Training for Mountaineering

When it comes to how to train for Mount Everest, Mount Rainier, Mont Blanc, or Colorado 14'ers, the theory and practice are the same. While we wrote the book on this subject, in this paper we will condense that information to concise, actionable advice backed up with enough theory that you can understand the why behind the how you should train for mountaineering.

The Mountaineer as Athlete

Training for mountaineering places big demands on an athlete. But nowhere near as severe as the stress mountains place on climbers. The option to drop out of a race that is going badly does not exist for a climber half way up a big route. A team of volunteers will not be waiting with warm blankets and hot food at the summit. When you reach the finish line, you can't relax and let your guard down like a normal athlete. The summit is, indeed, only half-way, and the descent is often as much of a challenge as the climb.

What mountaineering and a foot race do have in common is that the physiology of endurance is universal. We have used our decades of experience coaching and training in conventional sports to define the best methods to prepare for the challenges of mountain climbing.

"Fatigue makes cowards of us all."

Even though Vince Lombardi used this quote for football, it is even more poignant for mountain climbing. In the mountains, fatigue is the biggest controllable limitation that will come between you and success and safety. Furthermore, on long routes in big mountains, speed equates to safety in that the quicker you are up and down, the less chance you will be caught by a storm or encounter dangerously warming temperatures, or increase your exposure to a myriad of other objective hazards.

Traveling fast over complex terrain requires both a high level of technical competence and the endurance to support it. Climbing technique must be developed over years of practice by

climbing ever more challenging routes and mountains. Skilled guides and trusted climbing partners are the best people to refine your technical skills

An "Ideal" of Fitness

To back up, and see the big picture of training for mountaineering, we can identify the following key pieces of the fitness puzzle for mountaineers:

- *Aerobic capacity*: This is the metabolic ability of the body to move (climb) at a given power output.
- *Speed*: In the practical sense of mountain climbing, speed is strength. The quickness with which you push down into your boot determines your forward velocity.
- *Muscular endurance:* The ability of the legs to do a lot of work over long durations in a predominantly aerobic state—another form of strength.
- *Form/technique*: This is the mountaineer's proficiency at moving over the terrain. In-experienced and inefficient climbers will need a lot more aerobic capacity, speed, and muscular endurance to make up for lack of good technique.

A mountaineer should start by examining those pieces and decide how to train each one, first individually and then in combination. This is the most common training methodology: Start with simple, foundational training and implement increasingly complex, specific workouts as the goal event approaches.

Two Types of Training

Broadly speaking, there are only two types of training for any sport.

1) General Training. The general conditioning that readies you for event-specific training. Think of soccer players lifting weights in a gym and trail running.

2) Specific Training. The training that prepares you in a specific way for the event itself. Think of soccer players playing practice games at near-full intensity.

General Training consists of a mixture of strength training and endurance training and will <u>not</u> look at all climbing-specific. This is helpful to know, especially if you don't live near the mountains. The two goals of this training are building aerobic capacity and increasing basic functional strength for injury prevention and proper movement.

It is important to understand that the role of General Training is not intended to be of immediate benefit to your climbing. Its purpose is to generate a base of support to do the specific workouts and the training for climbing. General conditioning prepares you for training.

Specific Training consists primarily of climbing mountains or workouts that are designed to directly model mountaineering. Ideally this does include actual mountain climbing on peaks smaller than your goal-climb. It may also include more creative acts of training such as climbing stadium steps wearing boots and a heavy backpack. The two goals of this period are building aerobic capacity and increasing and increasing strength, specifically lower-body muscular endurance.

Descending from Stenar, Julian Alps, Slovenia. Marko Prezelj Photo

Aerobic Conditioning

Mountain climbing is an aerobic sport. Because a climb takes hours, or days, and the climbing is done in an aerobic state. This means that your body uses oxygen at the same rate you are able to supply it to the working muscles. Climbers, except in rare emergencies, don't sprint, and rarely go anaerobic. Because aerobic fitness is such a dominant factor in mountaineering it logically becomes the chief focus in our training.

Aerobic Self-Assessment for Mountain Athletes

This is the first concrete step once you're ready to start training. Assessing both your Aerobic and Anaerobic thresholds are important tasks for every mountain athlete. This how you will

correctly define your training intensities for different workouts. This section defines current best-practice recommendations for assessing aerobic fitness for mountaineers.

