

## Chapter 6 RACING ABILITIES

*Things worth having are not easy to obtain. Once obtained, those items must be treated with care and respect or they slip away*

—GALE BERNHARDT, elite coach

**YOU have identified** your strengths and weaknesses. Based on this testing and previous race experience you should now have a good idea of what makes you the rider you are. As discussed in that chapter, there are many possibilities when it comes to this determination: physical, mental, nutritional, technical, strategic, and more. In this chapter, as with most in this book, we will focus on the physical aspects of training.

Back in the 1970s when I began to study training seriously from a scientific perspective, I was convinced that if I could find a diagram which illustrated what training was all about I'd have a better grasp of the subject. For years I played around with various drawings, always trying to find the one that made it clear. Could training be a straight-line continuum? Might a circle best explain what happens in training for competition? Or maybe it's a three-dimensional spiral that best shows what training is all about. Nothing seemed to work.

Then I discovered the writings of Dr. Tudor Bompa, a Romanian scientist-coach who has written extensively about periodization. In his work he uses a simple diagram to describe training. This was it! Once I got a handle on the components of his diagram, training became simple. His figure not only helped me to simplify the elements of training, it also provided a third dimension of time.

In this chapter I'll introduce you to the Bompa diagram, which now serves as the basis for all I do when training athletes. While it appears to be very simple, there are many subtle nuances that require some consideration. But once you have grasped the concepts, the process of training – and the answers to many

## 第6章 竞赛能力

*值得拥有的东西不易得到。一旦拥有，就必须小心而特别注重地对待它们，否则它们就会溜走。*

——GALE BERNHARDT, 精英教练

你已经鉴别出你的强项和弱项。基于这些测试及过去的竞赛经验，对你为什么是现在这样的车手，你应该有了很好的认识。如那些章节所述，很多种因素都可能最终起决定性作用：生理，精神，营养，技术，战略等等。如同本书的大部分章节一样，在这一章我们将重点放在生理方面的训练。

回顾七十年代，当我开始从科学的角度认真研究训练时，我相信如果能找到一个展示训练全貌的图的话，我就能更好地掌握这个学科。几年间我花功夫画了各种各样的图，一直试图找到能清楚表现训练的图式。训练可以是一条连续的直线吗？或者最好应该用圆形来解释在为比赛而作的训练中发生的事吗？又或许三维的螺旋线能最好地表现训练相关的一切吗？实际上没有一个图管用。

随后我发现了罗马尼亚科学家兼教练 Tudor Bompa 博士的文章，他写了很多关于周期性训练的东西。他在工作使用了一种简单的图来描述训练。这就我要的！当我能掌握他的图上的各个部分时，训练变成了一件简单的事。他的图不但帮助我简化了训练的各个部分，而且还提供了第三个维度——时间。

在这一章中，我将会向你介绍 Bompa 的图，这个图现在是我训练运动员时全部工作的基础。它看上去非常简单，但里面有许多微妙的地方需要考虑。一旦你掌握了这些概念，训练的过程——以及许多关于该怎样训练的问题的答案——就会很清楚了。

of the questions about how to train – will be evident.

First, it's necessary that you first fully understand the concept of limiters that was touched on in Chapter 5. This is necessary because you must consider how the concepts of the diagram relate to your own strengths and weaknesses.

## Limiters

There are aspects of your physical fitness that hold you back when it comes to race performance. We discovered some of these weaknesses in the last chapter. While it would be nice to eliminate all of your weaknesses and have only strengths, that is neither realistic nor all that necessary. More than likely, only one or two of these shortcomings stand between you and better race results. These key weaknesses are your “limiters.”

Peak performance is a consequence of matching your individual strengths with the requirements of an event. This is similar to comparing your lottery ticket to the winning numbers and finding out that you had five of the six numbers right – close, but no million-dollar prize. Racing is like this. Having two of the three qualities necessary to race at the front isn't good enough. The one you're missing is the limiter. By correcting it, regardless of your other weaknesses, you're a contender. So it's really not weaknesses that should concern you, it's limiters.

A limiter is a race-specific weakness. For example, let's say you are training for a hilly, A-priority road race that is always won or lost on the last climb and one of your weaknesses is climbing. This weakness is obviously a limiter—it prevents you from performing at the level required for success. But if your other weakness is sprinting, this would not be a limiter for this race. So while you have two weaknesses: climbing and sprinting only one is limiting your performance in this important event.

首先，你需要完全理解第五章中提到过的限制因素的概念，因为你必须思考如何把图中的概念和你的强项和弱项关联起来。

## 限制因素

你的某些方面的身体素质会制约你竞赛的能力。我们已经在上一章揭示了一些弱项。把你的弱项全部消除掉，只留下强项当然好，但这既不现实也不完全必要。实际上，也许只有其中的一个或者两个缺陷让你不能取得更好的比赛成绩。这些关键的弱项就是你的限制因素。

运动能力的高峰是你个人的强项与某次比赛的要求相吻合的结果。这就好比你看彩票券和中奖号码比对，6位数字中有五位对上了——很接近，但却拿不到百万美元的奖金。比赛就和这差不多。你面对的比赛所需的三项特质中你拥有两项，那还不够好。你没有的那一项就是限制因素。只要把它改掉，无论你还其它的什么弱项，你就会是一个有力的竞争者。所以说，你该关心的是限制因素，而不是弱项。

限制因素是一种与特定竞赛相关的弱项。比如说，你正为一个多山的A级公路赛而训练，这个比赛总是在最后一个爬坡段决出胜负，而你的弱项之一就是爬坡。这个弱项明显是一个限制因素，它阻止你达到获胜需要的水准。如果你另外的弱项是冲刺，在这样的比赛中它不会是一个限制因素。所以虽然你有爬坡和冲刺两个弱项，但只有一个会限制你在这场重要比赛中的水平发挥。

What you should closely watch for in this chapter are the necessary requirements to race well in the types of races you do, and which of those requirements you are missing. Later I'll show you how to strengthen your limiters.

在这章中，你需要特别关注的是：在你参加的各种比赛中都有些什么样的要求，其中哪些是你不具备的。稍后我会告诉你怎样补强你的限制因素。

## Basic Racing Abilities

## 基础竞赛能力

In Chapter 5, I mentioned the three basic abilities required in all sports: endurance, force, and speed skill. Different types of races, from hilly or flat to long or short, require different mixes of these abilities. The basic abilities are the ones with which an athlete should start his or her training year. They also should be the foundations of the novice cyclist's development in the sport for the first year or two.

