching, and performing metabolic tests, I have found that more often than not, the age-predicted maximum heart rate formula (APMHR) underestimates MHR. I myself am an anomaly, with an actual maximum that is lower than the APMHR, so I

will use myself as an example to show that *if in fact the formula does match your MHR*, it may only be by coincidence.

At the age of 36, I was racing mountain bikes (in a local race series) and often reached my max at the race finishes (mountain bike racing is one of the most intense activities I know of).

My actual maximum heart rate was 176bpm. How do I know? When I reached it, the highest number I've ever seen on my monitor, my vision was momentarily blurred and I had a fleeting sensation of nausea, and I could not hold it for long. I hated being at this intensity (which might also tell you that I wasn't a very successful mountain bike racer).

Using the gender adapted APMHR of 226 – 36 predicted a max HR of 190. So you can see that my actual maximum was quite a bit below the age-predicted maximum (by 14 beats).

Did my lower maximum heart rate mean I am less fit? No, it has absolutely nothing to do with fitness, and little to do with age. More than anything, MHR is genetically determined. What is important is what you do with the heartbeats that you have available.

Ten years later, I was no longer racing mountain bikes (thank God) but I still rode my mountain bike and on a final push to the top of a steep tough climb, I saw a MHR on occasion of, you guessed it, 176. And yes, it hurt every bit as much as before. It didn't decline by 10 beats in that decade, because I continued to maintain my fitness.

At age 46, using the gender adapted 226 – age formula gave me a MHR of 180.

You can see that out of nothing more than coincidence, I am pretty close to the APMHR charts. In a few years, I should be exactly as "predicted." Ten years ago, my APMHR-based prescribed training zones would have been too hard, and today, they would be sort of on target, but only by coincidence. (You'll see shortly that I don't really care, because I don't use MHR, but rather LTHR to determine my zones.)

I have encountered older athletes whose actual maximum HR is close to 200, whereas the APMHR gave them a predicted MHR of around 155. That's a

difference of 45 beats, or about 23% error! For those with higher MHR than the charts predict, their prescribed training zones are far too easy. It's no wonder why so many people say they feel like they're doing nothing when they follow the "aerobic" training zones on the charts.

Potential liability (and common sense) precludes instructors from performing a max test in their classes—it's just not a wise thing to do. I do VO2 max testing and not only do clients pay well for it, but they also sign a pretty extensive waiver. Additionally, I've been well trained, and the session is done one-on-one so all my attention is on an individual client. You cannot expect an instructor who only took a one-day certification to know all the dangers or necessary precautions of pushing their students to their maximum level. This is why max tests should *never* be done in a class situation. (Nevertheless, it's not uncommon to see classes that come close to maximum efforts).

But the question remains, *is maximum heart rate even valid?* Does it really even matter? Why is the fitness industry so stuck on using MHR as the determinant for training zones, when there is enough information out there to prove that what is far more important is one's lactate threshold (or anaerobic threshold) as a predictor of performance and as an anchor for training zones? Why push yourself that hard in a max test when there is an alternative sub-max method that's even better and safer?

In the fitness industry's defense, it's a bit of a conundrum, because one cannot expect the average fitness enthusiast to pay for a lactate threshold or VO2 max test.

SOME EXAMPLES OF THE INEFFECTIVENESS OF MHR ZONES

Not only are zones based on MHR ineffective and confusing due to the fact that they apply to so few people, there is also an issue with the artificial ceiling prescribed by many fitness programs. As mentioned in the previous section, the maximum HR "allowed" in a Spinning class (and other fitness programs) is 92%of MHR. The idea behind this 92% MHR ceiling is based on the belief that the average general population may not ever have a need to exceed 92% MHR. Here again is proof that the MHR system is not only unreliable, it's a protection that is actually counterproductive and may hurt the population that it is trying to protect. Using this artificial ceiling actually allows the less fit to push themselves

too high, and puts a cap on the more fit population who could handle a higher intensity. Let me explain.

Let's examine three individuals. For ease in comparison, let's say they are all the same gender and age, 40-year old men without any other contraindications aside from general lack of fitness in the case of one of them. That would "suppose" an age predicted maximum heart rate of 180bpm; let's say for the sake of argument that this is pretty close to their actual maximum HR. For these men, their 85%MHR training intensity would be 153bpm, which as stated above, is the assumed threshold for the average person. The fitness world suggests that 92% is the maximum suggested intensity for anyone, which in this case is 166 bpm. Let's look at these three students in two different classes.

Student #1 is overweight, unfit and is new to indoor cycling classes. His actual LT is 145, which is just over 80% of the APMHR.

Student #2 is of average fitness, and has been coming to classes for a few years. His LT is 154, very close to the 85% on the MHR chart.

Student #3 is a long-time cyclist who races for fun at an amateur level. He has started IC classes for the first time to train in the off-season. His LT is 164, which is 91% of his APMHR.

Class #1: The instructor plans a threshold ride and asks the class to ride at 85% for two sets of 15-minute intervals in order to "elicit improvements in threshold". But here is what is happening for each of the above students in this ride if they are following the advised HR parameters:

Student #1 will not be able to last for long at all, in fact, once he goes over his own threshold of 145, he will struggle to even get close to 85%. He will be breathless, he will be very uncomfortable, but maybe he thinks that he really does have to try harder, so he pushes himself far more than he should. He might not come back to class after this experience, or, what usually happens, he will think that heart rate monitoring doesn't make sense and stop listening to the instructor and stop wearing the monitor.

Student #2 is the only one deriving the presumed benefits of this ride.

Student #3 is 11 beats below his threshold. If he rides here consistently, he will not only NOT see performance improvements, he will in fact detrain and his actual LT will fall. This will not be good for his racing!

Class #2: Now the instructor wants to do an interval class to 92%MHR and asks for 6 sets of 2 minutes at "92%MHR". She thinks she is "protecting" her students from excessive intensity by prescribing this ceiling, but it is quite the opposite.

Student #1 is pushing to a level that is so far above his threshold (21 beats) that even if *he were to reach it* (which is unlikely), he might be able to hold it for only several seconds. He will be in pain, and be very discouraged. In fact, this student is the one who needs "protecting" – he shouldn't even be pushing above his actual threshold until he has been riding for a few months and raises his general fitness level.

Student #2 is sufficiently challenged for those 2 minutes at 92%, but he could also safely reach a higher intensity for short intervals. That 92% ceiling is limiting him from receiving potential anaerobic capacity benefits if he never ventures higher than that.

Student #3 once again is detraining – he would only be working at about 2 beats above his LT. He could safely push to 95-97% of his MHR, but should use perceived exertion and not HR as a guide. True, as a competitive cyclist, this particular individual probably wouldn't listen to the instructions and allow himself to go higher, but for the sake of comparison, you can see how someone with a higher LT than the average is potentially limiting performance enhancements if he were to follow MHR guidelines.

THERE IS A BETTER WAY!

Unfortunately, training zones based on MHR aren't going to go away anytime soon. There are too many people out there using them who have already bought into the concept. Teaching them that zones should be based on one's LTHR and not MHR is a daunting task. My hope is that a new, inexpensive, and easy to administer method of determining LT will be discovered in the next few years so that it can become more mainstream.

There actually is one; it's called a field test and you're going to learn about it next, but it's probably too intense for *the less fit* student. Even though it is widely used in endurance sports coaching who abandoned MHR zones years ago, it is most certainly not mainstream in the fitness industry. However, it is my goal to start the evolution in heart rate training through this eBook and with my indoor cycling training program, ICI/PRO. But don't expect APMHR or MHR training zones to be put to bed for quite a few years.

Most quality endurance coaches in the cycling and multi-sport industry have made the switch to determining LT or AT through field-testing, lactate threshold or VO2 max testing, and then pegging training zones to this number.

For the cyclist interested in maximizing his or her cardiovascular conditioning and endurance during the winter months in indoor cycling classes, I strongly recommend that you read up on heart rate training for cyclists, either in Joe Friel's book, *The Cyclist Training Bible,* or Arnie Baker's eBook, *High Intensity Training for Cyclists.*

The following section will give a basic definition of lactate threshold, how to determine it, and provide training zones based on LT.

LACTATE THRESHOLD

For years, exercise physiologists and coaches have been using the more reliable marker of lactate threshold (LT) to determine training zones. They know that the exercise intensity at which lactate begins to accumulate in the blood is a powerful predictor of one's performance ability.

The key to managing your training and to monitor your current level of fitness is to find your lactate threshold. We defined lactate threshold in Chapter 10, but in a nutshell, it is the intensity at which muscles produce lactate faster than it can be metabolized, or absorbed by your system.

VO2 max has been described as the *size of your engine*. Your LT is more a measure of how *finely tuned your engine is*. VO2 max can be improved somewhat through specific training, but it has a high genetic component. Also, the greater your fitness, the less you can impact your VO2 max, whereas an unfit person can make great gains in his VO2 max.

LT, on the other hand, is highly trainable, far more than one's VO2 max. It is often expressed as a percentage of VO2 max. In less fit individuals LT usually occurs at about 50%–60% of VO2 max. For most active cyclists, LT will usually be in the range of 70%–85% of VO2 max, and elite cyclists at their peak might have an LT reaching 90%–95% of their VO2 max.

You can see that since LT can be so variable, basing your training zones on maximum heart rate doesn't make much sense. You may also recognize that the higher your LT, the greater your fitness, and the longer you can ride before actually relying on predominantly anaerobic means of producing energy. With an LT that is a higher percentage of VO2 max, you will utilize more fat as a fuel source and be more efficient. This will translate to being a stronger rider with greater endurance.

Suppose that with training, you raise your LTHR by five heartbeats. That means you have effectively *bought* yourself five extra beats before "going anaerobic." Those five beats can make a huge difference in your enjoyment and your performance in your sport.

Sounds like a great goal to me!

The term "going anaerobic" is actually a bit of a misnomer, but I only use it because it is understood that for longer events, you want to try to avoid this intensity as much as possible, or at least to minimize the amount of time you are there, because intensities above LT consume glycogen at a rapid rate. However, the term tends to imply that your body makes a complete switch from one system to the other. This is not the case—your lactate system is still working at lower intensities, it's just that the lactate doesn't accumulate and the reliance on this system isn't that great.

Conversely, above your LT, your aerobic system is still hard at work providing energy, but the predominance of the lactate system above this point is what becomes your limiting factor in how long you can maintain your effort.

Can you see how knowing your LT is far more important than knowing (or even caring about) your maximum heart rate? The first step is to determine what your LT is now, and then start planning your training intelligently with the intent to increase your LT. We'll discuss how to determine it in the next chapter.

HOW CAN YOU RAISE YOUR LACTATE THRESHOLD?