For a full treatment of this subject, read Aerobic Self-Assessment for Mountain Athletes.

We assess aerobic fitness for several purposes:

- To determine appropriate aerobic training intensities and ultimately by establishing intensity zones.
- To find out whether or not an athlete has what is known as Aerobic Deficiency Syndrome.
- To gauge future progress in aerobic capacity development.
- Note that you will need a recording heart rate monitor with a chest strap. The Heart Rate monitor on an Apple watch, or any other HR monitor that reads from your wrist, will not work. Heart Rate readings from wrists are not (yet) accurate enough for training.

Ideally you will perform two tests to get a picture of your personal aerobic response to different intensities. The first (and for mountaineers the most important) of these tests will pinpoint your Aerobic Threshold (AeT), which you reach at a rather low intensity. Aerobic Threshold can be determined by a number of different tests, each one discussed in the next section. The AeT sets the top of your Zone 2 (Z2) in a four-zone intensity scale, explained below.

Anaerobic Threshold is the second test, explained later, (Anaerobic Threshold (AnT), is also often called Lactate Threshold). Your AnT sets the top of your Zone 3. (Z3)

Although you can find many different zone systems with varying definitions of the zones, the following chart explains the system we use (also the most common). By anchoring this system to two important metabolic markers (AeT and AnT/LT), to define our zones, this approach does a good job of personalizing intensities to your unique metabolic response to the various intensities.

Aerobic Threshold Assessment

Assessment of the aerobic system's capacity for providing the needed energy can run from expensive laboratory tests to formulaic educated guess. This is not meant as a definitive list, but covers the most common options for determining your AeT. We've presented them from least to most expensive and least to most accurate, and discuss their pluses and minuses.

Here is an in-depth article on Aerobic Self Assessment Tools

MAF (Maximum Aerobic Function) Formula

Longtime endurance coach Phil Maffetone, most famous for coaching Mark Allen to six Kona Ironman Triathlon wins, came up with a simple formula to help people determine the heart rate that corresponds to the top of their aerobic base training zone. He did this through observations of many athletes. The MAF formula is simple to use but is based on a statistical average of a large population. Like any such result, it will give a statistically accurate answer when applied to the group but may or may not be accurate for any one individual. This means that if you apply this formula to 100 people from the general population it will have an 85–90 percent chance of predicting the AeT heart rate. The problem is that no individual can know if their personal prediction is correct.

The MAF formula is useful as a quick-and-dirty first stab. When compared to other tests, it tends to give a lower or more conservative AeT heart rate. This is a plus for most people who tend to do most of their aerobic base training at too high of an intensity.

The formula is simple: 180 minus your age. In order to semi-personalize it, we have found the following modifiers to be useful:

- If you are recovering from a major illness or on significant medications, subtract 10 bpm from the result.
- If you have been sick or injured and not training regularly, subtract 5 bpm from the result.
- If you have been training consistently for two years with neither a) nor b), use the formula 180 – Age.
- If you have been training consistently for more than two years and seeing improvements with neither a) nor b), add 5 bpm to the result.

Mountaineering near Mont Blanc, the Arete de Rochefort. Steve House Photo

Nose Breathing/Conversational Pace

This tests consists of closing your mouth during a run to see if you can sustain breathing through your nose for several minutes at a time. Alternatively, see if you can carry on a conversation in medium-length full sentences.

We were not inventing anything new here. Exercise science uses the ventilatory markers rate and depth of breathing for this same purpose when doing a Gas Exchange Test (discussed later), albeit with more accuracy. However, we discovered that this nice, simple test does not work with untrained and less well-trained climbers.

Heart Rate Drift Test

This test has become our go-to test for all our coached athletes. We like it so much we include it as the first workout in every aerobically based training plan we offer. This article provides a full description of this specific test, so we won't repeat the instructions here. We have found it to be well correlated (95+ percent) with Metabolic Efficiency Tests done in a laboratory. (The gold standard, explained later).

Simple in concept, this test uses the principle that when you hold an aerobic pace (<AeT), your heart rate will remain nearly constant for as long as an hour. If your heart rate rises more than 5

percent at that steady pace, your starting heart rate was higher than AeT. If the heart rate drift is less than 5 percent, your starting heart rate was below AeT.