在第五章，我提到有三种基础能力是所有的运动都需要的：耐力，力量和速度技巧。不同类型的竞赛，爬坡或平路，短途或长途，需要这些能力的不同组合。这些基础能力是运动员在他的年度训练开始时就有的，它们同时也是新车手在开始的一两年里要培养的基础能力。

It may help to understand where this discussion is going if you see the basic racing abilities as the corners of a triangle. While endurance, force, and speed skill sound simple enough, it may be helpful to explain how those terms are used here.

为了帮助你理解我们讨论的思路。你可以把这些基础竞赛能力看作是三角形的三个角。虽然耐力，力量和速度技巧听上去够简单了，但解释一下这些名词在这里是如何使用的可能会有些帮助。

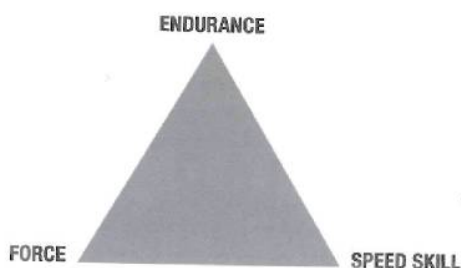


Figure 6.1 Basic abilities triangle

图 6.1 基本竞赛能力的三角图

### Endurance

### 耐力

Endurance is the ability to continue working by delaying the onset of fatigue. Within the context of this book, it implies an aerobic level of exertion. Endurance is specific to the event. For example, a one-hour race does not require the endurance to ride for five hours.

耐力是一种能够推迟疲劳出现而持续做功的能力。在本书中，该术语暗指有氧级别的发挥。耐力和特定比赛有关，例如，一个小时的比赛不需要能连续骑行五个小时的耐力。

As with other aspects of fitness, endurance is typically developed by starting with general

如同身体素质的其他方面一样，培养耐力通常从一般性的耐力训练开始，然后过渡

endurance training and progressing to more specific training. This means that an aerobic endurance base is built first in the winter months by developing the capabilities of the cardiorespiratory system (heart, lungs, blood, blood vessels), usually with crosstraining activities such as skiing or running. For those of you strongly committed to riding your bikes year-round, consider cyclo-cross training since it combines running with cycling and lets you hone your handling skills. Later in the winter, training will become more specific as the length of the longest rides are extended to a minimum of two hours or the duration of the longest race, whichever is longer.

For the novice cyclist, endurance is the key to progress. After all, the sport of road racing is primarily an endurance sport. If you don't have the endurance to finish the race, it doesn't matter how well developed any of your other abilities may be. This ability has to be nurtured before others are emphasized.

### Force

Force, or strength, is the ability to overcome resistance. In cycling, force comes into play on hills and when riding into the wind. It also has a lot to do with how big a gear you can turn any time you want to go fast. You develop muscular force by progressing from general to specific training during the year. This starts with weight lifting early in the season and eventually becomes big-gear repeats and then hill work. This progression, by the way, is typical of the general to specific preparation so common in proper training. When lifting weights you are engaged in general training as no bike is involved, but when suffering through big-gear hill repeats the training is specific to the demands of the sport. I mention this now because it will continue to be an important point in the development of all of the race abilities described here.

到更有针对性的训练。这意味着有氧耐力的发展首先在冬季通过对心血管系统（心脏，肺，血液，血管）的锻炼打下基础，通常是靠交叉训练，比如滑雪或跑步。对那些决意全年骑车的车手，可考虑一下公路越野训练，因为它结合了跑步和骑车，而且增强你的控车技能。在冬季的晚期，训练变得更有针对性，最长时间的骑行至少要增加到两个小时或是和最长时间的比赛一样长，以其中时间较长的那个为准。

对新车手，耐力是进步的关键。毕竟公路自行车竞赛主要是一个耐力运动。如果你没有足够的耐力完成比赛，任何其它方面的能力提升再多也没有用。只有先把这个能力培养好了，你才能关注其它方面。

### 力量

力量，或者说力气，是克服阻力的能力。在自行车运动中，力量体现在爬坡和顶风骑行时。它还在很大程度上决定了在你想加速时可以踩得动的最大齿轮比。一年中，你对肌肉力量的培养从一般性训练开始，并逐渐向针对性训练过渡。从赛季早期的举重训练开始，并最终过渡到大齿比重复，以及爬坡训练。这种进步方式，即从一般性训练过渡到针对性训练，是正确的训练中很常见的典型做法。举重时你做的是一般性训练，不需要自行车；但到了用大齿比在山地痛苦地重复爬坡时，你做的就是专门针对这项运动的训练。我现在提到这个，是因为这是本书论及所有的竞赛能力的培养时都要提到的重要观点。

### Speed Skill

Speed skill is the ability to move quickly and efficiently. It is the ability to pedal smoothly at a high cadence and to negotiate turns quickly without wasted movement. It is not used here as a measure of your race times or velocity, although these are related issues. As speed skills improve, so do race performances. Some aspects of this ability, such as 200 rpm pedaling, are typically genetic. Athletes with world-class speed have been found to have a high percentage of fast-twitch muscles that are capable of rapid contraction, but they tend to fatigue quickly. It's possible, however, to improve speed skill by improving economy – quick movement with little wasted energy. Several scientific studies have demonstrated that leg turnover is trainable given the right types of workouts and consistency of purpose.

Just as with force, speed skill training progresses from the general to the specific. The goal for this ability is to be able to pedal comfortably (in other words, with a lower energy expenditure) at a higher cadence than you are capable of now. Such training will start with drills (general) and slowly move toward riding with a higher cadence than you currently employ (specific).

### Advanced Racing Abilities

The triangle diagrammed in Figure 6.1 may be further defined. The basics of endurance, force and speed skill make up the corners, but each of the sides of the triangle represents a more advanced ability. These are the abilities the experienced athlete will emphasize in the later periods of training, once the basic abilities have been fully developed.