Raising your lactate threshold requires a periodized training program and a strong aerobic foundation, as well as the willingness to push yourself. It may require holding yourself back for a few months, and then judiciously adding in higher-intensity workouts as you approach your competition period (or for the non-competitive cyclists, as you approach the cycling season).

You raise your LT by training at, or just below it for long periods. If you spend too much time above it without sufficient recovery, you can actually suppress it, which doesn't do you any favors. You won't see many performance increases with haphazard training.

Warning! Many IC classes tend towards high intensity. As explained previously, some instructors will go to great efforts to "kick the butts" of their students in every class. It's very easy to get caught up in the energy and the music, and to allow yourself to push harder than planned or than your training schedule recommends. One cyclist told me that in the first few Spinning® classes he

attended, the intensity of the class was up in Zone 5 for extended periods *every single class*. This does the students no favors.

When you are in your base building period or have a recovery or endurance ride planned, make sure to wear your HRM and to stick to your plan. You may even want to let your instructor know that you'll be taking it easy. This way, he or she will leave you alone and won't try to push you harder than you want to be pushed. I like nothing more than when a student comes in and tells me, "I'm just going to do a recovery ride in the back, is that OK?"

Is it OK? I celebrate it! If it's appropriate, I'll even tell the rest of the class so everyone realizes that they too can ride easy if they need to, showing them that they can take an active role in their training.

On the other hand, if you are scheduled to train at threshold, then take advantage of the energy and motivation that is available in IC classes! Out of respect for the class however, it is not appropriate to do your sprint or VO2 max intervals while everyone else is doing an endurance ride. But you can certainly sit in the saddle for a higher intensity tempo or threshold ride.

You've heard the adage "train smarter not harder." Now is the time to take it seriously!

LACTATE THRESHOLD FIELD TEST ON AN INDOOR STATIONARY BICYCLE

Although LT is best measured in a lab, it can be estimated through the use of a field test. Physiologists have found that for a fit athlete, LT can be maintained for about 60 minutes, at least 20-minutes for most other individuals (except the very unfit). Studies have shown that a 20-minute field test is a very good predictor of LT.

There are several ways to estimate LT through field tests. The field test employed by Chris Carmichael involves two 8-minute efforts, where LT is the average of the two. Other methods for field tests include two 15-minute efforts, or one 30-minute effort, recording average HR only in the final 20 minutes.

The following test is taken from an aggregate of methodologies I've studied to find one that is easy to administer in an indoor cycling class format. I have done it in a class situation, but I find it especially effective when done one-on-one or with small groups.

You might ask the club if you can bring in a small group to take this test when classes aren't scheduled, or if that's not possible, work with your instructor to schedule a field test during one of the class periods. If you are an instructor, this should be something you should do every three or four months with your students.

In order to conduct a field test that produces the most accurate results, the following is necessary:

- Heart rate monitor with an average function or a lap function, and a new battery. Nothing is worse than having the battery die in the middle of a test (it happened to me)! Practice using the average function prior to the test so that you know how to take an average reading over a given period of time.
- You must be well rested, with very easy activity the day before, and only easy to moderate intensity the preceding two to three days. Also, you want to be fueled (at least 45 minutes prior to the test) and well hydrated.
- The test should be repeatable and easy to implement.

- The field test should be performed seated in the saddle. You are testing output over time, and don't want to alter it with changing terrain. Sitting in the saddle on a flat road is more repeatable and comparable with future efforts. If you need a break from the saddle, jog easily for a few minutes at the end of the warm-up or end of class, or use the initial five-minute effort to push out of the saddle if needed. (Note: short standing breaks during the test shouldn't alter the results very much as long as you keep them short and infrequent.)
- Have some fun, energetic music to motivate you!

PROTOCOL FOR INDOOR FIELD TEST:

- 20-minute warm-up at an easy pace (HR 60%–70% MHR)
- Give a hard effort for five minutes in order to activate the body's energy systems and prime the legs. You should be on the verge of breathless. Performing the test without this initial effort will not be as effective.
- Again, about 8 minutes at an easy pace
- Start the field test. Begin by ramping up to the highest speed, rhythm, power, and cadence that you can hold for the entire 20 minutes. Take one minute to get into a rhythm before starting the lap function. DO NOT sprint into the effort; you don't want to tire prematurely. You're looking for *steady state* effort at a cadence range of 80–95 rpm.
- One minute into it, ride seated for the remaining 20-minutes. It should feel *hard* to just *above hard*. It should be sustainable, but always in the back of your mind is the thought that it will feel very good to finish the test! Every five minutes or so, ask yourself if you can add a heartbeat or two. If you try and it is not sustainable, your body will settle back into the effort level it can maintain. This test is self-limiting. It's not possible to ride above threshold for twenty minutes, but it is possible to ride below it for that duration. Always ask yourself if you are giving it your all.
- During the twenty-minute test, turn your heart rate monitor away from you so you will not be tempted to ride at a pre-conceived level. It's better not to

know. Of course, you will have to turn it back prior to the end of the test, so you can turn it off. It may be better to have a separate stopwatch in addition to your heart rate monitor.

- At 20 minutes, stop your HRM or hit the lap button and record the average. This average number is your estimated threshold, and is the number you'll use in your equations to determine your LTHR training zones.
- Continue to spin the legs easily and cool down at least 8–10 minutes
- Record your effort, RPE, a description of how you felt, the room environment, what you ate prior to the test, etc. For future tests, try to duplicate the same environment and conditions as much as possible.

The first time you do this may not produce the most accurate results, as there is a learning curve when doing this field test. Participants often comment that they feel they might have been able to go harder, or that they went too hard at the beginning and noticed a declining effort over the 20 minutes. For this reason, I recommend redoing the test a week or two after the first one and use that number as your estimated LT. Then repeat the test every 2-3 months.

Remember, trying to perform this test when you are insufficiently recovered from previous work efforts, or when overwhelmed with illness, stress or fatigue (whether caused by exercise or other events in your life) will produce unreliable results.

An athlete who trains smart and sticks to a sound periodized training program that includes base building and structured high-intensity sessions, should see an improvement in his threshold heart rate over time. However, if an athlete's threshold is already at a fairly high percentage of VO2, increases in the absolute threshold HR might be slight, if at all. But what may be happening is that an athlete's power output at threshold is increasing. This is not measurable without a power meter, but on a subjective basis, you may feel a profound difference in how much work you can do at your threshold.

If you know your fitness has substantial room for improvement, and over several field tests you see neither an increase in your LTHR or a significant subjective improvement of your abilities at that HR, then it might be time to re-evaluate your training program.

If you are interested in knowing your power at threshold, you may want to have a lactate threshold and VO2 Max test at a lab or university.

TRAINING ZONES BASED ON LT

Various coaches utilize different philosophies for their training zones. For example, Chris Carmichael has five zones below LT, and each zone is fairly narrow. Other coaches have three to four zones below LT, and one to three zones above it. The zone methodology that I use below is based on Joe Friel's training zones, as this is the method that I've seen utilized by the highest number of coaches.

A person's lactate threshold can occur anywhere from 75% to 94% of MHR, depending on fitness, predominant muscle fiber type, training program, and of course, genetics. Therefore, it is difficult to accurately compare LT training zones with heart rate zones that are based on MHR. But for those who take Spinning® classes and work with an instructor who only uses the five Spinning® Energy Zones® based on MHR, I will attempt to do so in the following chart in order to give you an idea how to compare LTHR zones with those zones.

SPINNING® ENERGY ZONE HR % COMPARISON WITH FIELD TEST LTHR

Energy Zone®	% Based on MHR	Based on LTHR
Recovery	50%–65%	<72%
Endurance	65%–75%	72%–88%
Strength	75%–85%	88%–100%
Interval *	60%–92%	70%–115+%*
Race Day	80%–92%	95%–106%

Note that many zone methodologies based on MHR often suggest that LT is around 85% MHR. This is a rough average, but many instructors who do employ heart rate training consider it as truth. If you are used to using MHR percentages (and all your instructors do), and the LT zones are too confusing, *there is a way* to take your field tested LT and create training zones that will adhere to the Spinning® Energy Zones (or any other zone methodology based on a % of MHR). You do this by assuming your LT is 85% of your maximum, and

"backing out" a max HR. That gives you a number from which you can create the rest of the energy zones.

As an example, suppose your field-tested LT is 160. Divide this number by 85%, and you come up with a "supposed" max heart rate of 188. Now use the 188 to create the rest of your zones, by multiplying it by the percentages given. It would look like the following:

Energy Zone	**% MHR**	**Your Zones (MHR=188)**
Recovery	50%–65%	94–122
Endurance	65%–75%	122–141
Strength	75%–85%	141–160
Interval	60%–92%*	113–173*
Race Day	80%–92%	150–173

You can create your own table depending on the zone methodology you are familiar with (Spinning, Heart Zones Training, etc.).

Is this valid? Absolutely. Because now you know that your LT is 160, which is the top of your Strength Energy Zone. It often makes sense to climb longer hills, even when challenged, at or below your LT (though short fast climbs will definitely raise your intensity above threshold). And it makes sense to do your intervals at or above that heart rate. And now you know that your Endurance Zone is *well below* your LT, so you're getting the endurance training benefits as well if you follow.

When you do your field test again, perhaps six to eight weeks later, you will have to create new zones if estimated LT has increased. Suppose your new field-tested LT is now 165 (because you've trained "smarter, not harder"). Divide that by 85% and you get a "new" maximum HR of 194. You now have to re-compute

everything else, but because your LT has improved, *it still all applies*. You are still doing endurance efforts the correct amount below your LT even though the range has risen; you are still using your LT as a ceiling for your strength classes; you are still doing your intervals above it. But, you've improved, and thus the bar has been raised! This allows you to push the envelope a little, train a little harder, while still respecting the "train around your LT" maxim.

With this example, it's important to realize that your computed MHR really doesn't matter. In reality, *it didn't go up by six beats*, but who cares? Maximum heart rate in the scheme of things is not even relevant. What really happened is that your LT increased as a percentage of your actual maximum. The method explained here is simply a way for those who are stuck on MHR zones (or stuck in IC classes where those are the only percentages used by instructors) to utilize these zones but still have it based on their LT.

For those who can adopt a zone methodology based on LT and not MHR, let's take a look at training zones that are based on LT as 100%. This is the preferred method.

LT ZONE METHODOLOGY

The zone methodology I personally use is based on Joe Friel's *Training Bible* zones. Most coaches have zones that are very similar, so you may choose to use Friel's zones, or Carmichael's, or another coach's, it doesn't really matter. The point is that they are all based on LTHR.