Other Tests

There are better tests but from here on out they involve specialized equipment from $200 hand-held tools to full-blow Metabolic Carts that are only available in specialized labs. Note that the often-advertised “Max VO2 Test” is NOT what you need. Once you are ready to start actual training, start with the self test. Here is our full article on the subject.

Defining the Heart Rate Zones

By anchoring this system to two important metabolic markers (AeT and AnT/LT), our zones do a good job of personalizing intensities to your unique metabolic response.

Zone 1

Heart Rate: AeT-20% to AeT-10%

Perceived Effort: Very easy to easy

Training Effect/Purpose: Aerobic conditioning

Metabolism: Aerobic-fat

Muscle Fiber Recruitment: ST

Training Method: Continuous 30 min to several hours

Zone 2

Heart Rate: AeT-10% to AeT

Perceived Effort: Moderate for those with high AeT, easy for those with low AeT

Training Effect/Purpose: Aerobic capacity, economy

Metabolism: Aerobic-fat dominates, maximum fat utilization

Muscle Fiber Recruitment: Most ST

Training Method: Continuous 30–90 min

Zone 3

Heart Rate: AeT to Lactate Threshold

Perceived Effort: Medium, fun-hard not exhausting

Training Effect/Purpose: Aerobic capacity, anaerobic capacity, lactate shuttle, economy

Metabolism: Glycolytic/anaerobic begins to dominate

Muscle Fiber Recruitment: All ST + some FT

Training Method: Interval 10–20 min, continuous to 60 min

Zone 4

Heart Rate: Lactate Threshold to LT to maxHR

Perceived Effort: Hard, max sustainable

Training Effect/Purpose: Maximal aerobic power, strength/speed endurance, economy, technique

Metabolism: Both aerobic and anaerobic capacities maxed out

Muscle Fiber Recruitment: All ST + most FT

Training Method: Interval 30 sec–8 min

Denali seen from the summit of Mount Foraker, Alaska. Steve House Photo

Anaerobic (or Lactate Threshold) Assessment

To be clear, the first step in any training plan we create is determining Aerobic Threshold. The Anaerobic Threshold testing can wait a few weeks. Typically we do this in the fourth week of training because most athletes do not train any high intensity before the fifth week (at the earliest).

Your Anaerobic Threshold (sometimes called Lactate Threshold, or LT) represents the highest power output, speed, or heart rate that you can sustain for an extended period (30–60 minutes). It is the definition of endurance, personalized to your physiology and activity. While lab tests (both Gas Exchange Tests and Lactate Tests) will often claim to pinpoint this, we advise skepticism. Such tests, of necessity, keep you at any given intensity stage for only a few minutes before raising the intensity to the next level. The insufficient duration-at-each-intensity used by that protocol undermines the determination of what is supposed to be a long-duration threshold. Instead, we prefer the following field test.

Field Testing of Anaerobic or Lactate Threshold

Unlike the AeT test, which is conducted at low to moderate intensity, this test requires you to go as hard as you can for between 30 and 60 minutes (we will link you to another article that gives a full treatment shortly). You will want to use the most event-specific test you can arrange. In

other words, Mountaineers and alpinists should do a very steep uphill hike. If you are limited to indoor options, then a steep treadmill (15%) is the best option (better than stair stepper or stair mill.)

Your average heart rate during this test will be, by definition, the maximum that you can sustain for that duration.

This test requires maximal output so you need to be physically and mentally ready for a hard, all-out effort.

Here is a link (when you are ready) to our Step by Step Guide to Determining Anaerobic Threshold

The Bottom Line

With proper training, your Aerobic Threshold and Anaerobic Threshold will improve in terms of both heart rate and the speed with which you can move at that heart rate. As we said at the beginning: It is important to know where you started if you want to be able to chart your progress and know where you end up. But, it is also useful to have some ways of assessing your current position during this journey. These tests are all meant to allow you to monitor progress in your aerobic development.

Steve House training for Nanga Parbat in 2004. Ben Moon Photo.

Workout types

Mountaineering training workouts ideally consist primarily of hiking in hilly terrain, an excellent proxy for actual mountaineering. Ideally you do all of your training outdoors on hilly hiking trails. Wearing a pack is also important, and we'll talk about that shortly.