#### Muscular Endurance

Muscular endurance (ME) is the ability of muscles to sustain a high load for a prolonged

### 速度技能

速度技能是快速及高效移动的能力。它是以高踏频流畅踩踏及没有多余动作快速转动的能力。在这里，它不是用来度量你的竞赛时间和速度，尽管它们之间确实相关。改进速度技能，竞赛能力也会随之提高。这项能力的某些方面，比如 200 转/分钟的踏频，一般都是天生的。我们发现拥有世界级速度的运动员，他们的快肌纤维比例较高——快肌能够快速收缩，但会很快疲劳。然而可以通过提高运动效率——即减少能量浪费来快速移动——来提高速度技能。数项科学研究已经证实，依靠正确的锻炼方式和持续的目标，腿的旋转能力是可以训练的。

如同力量训练一样，速度技能训练也是从一般性训练向针对性训练过渡。这项能力的目标是使你能够在比现在高的踏频下舒服地——换句话说，能量消耗更少地——蹬踏。这样的训练从各种踏频练习（一般性的）开始，慢慢转向以比你现在高的踏频骑行（针对性的）。

### 高级竞赛能力

图 6.1 所示的三角形还可以进一步扩展。耐力，力量和速度技能构成了三个顶点，但三角形的每一条边则各表示一种更高级的能力。这些是有经验的运动员在训练的后期阶段着重发展的能力，当他们的基础技能已经完全培养好了以后。

#### 肌肉耐力

肌肉耐力（ME）是肌肉长时间承受高负荷的能力。它是基础的力量和耐力相结合的一

time. It is the combination of the basic force and endurance abilities. In the world of cycling, muscular endurance is the ability to repeatedly turn a relatively high gear for a relatively long time. For the road cyclist, this is a critical ability. ME is what allows you to ride in a fast-moving group without suffering, to time trial faster than you have done before, and to hang with the leaders on a very long, steady grade.

Excellent muscular endurance is evidenced by a high level of fatigue resistance when turning a big gear. It is so critical to performance in road cycling that we will work on it almost as much as the more basic ability of pure endurance.



Figure 6.2 Higher abilities triangle

The “general” aspect of muscular-endurance training is the development of the accompanying corners – endurance and force. Once these abilities are deep-rooted, ME training begins with long repeats (endurance) in a higher-than-normal gear (force). The intensity is not high at first, being well below the lactate threshold, but eventually such training approaches and often surpasses threshold effort. As the early-season training progresses, the work intervals gradually get longer as the recovery intervals remain quite short – about one-fourth of the work interval duration.

### Anaerobic Endurance

Anaerobic endurance (AE) is the ability to resist fatigue at high cadence while turning a big gear. In advanced athletes, it is the blending of speed skill and endurance. Anaerobic

种能力。在自行车的世界里，肌肉耐力就是持续长时间以相对较大齿比持续转动的能力。对公路车手来说，这种能力非常关键。肌肉耐力能使你比较轻松地在高速前进的队伍中骑行，让你在计时赛中比以往骑得更快，并使你能长时间地在一个稳定的速度级别上咬住那些领骑的人。

超强的肌肉耐力体现在以大齿比转动时身体能够抵抗较高级别的疲劳。它对于公路车手的能力而言是如此关键，以至于我们必须在这上面付出和训练基础耐力一样多的精力。

图 6.2 高级竞赛能力的三角图

肌肉耐力训练的“一般性”方面是指发展相邻的两个角——耐力和力量。一旦这些能力已经打下扎实的基础，肌肉耐力训练就可从长时间重复（耐力）较高的齿比（力量）开始。刚开始时强度不用太高，最好在乳酸阈值之下，但最终这些训练会接近并经常超过乳酸阈值的强度。从赛季早期开始，随着训练的进展，高强度间歇时间逐步逐步拉长，而恢复间歇时间仍然保持比较短的水平——大约是高强度间歇时间的四分之一。

### 无氧耐力

无氧耐力（AE）是用大齿比高踏频运转时耐受疲劳的能力。对高级运动员来说，它是速度技能和耐力相结合的能力。在需要长程冲刺来决定名次的比赛中，无氧耐力是胜利的

endurance is fundamental to races in which long sprints determine success. A rider with the ability to maintain sprint speed for several hundred meters can often dictate the outcome of a race either as a strong lead-out or as a solo effort. AE is also present in the rider who is capable of single-handedly bridging a gap. Another time when this ability is needed is when climbing steep hills that take only a couple of minutes to ascend. In short, fast events such as criteriums, AE is challenged by the many surges that take place. Such rapid changes of effort cause the creation of high levels of lactic acid. Without well-developed anaerobic endurance a rider would quickly fatigue as lactate accumulates.

From this discussion, it should be evident that any rider who wants to compete at the highest levels must fully hone his or her anaerobic endurance. But for the novice, AE training is to be avoided for at least the first year. This is a very successful type of training that is most likely to lead to injury, overtraining, and burnout. The recovery requirements for this type of training are also the highest of any.

There are two types of anaerobic-endurance workouts. Both are interval-based. One is done at a power output roughly equivalent to what you would experience at the highest levels of your aerobic capacity (VO<sub>2</sub>max). If you have a powermeter, this is your CP6 zone. If you train only with a heart rate monitor or ratings of perceived exertion, the heart rate zone is 5b and the RPE is 18 to 19 on the 6 to 20 scale. The work intervals are about three minutes long with equal recovery intervals. As the season progresses and fitness improves, the work intervals are shortened.

The second type of AE interval workout prepares you for the stresses common when repeated surges occur. Short repetitions (less than a minute long) at very high power outputs are completed with only short recoveries between them. This is exactly what you experience in a criterium. The idea of these workouts is to challenge the body's lactate-

基础。能够以冲刺速度保持骑行几百米的车手通常能决定比赛的结果，不管集体领骑还是个人突破。在需要单独行动来弥合与前方对手差距时，这些车手同样需要表现出无氧耐力的能力。另一个需要这项能力的地方是在攀登只需几分钟到顶的陡坡的时候。在短距离，快速的竞赛中，比如绕圈赛，多次的突然急剧加速会考验你的无氧耐力水平。这样快速的负荷变化会产生大量乳酸。没有很好培养出自己无氧耐力的车手会因乳酸盐累积而迅速疲劳。

从以上讨论中可以明显看出，任何想在最高级别比赛中胜出的车手都必须强化自己的无氧耐力。但是对新手来说，无氧耐力训练是要避免的，至少第一年是如此。这一类的训练在导致受伤，过度训练和生理/心理衰竭方面简直太成功了。另外这类训练对训练后的恢复方面的要求也是最高的。

有两种类型的无氧耐力训练方式。两者都是基于间隔式的。一种是大致在你最高水平的有氧能力下能够输出的最大功率上进行。如果你有一块功率表，这就是你的 CP6 区。如果你只有心率表或者靠个人感知发挥度来掌握强度，心率区间是 5b，按 6-20 划分的感知发挥级别（RPE）是 18—19。每次做功间歇时长大约三分钟，恢复时长也是一样。随着赛季的进展和身体素质的增强，做功时长要逐渐缩短。

无氧耐力训练的第二种方式是让你体验常常在反复冲击下产生的压力。以极高的功率输出完成间歇之后（不到一分钟）只有很短时间的恢复，然后继续下一次重复。这和你绕圈赛中遇到的情况完全一样。这种训练的思路是压迫和刺激体内清除和缓冲乳酸盐的系统，最终使你能很快地排除和适应这

clearance and buffering system so that eventually you will be able to remove and cope with so much lactate so quickly that staying with such a demanding event becomes considerably easier – but never easy. It is not the sort of training you want to do frequently or for many weeks. This is the most demanding of all workouts.

