Harvard Cycling: Training to Race
2000-2001

Training Overview

Harvard Cycling: Training to Race

Welcome! These training materials are designed to help Harvard cyclists prepare for the spring collegiate road racing season.

Our materials have several parts:

- This overview of the training process;
- Calendars indicating which abilities should be emphasized when;
- Detailed descriptions of the various abilities and how to train and test them;
- Guides to weight lifting exercises for the gym, interval exercises on the bike and stretching;
- A MS Excel spreadsheet in which to record the results of your tests to monitor changes in your performance; and
- A bibliography.

These materials are designed to help you be as self-sufficient as possible. With input from your coaches and more experienced teammates, you should be able to understand, plan and implement your training regimen in preparation for the spring collegiate season.

How to use these materials

We assume that you have a basic understanding of bike fitness and exercise terminology, as well as familiarity with the form and technique lessons John Allis and Ed Sassler taught on morning rides in September, October and November. Feel free to ask your coaches and more experienced team members the questions you have after reading through these training materials.

While we describe some sample workouts in the pages that follow, there will be nothing cookie cutter about your training. Your individual needs will be met with these materials and advice from your coaches and teammates.

1. **Read.** Start by reading through all the materials to familiarize yourself with the team's training philosophy, the various types of abilities we train and the exercises we use to train them.

2. **Set personal goals.** Next, think through your personal goals for the upcoming season. For instance, If you're a novice you might set goals such as finishing all the races you enter or learning how to ride as a member of a team. Someone with a little more experience might set the goal of winning a race, or upgrading to a more advanced category, or riding as a team leader.

3. **Identify obstacles.** Next, think about what currently prevents you from achieving your goals. What will it take for you to succeed, however you have chosen to define your success? For all riders, some of the obstacles will be mental: novices may be uncertain about racing, intermediates may need to develop a killer instinct, advanced may need to develop their team leadership skills. You should talk with your coaches and team mates about how to work on the mental side of the sport.

4.a. **Work on the mental side.** Many of the obstacles will be physical, and these training materials will help you address those: developing the endurance to finish your races, the cycling skills to keep you safe and make you a credit to the Harvard team, the strength to put the hammer down in the hardest moments of the race.

4.b. **Work on the physical side.** Next, with your goals and physical abilities in mind, use these materials to plan and execute a training program that maximizes your chances of success in the spring racing season. Of course this is the hard part, but we hope that these materials and your coaches and teammates can take some of the mystery out of how to train in a focused, systematic manner. Perhaps the most important input in your planning should be an honest assessment of your time constraints. Understanding how many hours a week you can devote to exercise will enable you to prioritize workouts and get the most bang for your buck.

5. **Self-test and learn.** Finally, you must deepen your knowledge of your body by periodically testing it to ensure that your training appropriately reflects your strengths and weaknesses, and to avoid overtraining and injury. These materials describe how to perform tests that monitor changes in your abilities.

Just to be clear, we expect you will tailor your training to meet your personal needs.

Novice, intermediate and advanced riders have different needs

These materials are intended primarily to help novice and intermediate riders: novices make up the vast majority of the Harvard team this and every season. If you are a novice, you should focus your training on the fundamentals of cycling:

•**Endurance** results from one or more seasons of training.
• **Form** ensures that all your strength gains move the bike down the road, and on the bike **technique** ensures that you are a responsible member of the peloton.
• **Strength** enables you to be there when the race is at its hardest.

Time spent laying this foundation will serve you well in future years. After a season of training and racing, you'll have a sense of your relative strengths and weaknesses and what it takes to succeed in your race category. You'll also have a base of fitness on which to develop additional abilities. As you become more experienced, you should increasingly refine your training plan to reflect your time commitment and what works for you.

Injuries, over-training and burnout are ever-present risks

While organized, intense training promises significant performance gains, it comes with associated risks of injury, over-training and burnout. In particular, weight lifting may put unusual strain on your body. When starting that and other elements of your training, a few common sense techniques can help ensure your health and happiness:

- Ease into it: your muscles, joints and tendons need time to adapt to the increased workload of a strength routine. Use a month of high rep, low weight multi-joint circuits to prepare your body.
- Take time to learn the proper form for each exercise, especially focusing on those exercises that require you to lift relatively large amounts of weight (such as exercises that work the glutes, quads and hamstrings), otherwise you decrease the exercise's muscle-specific benefit and greatly increase injury risks.
- Learn weight-room etiquette.