In reality, few people live near enough to hilly hiking trails to make hiking a viable option all of the time. Most of us are limited to indoor training. In this case a treadmill is the best choice. This is because of all the indoor training tools (treadmills, stair-steppers, stair-mills, etc) the treadmill is the closest simulation because you have to step up (one-legged) against gravity lifting your full weight. In the case of stair-steppers and stair-mills the step moves down, away from your foot, as you press down. This means that you never really lift your entire body weight and makes these tools much less effective than a treadmill.

The other excellent indoor-choice is a sturdy wooden box; simply step up and down. This is great because you can step on and off all four sides of the box, working every direction. But the box is pretty boring and it's probably not a viable option for more than the occasional workout.

Note that if you use a box it should be about 70-75% of the height of your shin bone.

Whatever you choose: hiking, treadmill, box or a combination of these, this will form the bulk of your training time. We will also simply refer to all of this as aerobic base training.

Backpacks

All but the most advanced climbers will start their first hikes un-weighted, but soon a weighted backpack will be incorporated. The reasons training with a weighted pack is important are self-explanatory. Remember the principle that training starts off looking like a facsimile of the event and becomes more and more event-like as you advance. This is absolutely true with mountaineering training. Starting without weight for at least 4 weeks (12-16 aerobic workouts) gives your body a chance to build some basic fitness and then we can start to add complexity and greater challenge.

Keep in mind that these progressions may appear conservative. However they follow the most fundamental and well-established principles of endurance training. Gradualness of progression is one of those principles. And frequency (consistency) of training stimulus is another.

Pack Weight

We recommend a minimum of four weeks of training, or 16 aerobic workouts in a 4 week period as a minimum number of workouts to complete before adding weight. After that weight should be added gradually. Start light, 10% of body weight adds a lot of pounding to a pair of knees over half-dozen miles of hiking. Then add the weight gradually.

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10
0	0	0	0	5% Body-weight	5% Body-weight	10% Body-weight	10% Body-weight	15% Body-weight	15% Body-weight

Note that athletes on the lighter side (sub 130lbs) will be wise to increase pack weight more aggressively. 5% of 120 pounds is only 6 pounds, and 20% is only 24 pounds. These athletes should add an additional 5% to get to pack weights that train you properly for the reality of a mountaineering backpack.

We do not recommend trying to build up to the actual pack weight of your heavy carries on your goal-climb. Please believe us that this training, in combination with the strength training, will prepare you very well for the heavier packs of your climb. The max pack weight we typically recommend for training tops out at 20% of body weight, and this is only for the most fit and well trained mountaineers.

If you go heavier than this you tend to (typically without realizing it) start to train a different energy system, Muscular Endurance, which we mentioned in the opening paragraphs. It is always a mistake to mix up the purposes of different workouts. Keep in mind that the long low intensity hikes with 20% of body weight are aerobic base training; they are not meant to have a profound muscular endurance training effect. To get slightly ahead of ourselves, as you advance past 16 weeks/four months of continuous training, the role of these workouts is to maintain the aerobic base while in the Muscular Endurance phase. Once you get that far along into training there will be weeks where the most important workouts are a Musuclar Endurance focused. And on those weeks most climbers will need to carry 50lbs or a weight that will cause local muscular fatigue to be the limiting factor. More on Muscular Endurance Training later.

Rest days and Easy Weeks.

We have the best success with most athletes training 6 days a week, four of those days are aerobic training, 2 are strength training, and one is a full day off from any form of training. A rest day. Most athletes take these on Monday because, well Monday…

Periodic easy weeks are also necessary. Typically these occur every third week. More frequently for the less-training, and less frequently for the well-training

Modulation

The third fundamental law of endurance training is modulation. Modulation simply means that the training load, or overall work you're doing in training is modulated over time. This means the training load must increase according to the first two principles (frequent stimuli whose duration is increased gradually). Most commonly we progress training load for 3 weeks in a row. Then we prescribe an easy week that is typically 50% of the training volume (time) of the most difficult week in that block of 4 weeks.