Training Zones	% of LT Lower	% of LT Upper
Z1. Active Recovery		< 80%
Z2. Endurance	80%	89%
Z3. Tempo	90%	93%
Z4. Subthreshold	94%	99%
Z5a. Suprathreshold	100%	102%
Z5b. Aerobic Capacity	103%	105%
Z5c. Anaerobic Capacity	>105%	

NOTE: many zone methodologies combine Zone 4 and 5a as "threshold," including that little bit below and little bit above LT. Joe Friel shaves off the few beats just above LT for additional fine-tuning and labels it as Zone 5a. He also breaks down Zone 5 into three sub-zones, whereas many other coaches label any effort above LT as "Zone 5." I'll cover the latter in the HIT chapter. For more information, read *Total Heart Rate Training* and/or *The Cyclist's Training Bible*, by Joe Friel.

Zone 1: Active Recovery. Very easy. Used for warm-up and cool down. There is little training effect in this zone, but it is very beneficial when the volume of training is high because it may hasten recovery from a preceding challenging

workout. It also has a beneficial mental effect. This is the zone in which cyclists will ride on the day following a very tough workout in Z4 or Z5.

Zone 2: Endurance. Some coaches refer to this as the *aerobic threshold,* in which the slow-twitch muscle fibers are overloaded, increasing endurance. It is this zone that provides the physiological foundation for more intense efforts. Without this foundation, the Z4 and Z5 workouts will quickly tear you down.

This is the zone used for long distance events, and therefore is one of the most essential fitness elements. Even athletes training for shorter events will want a strong aerobic base to stimulate adaptations in the slow-twitch muscle fibers. However, the aerobic benefits don't really start to kick in until 30–45 minutes into your ride, so it is best trained for periods longer than an hour. Training here will increase your body's ability to choose fat as its fuel source, increasing endurance and stamina.

It may be difficult to believe that many training adaptations are occurring at all when in this zone, because for many people, it will feel far too easy. But going too hard on your easier days in Z2 will preclude you from being able to maximize your workouts on harder training days in Z4 and Z5. As a result, all of your training becomes mediocre. Z2 training days are sacrosanct and make up a significant part of a cyclist's training in the base building period.

Very little recovery is needed after training in this zone, unless the duration is very long (2-3 hours or more).

Zone 3: Tempo. This is still an aerobic pace, with a little more challenge. Fat is being used as a fuel source, but the reliance on carbohydrate is much higher than Z2. Still, the intensity is too high for maximal stimulation of the slow-twitch muscle fibers and too low for stimulation of the anaerobic system. It is also too low to make yourself any faster. For athletes, Zone 3 is sometimes called the "no-man's land" or the "dead zone."

Nevertheless, it's probably where most riders spend too much of their time, and it's often the pace of group rides outdoors. Indoors, it's probably where most classes tend to "hang out." But also indoors, if you are religious about using your HRM and sticking to your goals, you may have a little more control over this because it is you, and not Mother Nature, that creates your terrain!

Note that indoor cyclists who only attend 2-3 one-hour classes per week don't need to worry about training in Zone 3 too much. It is only those cyclists who spend much more time in the saddle, especially if there are weekends with rides of several hours, who have to carefully monitor if most of their training time is spent in this moderately high zone.

Zone 4: Sub-Threshold. This is the highest intensity in which the body can absorb lactate as quickly as it's produced. Both aerobic and anaerobic systems are working side by side here, but the anaerobic system isn't producing enough acid to slow you down. For this reason, you can maintain this intensity for 20–30 minutes (or up to 60 minutes for fit riders). Your goal for many of your rides should be to work just below your LT, and over time, you will raise it.

Fast-twitch muscle fibers are being trained to produce less lactate while slow-twitch muscle fibers are being trained to consume lactate, a perfect combination. It is said that training in this zone has the highest cost-benefit ratio of any training, although depending on the periodization schedule, you want to follow a Z4 workout with adequate recovery and you wouldn't spend more than 25% of your total training volume here.

Z5a. Supratheshold Training. This is your LT intensity and slightly above. This zone is quite small, only about four beats. As explained earlier, Joe Friel carves these few beats off most other coaches' Zone 4's, so you can pinpoint your LT training. Workouts in this zone are more anaerobic, as just above LT, acidosis is increased. Your tolerance for working in an "acidic" environment is improved by training in this zone.

Z5b. Aerobic Capacity. The title of this zone is a bit of a paradox, because training in this zone improves anaerobic endurance and utilizes primarily the lactate system (glycolysis) to create energy. But it also is the zone that boosts aerobic capacity, your VO2 max, which is the physiological capability to use oxygen to produce maximal efforts. Joe Friel describes the benefits of this zone as having a "trickle-down" effect that benefits all submaximal efforts. (Friel, *Total Heart Rate Training*, p 83).

Some coaches refer to this type of training as lactate tolerance, but that depends more on the duration of the interval, which we will discuss in Chapter 13.

This zone requires significant recovery because it is very stressful on the body.

Z5c. Anaerobic Capacity. Training in this zone develops muscular power and challenges the body's ability to tolerate acid in and around the muscles. It is rare that an endurance athlete would ever need to go to this intensity, but cyclists who race in criteriums or who are sprinting specialists in road races must become comfortable with this zone.

Duration for Z5c is 8–15 seconds, and utilizes the ATP-CP energy system. Extensive recovery is required from these workouts and the risk of injury and overtraining is high.

You may notice in IC classes, some instructors gravitate towards frequent "sprints." A true sprint is in this Z5c, but it is doubtful that most IC students attain this intensity, though they still probably spend too much time above LT. Nevertheless, you should know when it is and isn't appropriate for you to attain this Zone 5c. It depends on your sport/event and on the period of the year. You may find yourself sitting out of most so-called "sprints" in your IC classes.

CHAPTER 12. PERIODIZATION AND INDOOR CYCLING

In a periodized training program, seasons are divided into periods of time, with each period devoted to a unique purpose. As the season progress, the stress applied to the body is changed. The principle idea is to gradually build fitness in stages in a goal-oriented plan so that you can reach a peak at prescribed times. Most competitive athletes, regardless of sport, train this way.

I would suggest that even if you are not a competitive athlete, and consider yourself a recreational cyclist, you will dramatically improve your fitness, endurance, and overall enjoyment of the cycling season by periodizing your training in the winter and spring. It may not have to be as specifically goal-oriented as an athlete training for specific races (although goals are excellent ways to motivate you to stay committed to your training program and I highly recommend them)!

IC classes are an excellent way for you to periodize your training provided you pay close attention to your intensity, especially if you know the instructor tends to push the class on a regular basis.

During your base building months, learn to ignore the instructor's motivational efforts to push everyone harder. It would be wise to let her know prior to class that you intend to ride at an aerobic pace during the class. Later, when it's time to add higher intensity and do an interval workout, this is when you can take full advantage of the motivation provided by the coaching, music, and energy of an IC class.

Most periodized programs include the following phases: *Preparation, Foundation, Build, Peak, and Competition.* These are further divided into smaller cycles, or "mesocycles." For the competitive athlete, mesocycles are divided into "microcycles." Please read Joe Friel's *Cyclist's Training Bible* or other books on periodization to fine-tune your own training. My discussion here will be fairly basic, designed for recreational cyclists who want to ride faster, to ride farther, and perhaps to peak for a few centuries or for another major cycling event or trip, like climbing Mont Ventoux or Alpe d'Huez in France or participating in an extended group ride such as Ride the Rockies in Colorado.

Before describing the phases of a periodized program, let's first discuss the basic fitness elements and the advanced fitness elements, because each phase will focus on a different combination of these elements.

THE BASIC FITNESS ELEMENTS

The three basic fitness elements for an endurance athlete such as a cyclist are endurance, strength, and speed skills (sometimes referred to as efficiency). Failing to perfect these three elements will be the biggest limiter to your performance. Many athletes become impatient and shortchange their base building efforts by introducing the advanced fitness elements too quickly. Nothing will sabotage your training quicker.

These base elements take a longer time to develop than the advanced elements. Every athlete, every single year, must return to this development stage. This also applies to recreational athletes with more basic fitness and cycling goals. The longer you've been training, the less time you will need to devote to your base, but for your own good, do not shortchange yourself by going too fast, too hard, too early!

ENDURANCE

Endurance is the most important basic fitness element and takes the longest to develop, sometimes many years. The athlete with well-developed endurance will tend to rely more on fat as a fuel source, spare glycogen for when it's most needed, and resist fatigue on longer events. An athlete with underdeveloped endurance will fatigue much more quickly, be limited on the length of hills she can climb, and generally enjoy her sport less. Endurance is the golden key to cycling enjoyment!

Training this basic fitness element requires long, low to moderate intensity efforts in Zone 2. Since most IC classes tend to be 50–60 minutes, you may want to see if it is possible to come early to class or stay longer after class to increase the duration of your workouts. If your club has back-to-back classes, this may be the perfect solution, provided it's permitted by your club to do two in a row.

If this is not possible, then make sure to include longer indoor training sessions on weekends using your indoor trainer at home. Don't shortchange your endurance by not including some longer sessions in Zone 2.

An indoor cycling class that is less than 60-minutes is not likely to improve aerobic endurance. For this reason, it is advisable to use these classes for interval, strength or threshold development workouts at higher intensities (Zones 3-5), while also focusing on technique. They are also excellent for recovery rides (Z1).

STRENGTH

Strength is the ability to overcome a resistance, which translates to hill climbing and high gears for cyclists. Improving your strength as a cyclist can include strength-training sessions in the gym and progress to cycling-specific workouts. No doubt you've heard that strength training will not increase your endurance; this is true. But what it can do is, when combined with endurance, increase your muscular endurance, which as you will see is an advanced fitness element. Also, later in your periodized schedule, increased strength when combined with speed skill will increase your power potential.

If you are a competitive cyclist who shies away from strength training out of fear of building bulk, you will want to consult with a strength training coach or review books designed specifically for strength training for cyclists. You too will want to increase the force-generating capabilities of your leg and hip muscles, but you may want to avoid upper body workouts.

If you are a recreational cyclist, focus more on lower body workouts, but there is no need to completely avoid upper body strength development, because it plays a huge role in posture and overall fitness. No matter what kind of cyclist you are, however, you should always include core training in your program, because a strong core will go a long way to limiting fatigue in the neck, shoulders, and back, and help with minimizing or eliminating back pain from long rides. It also helps in the generation of force as you pedal.

Cycling-specific strength workouts will require training in Zones 3 and 4, utilizing higher resistance such as in hill repeats and medium steady state climbs. It is too early in your program to include longer climbs.

SPEED SKILLS/EFFICIENCY

The nervous system is developed with efficiency training, and it is every bit as important as all the other fitness components, but it is probably the one left out of most programs (especially indoor cycling). If you avoid developing and improving your pedal stroke or riding position, you waste energy through poor technique. If your muscles are fighting against each other, you are wasting energy. You will never come close to your potential unless you focus on this important element.