Over-training is a second risk associated with an intensified workout routine. Training works only to the extent that you allow your body to recover from the hard work you do. You can ensure that you are not over-training by listening carefully to your body for such warning signs as:

- Your resting pulse (measured before you get out of bed in the morning) creeping upward over the course of a week or two.
- The difference between your resting and base pulse (measured immediately after you get out of bed) similarly creeping upward.
- Your performance on the anaerobic threshold tests declining rather than improving.

If you see these warning signs, the appropriate solution is a period of reduced work and increased laziness.

A final word on burnout: too much devotion to the bike is a bad thing. After a period of several months of hard work, such as a rigorous off-season and racing schedule, it is only normal for you to want to do something else. We encourage you to take substantial time off after the season is over to enjoy other parts of your life. Return to your bike when you are excited to do so. However, if you are having a hard time starting or maintaining a workout schedule, talk with your teammates about motivation methods.

Nutrition is not your team's forte

We really don't have too much to say about nutrition. In our experience, one of the advantages of cycling is that when you are in training, you can eat almost anything you want in moderation and your body will turn it into fuel. Cool, huh? Generally speaking, cyclists should consume a diet that is high carbohydrate, moderate protein and low fat. Our longer workouts and races help us convert this to energy and not gain weight. When your exercise routine is emphasizing shorter, more intense workouts (as it is in the winter), increasing your protein consumption and reducing your carbohydrates will help your body recover from workouts and build lean muscle mass without getting fatter.

Two areas where we have more specific thoughts are 1) on-the-bike hydration and eating and 2) post-ride hydration and eating. Consuming a significant amount of food and liquid during a ride will help you avoid declines in performance – up to and including the dreaded "bonk." While the amount of water and food necessary to support you during a ride will vary with the weather, terrain, level of effort and your own idiosyncrasies, here are a few rules of thumb:

- Plan to drink a large water bottle every 30-90 minutes, depending primarily on temperature;
- Bring food on any ride significantly longer than 2 hours;
- Eat and drink whatever works for you and your budget: water, sports drink, home-made sports drink, fruit, cookies, pop-tarts, energy bars/goo, etc. Figure out what will give you the water, electrolytes and carbohydrates you need and that your body can easily process on a bike.
- Any race significantly longer than 2 hours will have a feed zone: take advantage of it by having a teammate hand out extra water and food.

After a ride, you can significantly improve your body's recovery by rehydrating and consuming carbohydrates and protein in moderate quantities within 30-60 minutes of finishing. Again, figure out what works for your body and budget – e.g. burrito, tuna salad sandwich, sports drink with protein supplement, skim milk and cereal. And don't forget to drink lots of water – you want your urine to run clear.

We repeat: Planning, testing, and record-keeping are important

The whole idea of training is improvement. To maximize the amount of improvement you get from your time and energy, you should test yourself to establish a benchmark, exercise appropriately, and then test yourself again to evaluate yourself and your workout program. Because improvement is an ongoing process of evaluation, work, re-evaluation and refinement, we strongly recommend that you prepare and write down a training plan, perform appropriate tests and record the results, monitor and record the effectiveness of

your workouts, revise your workouts and so on. Included with these materials is a MS Excel spreadsheet that will help you record your test results and monitor your improvement.