The easy week is called the consolidation week by coaches and this week is hugely important to give your body enough time and energy to fully recover from training and build new structures in your body. Meaning building more mitochondria, greater bone density, manufacturing more red blood cells, create new and more dense capillary beds in the muscles you are training. These structural changes are necessary, important, and invisible. Yet they take a lot of energy for your body to produce and we must allow a periodic rest so that it can accomplish these needed improvements.

Top of Tocllaraju, Peru

Strength Training

Second is strength training in a weight room. Strength is a key component of endurance. A proper strength program will help you develop into a more durable, more powerful, and more

efficient mountaineer capable of moving well over a period of many hours, day after day. As with any well-engineered training progression, an endurance-oriented strength regimen starts out fairly general and sharpens into something more specific over time. Ideally it should be geared toward the unique physical demands of mountaineering, stepping carefully up steep mountainsides.

What Is Strength?

In the context of sports, strength is the ability to exert the greatest force with the least effort. Under this umbrella definition, it is possible to account for a broad swath of applications—from the Olympic weightlifter who can snatch 300 pounds to the mountain runner who finishes a marathon with 8,800 feet of climbing in 3:45 (as Kilian Jornet did in July 2017). In both cases, the athlete overcomes some form of resistance; they leverage an ability—their "strength"—to accomplish that load with great efficiency. However, they are drawing upon very different sport-specific strength qualities to resist and overcome gravity. For the weightlifter, that quality is their maximal explosive power. For the mountain runner in the above example, as for a mountaineer, it is the ability to generate sub-maximal forces for hours on end without a diminution in those forces.

Speed As Strength

An athlete's speed depends to a large extent on their power (the rate that strength is applied), which is rooted in their strength. In order to move faster up and down a mountain, you need to be able to create higher forces (strength) in the locomotive muscles, and you need to be able to do so more quickly.

Mountain Strong Is Not Gym Strong

It is worth mentioning that for many the term *strength training* conjures images of muscle-bound gym-goers grunting out bicep curls in front of a mirror or chasing a new one-rep max for a particular lift. Banish that from your mind, because that is not what strength training should look like for you as an mountaineer. You need to develop climbing-specific functional strength for mountaineering. The last thing we want you to do is create bulk you'll then have to haul up a hill, mountain, or route. You simply can't afford to gain strength at the expense of adding appreciable muscle mass. (Note, there are individuals who can benefit from adding muscle mass, but they will want to consult with a coach because their training is more nuanced.)

How Strong Is Strong Enough?

In mountain athletics, weightlifting should never be an end unto itself. Spending undue time and effort on general strength can deprive you of the greater benefits gained through specific training. Plus, it is possible to become *too* strong.

Take the back squat, for example: Improving this strength—up to a point—will translate to better mountaineering performance. We don't want to pass that point. For the curious, we never train athletes to lift more than 2x body weight in the back squat.

For a fuller treatment on strength training and the mountain athlete, pick up our book and/or read this article.

And note that the older you become the more strength training should be prioritized. If you're over 40, this means YOU should take a moment to read this article.

Workout distribution and timing

It is well understood that one of the most important signals your body needs to develop aerobically is frequency of training. Therefore a minimum 4 aerobic workouts per week will be needed for almost all athletes. Less than this and the time between the training stimuli will

simply be too long and your body will de-train and you will either stay the same or loose aerobic conditioning. This is why when you only exercise on the weekends you de-train over time, no matter how big you go on the weekend. Here is an article that goes into a full explanation of the weekend warrior phenomenon.

How much time per week?

How much training stimulus you need to improve your fitness depends on how fit you are to start. Un-trained people with a higher BMI, typically start with 5 hours of training time per week spread over 6 days. Prospective mountaineers with a lean-looking figure, less than 10 extra pounds, typically can start with 7 hours of training time per week. Also distributed over 6 days. Fit, active people who can jog 10 miles without interruption probably will need to start with 8-10 hours per week. Note that these times include time for both aerobic conditioning and strength training.

How many weeks must I train?

The minimum effective training plan is 8 weeks. The longer the better. The reason there is no two or four week training plan that is effective is the fact that aerobic training makes significant changes to your metabolism as well as your body, from the cellular to the skeletal level. There are no shortcuts to building aerobic fitness. If there were they would have been discovered long ago. If you want to understand more about what happens in your body during training, we recommend reading this overview of training for Everest, even if your goals are much more modest, the training works the same way.