Please read Chapter 14 for information on how to use IC classes to improve your efficiency and technique, because there are some elements of the indoor bike that may limit its effectiveness, especially if not done properly.

Proper form is paramount when developing this element of your fitness. Since you are focusing on improving your neuromuscular abilities, poor form will just enhance poor movement and is counterproductive. The moment you feel your form has fallen apart, it is time to rest, or discontinue that part of your training for that day.

Cycling-specific drills are usually too quick to utilize heart rate as a measure of intensity.

ADVANCED FITNESS ELEMENTS

The three advanced fitness elements are muscular endurance, anaerobic endurance, and power. These abilities will determine a higher level of performance in endurance events. They do not take as long to develop as the basic elements, and consequently, not as much time is devoted in your periodized program. You will see that each of these elements is based on at least two of the basic elements. It bears repeating: your advanced abilities will not do you any good if you do not have a solid foundation of all three basic elements.

MUSCULAR ENDURANCE

Muscular endurance is the ability to repeatedly contract against a resistance. This is essential for improved hill-climbing abilities, your power at lactate threshold, performing time trials, and your ability to push a higher gear at a faster cadence, as into a headwind. It is a combination of the two basic elements of fitness: endurance plus strength. The training zones utilized are Zones 3–5a.

It is generally considered that climbing at lower cadences of 55-70rpm will develop your strength, and higher cadences of 70-85rpm will develop muscular endurance. IC classes are perfectly suited to this type of training, especially when utilizing the beats of the music to set the tempo of the climb.

If hills are not your forte, or you live in a region in which the biggest hill is a highway overpass, you will be delighted, and perhaps a bit surprised, at the strength and muscular endurance you can attain indoors. If you are not used to long climbs, begin with shorter hill repeats of three to four sets of 8–10 minutes each, and gradually increase the length of the repetitions. Match your training indoors to your outdoor goal. If you plan to participate in Ride the Rockies or to go to France to climb Mont Ventoux, you want to make sure that you can eventually sit and climb for two hours or more! Give yourself time to develop this by gradually increasing your climbing over time.

Refer to Chapters 6 and 7 for climbing techniques on an indoor bike to maximize the application to your outdoor riding. In general, you will want to spend more time seated than standing, and keep your cadence between 55 and 85 rpm.

Cycling-specific strength training in IC classes works extremely well to prepare you for outdoor climbing! I have had clients on bicycle tours to the Alps who have done most of their hill-climbing training in IC classes.

ANAEROBIC ENDURANCE

Anaerobic endurance is the ability to resist fatigue at high efforts. On a physiological level, you increase your ability to tolerate acid and to absorb lactate. You need this fitness element for higher-paced efforts, breaking away, attacking, and for performing well in many events both long and short. Mountain bikers will require more anaerobic endurance than most recreational road riders.

This element is a combination of endurance and speed efficiency because you must be able to turn the pedals quickly without wasting energy, while resisting fatigue.

The training zone utilized is Zone 5b.

Since high-intensity interval training (HIIT) sessions require shorter durations, one-hour IC classes are perfect for this type of training. The energy and the music, combined with a good coach to motivate you to push harder, may allow you to better reach your goals for that training session. Alone, it is often difficult to push yourself as hard or for the length of time needed. This is where an IC class excels!

The only problem is that far too often *every* class becomes a high intensity interval class, and often the instructor performs haphazard intervals without a greater overall objective. Not all intervals are created equal! It is for this reason I have included a chapter on HIIT profiles for indoor cycling classes (Chapter 13). Refer to this for your HIIT sessions.

You also may want to give your instructor the link to purchase this eBook to augment his or her interval training profile knowledge. (It is greatly appreciated if you do not give a copy of this eBook away, either electronically or printed. Many thanks!)

POWER

Power is the ability to apply maximum force very quickly. This element is only necessary for advanced athletes who must be skilled at sprinting, attacking, and powering up a short, steep hill without losing momentum.

It is a combination of the basic elements of strength (force production) and efficiency (turning the pedals without wasting energy).

The training zone utilized is Zone 5c. Adequate recovery is paramount.

The application in IC classes is short-duration intervals at high intensity, namely sprints. Refer to Chapter 7 for correct form in sprinting. In order to maximize the effectiveness of sprinting indoors, you should include ample recovery time after each one. Some instructors do not know that sprints require longer recoveries, and as a result, the class really doesn't even end up "sprinting" because they are too fatigued.

On the other hand, by the time you would be, or should be, introducing sprinting into your periodization schedule, it is probably time to ride outdoors. If you enjoy sprinting in IC classes, by all means, do them. But use them judiciously and sparingly, and make sure to provide yourself ample recovery.

Now let's discuss the phases of a periodized program and which fitness elements are the focus for each phase.

THE PHASES OF PERIODIZATION

THE PREPARATION PHASE

This period that allows you to "prepare" to train and is focused more on general fitness. It follows a competitive or active cycling season and is fairly unstructured, introducing cross-training and sport-specific training to avoid boredom and add spice to the training program. It generally includes the periods surrounding the holidays of November and December and the New Year (for Northern Hemisphere athletes), which is the perfect time to take your mind off of your regular sport and spend more time with family.

In your IC classes during this phase, go with the goal of simply having fun. Intensity should be easy to moderate, although a few higher intensity sessions are OK, as long as you allow plenty of recovery.

The length of this phase depends on the athlete's aerobic fitness and potential for burnout from the previous competitive phases, and is usually two to six weeks.

THE FOUNDATION PHASE

This phase, also known as the aerobic base building phase, develops basic fitness elements and sport specific abilities, spends most of the time at aerobic levels, and introduces muscular endurance. This is undoubtedly the most important phase for endurance athletes. Recruitment of slow-twitch muscle fibers is enhanced in this phase, developing an efficient aerobic engine. Training sessions are performed at or slightly below aerobic threshold, primarily in Zone 2.

During the base period, your ceiling may drop somewhat while working on the low end, but the foundation is the most important element, and will be of significance when it's time to raise your fitness ceiling. You simply cannot have high power output or anaerobic abilities with a non-existent or weak aerobic foundation.

Think of your base building period as the foundation of a house, and the framing, beams, drywall, roof, and other building materials as your other fitness elements. Without the solid foundation, the rest of the house's materials will do you no good; they will be unstable and can result in disaster! One must come before the

other, and with fitness, as in home building, it is impossible to build all elements at the same time.

Base training is the time to address the areas in which you are weak, what are known as your limiters. When you examine your weakness, you will notice that it is most likely a basic fitness element that is lacking, and not an advanced element. It is the basic elements that determine the potential of our advanced fitness elements.

Refer to Chapter 14 for efficiency and leg-speed drills to employ during this phase in your IC classes. The base period is also the perfect time to focus on your riding abilities, such as relaxing the upper body to reduce wasted energy and stress, and to bring in the knees if you tend to let them fall to the side when pedaling.

The length of this phase depends on the athlete's aerobic fitness level and years of training, and can last anywhere from 8 to 14 weeks. Volume will increase throughout the phase, incorporating a lower volume week every four weeks.

Up until recently, many endurance coaches advised against any high-intensity training at all during this period. There may still be some coaches who follow this philosophy, but it seems that more and more believe it's important to incorporate a threshold training session to Z4 once per week (in intervals of six to eight minutes), and one interval session to Z5b once every two weeks or so, in order to limit any "detraining" of LT and VO2 max, or in other terms, to limit how low your "ceiling" drops.

The bulk of your training during this period should be in Zone 2 with some Zone 1 and 3.

Some IC programs will incorporate a base building period into their schedules. I have always done a two-month aerobic base building program during the months of January and February at my club in Vail, Colorado. We did this by requiring all instructors to teach all classes at 80% MHR and below. If students knew their LT, we advised them to stay below their LT by at least 5–10 beats during this program.

Classes were still varied and included Endurance, Strength, and Interval classes that focused on aerobic intervals.

When we first began the program in 1999, at first members grumbled. They missed the hard classes. It didn't take long before they realized the huge benefits and within a few years, they begged for us to continue the program and our numbers increased. Not only were they able to ski without being fatigued from Spinning® classes, but many of them were cyclists who saw dramatic improvement in their endurance once they got back on their bikes. We also incorporated longer classes up to two hours in the shoulder season of May and June (around here, that period is also known as "mud season").

If your club doesn't have a base building program, and your instructor doesn't see the need to incorporate more Endurance training (truth be told, she will probably lose most of her non-cycling students if she did that, if it's not a cycling Mecca like where I live), then it will be up to you to stay within your planned zones during all classes.

Remember, as a cyclist you must plan your work and work your plan!

If you want to know more about how to incorporate an aerobic base building program at your facility, please e-mail me (my contact information is available in the appendix).

THE BUILD PHASE

This phase continues the recruitment of slow-twitch muscle fibers but begins to introduce higher intensity and activate fast-twitch glycolytic muscle fibers. A major goal in this phase is to develop the more advanced abilities and improve lactate threshold to maintain sustainable race pace. This is where a higher volume of work at Zone 4 and Zone 5a begins with cruise intervals and race pace efforts.

Power training is introduced in small amounts early on and increased towards the end of the phase. It will replace speed and efficiency training (though the latter should be maintained with one training session every two weeks).

Endurance work may be reduced, but it is still a prominent aspect of your training. Resistance training is reduced to one day per week.

This phase is four to nine weeks depending on the athlete, and may be repeated if you are planning on multiple peaks for multiple events. Recreational athletes should spend the entire nine weeks developing the elements of this phase.

All varieties of IC profiles can be incorporated in the build phase. However, the class that the instructor is planning on teaching may not jive with what you would like to do. My advice is to just go with it and enjoy the workout (providing it is cycling specific—remember, you can sit out the jumps or runs if you don't want to do them), as long as it is a workout that you are planning on doing that week, such as hill climbing or intervals. You can always make small adjustments to the rest of your training plan that week.

There may be times when you decide you want to work your training session as planned and ignore what the instructor is doing. This is most easily done when you are planning on an easier training session than the instructor has planned. It can also be done if you'd like to train at a tempo or threshold pace or a long seated climb. As a cyclist, most of your training session will be (should be) done in the saddle, so it should be easy to simply add resistance while you sit in the saddle if you want to climb, or focus on your pedal-stroke drills, or increase your cadence on a flat road if you want to do some speed work.

However, if you do this, sit in the back, and make sure it does not in any way interrupt the class. Please respect the instructor and the other students and do not do any high-intensity training while the others are at an easier pace and do not come out of the saddle for standing climbs or runs when everyone else is sitting.

I'm telling you this as an instructor who has experienced it from students, and it is very distracting and in truth, rude. There are so many ways for you to still achieve your goal by sitting in the saddle and working at a tempo or threshold pace.