We've tried to minimize the equipment requirements

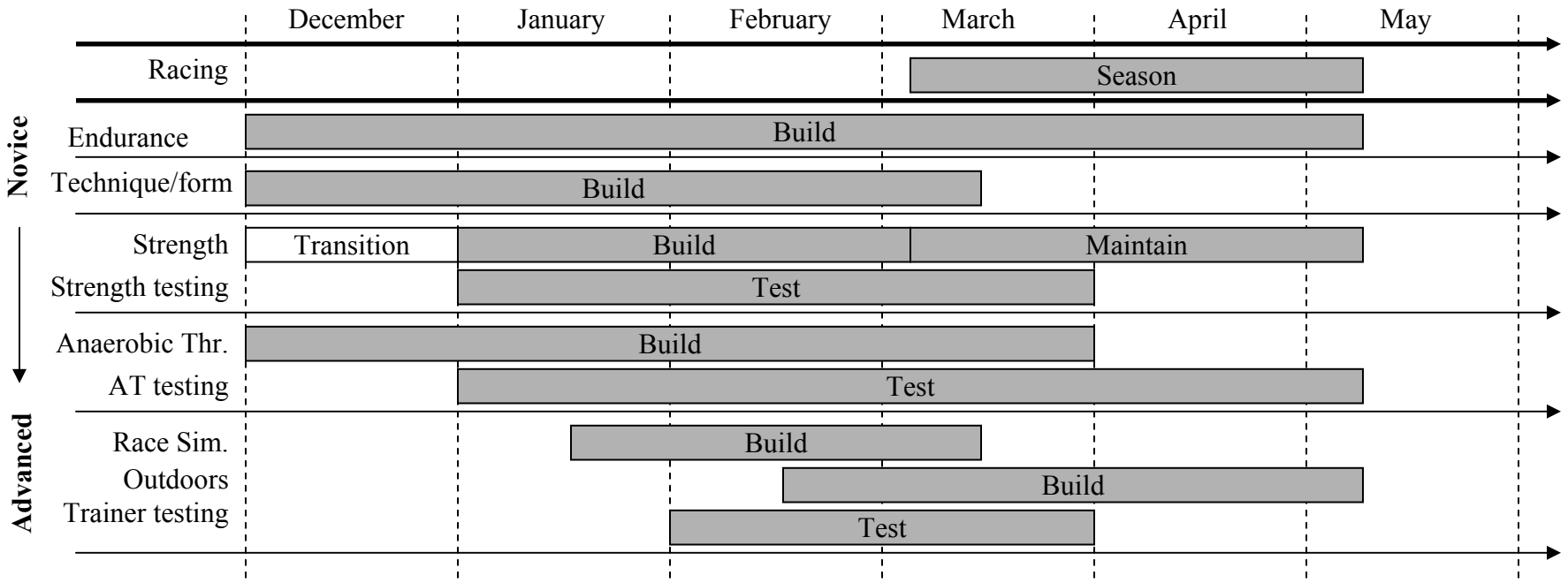
In addition to all the gear you have in order to be able to ride your bike on the road 200 days a year, here is a list of other pieces of equipment that are somewhere between useful and necessary for this training program. We realize that cycling can be a gear- and money-intensive sport, so our training program is designed to require a minimum amount of additional equipment.

Equipment	**Comments**
Stopwatch with multiple-lap memory	Necessary for almost all self-tests.
Free weights	Useful. Use for circuit exercises to prepare your body for harder strength workouts.
Weight machines	Necessary for almost all weight workouts (reduces the risk of injury and allows isolation of individual muscles).
Cardiovascular machines, e.g. treadmill, ergometer, stairmaster, elliptical trainer	Necessary for anaerobic threshold testing.
Trainer and rollers	Very useful. Allow you to ride your bike indoors when the weather is bad. The team has a limited number of each that you are welcome to use. Trainers support you're and your bike's weight (by clamping on some combination of the rear axle, the bottom bracket and the fork dropouts). Rollers provide no support and require you to balance yourself and your bike on three rotating drums as you ride.
Heart rate monitor	Very useful. Allows you to determine your body's level of exertion, particularly your anaerobic threshold, and then to plan workouts around that heart rate.
Power monitor	Useful. Trainers, wheels or cranks that measure your power output in watts help you determine how efficiently your body is working.
Stationary bicycle	Not at all useful. Destroys your technique.

Training calendar

Below is a training calendar covering the period from December through May, showing the periods in which you should focus on the five abilities we train.

Again, if you're a novice you should focus your workouts on the first three abilities -- endurance, technique/form and strength. As you get more seasons under your belt, your pre-season focus will shift to the higher end – strength, anaerobic work and race simulations.