### Power

Power is the ability to apply maximum force in the shortest time possible. It results from having high levels of the basic abilities of force and speed skills. Well-developed power, or the lack of it, is obvious on short hills, in sprints, and in sudden pace changes.

Since it is based on the speed skills and force components of the triangle, power is in the realms of the nervous and muscular systems. It's dependent on the nervous system to send signals to the proper muscles, initiating their contraction at just the right times. The muscles then must produce a large contraction force.

Training for greater power involves short, all-out efforts in the power CP0.2 zone or at RPE 20 followed by long recoveries to allow the nervous system and muscles to fully recover. Inadequate recovery will diminish the value of this workout. These repetitions are quite short – on the neighborhood of eight to twelve seconds or less. Heart rate monitors are of no use in power training.

Attempting to improve power while fatigued is counterproductive. Such training is best done when you are rested and early in a training session when the nervous system and muscles are most responsive. This is not to say that you should never work on sprinting late in a workout. You should at some time in the season prepare to sprint when tired as that is what usually happens in a race. But when trying to improve power earlier in the season be sure to be well-recovered.

么大量的乳酸盐，从而使得如此苛刻的比赛变地相对轻松些——不过想达到这一点可不容易哦。这可不是你愿意经常参与或持续数周的那类训练，这是所有的训练中最要求最高也最累人的。

### 力度

力度是在尽可能短的时间内爆发出最大力量的能力。它来自于你所拥有的两种高水准的基础能力——力量和速度技能。在爬短坡时，以及冲刺和突然的节奏变化时，就能明显看出你的力度能力是否培养好了。

因为它基于三角形中速度技能和力量两项能力，力度涉及到神经系统和肌肉系统的控制。它依赖于神经系统向合适的肌肉群发出信号，在合适的时机激发它们收缩，这时肌肉群必须爆发出巨大的收缩力量。

为了增强力度而进行的训练包括：短暂的，全力以赴的出力，功率区域在 CP0.2,或者感知发挥度（RPE）20，然后是长时间的恢复以使神经和肌肉系统完全恢复。不充分的恢复会削弱训练的价值。每次重复回合的出力时间相当短，大约是 8-12 秒，或者更少一些。心率表在力度训练中没有用处。

试图在疲劳时做力度训练只会适得其反。这种训练最好是在已经休息好了以后做，在每次训练的开始时候做，这时神经系统和肌肉是最灵敏的。这并不是说你绝对不能在每次训练的后期练习冲刺。你应该在赛季中安排某段时间专门练习在疲倦的时候冲刺，就象在竞赛中常常发生的那样。但是当你想要在赛季初期改善力度能力的话，记住一定要等完全恢复好了以后做。



## Limiters and Racing

Let's return to the discussion of limiters, which were previously defined as race-specific weaknesses. By now you should have a good idea of what your physical ability limiters are. The basic abilities of endurance, force, and speed skill are easily identified. The advanced abilities are somewhat more difficult to recognize. But since the higher abilities are based on the combination of the basic abilities, a weakness in basic abilities produces a weakness in the higher abilities. For example, if your endurance is weak it will limit both muscular endurance and anaerobic endurance. If endurance is good but force is lacking, muscular endurance and power are negatively affected. Poor speed skill means low power and inferior anaerobic endurance.

As mentioned, the types of races you do determine what strengths are needed and how your weaknesses limit you. Matching your abilities to the demands of the event is critical for success. Let's examine how that works.

### Race Prescription

There are several variables that define the demands of a road race. For example, races vary not only in course length, but also in terrain characteristics such as hills and corners. Other variables include wind, temperature, and humidity. Perhaps the most significant variable in road racing is the competition. Matching your physical fitness to the demands of the most important events for which you are training produces the best results.

The longer the race is, the more it favors the basic abilities. Conversely, the shorter the race, the more important the higher abilities are. In preparing for a longer race, endurance is paramount, but force is also necessary to deal with hills, and good fuel economy resulting from good speed skill conserves energy. Muscular endurance plays an important role,

## 限制因素和比赛

让我们回到限制因素的讨论中来，限制因素在前文中定义为比赛特定的弱项。到目前为止，你应该对自己有哪些生理能力上的限制因素有了很好的认识。耐力，力量和速度技能这些基础能力可以容易地鉴别出来。对高级能力的认识有些难度，但因为更高级的技能是基于基础能力的组合，一项基础能力弱就会造成一项高级能力弱。例如，如果你的耐力比较弱，那么它就会限制你的肌肉耐力和无氧耐力。如果耐力好但缺乏力量，肌肉耐力和力度都会受到负面影响。速度技能糟糕意味着低的力度和低水准的无氧耐力。

如前所述，你所参加的竞赛类型决定了你需要什么样的强项以及你的弱项会怎样拖你的后腿。让你的能力与比赛的要求相吻合是取胜的关键。让我们来看一下具体是怎么做的。

### 竞赛处方

公路自行车赛的要求取决于多个变数。例如，竞赛要求的里程不同，地形特征，如山地，拐弯也不同。其他的变数包括风，温度和湿度。也许公路竞赛中最大的变数就是竞争。让你的生理素质符合于对你来说最重要的比赛——这也是你训练的目标——的要求才能产生最好的结果。

竞赛的时间越长就越倚重基础能力，反之，竞赛时间越短，则高级能力就越重要。当你为一场较长距离的竞赛作准备时，耐力的重要性是压倒一切的，但需要爬山时则力量也是绝对必要，好的速度技能可以更经济地节约能量。肌肉耐力也会发挥重要的作用，但相比之下，无氧耐力和力度的训练的意义不

but training for anaerobic endurance and power is of less value.

In the same way, a short race such as a criterium favors the higher abilities, especially anaerobic endurance and power. That doesn't mean that endurance and force aren't needed, just not to the same extent as for the endurance events. Speed skill training is critical for short races, and muscular endurance also plays a role.

Training for an important event means first deciding what is important for success and then improving your weaknesses that don't match the demands of the event, while maintaining strengths that already fit its demands.

### Other Limiters

Besides the event-specific ability limiters discussed here, there are other factors that may also hold you back from achieving race goals. One of the most critical is a lack of time to train. This is perhaps the most common limiter. If this is a limiter for you, when designing a program consider that the specificity of training discussed in Chapter 3 becomes increasingly important as the hours available to work out diminish. In other words, when time becomes scarce, your training must increasingly simulate racing. So as volume declines, workout intensity specific to the event increases. The next chapter will help you decide how many weekly training hours are reasonable and necessary.