If you really must get those HIT intervals in, wait until after class if you are allowed to stay, and add them after everyone has left. While the instructor is doing a cool down and stretch, you can sit quietly in the saddle and continue pedaling, providing you have asked the instructor prior to class. Now you see why you want to be to the back of the room!

THE PEAK PHASE AND COMPETITION PHASE

By this time, many cyclists will most likely say farewell to indoor cycling classes until the days get shorter and colder and they are driven indoors once again after the cycling season ends! Your training in these phases will need to be sport specific, and that is best done on your bicycle, outdoors.

However, there will still be those of you who may need to rely on the occasional IC class to maintain cycling fitness mid-week so you can devote your weekends to longer rides, especially if you are restricted by your work schedule or live in a big city with limited outdoor riding. It will be important in this phase to make sure you have a balance in your training week, with some days devoted to speed/efficiency drills, other days to muscular endurance/hill climbing, and still others to high-intensity anaerobic endurance. IC classes are excellent for these three elements. Remember you can always use an IC class for active recovery too.

Save your weekends for your outdoor road rides. Include longer endurance sessions and rolling hills on group rides or out on your own. If your group rides tend to be hammer sessions at or near LT, make sure to devote at least one weekend day to LSD (Long Slow Distance in Zone 2) so that you are maintaining your endurance fitness element. By this time in your training cycle, you'll need longer than one hour to overload, and therefore, improve your aerobic system and maintain endurance. If your IC classes are an hour or less, use them midweek for HIT (Zone 5a, b, c), climbing (Zone 3-5a), threshold work (Zone 4 and 5a), and recovery (Zone 1), and not in Zone 2.

Please consult with a periodization guide tailored to your specific goals to further improve your fitness elements in these phases. In general, as you get closer to your event, your training sessions will become more and more specialized. High intensity will be key, as will sufficient recovery. During the 7–10 days prior to your event, you will need to taper and cut volume significantly, but short high-intensity sessions will prevent you from losing fitness.

A WORD ABOUT RECOVERY

One key point to always remember is that your training only creates the *potential for fitness*. Your fitness is realized during your recovery! Training creates stresses on the body, and it is through these stresses that the body has a reason to get stronger. But it is during the recovery where your body resynthesizes what was stressed and makes it stronger. Muscle rebuilds, circulation increases, heart rate is stabilized.

Joe Friel has an excellent analogy for the need for recovery in *Total Heart Rate Training* (p 87):

> Balancing rest and stress is much like managing a checking account to make sure you don't run out of money. Writing a check may be compared with exercising. The check you wrote (workout) can be a large one or a small one. Making an account deposit is similar to resting. You can make a big or little deposit (rest). What you *don't* want to do is have your checking account in a negative balance for too long. If you write a big check and don't make a big enough deposit to cover it, you will be penalized by the bank with a hefty fee. In the case of your body, this penalty is called "overtraining."
>
> You may know that you can have your checking account withdrawn in your check register for a couple of days, so long as you make a deposit soon. Again, it's the same with your body—you can over train for a few days and, so long as you soon make an adequate deposit in the form of rest, your body will be "in the black" once again with no penalty.

Rest can be classified as passive or active recovery. The best kind of rest for an athlete, especially one in the higher intensity phases of a training plan, is sleep. Otherwise, you want to make sure to follow a regimen of hard-easy cycles. Harder training days should be followed with easier days in Zone 1 or 2. A hard series of days should be followed with an easy series of days. A hard few weeks should be followed with an easy week. In this way, you can guarantee that you are stressing the systems you should be stressing (provided you are following the periodized plan and a balanced workload) while also allowing sufficient recovery to ward of the potential for overtraining.

IC classes are a perfect place to do recovery rides at a very easy pace. You can enjoy the company and the music, but simply sit back and pedal easily for the duration of the class. Recovery rides should be in your Zone 1. They are most effective on the day following a longer Z4 or Z5a session, or anything that reaches Z5b and Z5c.

The day following a Zone 3 workout (dead zone) should also be easier, but can be in Zone 2. You will then be fully fit and prepared for a Zone 4–5 workout on the following day or two.

CHAPTER 13. HIGH INTENSITY TRAINING

In some clubs, almost every IC class tends to turn into a high-intensity interval profile. Intervals are fun, members like them, and in truth, it is a great way for the average person with basic fitness goals to train, especially if they only train cardio one to two times per week. I would tell them that they would benefit even more with increased aerobic training at lower intensities for several months in a row (a periodized program for basic fitness), but most wouldn't listen to me.

Getting instructors to do this can also be difficult.

However, cyclists with performance goals need to be a little more scientific and structured about their intervals. First, even in the build or peak phase, too many interval sessions can be detrimental, and may even suppress LT, especially if done back to back with insufficient recovery in the day(s) that follow.

Secondly, not all intervals are created equal. A few heartbeats separate different potential adaptations that occur in the body, and the length of time that you spend at certain intensities will have an effect on the physiological benefit available.

In general, intervals that are done against a higher resistance with a lower cadence (hills, headwinds) will have a muscular strength or muscular endurance benefit, and intervals done with a higher cadence and lower resistance have more of a neuromuscular benefit (as in leg speed). You can achieve the same heart rate in both these instances, but the ultimate physiological emphasis is different.

Let's look at five different types of intervals based on the physiological system that is stressed. These are aerobic, lactate threshold, VO2 max, lactate tolerance, and anaerobic capacity/power intervals. For each one we'll address the duration and intensity that is most effective and its application in an IC class.

Finally, several different indoor cycling interval class profiles will be presented.

FIVE DIFFERENT TYPES OF INTERVALS

AEROBIC SYSTEM

Zones 1 and 2 should be done as steady state efforts, but Zone 3, the Tempo Zone, can be enhanced through interval training. Slow-twitch muscle fibers are maximally challenged in this zone. A subset of your fast-twitch muscle fibers (called Type IIa muscle fibers), are more oxidative than their counterparts (Type IIb) and thus can be trained to be more aerobic-like. These Type IIb fibers are also engaged in this zone.

Duration: Three to five sets of 12–20 minutes in Z3, with recoveries that are one-fourth to one-fifth as long. Best done as a seated flat, cadence 80–100 rpm, or vary it with occasional short hills.

Application in IC classes: Endurance classes, or general "all-terrain" classes at light to moderate intensities. Tempo rides can include flats and rolling hills, with a focus on a higher cadence.

LACTATE THRESHOLD

Training at or just below your LT has significant physiological benefits. Begin this training late in the base period and gradually increase it throughout the build and peak periods. The aerobic system is stressed maximally just below LT (Zone 4) as is your power at threshold. In Zone 5a, at and a few beats above LT, an added benefit is an improvement in lactate clearance.

Types of Intervals and Duration

Cruise intervals: Three to six sets of 6–12 minutes in Z4. Recoveries should be one-fourth to one-third as long (e.g., an eight-minute interval requires at least a two-minute recovery). As fitness improves, intensity can be taken to Z5a, with longer recoveries as the intensity rises (half as long).

Cruise steady state: After three to six weeks of cruise intervals, add 20–30 minutes steady state in Z4. At the latter stage of the build phase, increase to Z5a.

Application in IC Classes

Cruise intervals would correspond to a threshold interval class. Your intensity is more important than the mode; for example, you can combine different IC movements, or to keep it more cycling specific, choose to stay in the saddle. The steady state efforts up to 30 minutes would correspond to a field test effort, or a race pace effort time trial. Both can be used to improve muscular endurance by choosing hills to achieve the intensity.

VO2 MAX INTERVALS (AEROBIC CAPACITY)

VO2 max is the highest volume of oxygen that your body can consume at work. It is often referred to as the "size of your engine." You have your parents to thank for your potential VO2 max, however, VO2 max can be improved with specific training. Small improvements in VO2 max can have significant improvements on performance.

Intervals at this intensity are known as aerobic capacity intervals because they challenge the body to use oxygen at its maximal rate. This adaptation is important for *all* athletes, even endurance athletes who participate in longer events such as centuries, triathlons or multi-day rides. However, the latter athletes should only perform these in the Build phase, and not within 4-6 weeks of their long events. The intensity is simply too high and they should be focusing on the intensity and duration that mimics their event. The specificity principle states that the closer you get to your event, the more closely your training must resemble your event.

Recreational cyclist? If you don't have a specific training goal, then feel free to do these once or twice a month if desired, less if you have a period of higher volume.

Duration and Intensity

These are probably the hardest intervals to perform, and are what many cyclists refer to as a "sufferfest". Studies have shown that VO2 max is best stressed with longer anaerobic efforts of three to six minutes at intensities of 4–10 beats above LT. Durations shorter than that are unlikely to elicit VO2 max, and if any longer,

fatigue will interfere with quality time spent at VO2 max. The effort will be high cost with little gain.

Recovery interval should be equal to the work effort. Total time spent at this effort should be 12–25 minutes.

These intervals have a high gain because the benefits will trickle down to all lengths of events since a "larger" aerobic engine will improve aerobic function at any effort. Intervals of this length, when performed at the correct intensity, can be painful for cyclists, and especially uncomfortable for the average fitness enthusiast. VO2 Max intervals are so hard that few IC instructors will conduct intervals this long; shorter 30-second to 3-minute intervals are favored. Programs that are periodized are more likely to help riders to develop this aspect of their fitness, because higher intensity efforts are gradually extended over time.

However, cyclists may have to perform these outside of class.

Application in IC Classes

When I do VO2 max intervals in my classes, I generally ask students to come out of the saddle in a hard standing climb at about 80 rpm and hold it as long as they can or as long as they feel like it. Perceived exertion is "very hard". Heart rate does not respond until at least a minute or two into the interval. Once they hit the point of breathlessness, they can choose to stay standing or sit back down but continue to work hard at maintaining the effort for the entire duration. You can choose a hill (use a cadence on the higher side of the climbing range to help keep intensity higher: 70—80 rpm) or a flat road (cadence 80—100 rpm) to maintain the intensity. Runs or jumps are often irrelevant to a cyclist; my suggestion is to stay seated unless you want the variety of these other movements. If you choose to do jumps or runs, keep an eye on your HRM as it's more difficult to maintain a consistently high effort.

Riders should be encouraged to recover well in Zone 1 on the following day or two.

LACTATE TOLERANCE

Lactate tolerance, or acid tolerance, intervals generate a high amount of acid (H+) since the energy is achieved through anaerobic glycolysis. Lactate tolerance

intervals hurt, but because they are shorter than VO2 max intervals they are a little more tolerable. Breathing at this intensity is extremely labored. The goal is to improve your ability to continue even though the muscles are flooded with acid.

Those who participate in events such as cross-country mountain biking, criteriums, or other shorter, higher intensity events will need to incorporate these more often than cyclists who focus on longer, more endurance-based events such as centuries.