Bike racing abilities

What follows is a list of the abilities that you should emphasize, with details provided on each ability. Use the sample workouts and tests indicated in each table to plan your weekly training schedules for December through May (examples of sample weekly schedules follow the tables).

Ability:	Basic bike endurance
Goal:	Be able to comfortably ride (at a brisk pace) distances longer than your longest race, so that when you're at the start of a race, you're thinking about whether your team is going to win, not whether you're going to finish.
Method:	Ride as much as possible prior to the beginning of the season. Increase the length of your weekend ride to approximately 120% of your longest race.
Test:	How do you feel at the end of the Saturday ride: could you do another hour if you had to? How do you feel when you get home: are you totally useless? How do you feel the next day: could you ride the same distance again? If you can't answer "Yes" to these questions, add an extra endurance workout during the week
Sample workouts:	• Short-Res (20 miles), Long-Res (22 miles), Silver Hill (28 miles). • Harvard Square to the Concord-Carlisle loop and back via Weston (35 miles). • Sudbury loop (40-45 miles). • Acton loop (60-65 miles). • Harvard loop (75-80 miles). • Fitchburg and back (100-120 miles). • Steady workouts on a trainer, rollers or other cardiovascular machines.
Comments:	Over the weeks, gradually increase the mileage of your long ride. Take care to bring sufficient food and water. Use these long rides as an opportunity to • Practice form and technique. • Get to know teammates better. • Push yourself by riding with people who tend to be faster or more experienced than you. • Recover and help other teammates by riding with people who tend to be slower or less experienced than you, or who don't know the loops. • Just enjoy the great outdoors.

Ability:	Form
Goal:	Improve your on-the bike technique so that all fitness gains result in moving the bike more quickly down the road rather than being wasted effort. Develop even breathing, relaxed muscles, a fast, easy spin that accesses all muscle groups and generates power all the way around the pedal stroke.
Method:	Spend time on the bike focusing on your body's movement and on relaxation.
Test:	What is your maximum cadence? How long can you hold it for? Are you the fastest spinner on your group rides? Can you feel yourself applying power all the way around the pedal stroke? Other than how quickly you can spin, this is a subjectively measured ability.
Sample workouts:	• On any indoor or outdoor ride, think of your pedal stroke as a clock face, and focus on applying power through each quadrant of the pedal stroke with each leg: 2-4 o'clock (down); 5-7 (back); 8-10 (up); and 11-1 (over the top). Pay particular attention to back and over the top. 2 minutes per quadrant. • Ride up hills seated and in a bigger gear / lower cadence than usual, so that you can focus on the application of power throughout each pedal stroke. • On any ride, focus on keeping your face, arms, torso and legs relaxed throughout (say "Relax!" to yourself midway up each hill, periodically shake your arms, yawn, etc.). Focus on breathing in your belly rather than in your chest. • Pedal one legged on the road or on a trainer: increasing interval of time spent exercising each side from 1 minute to 5 minutes or more. Concentrate on smoothing out the transitions at the bottom and top of each pedal stroke and applying force evenly throughout each pedal stroke. • Ride rollers for 20-30 minutes, focusing on a relaxed, high cadence by working on one of these exercises. • Ride group rides in a smaller gear / at a higher cadence than the rider in front of you to focus on increasing your cadence. • Do spin-ups on a trainer, on rollers or on the road: increase your cadence over 15 seconds to your maximum, and hold it there for 15 seconds. Focus on relaxing your torso, arms and legs, maintaining even breathing, and avoiding having your hips bounce. If your form starts to deteriorate, reduce cadence slowly until you regain control. • Ride a fixed gear to focus on pushing a big gear up hills and on spinning at a high cadence on downhills and flats.
Comments:	Any energy not applied perpendicularly to the cranks is wasted energy, so conserve! Good pedaling habits developed as a novice and maintained will serve you well as you get better. Bad pedaling habits will take a lot of time and effort to undo and will prevent you from fully enjoying the results of your training.