We feel it is important to reiterate that anyone who tells you there is a shortcut to endurance fitness of this type is either ill-informed or selling snake-oil. The fitness demands of a multi-hour or multi day climb will not be adequately met by doing gym based high-intensity training, Crossfit, building massive leg strength, power yoga, or spin classes. Endurance training has been studied and practiced for well over 100 years and there is truly nothing new when it comes to the best way to do it.

So if eight weeks is the minimum, what is the maximum? 10 years. It is well known that adults can continuously develop their aerobic systems for approximately ten years. Look at the age of world-record holders in marathon and ultra-marthon events. They're not 22, they're late-20's and early 30's. And this is the reason.

But you don't have 10 years to train to climb Mount Rainier, and you want to climb it next summer. The simple reality is that the sooner you start training, the fitter you will be when you clip on your crampons. If you have 8 weeks, use that. If you have 24 weeks, use that. And yes, you can build from year to year, even well into your 50's and possibly 60's.

Planning Training

The first thing to do is lay out a schedule for a minimum of eight weeks. Below is a template cribbed from our New Alpinism Training Log. You can copy this format into a notebook or you can also buy that book. In the case of the book, a lot of the work will be done for you and it serves as a very handy training guide integrated with a notebook to record your training. And don't forget you can share and collaborate with others on the Uphill Athlete forum pages. The outline below is intended to get you started and guide you through weekly volume increases. Use the starting training volume (hours) suggested above and adjust up/down based on how well you feel you're handling that amount of training.

Week	Period	Strength	Page References *Training for the New Alpinism*
1	Transition	General & Core	Start with a volume of 50% of last year's weekly average. See pages 188-191.
2	Transition	General & Core	See pages 192-206 for core strength info. See pages 207-221 for general strength info.
3	Transition	General & Core	
4	Transition	General & Core	
5	Transition	General & Core	
6	Transition	General & Core	
7	Transition	General & Core	
8	Transition	General & Core	

The second eight weeks of training get a little more serious. You'll be getting fit by now and so the training stimulus will necessarily be higher. You can follow the guidance offered here:

1	Base	Core & Max	Calculate based on completed hours, not planned hours.
2	Base	Core & Max	See pages 226-232 for Max Strength info. See pages 241-253 for Base Period planning info.
3	Base	Core & Max	
4	Base	Core & Max	
5	Base	Core & Max	
6	Base	Core & Max	
7	Base	Core & Max	
8	Base	Core & Max	

Note that page number references are for our book *Training for the New Alpinism*.

Muscular Endurance Training

We recommend adding Muscular Endurance Training, on average, in Base Week 9 (Overall week 16).

Once you get this far we recommend starting this progression as follows:

- Vertical gain: 50% of the vertical gain of your biggest day on your goal climb.
- Weight in pack: 15-40% of body weight is typical. The point is to have the rate of climb be limited by your leg strength, not by your breathing.

More on Muscular Endurance Training:

Vertical Beast Mode: What Is Muscular Endurance? Why Is It Important and How Do You Train It?

Muscular Endurance, the Money Workout

Muscular Endurance Seminar Video

Pausing on the summit of Mount Alberta, Canada. Steve House Photo.

Tapering

The weeks prior to your climb are NOT the weeks to go train extra hard. On the contrary. They are the weeks to, in coaching terms, consolidate your fitness gains by doing LESS training. What training you do execute should look like your goal climb.

Let me give you an example. Summit day on Mount Rainier via the Disappointment Cleaver route is about 4,000 vertical feet. 8 weeks out from your climb you should be doing at least one workout per week where you ascend 4,000 vertical feet in one day, with a backpack of approximately the same weight which you'll carry on Rainier, typically about 25 pounds. Note that you'll be doing these workouts after a good night sleep, in your own bed, after a solid breakfast, in comfortable, dry hiking shoes at low elevation. It is still only an approximately of the real Rainier climbing day which will follow a couple of hours of fitful sleep at 10,000' in a noisy tent, followed by a bar for breakfast, some bad instant coffee, and feet stuffed into frozen boots attached to crampons.

If you're doing these simulations, the physical challenge of the climb itself will be easy in good conditions and weather and give you the reserve you need to persevere in bad conditions and sub-optimal weather.

Here is a typical taper period training week before a big climb

One Zone 1 workout that comprises 25 percent of your total weekly aerobic target volume.