Duration and Intensity

These intervals are one to two minutes long at the maximum pace you can maintain for that duration. A one-minute interval will be more intense than a two-minute interval. Recovery should be at least 2-2½ times as long as the effort.

Another type of acid tolerance interval involves incomplete recovery, which may be important depending on your event (mountain biking comes to mind). An example is three to six repetitions of 30-second efforts followed by 30 seconds at an easy pace. That is one set. Follow each set with a five-minute complete recovery, and repeat one to two times.

Total time in zone should be a maximum of 12 minutes, as in 6 X 2 minutes, with 5-minute recoveries. These are done in Zone 5b, but generally heart rate responds too slowly to use it to gauge intensity for intervals less than two minutes. Perceived exertion will be *Very Hard*.

These intervals are very stressful on the body, though very effective in helping you peak for your event. A Zone 1 recovery ride should follow on the next day. Only four to six weeks of lactate tolerance intervals are needed to fine-tune the body for the event, so they shouldn't be incorporated until six to eight weeks prior to your most important high intensity events.

Application in IC Classes

These are best done as powerful standing climbs for the duration of the interval. In a class environment with a motivating instructor, they can be very fun. Instructors love these. They make their students think they are gods or goddesses!

POWER (ANAEROBIC CAPACITY)

This intensity prepares athletes for those rare moments when an all-out effort is needed. These intervals are excellent for building muscular power, which will be important for shorter, high-intensity events less than one hour. Most endurance athletes do not need to do these types of intervals.

Duration and Intensity

Since the energy system being employed is the ATP-CP system, the duration is 8–20 seconds. Recovery should be at least one minute, up to five minutes. Heart rate is not a good indicator of effort because the duration is too short. In fact, the heart rate will most likely not even rise until after the rider has sat back down. The RPE will be *Very, Very Hard*.

It is possible to do these as incomplete recovery intervals, but know that they are very intense and only recommended for athletes with a solid base and experience. An example would be 4 X 20 seconds with 20-second recovery. That is one set. Ride easy for five minutes and repeat one to two times more.

IC Application

Sprints. Sigh…I don't want to beat a dead horse, but so many IC classes have mismanaged "sprints" for so long, that most instructors and students do not even know what a true sprint really is. For one thing, they rarely have enough resistance to achieve any power benefits, and are thus done at unrealistically high cadences of over 110 rpm, on up to 140 rpm or more. Also, they are often way too long.

Because of this, in most cases "sprints" end up being slightly anaerobic surges with incomplete recoveries, such that no one is getting the desired physiological benefit. It ends up being a bunch of "mediocre" efforts, even though heart rate and perceived exertion may still be high.

But the potential benefit is huge if done properly. Personally I rarely sprint in my classes; maybe at the end of a Tour de France stage simulation a few times a year!

Refer to page 62 for sprinting technique indoors. However, if you are a cyclist who is truly training for an event that requires explosive power, these might best be done on your own on your road bike outside. If you simply want to sprint in your classes, make sure to do what you know to be correct and ignore what you know to be improper sprinting. If you are brave, maybe you can ask your instructor to incorporate some *real* and effective sprints for your benefit!

SOME SAMPLE INTERVAL CLASS PROFILES FOR INDOOR CYCLING CLASSES

A. THRESHOLD INTERVAL CLASS #1

This class consists of 6 sets of 5-minute intervals, all at LT. The first 3 are on hills (you decide when to sit or stand), the second 3 are on flats.

Warm-up 8 min

6 X 5-min @ LT, 3-min recovery

Intervals #1–3: strength building hill repeats. Cadence 55-65 rpm.

Intervals #4–6: flat road (seated flat primarily. Non-cyclists may want to incorporate some runs/jumps). Cadence 90–100 rpm

Cool down 6 min

B. THRESHOLD INTERVAL CLASS #2: M.E. HILL REPEATS

This class consists of 6 sets of 5-minute intervals, all at LT and all climbing. The goal is improving muscular endurance (ME), so keep the cadence in the 70-80rpm range. Recovery is a seated flat, with jogs out of the saddle if needed. The variation of seated vs standing climbs will change with each set (and is provided mostly for the benefit of the non-cyclists who don't like to sit for long).

Warm-up 8 min

6 X 5-min @ LT, 3-min recovery
#1: seated climb 5 min
#2: sit 3, stand 1, sit 1
#3: sit 3, stand 2
#4: sit 2, stand 2, sit 1
#5: alternate sit/stand (30-sec each)
#6: rider's choice

During recovery, non-cyclists can jog in standing flat if HR stays low.

Cool down 6 min

C. THRESHOLD INTERVAL CLASS #3: CRUISE INTERVALS

This class consists of 3 sets of 12-minute intervals, all just below LT and all spending as much time in the saddle as possible (non-cyclists can take as many saddle breaks as needed). The goal is improving muscular endurance, simulating a flat road with a slight headwind or a higher gear choice. Recovery is a seated flat, with occasional easy saddle breaks if needed.

Warm-up 8 min

3 X 10-min @ Zone 4 (LT minus 1–4 beats). Seated flat, cadence 80–85 rpm.

Recoveries are 3 minutes. Riders can jog easily if needed.

Cool down

Modifications as you gain fitness: Perform 3X10-min intervals for a few weeks, then increase the duration to 12-minutes, then 15-minutes, then 18-minutes and finally 20-minutes. As duration increases, so should the length of your recovery, by about minute each time. You can also let the interval heart rate increase to Z5a, just a few beats higher. Or, do the same thing at a higher cadence of 80-85, or 90-95 rpm.

D. THRESHOLD INTERVAL CLASS #4: STEADY STATE LT

This class consists of two 15- to 20-minute intervals just below LT. Do these only after this zone has been improved with shorter cruise intervals for several weeks. The goal of the workout is improving muscular endurance and raising LT.

Warm-up 8–10 min

#1.Seated flat, just below race pace, cadence 85–95 rpm. Spend as much time in the saddle as possible but take standing breaks as needed.

#2. Climb at the same intensity, but at a cadence of 70–80 rpm.

Recovery of 7–10 minutes in between intervals is a seated flat, with saddle breaks as needed.

Cool down

E. VO2 MAX INTERVAL CLASS # 1

This class consists of VO2 max intervals after several aerobic ones. Terrain and position can be varied as the instructor sees fit. The following is just an example. (R = recovery, done at least 30 beats below LT)

Warm-up 6 min

1. 2 X 4 min @ 15 and 10 beats below LT (the second interval is done 5 beats higher than the first). These are aerobic intervals to extend the warm-up.

   2 X 1 min R (after each one)

2. 2 X 3 min @ 104%–106%LT (or 4–-10 beats above LT)
   These two are done as a seated flat, working on leg speed against a resistance. Cadence 95–-110 rpm.

   2 X 3 min R

3. 2 X 3 min @ 104%–106%LT (or 4–10 beats above LT)
   These two can be done as runs or jumps for variety (for the non-cyclists in class). Cyclists may want to continue the high-cadence seated flats.

   2 X 3 min R

4. 2 X 3 min @ 104%–106%LT (or 4–10 beats above LT)
   These two are done as climbs, alternating seated and standing as desired. Cadence 70-80rpm.

   2 X 3 min R

Cool down

F. VO2 MAX INTERVAL # 2: PYRAMID

This is a tough class for conditioned riders only. Modifications must be given for less fit students. The intervals get progressively longer, then shorter. The recovery stays the same, so it gets shorter relative to the length of the interval.

Warm-up 5-8 min. Intervals are instructor's/rider's choice for terrain.

1. 2 X 4 min @ 15 and 10 beats below LT (the second interval is done 5 beats higher than the first). These are aerobic intervals to continue the warm-up.

   2 X 1 min R

2. 1 X 4 min @ 104%–106%LT (or 4–10 beats above LT)
   1 X 4 min R

3. 1 X 5 min @ 104%–106%LT (or 4–10 beats above LT)
   1 X 4 min R

4. 1 X 6 min @ 104%–106%LT (or 4–10 beats above LT) (OUCH!)
   1 X 4 min R

5. 1 X 5 min @ 104%–106%LT (or 4–10 beats above LT)
   1 X 4 min R

6. 1 X 4 min @ 104%–106%LT (or 4–10 beats above LT)
   1 X 4 min R

Cool down

G. MIXED INTERVAL CLASS #1

This format includes 2 sets at aerobic levels (your choice of terrain); 2 sets VO2 max intervals focusing on higher cadence, lower resistance (fast seated flat); 2 more sets VO2 max intervals slightly higher resistance; and 3 sets of lactate tolerance HIT as a standing climb. Recoveries are all seated flat 30 or more beats below LT, at rider's preferred cadence.

Warm-up 8 min

1. 2 X 4 min @ 15 beats below LT (the second interval is done 5 beats higher than the first). These are aerobic intervals to continue the warm-up.

   2 X 1 min recover

2. 2 X 3 min@ 104%–106%LT (or 4–10 beats above LT)
   Seated flat at cadence of 85-95rpm. If desired, you can integrate some runs and/or jumps (not as cycling specific)

   2 X 3 min recover

3. 2 X 3 min @ 104%–106%LT (or 4–10 beats above LT)
   Seated flat, focusing on leg speed (cadence 100–110 rpm). These are very hard.

   2 X 3 min recover

4. 3 X 90 sec @ >106%LT (Lactate Tolerance Intervals)
   Powerful standing climb

   3 X 3 min recover

Cool down

H. MIXED INTERVAL CLASS #2

This challenging format includes 1 aerobic interval (your choice of terrain), 2 sets threshold intervals, one focusing on strength development (climbing) and the other on leg speed (fast flat), and 3 sets X 3 reps of incomplete recovery lactate tolerance intervals of 1 minute each (very hard).

Warm-up 8 min

1. 1 X 8 min @ 15 beats below LT

   1 min recover

2. 2 X 6 min @ LT
   #1: Seated climb (come out of the saddle as needed), cadence 60–70 rpm.
   #2: Seated flat, work on leg speed, cadence 95–110 rpm (come out of the saddle for short 10-15-sec breaks if needed)

   2 X 3 min recover

3. 3 X 1 min @ >106%LT
   Powerful standing climb
   Recover only 30 seconds in between each one.
   At the end of the set, recover 3 minutes.

   Repeat for a total of two sets. These are very hard. If effort level falls significantly on the second set, the rider should NOT attempt to continue at that effort and instead should ride easy.

Longer Cool down

I. MIXED INTERVAL CLASS #3

These include several sprints, including one set with incomplete recoveries. These are NOT for everyone.

Warm-up 8 minutes

1. 1 X 10 min @ Tempo (Z3)
   3 min R

2. 3 X 15 sec sprints Z5c
   This gives the students time to practice a properly executed sprint. Load, stand, explode, then sit back down.
   R 3–4 minutes between each one. Increase R if needed (check on how the class reacts).