Ability:	Technique
Goal:	Develop your cycling skills/knowledge so as to be a responsible, savvy member of the peleton: develop good bike-handling habits, safety skills, tactical understanding, etc.
Method:	Routinely perform skill-building exercises alone and with teammates; talk with more experienced riders; watch pro-bike races.
Test:	Are you comfortable pace-lining? Do you feel comfort or dread in high-speed group rides and races? When someone bumped you in the corner of a criterium, what did you do? How well did your team do in its most recent race? To what do you attribute your team's successes and failures? How many times have other racers shouted at you? Why? (Sometimes being shouted at is a good thing)
Sample workouts:	John Allis's skill-building exercises: • Bumping exercises on grass. • Riding while making contact with other riders. • Cornering in parking lots. • Climbing hills in and out of the saddle. • Doing sprint accelerations from one phone pole to the next. • Contesting town line sprints on group rides.
Comments:	This mental/skills side of the riding is one of the areas that totally separates road racing from other endurance-based sports. Experience and cunning frequently defeat youth and strength.

Ability:	Strength
Goal:	Develop your body's ability to perform in the most demanding race conditions, such as steep climbs and finishing sprints.
Method:	Train maximum strength and overall strength in the weight room, while maintaining flexibility and suppleness with stretching and spinning on the bike. Translate weight room strength gains onto the bike by riding hills and doing sprint workouts.
Test:	See weight room guide. Ride a hard hill (Prospect Hill Park in Waltham, Water Tower hill in Arlington) twice, and compare your two times to one another and to subsequent tests.
Sample workouts:	• See weight room guide. • Hill repeats, seated or standing, accelerating over the top.
Comments:	• On the bike strength is a big separator of stronger and weaker riders. strength gains from off-season weight workouts are one of the quickest ways to improve your racing results. • There is no such thing as a free lunch however. Here, those gains come with the risk of increased injury and overtraining. So use proper technique, listen to your body and be careful! • To maximize the translatability of your strength gains, mimic your on-the-bike form when weight-lifting: e.g. feet the same distance apart as on your pedals, hands the same distance apart as on your handlebars. • Strength work should always be accompanied with working on form (on alternate days) and stretching (during and after strength work). Both of these will ensure that getting stronger doesn't lead to getting tighter or losing your muscles' cycling flexibility.

Ability:	Anaerobic threshold fitness
Goal:	Maximize your chances of being there when the race is at its fastest, by developing your body's ability to work hard, recover quickly and work again, and to work hard for long periods of time.
Method:	On-the-bike or cross-training intervals of work and recovery above and below anaerobic threshold; sustained efforts just below AT.
Test:	Use a treadmill, elliptical trainer, Stairmaster or trainer to test for changes in anaerobic fitness (improvements are expected, declines indicate overtraining) on a weekly or biweekly basis. • Use percentages above and below your anaerobic threshold as work and recovery targets (5-10% is a reasonable percentage). Determine the appropriate work and recovery rates for the machine you are using to perform the test (e.g. minutes per mile and slope on a treadmill). This will require experience with your body's performance on the machine. • After a suitable warmup, perform the test. The test consists of a work interval until you cannot maintain your target heart rate, followed by recovery at your recovery rate until your heart rate drops to the recovery target. After an additional one minute interlude, repeat. • Stop when your heart rate does not drop to the target rate at an appopriate rate (again, this will require experience).
Sample workouts:	• Running, nordic skiing, snow-shoeing. • Stadium running. • Treadmill, Stairmaster, elliptical trainer. • Interval training on a trainer (see attached workout guide).
Comments:	• Your anaerobic threshold is the heart rate above which your muscles can no longer work aerobically. They shift to anaerobic methods, which are not sustainable for periods longer than a few minutes. Once your muscles are working anaerobically, lactic acid production increases, and it cannot be cleared from your muscles. From your perspective, as you pass your AT your breathing deepens and grows ragged, your muscles start to hurt, and it feels like you can't continue to work at that rate much longer. • One way to determine your AT fairly precisely is to ride a 10 mile TT as hard as you can and record your average heart rate over this effort. This heart rate is approximately your AT. You can develop a sense for when you pass your AT by being attentive for changes in your breathing and comfort as you incrementally increase the work you're doing. • This is training to work hard. As a result, your workouts will also be hard work. The average group ride does not count, but one that mimics race conditions does (e.g. the hammer ride).