大。

同样的道理，短距离竞赛，比如绕圈赛，倚重的是高级能力，特别是无氧耐力和力度。这并不意味着耐力和力量就不需要，只不过它们不象在耐力型比赛中那么重要而已。速度技能训练对短距离竞赛很关键，肌肉耐力也有一定作用。

为一场重要的比赛而准备训练，意味着首先要决定哪些是获胜所需的最重要的因素，然后改进你的那些不符合竞赛要求的弱项，与此同时还要保持那些符合要求的强项的能力。

### 其他的限制因素

除去已经讨论过的与特定比赛相关的能力方面的限制因素以外，还有一些其他方面的因素也许会阻止你达成目标。最重要的一个就是缺少训练时间。这可能是最常见的限制因素了。如果这也是你的限制因素，那么在设计你的训练计划的时候，多考虑一下第三章讨论过的训练的确定性。你可用于训练的时间越少，那么这个原则就越重要。换句话说，当训练时间变得稀缺时，你的训练就必须更加接近比赛。训练量下降了，但针对比赛的训练强度相应提高了。在下一章我会帮助你确定每周需要多少训练时间才是合理和必要的。

能力	训练次数*	间歇训练时间**	目标心率区域	恢复***	RPE	心率区域	功率输出	功效	举例
耐力	1-4/ 周连续	20'-6 hrs.	无	无	2-6	1-3	CP180	a.延缓疲劳 b.发展慢肌 c.运动效率	平坦路面上, 3hrs
力量	1-2/	20-	30"-2'	1:2	7-9	4-5b	CP12-	a.肌肉力	重复地坐着

	周 间歇	90'					60	量 b.运动效率	爬坡
速度技能	1—4/ 周	20— 90'	10— 30"	1:2—5	9—10	无	CP1	a.高踏频 b.运动效率	30" 快速蹬踏
肌肉耐力	1—2/ 周	30-2 hrs. 间歇/ 持续	6—20'	3—4:1	7—8	4—5a	CP30— 90	a.力量耐力 b.适应竞赛节奏 c.提升LT下的速度	间歇训练 4x6'(2' RI)
无氧耐力	1—2/ 周	30— 90'	3—6' 30— 40"	2:1—2 2—3:1	9	5b	CP6	a.提高VO2max b.提升VO2max下的速度 c.清除乳酸盐能力 d.乳酸盐耐受力	5x5'(5' RI)  4x(4x40"(20" RI)) 每组间 5' RI
力度	1—3/ 周	20— 90'	8—12"	1:10	10	无	CP0.2	a.肌肉力度 b.快速启动能力 c.爬短坡能力 d.冲刺能力	10x8"(80" RI)
* 可根据个人情况，赛季不同时期和可供训练的时间而相应变化									
** 每次训练总的时间，包括为培养该项能力的出力时间									
*** 出力时间和恢复时间之间的比率，例如，3: 1 意味着每出力 3 分钟，休息时间就有 1 分钟									
注： ' =分钟，" =秒，hrs = 小时，RI = 每次间歇的恢复（休息）时间									

Table 6.1 Summary of Abilities

图 6.1 比赛能力汇总表

## Training of Abilities

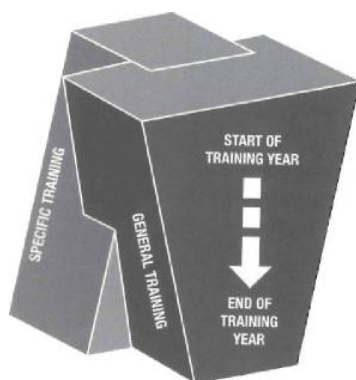
As you can see from the brief discussion of abilities, there are training patterns that progress from the general to the very specific. Figure 6.3 illustrates this concept. At the start of the training year, much of the work is general in nature, meaning that it may not include a bicycle or may involve riding in an unusual fashion, as when doing drills. Force (strength) training serves as a good example of the progression from general to specific. Early in the training year, weight workouts take up a large portion of training time. Later in the winter, weight room training is cut back as the

## 能力的训练

从以上对诸能力的简单讨论中，你可以看到一种从一般性发展到针对性的训练模式。图 6.3 表现了这个概念。在年度训练的开始，很多功课实际上都是一般性的，这意味着可以不用骑车或者以非常规方式骑车，比如做练习时。力量（力气）训练是一个从一般性训练过渡到针对性训练的好例子。在训练年度的早期，举重锻炼占据了训练时间的很大一部分；到了冬季的后期，举重房里的训练减少了，而爬山训练的次数增加了——特别是使用大齿比，低踏频的情况下。最终，运动员可能过渡到重复爬坡或者爬坡式的间歇

number of hilly rides increases – especially in a high gear with low cadence. Eventually, the athlete may progress to hill repeats or hill intervals, and, finally, to racing on hilly courses – the most specific of force-related work.

Each ability has a unique method of training associated with it throughout the season. Here is a brief and simplified summary of how to train abilities from the start of the season through the end. Chapter 8 will provide details of how to blend all of the abilities, and Chapter 9 will furnish workout menus and the criteria for selecting workouts for each of these abilities.



**Figure 6.3** General to specific training emphasis throughout the training year

训练，最后过渡到爬坡式的比赛——这也是最有针对性的有关力量的功课。

每种比赛能力的培养都有一个和它相关的贯穿整个训练季的独特训练方式。下面会简明扼要地总结一下如何在整个赛季期间训练这些能力。在第八章将会给出更多的关于如何混合训练各种能力的细节，而在第九章将会提供训练科目表，以及如何针对每种能力选择相应的训练方式。

**图 6.3** 贯彻全年的强调从一般性到针对性的训练

## Endurance

Endurance training starts in early winter with aerobic crosstraining activities such as Nordic skiing or in-line skating. These modes of training will provide enough stress to the heart, lungs, blood, and blood vessels to improve their endurance qualities. By mid-winter, the program calls for a gradual phasing-in of on-bike training and the gradual elimination of crosstraining. Late-winter or early-spring rides should increase until they are at least as long as the longest race of the upcoming season. By this point, you have already established a good level of stamina and you begin to favor high-intensity workouts over endurance training. During the Transition period from the end of the race season to the beginning of the Base

## 耐力

耐力训练从初冬开始，采用有氧的交叉训练活动，比如越野滑雪或单排轮滑。这些训练模式可以给心，肺，血液和血管足够的压力，从而提高它们的耐力水平。在冬季中期，训练课要逐渐过渡到车上训练，并逐渐减少并排除交叉训练。在冬季晚期或初春，应该逐渐增加骑行距离，直到和下一赛季中最远的比赛距离一样长。到这个时候，你已经培养出了很好的耐力水平，并开始喜欢在耐力训练中穿插的高强度锻炼。从上赛季结束到新训练季的基础期开始之前的这一段过渡时期里，你可以用交叉训练方式来维持最低的耐力水平。

period, you can maintain a minimum level of endurance with crosstraining.