3 4 X 15 sec sprints Z5c, with 30-second recovery. Very, Very Hard!
   Follow with 5 minutes easy Z1.
   For an advanced class that is following a periodized training program, this can be repeated 1X.

The remainder of the class can be cruise intervals in Z3 or Z4, depending on the abilities and fitness of the class.

CHAPTER 14. TECHNIQUE DRILLS IN INDOOR CYCLING TO IMPROVE SKILLS

CYCLING ECONOMY AND PEDAL-STROKE DRILLS

Cycling economy refers to how much oxygen is used when cycling. The more economical you are in your pedaling, the less oxygen you will consume (fewer calories consumed for a given effort) and hence, the less fatigue you will feel. Or, at the same effort level, you can pedal faster, improving your speed. Improving economy should be a goal of every cyclist, because outdoors, you can ride farther with less fatigue.

I must admit, most non-cyclist IC students don't really care about consuming "fewer calories" by becoming more efficient. Au contraire—they want to burn more calories, so if the instructor were to tell them they would burn fewer calories by becoming more economical, they would look at the instructor like he's crazy and continue with their uneven, jerky pedal strokes. But what they don't realize is that once their "economy" is improved, they can then channel the caloric "savings" into a slightly higher resistance and/or cadence (provided their cadence isn't already artificially high via the flywheel) and improve their overall fitness and hence, actually increase their caloric burn.

But you, the cyclist, know that already, right?

Cycling economy is a measure of how efficient you are at turning the pedals. It is more neurological than muscular or cardiovascular, so you won't be breathing hard or pedaling against a large resistance when working on this aspect of your cycling fitness. Improving your pedaling skills requires attention to detail, focusing on your pedal stroke in ways that will make it smoother, more fluid, and totally under your control.

IC classes are a great place to work on improving economy and skill acquisition through pedal stroke and cadence drills. They are best done during longer endurance rides at moderate intensities because it's a great way to occupy your mind. Make sure you read Chapters 5 and 7 on the differences between your road bike and an indoor stationary bike, and on cadence and resistance selection. Those chapters explain why drills such as these will not be effective if you don't

first have an understanding of the mechanics of indoor bicycles with a fixed-geared system and a weighted flywheel.

On the other hand, with a realistic resistance and cadence indoors that simulates their preferred cadence outdoors, most cyclists can make great gains in smoothing out their pedal stroke and even increasing average cadence; skills that can be transferred to their outdoor riding. However, for the elite cyclist looking for the highest level of pedal stroke fine-tuning, it would be wise to do these drills on your road bike on your trainer where there is no inertial effect at all from the flywheel.

It's important to remember that on a fixed-geared indoor bicycle, you should never take one foot out of the pedal when working independently (see page 81). Instead, you want to do what is referred to as *one-leg dominance drills*, which means focusing on one leg while the other foot remains attached to the pedal, going along for the ride.

When you focus on one leg at a time, you simply bring the movement of that leg to your conscious attention. You don't try to push faster, or harder, you merely become aware of which muscles are being used through the four quadrants of the pedal stroke, and whether they are activating quick enough. Through this awareness, you can notice any discrepancies, or any differences from the other leg, and work on improving them.

Because the brain and body like variety, I've come up with several ways to visualize a smooth pedal stroke. These are some of the drills that I teach regularly in my own classes as well as to instructors in workshops at conferences.

THE FACE OF A CLOCK

Isolate the muscles used at various phases of the pedal stroke. Focus on one leg first for about two minutes, then the other, then both together. Repeat for each quadrant.

Imagine the full pedal revolution as the face of a clock, with top dead center (TDC) as 12:00 and bottom dead center (BDC) as 6:00, and 3:00 as straight out in front. This 3:00 position is known as the "position of power" because it is where the most force is transferred to the pedal. Here, the angle of the force is most perpendicular to the pedal (the foot pushing downward), rendering it much more powerful than at any other point.

A breakdown of the four quadrants and the muscles used in that quadrant is as follows:

- 10:00–2:00 = knee extensors (quadriceps). This is the top portion of the pedal stroke.
- 11:00–5:00 = hip extensors (hamstrings, glutes). This is the "power phase," or downward phase. Knee extension continues.
- 4:00–8:00 = knee flexors (hamstrings, gastrocnemius). This is the bottom portion of the pedal stroke.
- 7:00–12:00 = hip flexors (iliopsoas, and rectus femoris). Known as the recovery phase, or upward phase. Knee flexion continues.

Focus on the movement during each quadrant, and see if you can feel the muscles at work. As you alternate from right leg to left leg, note if there is any difference (most people do have a dominant and more coordinated side). Try to even out any inequities. Your goal is to try to take out all the "corners" so you are pedaling in a smooth, round circle.

I like to think of the isolation of each muscle group as being similar to a solo performance of various instruments in an orchestra. Then when they all perform together, it is a "symphony of muscular movement."

SCRAPING MUD OR THE SKATEBOARD

This is probably one you're familiar with. Greg Lemond is credited with comparing the bottom part of the pedal stroke to scraping mud off the bottom of your shoes. You can also imagine pushing off a skateboard with one leg. For both these drills, you are focusing on the bottom half of the pedal stroke and should be aware of hamstring involvement. Your goal should be to instigate the firing of the hamstring a nanosecond sooner, so you spend less time pushing straight down, and more time pushing the pedal backwards. Notice I said "pushing" it back, not "pulling" it back. The sensation however is the hamstring pulling the lower leg back. Improving this phase of your own pedal stroke will help to eliminate or minimize bouncing in the saddle if that is a problem for you at higher cadences.

TOP/FRONT OF SHOE PEDALING

This one comes from Joe Friel, the author of *The Cyclist's Training Bible*. He tells his riders to feel their toes touch the top of the shoe during the last half of the recovery phase (9:00–12:00), and then push the toes forward to the front of the shoe at the top of the pedal stroke (11:00–2:00). You should be aware of your quadriceps muscles during this quadrant.

LINKS OF A CHAIN

Visualize the links of the chain connecting smoothly with the teeth of the chain wheel. You can feel when there are any inconsistencies. You should feel like you're staying "attached" to the drive train of the bike and that it's you propelling the flywheel at all times, not that it's pulling you through any point in the circle. If the connection is at all jerky, it may be due to an inconsistent pedal stroke. [Or, it could be a maintenance issue of a lose chain and/or bottom bracket! However, when this is the case, you can actually focus even more closely and take out the jerkiness, helping your pedal stroke even more].

STAIR STEPPING, OR "UNWEIGHTING"

This drill is for improving your pedal stroke during the recovery phase of steady-state pedaling. Imagine how heavy one leg is, and if you don't get it out of the

way as the pedal is moving upwards, the extending leg has to work harder as it lifts the weight of the opposite leg. So you need to get the leg "out of the way" during the recovery phase.

Your goal is not to actively pull the pedal upward; your foot should not leave the bottom of the shoe. You simply want to *unweight*, or *unload* the pedal, so you allow your foot to be *just ahead* of the moving pedal. If you are a skier, you understand this concept of unweighting. In a ski turn, you lighten up your skis to change edges and move them to the other side of the turn by unweighting them; you do not "lift" them off the ground (except in hop turns). (Can you tell I was a ski instructor in my past?)

Another way to think of this is to lift your knees towards the handlebars as if you are climbing stairs. Again, don't try to pull the pedal with your shoe. There is a stair-stepper in many gyms with two independent pedals that you stand on that follow your foot as you "step." This knee-raising movement of pedaling is much like what you do when using these machines—you lift your knee, the pedal follows your foot upwards until you push it back down.

Another tip to make sure your knees are in proper alignment, when you lift the knee towards the handlebars for this drill, lift it towards the middle third of the bars, thus keeping your knees in proper position. You are therefore solving two pedal stroke issues.

Note that in a high-powered sprint or hard standing climb, you would actually pull the pedal upward with a strong hip-flexor activation. You couldn't maintain this for long – these muscles tire very quickly and it is a highly anaerobic effort.

CADENCE AND LEG-SPEED DRILLS

Just as in the pedal-stroke drills, cadence drills on an indoor bike are only going to be effective when done with a realistic resistance that simulates what you would encounter outside. To truly have an effect on the neuromuscular abilities of your muscle fibers, they should be done on a flat road within a cadence range of 90–110 rpm (or 120 rpm for cyclists with a higher natural leg speed or technique).

Because the inertial effect of the weighted flywheel is magnified at higher speeds, leg-speed drills above 110rpm (120rpm for skilled cyclists) are going to be ineffective on these types of bikes. If leg speed at the higher cadence range is your goal, then once again, it would be better to use your road bike on a trainer, where you can perform leg-speed drills as fast as 140 rpm and actually achieve a neuromuscular adaptation from those.

For the average cyclist working on improving outdoor leg speed from 80 to 85 rpm, or 85 to 90 rpm, these drills can still effectively be transferred to outdoor riding skills.

PHYSIOLOGY OF CADENCE

Why would you want to increase your average cadence? Studies have found that cyclists are often more efficient on both hills and flat terrain when they pedal quickly rather than at slower cadences. More recent studies have found oxygen consumption to be equal in both high gear/low cadence vs high cadence/low gear pedaling. Past studies found O^2 consumption to be less at slower cadences with a higher gear. The latter is paradoxical, since a lower O^2 consumption usually means a higher efficiency.

But what they've found is that the rate at which glycogen is depleted in fast-twitch muscle fibers is higher during slow, high-force pedaling. This rapid loss of carbohydrate explains why a slow cadence is less efficient than faster pedaling (Allen, *Why Fast Pedaling Makes Cyclists More Efficient*, p. 1).

Since fast-twitch muscle fibers are more powerful than slow-twitch fibers (they are used to generate force), they kick into action when a higher gear is used.

When these fast-twitch fibers deplete their glycogen stores, their contraction becomes less forceful, so more muscle cells must be activated. This in turn drives up O^2 consumption, reducing economy.

On the other hand, you use your slow-twitch muscle fibers for the faster pedaling cadences. This too may seem like a paradox, but slow-twitch fibers are more oxidative, meaning they have more aerobic qualities. They generate less force (lower gears) but can go on much longer than fast-twitch fibers. Think of them as the Energizer Bunny! They have no problem handling 80–100 rpm.

Another wonderful side benefit from this is that your slow-twitch fibers, being more aerobic, can actually burn more fat as their fuel source than their fast-twitch counterparts.

While it is true that everyone's physiology is a little different, and that some people are actually more efficient at "mashing" than "spinning," if you can increase your outdoor average pedaling cadence by any amount, it will ultimately increase your economy. And if you have any doubts about its effectiveness, go to your computer and Google "Lance Armstrong" and "faster cadence."