Ability:	Race simulation
Goal:	Aggregate all the abilities described above and apply them in race and race-like situations.
Method:	Do trainer workouts or on-the-road rides that mimic race quality efforts.
Test:	This is tested in race situations: what are your strengths and weaknesses compared to your opponents: hills, sprints, breaking away, pace-lining, bridging, time-trialing, etc.?
Sample workouts:	• On a trainer, after a warmup maintain a consistent output (measured in speed or watts) for 20 minutes. Every 5 minutes, shift to a harder gear, until you're dying at the end. • Hard group rides, such as the hammer ride around the Concord-Carlisle loop. • ITT around the Concord-Carlisle loop. • 40K ITT on the road or on a trainer, focusing on maintaining consistent output (measured in speed or watts) throughout, while perceived effort gradually increases until you're dying at the end.
Comments:	This is where you and your teammates put it all together. Your focus should be on integrating both the mental and the physical sides of your training.

Putting it all together: Sample weekly workout schedules

The workout routine that is best for you will depend on a number of variables, including your experience and fitness levels, your strengths and weaknesses, and – perhaps most importantly -- the amount of time you can devote to exercise each week. With all those caveats in mind, here are some sample weekly workouts schedules to give you a sense of what you might prepare on your own.

Ability level	December	January	February	March	April
Novice rider with limited fitness at outset	1 long ride 1-2 form/technique 1-2 circuits in gym	1 long ride 1 form/technique 1-2 strength 0-1 cardiovascular	1 long ride 1 form/technique 1-2 strength 0-1 cardiovascular	1 form/technique 1-2 strength 1 race specific	1 form/technique 1-2 strength 1 race specific
Total workouts =	**3-5 workouts/week**	**3-5 workouts/week**	**3-5 workouts/week**	**3-4 workouts/week plus races**	**3-4 workouts/week plus races**
Novice rider with significant fitness at outset	1 long ride 1-2 form/technique 2 circuits in gym	1 long ride 1 form/technique 2-3 strength 1-2 cardiovascular	1 long ride 1 form/technique 2-3 strength 1-2 cardiovascular	1 form/technique 1-2 strength 1 race specific	1 form/technique 1-2 strength 1 race specific
Total workouts =	**4-5 workouts/week**	**5-6 workouts/week**	**5-6 workouts/week**	**3-4 workouts/week plus races**	**3-4 workouts/week plus races**
Intermediate rider	1 long ride 0-1 form/technique 2 circuits in gym 0-1 cardiovascular	1 long ride 0-2 form/technique 3 strength 1-2 cardiovascular 1-2 race specific	1 long ride 0-2 form/technique 3 strength 1-2 cardiovascular 1-2 race specific	1 form/technique 1-2 strength 1 race specific	1 form/technique 1-2 strength 1 race specific
Total workouts =	**4-5 workouts/week**	**5-7 workouts/week**	**5-7 workouts/week**	**3-4 workouts/week plus races**	**3-4 workouts/week plus races**

Next step: prepare your weekly workouts!

By now you've articulated your goals for the racing season. You have a sense of what it will take to get there as well as your time commitment and the workouts for each month that will take you where you want to go. The final step is to use the attached MS Excel workbook to design your training plans for each month, perform the workouts and record your results. Remember to stay flexible in your planning: listen to what your body, coaches and more experienced teammates tell you and make the appropriate modifications.

Good luck!