One Zone 2 aerobic session that comprises 10 percent of your total weekly aerobic volume.

Make up any remaining volume with easy aerobic exercise at Zone 1 or recovery pace.

Two General Strength sessions each week; use Scott's Killer Core Routine as a warm-up.

Executing and Recording

As you see, you need to record the training you've done. At a minimum you need to track two things each day:

- The amount of time trained
- The intensity you trained in, typically measured by heart rate zones, as we discussed.

You can use a pre-made log book, like ours. You can put it all into a spreadsheet. Or you can use an online training app, we recommend TrainingPeaks. We are paying clients of TrainingPeaks and we use it extensively.

No matter what method you use to record, it will also make sense to lay out your plan using this same method. You can skip this by purchasing a training plan created by experts. The best results possible are always attained by bringing in the expertise of a coach.

Diet and Nutrition

Food is your fuel and food on a mountain is fuel you must carry with you and add to the engine while moving up and down the mountain. It's imperative that you learn how to eat properly during a climb. Keep in mind that you'll be eating at odd times, often in the middle of the night, and while you're moving or on very short breaks. Many fit climbers have failed to summit because they messed up their nutrition.

Fasted Training

We recommend that all athletes begin to integrate fasted training in their aerobic workouts as soon as possible. This is detailed in all our training plans. In summary you need to start your training session having no calories (including sugar or milk in coffee or tea) for at least 4 hours prior to starting the training session. For the first half dozen fasted training sessions you'll need to carry some kind of food with you, a gel or small bar is usually best. The food is for when you feel yourself hitting the wall and slowing down or getting light-headed. This marks your bodies' current limit on how much aerobic work they can do on stored energy. This will get longer each time you execute a fasted training session. Within 4-8 weeks your metabolism will be shifted far enough away from burning carbohydrate during lower-intensity exercise that you will be able to do all your aerobic workouts fasted without a problem.

Here is a guideline which will work for many athletes to get them on the road to being fat-adapted athletes.

Week	# Fasted Aerobic Workouts	Tips
1–2	1	Apply to shortest workout
3–4	2	Apply to shortest workout + next shortest
5–6	3	Apply to all but the long workout
7–8	4	Include long workout. During long workout, go as long as possible before eating. Bring some fuel for when you “bonk.”
9+	All	All aerobic workouts are done fasted from here on out!

It’s easiest and most effective to undertake fasted training first thing in the morning before you’ve taken in any calories. Having not eaten for about 12 hours, you’ll be glycogen depleted already. Training in this depleted state will jump-start the fat adaptation process.

Your rate of progress will depend on your history. If you’re highly carb dependent, typically meaning you eat a lot of carbs/sugars and/or engage in a lot of high-intensity training or activity, then expect that this process will be slower and a bit rocky.

If you are new to this, start gradually. Try one shorter aerobic base (Zone 1–2) workout and see how your energy holds up. If you struggle with energy during it, do not get discouraged! This is a great indication that you will see big gains from becoming more fat adapted. Once you can manage an hour-long fasted workout, begin to do more of these relatively short, easy aerobic workouts fasted until you find you finish them and are not hungry. When you are able to comfortably train fasted daily, it's time to try longer fasted workouts. Take a snack on the first longer fasted workout so you can fuel when you notice your energy levels dropping.

Eventually you'll be able to handle long days in the mountains with minimal to no fueling when the intensity is low.

Note that for best results you always do strength and high-intensity workouts having eaten recently, usually 1-2 hours prior.

Eating right after your workout will speed your recovery. The standard recommendation is 300 calories roughtly split: 60/40 between carbohydrates/protein will go a long ways towards proper recovery. And take note: This is also true when you are actually climbing. Plan to consume a recovery snack as soon as practical when you arrive at that day's destination.

Fasted training is nothing new and nothing controversial, it's been around the endurance world for decades and is well understood. For a greater understanding of how this works

Read more:

Nutrition and Fat Adaptation

Maximizing Fat Adaptation in Endurance Athletes

Mental training

Simply put, mental strength is gained by gradually increasing the level of a specific type of stress over time. Being able to work under a tight deadline is not the same type of stress as climbing an exposed ridge. But toughness in both situations relies on confidence that you are up to the task. This means that training for mountaineering, and we have observed this hundreds if not thousands of times, leads to greater mental toughness in mountaineering scenarios.