### Force

Force development begins in early winter with training in the weight room. If you have followed the schedule, you should attain the maximum strength necessary by the end of Base 1 near mid-winter. You should then shift your emphasis toward improving your force when on the bike. Depending on the weather, late winter is the best time to begin riding in the hills. Later, hill work may evolve into hill intervals and repeats, depending on your weaknesses. A rider can work to maintain strength throughout the season with weight room training and hill work. This is especially helpful for women and masters.

### Speed Skill

As with force, speed-skill development improves pedaling economy. Frequent drill work, especially in the winter months, teaches big and small muscles exactly when to contract and when to relax. As the muscles involved in pedaling are activated with precise harmony, precious fuel is conserved. Just as with endurance and force, speed skill training begins in the late fall or early winter, depending on the race schedule, and continues at a maintenance level throughout the rest of the season.

### Muscular Endurance

Muscular-endurance work begins in mid-winter with sustained efforts of several minutes in the heart rate zone 3 or power zone CP90. By late winter, it gradually progresses to interval training in the heart rate zones 4 and 5a or CP30 to CP60. The work intervals gradually get longer as the recovery intervals shorten. By spring, the athlete is riding up to an hour in these zones. The effort is much like “controlled” time trialing and tremendously effective in boosting both aerobic and

### 力量

力量能力的培养从初冬的举重房里的训练开始。如果你遵循训练计划的话，你会在接近冬季中期的基础期 1 结束前获得所需的最大力量。然后你应把重点转向在车上提升你的力量。根据天气状况，晚冬是最佳的开始爬山的时间。接着，山地骑行会演化为间歇式爬坡和重复式爬坡训练，具体选择取决于你的弱项。通过举重和爬山训练，车手可以在整个赛季里维持其力量水平。这对女性和老将们尤其有帮助。

### 速度技能

与力量能力一样，速度技能的培养会提升蹬踏的效率。经常地做高踏频练习，特别是在冬季，能够教会大小肌肉群何时放松何时收缩。当与蹬踏相关的肌肉群能够精确和谐地运动时，你就能节约很多宝贵的能量。正如耐力和力量训练一样，速度技能的训练也是从深秋或初冬开始，取决于你的比赛日程，并在余下的整个赛季中维持在一个稳定的级别。

### 肌肉耐力

肌肉耐力训练从冬季中期开始，方式是在心率区间 3 或者功率区间 CP90 持续出力。到了冬季晚期时，要逐渐过渡到在心率区间 4 和 5a 或者功率区间 CP30 到 CP60 之间的间歇训练。每次间歇的出力时段逐渐加长，而恢复时段逐渐缩短。到了春季，运动员要能够在这个强度上骑行一个小时。这个练习很象受控制的个人计时赛，对提升有氧能力和无氧适应力极其有效，而且几乎没有过度训

anaerobic fitness with little risk of overtraining. Throughout the Race period, muscular endurance is maintained.

练的风险。在整个比赛期，你需要保持已有的肌肉耐力水平。

### Power

### 力度

Power may be the most misunderstood aspect of training in cycling. Most athletes do sprints with brief recovery periods to try to improve their power. They are really working on anaerobic endurance. You can improve power with brief sprints at near maximum exertion followed by long recovery intervals. Natural sprinters love these workouts. Those with little power – riders possessing great endurance and little speed skill or force – find power workouts painful and dread doing them. For these cyclists the blending of speed skill and force training into power development will lead to an effective jump at the start of sprints

力度可能是自行车训练中最易被误解的方面。大部分运动员尝试改善力度水平的训练方式是夹杂短暂的恢复期的反复冲刺。但他们练的其实是无氧耐力。改善力度的方法其实是以接近最大努力的短暂冲刺加上长时间恢复期的间歇训练。天生的冲刺好手喜欢这样的锻炼。那些力度不足的车手——他们拥有极好的耐力以及很差的速度技能或力量——会觉得力度训练痛苦不堪而害怕做这类锻炼。对这些车手来说，把速度技能和力量训练融合为力度水平的提高，将会使他们在开始冲刺时有明显的飞跃。

### Anaerobic Endurance

### 无氧耐力

Anaerobic-endurance training includes aerobic capacity-developing intervals and lactate tolerance repetitions. At the start of the Build period of training, the experienced athlete should phase into interval training to bring his or her aerobic capacity to a peak. During the last weeks of the Build period, lactate-tolerance work trains the body to dissipate lactate from the blood and to buffer its usual effects. Anaerobic-endurance training is quite stressful and should not be a part of the novice cyclist's regimen. Both speed skill and endurance should be well established with at least two years of training before regularly attempting these workouts. The likely results of too much anaerobic-endurance work too soon are burnout and overtraining.

无氧耐力训练包括培养有氧能力的间歇训练和重复性的乳酸耐受式训练。在发展期开始时，有经验的运动员会引入间歇训练以使自己的有氧能力到达顶峰。在发展期的最后几个星期里，乳酸耐受训练使身体能够从血液中的尽快排出乳酸盐并缓冲它的影响。无氧耐力训练的强度非常大，所以新车手不应该考虑这种类型的训练。在有计划地尝试这类训练项目之前，你应该已经训练了至少两年来建立良好的速度技能和耐力。过于心急地进行过多的无氧耐力训练很可能会导致力竭和训练过度。

### Ability Regions

### 能力区间

In this section, it may sound as if I'm encouraging you to specialize in a particular category of races. I'm not. My purpose here is to show you how to blend the six abilities

这一节的内容听上去好象是我在鼓励你去专攻某些特定类型的比赛。其实不是这样的。我的目的是向你展示如何把前面谈过的六项能力融合起来并在特定类型的比赛中发挥出

previously discussed to produce optimal performance for specific types of races. Your strengths will favor success in some of these, but it is likely that you will still need to improve limiters for complete mastery. It will also help you to begin seeing how strengths and limiters are blended into a comprehensive training program.

To understand the requirements of various types of races, it is helpful to further refine the triangle as in Figure 6.4.