Give us your feedback

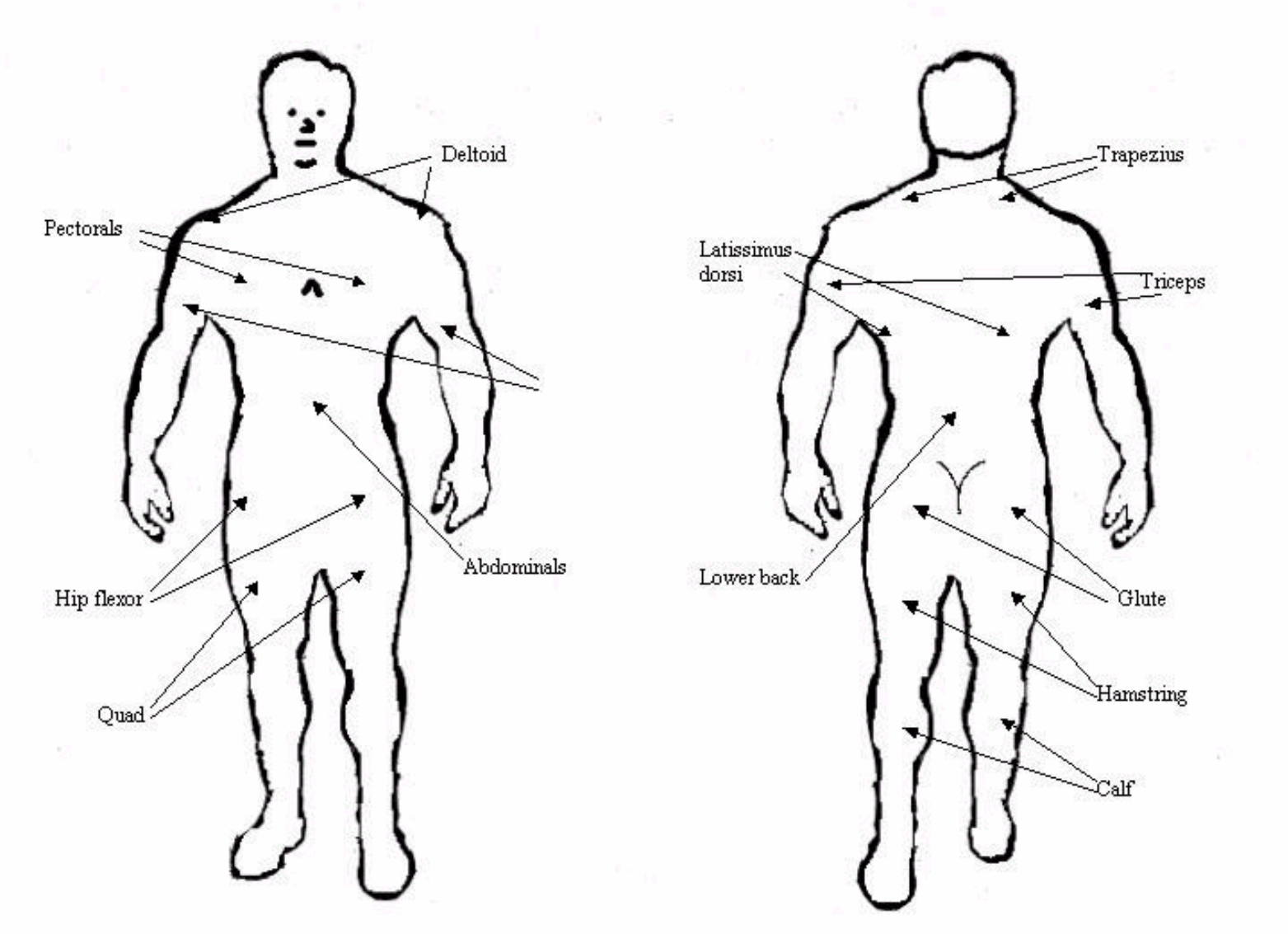
This is the first time Harvard Cycling has organized training programs for its members in this fashion. We really appreciate any suggestions you have for making the next version more effective.

Bibliography

Here are some books on training (both cycling and general interest) that you may find useful in learning how to train to race.

Bob Anderson, Stretching, 1980.
Edward Borysewicz, Bicycle Road Racing : The Complete Program for Training and Competition, 1986.
Joe Friel, The Cyclist's Training Bible : A Complete Training Guide for the Competitive Road Cyclist, 1996.
Greg Lemond, Greg Lemond's Complete Book of Bicycling, 1990.
Dr. Domhnall MacAuley, A Guide to Cycling Injuries: Prevention and Treatment, 1995.
Bill Pearl, Getting Stronger, 1986.

Appendix: The major muscles



* N.B. This guy may be able to bench press 300 pounds, but you can kick his butt on a bike!