We theorize that this is true because training is mentally tough for people. Getting out the door for a workout six days a week for months on end is a serious accomplishment. Furthermore, fitness and strength give you a raw, physical confidence. Confidence in your body that you can carefully step your way up or down an exposed section of ridge because you're in perfect control of your body.

It is worth pointing out that too much stress can cause trauma, which is detrimental to one's mental, and usually physical, health.

With both mental toughness and increasing physical fitness the stress, or training load, one thing is always true: It must be applied consistently and increased gradually. Equally important is periodic breaks timed to allow rest right when you're reaching your new maximum. These three ideas: consistency, gradualness, and modulation are the three principles of all training.

Our prescription for training mental strength for climbing is therefore to follow a properly structured physical training plan for a minimum of several months.

Like many mindful pursuits—climbing mountains is at its most simple level, the sum of your daily choices and daily practices, this includes the decision to include movement and fitness. Progress is entirely personal. The spirit of climbing does not lie in outcomes—lists, times, numbers of conquests. You do keep track of those; you will always know which mountains you have climbed, which you have not. We climb knowing that what and where we can do is a manifestation of the current, temporary, state of our whole self. Ascent is an expression of many skills developed, refined, mastered.

Rappelling a fixed line in Peru. Steve House Photo

Technical skills

We would be remiss if we did not mention technical climbing skill. With technical skills we are referring to the competency and efficiency you have on any given terrain type. Most mountaineering requires a fairly basic set of climbing skills, proficiency with crampons on moderate angle ice (up to 35 degrees typically), proficiency with an ice axe used for balance and security, the ability to do basic climbing ropework. As you get into more difficult

mountaineering routes you may need to be good at climbing with big boots and crampons on hard ice and bits of exposed rock.

Technical skills are important because one of the most common causes of people not having fun and not succeeding with their mountaineering projects is that they are highly in-efficient, in climbing techniques. You can be super fit, but if your technique is bad, you won't make the summit of anything.

If this describes you, take heart. These skills are not difficult to aquire and there are many qualified guides and instructors out there to help accelerate your learning curve. If you're new to mountaineering, it pays to take a gradual approach to learning the sport. Take a course or join a mountaineering club. Start with the objective of learning how to use your tools before you start to consider climbing to the summit of anything. A good rule of thumb is that for every summit you should have an absolute minimum of five days of practice with gear and terrain like what you'll encounter climb. (pull quote) Don't be that person the signs up to climb Everest having never worn crampons.

Training Summary

If we had to condense this into the fewest possible words it would be:

1. Start with an aerobic self-assessment to determine the proper heart rate training zones for you.
2. Engage in four days a week of zone 1 and zone 2 training efforts, the longest duration workout should make up 50% of the total weekly aerobic training volume.
3. Twice a week do a good core routine such as Scott's Killer Core Routine plus a lower-body focused, progressive, Strength Training routine

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Conclusion

Training is the most important vehicle for preparation for the mountains. Constant practice begets examination and refinement of technique as well as fitness. It is not our natural tendency to value struggle over success, a valuable worldview that climbing sternly enforces. Embracing struggle for its own sake is an important step on your path as a mountaineer. Incremental vacillations in your self—your physical and mental selves—are exquisitely revealed in practicing

ascent. There is no end to your progress or your process. For the two of us the pursuit of climbing mountains has been among the most powerful personal experiences we have known. Nothing else has come close to the blunt power of climbing to inform us about ourselves.

We have climbed and coached climbing at the highest levels of the sport and we know that structured, progressive training is the single least utilized—and single most powerful—tool available to every mountaineer. But not only because it will help you climb harder and faster—though it will. Training prepares your body and, most important, your mind for ascent through consistent, hard, disciplined practice.

Go simply, train smart, climb well.

By Uphill Athlete co-founders, Steve House and Scott Johnston

Got a question? Email us at coach@uphillathlete.com, or for the fastest response, post to our free forum.

Suggested Additional Reading:

Fit to Climb Everest

David Goettler and Ueli Steck Put Low-Intensity Training to the Test in the Khumbu

What Enables Endurance

Training for the Corporate Athlete

Perfect Preparation