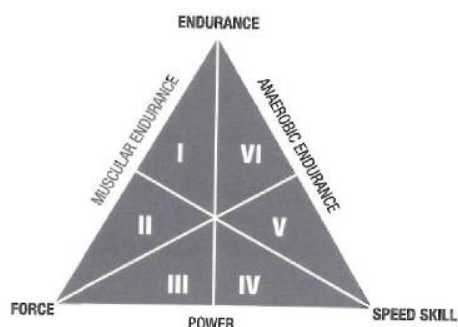


Figure 6.4 Racing abilities regions

Note that the triangle is divided into six regions, each representing a specific set of ability requirements. By now, you should be able to position yourself within one of the regions based on your known strengths. For example, if endurance is your number one ability and force is second, then you are a region I cyclist – high in muscular endurance with a tendency toward endurance. If two or all three of the natural abilities are equal for you, then your proficiencies may help define your region. Sprinters usually fit into the speed skill regions (IV-V), climbers into the force regions (II-III), and time trialists into the endurance regions (I-VI).

Races may also be divided into these same six regions based on their type, distance, and terrain. If you are a region I cyclist, then you will do best in region I races. The ability regions triangle also helps you decide what to work on in order to perform better in any of the other regions.

Following is a race description by ability regions and a prioritizing of the abilities you

最好的成绩。在有些比赛中，你的强项能使你处于有利位置，但可能你还是需要改善某些限制因素后才能取得完全的优势。另外本节内容这还能帮助你了解怎样把强项和限制因素融合进一个全面的训练规划里。

为了帮助你理解各种不同类型的比赛的要求，我们把三角形进一步细化，如图 6.4 所示。

图 6.4 竞赛能力区域图

三角形被划分为六个区域，每个区域代表一个特定的能力要求集合。现在基于你已经知道的自己的强项，你应该可以在这些区域中找到你自己的位置。例如，如果耐力是你最强的能力，而力量排第二，那么你就是区域 I 车手——肌肉耐力很强，并偏向耐力。如果你有两到三种自然能力的水平相当的话，你最擅长的技术也许会帮助你定位。例如，冲刺好手通常是在速度技能的区域（IV-V），爬坡好手在力量区域（II-III），而计时赛好手在耐力区域（I-VI）。

比赛也可以根据其类型，距离和地形划分为同样的六个区域。如果你是个区域 I 的车手，那么你在区域 I 的比赛中就会发挥得最好。能力区域三角图还可以帮助你确定需要如何努力才能在其它区域的比赛中表现得更好。

以下将描述按能力区域划分的不同类型

must train for each type. Obviously, your strengths will require less training time than your limiters. Chapter 8 will teach you how to blend the training of the various abilities, and Chapter 9 will provide detailed workouts to support each of these ability requirements.

The priorities of training that are listed here for each region do not imply an order of training, but rather an emphasis in training. Given that you have time and energy constraints placed on your training (career, family, home maintenance, etc.), it is necessary to decide what is most important in order to properly focus. If any of the first three abilities in a given list is a personal weakness, and this is the type of A-priority race you are training for, then you must elevate the identified ability to first priority when it comes to training. The last three abilities in each priority list have limited value for the type of race for which you're training. Do not avoid these areas, but do assign them less training time and energy. If a strength area falls into one of the last three abilities, you need place only minor emphasis on it. Realize that you can't be good at everything. And also realize that we are working within the concept of limiters. Determine what's holding you back and then correct that weakness.

### Region I

Region I includes the long, flat to rolling races that are so common in the northwestern European countries of the Netherlands and Belgium. In the United States, races of more than 100 miles are becoming harder to find. Wind direction, team tactics, and mental tenacity go a long way toward determining the outcome of those races. Riders with excellent endurance and time trialing proficiency are likely to emerge victorious. These races are also likely to come down to a pack sprint.

Also included in this region are time trials that are 30 kilometers or longer. Indeed, time trialing proficiency is critical to performance in region I races. If your weakness is time trialing,

比赛，以及按优先级排列的你必须为之训练的各种比赛能力。当然，相比于你的强项方面，你应该在你的限定因素方面花费更多的训练时间。第 8 章将会教你怎么把各种能力的训练合在一起，第 9 章会提供详细的训练科目来满足每种比赛能力的需要。

注意每一个区域里列出的训练的优先级并非训练的顺序，而只是训练的重要性指标。因为你的训练会受到时间和精力方面的限制（工作，家庭，修缮房子之类），所以必须要确定什么是最重要的，从而让你更好地抓住重点。如果某个列表的前三项能力中有任何一项是你的弱项，而这类比赛又是你的训练年度中的 A 级赛事，那么你在训练时就必须要把这些弱项能力的提高放到最优先的位置。优先级列表中的最后三项对该类型比赛的价值很有限，但是不要避开这类训练，还是应该花费少量时间和精力在上面。如果你的某个强项成为列表中的最后三项能力之一的話，那么你只需要对其稍加留意就可以了。要知道你不可能所有的方面都强。另外还要认识到我们是在限制因素概念的指导下训练。也就是说确定是什么东西拖了你的后腿，然后强化这个弱项。

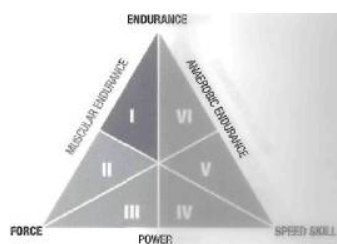
### 区域 I

区域 I 包括那种长距离的路面平坦的比赛，这种比赛在西北欧国家如荷兰和比利时是很常见的；但是在美国，超过 100 英里的比赛越来越难找了。风向，团队战术和坚韧的意志很大程度上决定了比赛的结果。拥有绝佳耐力和计时赛专长的车手很可能成为胜者，虽然这些比赛也可能最终会以集体冲刺收场。

这个区域的比赛还包括 30 公里或更长的计时赛。的确，计时赛专长是区域 I 比赛水平发挥的关键。如果你的弱项是计时赛，那么你需要把大量精力放在肌肉耐力的训练



you need to put a great deal of emphasis on muscular-endurance training in order to race well. Good time trialists have exceptional lactate thresholds relative to their aerobic capacities and maximum power outputs. They develop the ability to ride comfortably in an aerodynamic position and minimize wasted energy in pedaling. They also have superior ability to concentrate despite great suffering.



### Priorities for region I training

Primary importance

Endurance

Muscular endurance

Force

Secondary importance

Anaerobic endurance

Speed skill

Power

### Region II

Region II races include time trials of about 15 to 30 kilometers and road races of less than three hours. Hills are usually the element that determines outcomes. These are common road races in U.S. cycling.