MEASURING YOUR CADENCE INDOORS

Cadence computer: If you are at a facility that has the cadence computers then you have an advantage, *as long as the club has calibrated them correctly*, which unfortunately I've found to be a problem with some clubs. If you suspect the calibration is off, you might ask management to verify with the instruction manual. The Star Trac computers use a magnet attached to the flywheel to determine cadence. They have an internal calculation that determines cadence based on the size of the flywheel; hence if it isn't calibrated to the flywheel that they have at that club, cadence can be off by 5–10 rpm.

There are three other methods you can use indoors. Once you do any method frequently enough, with practice you will be able to guess your cadence within 4–5 rpm.

Counting pedal strokes: This is best done watching a sweep second hand; watching the numbers on a digital clock may throw you off (at least it does me). Count the number of times one knee hits the top of the pedal stroke (or you can

use the number of times one foot reaches the bottom of the pedal stroke). Begin your count with "0." The longer you are able to count, the less your margin of error. For example, if you count the pedal strokes for 30 seconds, you simply need to double it, and your margin of error is small (1-2 rpm). Or, count for 15 seconds and multiply by four. It's possible to count for 6 seconds and add a "0" (multiply by 10) but your margin of error is much higher.

Metronome: You can purchase a metronome at a music store for about $20. They are about the size of a small solar calculator. You can set a certain bpm/rpm and have your feet match the beat. These are an excellent tool for those focused on improving cadence, and should be in the toolbox of every good instructor.

Leg speed is a highly trainable part of your cycling fitness and technique, so pedal-stroke and cadence drills are something you want to include in your weekly training program.

Match the beat of the music: As an instructor, I like to choose songs of a specific beat per minute (bpm) that helps define the desired cadence. For hills I use bpm of 110-160, which creates a cadence of 55-80rpm. This is because you are only counting one leg, and are thus pedaling to the half beat. For faster cadences, I use songs from 160-220bpm, creating an rpm of 80-110.

Riding to the beat is fun, and is especially helpful for leg speed drills. However there are disadvantages too. Not everyone can hear the beat. And this requires extra work on the part of the instructor, such as either measuring the bpm (it's not inherent in every mp3) or purchasing music mixing software. Your instructor may not be that interested or capable of doing this.

It's also nice to break from the beat of the music and ride at your own preferred cadence at times, as well. So even if you do like to use the beat, don't become a slave to it.

THE BOUNCE TEST

Once you are fully warmed up, start with a flat road resistance at 80 rpm and gradually increase your cadence about 5 rpm every 30 seconds. Pedal until you find yourself bouncing in the saddle. This is your "bounce" threshold. Back off the cadence until you no longer bounce, and work on some pedal-stroke drills at

this point. You do not want to exceed your bounce threshold until you can hold the cadence without bouncing in the saddle.

There are several reasons for bouncing. Indoors it most often is because the rider doesn't have enough resistance and is being pulled around by the flywheel. Raising the resistance usually causes the cadence to slow down, while also creating a better connection with the drive train.

The principle reasons for bouncing are due to muscles that haven't been trained to fire quickly enough. As one leg extends towards the bottom of the pedal stroke, if the hamstring doesn't initiate soon enough to pull the foot back, the quadriceps continue to extend the leg (even as the pedal pulls the foot around), and when the foot reaches BDC, the hip is raised (more like "pushed") off the saddle ever so slightly. Repeat 90–100 times per minute and you've got bouncing.

CADENCE PYRAMID ON A FLAT ROAD

Begin at 80 rpm. Every three to five minutes, raise the cadence by 5 rpm: 80–85–90–95–100–105–110 rpm. If you are skilled, you can continue to 115 and 120 rpm. If on the other hand your bounce threshold is below 110, do not surpass it until you can easily ride at that cadence without bouncing.

ACCELERATIONS OR "SPIN-UPS"

These are fun drills to work on your leg speed. When you do spin-ups, you should already know your bounce threshold and try not to exceed it. Since you will be raising your cadence pretty quickly, you won't have time to measure it, so if you don't have a cadence computer, you should first practice slowly until you can sense what each level feels like, especially the ceiling of 110/120 rpm. Stronger cyclists may want to try these drills at a variety of resistances.

Stage 1. Begin at 80 rpm on a flat road, seated. Take 30 seconds to gradually and smoothly raise your cadence to 110 rpm (or 120 rpm for skilled cyclists). Hold for 30 seconds and gradually bring it back down to 80 rpm over 30 seconds. Hold 30 seconds at 80 rpm, and repeat several times.

Stage 2. Repeat the same exercise, but raise your cadence from 80 to 110 rpm over 15 seconds, hold for 30 seconds, drop it down over 15 seconds, hold for 30 seconds at 80 rpm, and repeat several times.

Stage 3. Same exercise, but this time you will go from 80 to 110 rpm much more quickly, over 7–8 seconds. Hold at the ceiling for 30 seconds, then drop it down quickly to 80 rpm. Hold for 30 seconds and repeat several times.

Stage 4. Same exercise, same drill but even quicker yet! Very quickly raise your cadence from 80 to 110 rpm, as if sprinting (but do not take it to the intensity of a sprint and stay seated in the saddle) over 4–5 seconds. Hold for 30 seconds, lower it back down to 80 rpm, and hold 30 seconds. Repeat several times.

These drills work on your ability to fire your fast-twitch muscle fibers more quickly.

CADENCE PYRAMID ON A HILL

Leg-speed drills with resistance indoors isn't going to improve your outdoor climbing cadence by much, because as explained on page 66, there is no way of knowing the percent grade or gear selection, which is what determines your cadence outdoors. However, running through a pyramid of various cadences on a hill indoors adds variety and helps improve strength and muscular endurance, if not neuromuscular abilities.

Begin seated on a moderate hill at a cadence of 60 rpm. Raise cadence against that same resistance by 5 rpm every two minutes: 60–65–70–75–80 rpm. Depending on your fitness, and where you started on the resistance knob, you may not be able to maintain 80 rpm without lowering the resistance a little for the final stage or two.

You can try the same exercise standing.

Another climbing drill is to find a moderately hard hill in a standing climb at 80 rpm. Every two minutes, raise the resistance, allowing the cadence to drop by 5 rpm: 80—75–70–65–60 rpm. If your strength and form is good, you can go as low as 55 rpm. By the end, your hill should be very challenging.

APPENDIX A. ABBREVIATIONS USED IN THIS EBOOK

APMHR – age predicted maximum heart rate

AT – anaerobic threshold

ATP – adenosine tri-phosphate

BDC – bottom dead center (of the pedal stroke)

BPM – beats per minute (music)

MHR – maximum heart rate

HIT – high-intensity training

HP – hand position

HR – heart rate

HRM – heart rate monitor

IC – indoor cycling

LBS – local bike shop

LT – lactate threshold

LTHR – lactate threshold heart rate

PE – perceived exertion

RPE – rate of perceived exertion

RPM – revolutions per minute (pedaling cadence)

TDC – top dead center (of the pedal stroke)

APPENDIX B. REFERENCES & TRAINING RESOURCES

eBooks

Arnie Baker, *High Intensity Training for Cyclists*, (year?)

Books

Tudor Bompa, *Periodization Training for Sports*. Human Kinetics. 1999

Chris Carmichael, *The Ultimate Ride.* Putnam, 2003

Edmund Burke, PhD, *Serious Cycling*, Human Kinetics, 1995

Edmund Burke, PhD, *High-Tech Cycling*, Human Kinetics, 1996

Thomas Chapple, *Base Building for Cyclists*, Velo Press, 2006

Joe Friel, *The Cyclist's Training Bible*, Velo Press, 2006

Joe Friel, *Total Heart Rate Training*, Ulysses Press, 2006

Internet, Magazine, and Newspaper Articles

Hunter Allen, "Why fast pedaling makes cyclists more efficient"
www.peakscoachinggroup.com

Brett Bastian, "Developing a Triathletes Annual Training Plan for Peak Performance."
www.peakscoachinggroup.com

Joe Friel, "Developing Speed Skills," Inside Triathlon Duathlon Column, April 2000.

Joe Friel and Doug Bush, "Demystifying Lactate Threshold,"
http://www.endurancefactor.com/Articles/Lacatethreshold.html

Kolata, G, "Maximum Heart Rate Theory Challenged," The New York Times Health Page, April 24, 2001.

Len Kravitz, PhD. "Lactate: Not Guilty as Charged"
http://www.drlenkravitz.com/Articles/lactatearticle.html

Len Kravitz, PhD. "Lactate Threshold Assessment"
http://www.drlenkravitz.com/Articles/LTassessment.html

Stephen McGregor, PhD. Intervals to Target VO2 Max Adaptations.
www.peakscoachinggroup.com

APPENDIX C. INDOOR CYCLING INSTRUCTOR ONLINE EDUCATION

Continuing education and ongoing instructor training

In April of 2011, I founded the Indoor Cycling Association, an online training program for indoor cycling instructors,. It is not a certifying agency, but once certified, we provide them with some of the most current training possible. My goal is to teach instructors everything they need to know to in order to become a solid, caring, educated instructor who understands the need to *Keep it Real*, regardless of whether there are cyclists in the class or not. If it's not good for a cyclist to do it, if it's potentially dangerous, if it hampers pedal stroke, technique and efficiency, then it's not good for non-cyclists as well, and no one should be teaching it in a class. At ICA, we are developing continuing education workshops to expand an instructor's knowledge of physiology, biomechanics, proper training principles used by the endurance coaching field, coaching skills, profile design and much more. We use modern training methods, including blogging, audio downloads, webinars, videos and other online tools. If you know an instructor who is in need of furthering his or her education on indoor cycling coaching, please pass on this link!

www.indoorcyclingassociation.com

APPENDIX D. USING INDOOR CYCLING TO TRAIN FOR A EUROPEAN BICYCLE TOUR?

Yes, it's possible! I have already referenced that I have had clients who came to France and climbed Alpe d'Huez, the Col du Galibier, the Col de la Colombière, and a few others all in the same week, almost exclusively through training in indoor cycling classes! Other clients have explored the cols of the Pyrénées after hill training in IC classes.

Yes, they did ride their bikes outdoors and got their base mileage…but because they live in the flat regions, the hill training was done indoors.

All my bicycle tour clients receive a training program that can be done indoors or outdoors to help them prepare for the tour.

If you would like more information on a guided or self-guided bicycle tour to France, Italy, and now Colorado and California, please contact Jennifer at info@vivatravels.com. Viva Travels can also customize a private tour for your group of friends or cycling club, which can include a cycling or triathlon training camp, or simply all the riding you want, where you want, followed by all the gourmet food and wine a cyclist can enjoy! Contact us for the specifics.

Our website is www.vivatravels.com. Also check out Viva Travel's blog on cycling in Europe at http://cyclingeurope.wordpress.com.

In Velo Veritas