Climbing is a central proficiency skill for region II. What makes for champion climbers? Typically, they have less than two pounds of body weight for every inch of height. They are capable of generating high wattage per pound of body weight in sustained efforts. This requires a high lactate threshold-power output and a large aerobic capacity. Natural climbers have an economical climbing style and are especially nimble on the pedals when out of the saddle on a climb.

上，才有可能在比赛中表现好。相比于他们的有氧能力和最大功率输出而言，好的计时赛车手都有超乎常人的乳酸盐阈值。他们能长期保持空气动力学姿势舒适骑行，并具有高效率蹬踏的能力。他们还具有在承受巨大痛苦时保持专注的超强能力。

### 区域 I 训练的优先级顺序

最重要的：

耐力

肌肉耐力

力量

次重要的：

无氧耐力

速度技能

力度

### 区域 II

区域 II 比赛包括了 15—30 公里的计时赛以及少于 3 小时的公路赛。爬坡往往是决定这类比赛结果的主要因素。这类公路比赛是在美国最常见的。

爬坡是区域 II 的核心技能。是什么造就了爬坡冠军呢？通常他们身高和体重的比例是平均每英寸身高少于两磅。他们的单位体重所产生的输出功率更高，并能保持这种做功状态。这需要在乳酸阈值状态下的较高的功率输出以及较大的有氧能力。天生的爬坡手有高效的爬坡方式，在站立式爬坡时的蹬踏也特别灵巧。



### Priorities for region II training

#### Primary importance

Force  
Muscular endurance  
Endurance

#### Secondary importance

Power  
Speed skill  
Anaerobic endurance

### 区域 II 训练的优先级顺序

#### 最重要的：

力量  
肌肉耐力  
耐力

#### 次重要的：

力度  
速度技能  
无氧耐力

### Region III

Region III in road racing is found only in short prologues of stage races. These are generally individual time trials on hilly courses taking only a few minutes to complete. As such, there is no need for the road racer to train for these events. The stage racer must simply grin and bear the agony.

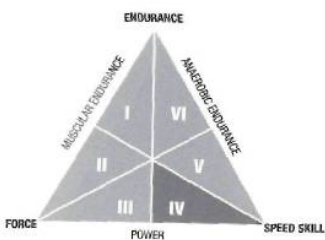
### 区域 III

区域 III 类型的公路赛只出现在分段式公路赛的短距离序幕战中。这些比赛一般都是几分钟就能完成的山地路段的个人计时赛。正因如此，车手们没有必要为此类比赛专项训练。他们只需要咬咬牙忍过这段痛苦就行了。



### Region IV

Region IV is in the domain of the track racer, especially the match sprinter. Training for this region is not within the scope of this book.



### 区域 IV

区域 IV 是场地车手的领域，特别是追逐冲刺选手。关于该区域的训练不在本书的范围之内。

### Region V

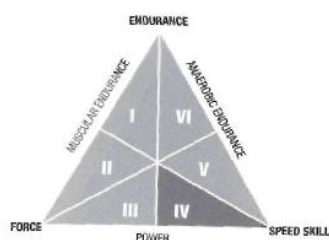
Region V includes short criteriums that are typical of many masters, women's, and juniors races. These are forty-five minutes or less and

### 区域 V

区域 V 包括短距离的绕圈赛，这是许多老将级车手，女性车手和新手们的典型比赛。这些比赛的时间通常为 45 分钟或者更短，并

have a high requirement for speed skill and anaerobic endurance. You must also realize that while this is a short event with much sprinting, it is still an endurance race. Don't disregard the development of this primary ability.

Short criteriums attract riders who are good sprinters. They usually have great total body strength and a capacity to produce extremely high power outputs instantaneously. This power is often marked by the ability to produce vertical jumps in excess of 22 inches. Champion sprinters have the dynamic balance of a gymnast and can turn the cranks at extremely high cadences. In close-quarters sprints, they race aggressively with no thought given to "what would happen if . . ." — they are confident in their ability to win the close one.



### Priorities for region V training

Primary importance

Speed skill

Anaerobic endurance

Endurance

Secondary importance

Power

Force

Muscular endurance

### Region VI

Region VI races are long criteriums and circuit races. This is the most common type of race in the United States. Notice that the primary quality of criterium racing is still endurance. Criteriums, however, requires less endurance ability than do longer road races. The ability to maintain speed and repeatedly sprint out of corners is necessary for success, as are superb

对速度技能和无氧耐力有很高的要求。你还必须认识到，虽然比赛时间短，冲刺也很多，但它仍然是耐力性比赛。不要忽视了这项主要能力的培养。

短距离绕圈赛对好的冲刺型车手很有吸引力。他们身体的总体力量较强，能够在瞬间爆发出极高的功率输出。这种爆发力通常表现为能垂直弹跳离地超过 22 英寸（56 厘米）。冠军级冲刺手有象体操运动员一样的动态平衡能力，并能够以超高的踏频驱动曲柄。在贴身肉搏式的冲刺中，他们表现得非常勇猛，决不会去想“如果...会怎么样”之类的问题。他们非常自信有能力赢得这类差之毫厘的比赛。

### 区域 V 训练的优先级顺序

最重要的：

速度技能

无氧耐力

耐力

次重要的：

力度

力量

肌肉耐力

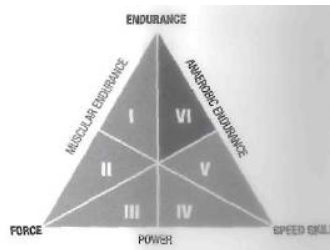
### 区域 VI

区域 VI 类的比赛是长距离的绕圈赛和巡回赛。这是美国最常见的比赛类型。要注意绕圈赛需要的主要能力仍然是耐力。当然和长距离的公路赛比起来，绕圈赛需要的耐力能力稍低一些。保持速度和出弯道时的重复性冲刺的能力对取得胜利所必需的，另外在过弯，挤撞和保持平衡时也需要极好的控车技

The Cyclist's Training Bible (3<sup>rd</sup> edition)  
Chapter 6 RACING ABILITIES

bike handling skills when cornering, bumping, and balancing.

If in a particular race, a hill or hills are the deciding factor, then force may replace speed skill as a success characteristic.



**Priorities for region VI training**

Primary importance

Endurance  
Anaerobic endurance  
Speed skill

Secondary importance

Muscular endurance  
Force  
Power

自行车训练圣经（第三版）  
第 6 章 竞赛能力

术。

如果在某个比赛中，一座或多座山是决定性的因素时，力量会取代速度技能成为获胜所需的条件。

**区域 VI 训练的优先级顺序**

最重要的：

耐力  
无氧耐力  
速度技能

次重要的：

肌肉耐力  
力量  
力度