

American Alpine Institute^{Ltd.}

Physical Conditioning for Mountaineering and Expeditions

Note of Caution: The ideas for training in this article describe what can work well for many people. Depending on your body, they may not work well for you, and depending on your medical condition, they may not be safe for you. Before using these suggestions or those from others, be sure to consult with your doctor or a professional trainer on what is best for you considering your health, body type, and specific needs and goals. AAI assumes no responsibility or liability for your use of the suggestions offered in this article. While describing what can work well for some people, AAI makes no assertion regarding the appropriateness of particular training processes or techniques for any individual. You must make your own assessments and decisions, preferably after consulting with your physician and/or professional trainer.

Also remember that with whatever training program you use,

- Start gradually
- Don't push it if you have prolonged soreness
- Stop and get an exam if you sense an injury
- Make sure and drink a lot of fluids (water or exercise drink mix) before, during, and after your sessions.

What does it take to adequately prepare for climbing mountains in the great ranges in the world? Unfortunately there is no single right answer to this question. People come in many shapes, sizes, and ability levels, and each of our unique physiologies plays the central role in determining what it takes for us to adequately prepare for a chosen objective.

In this article, I'll share some of the tips, ideas, and philosophies that I have informally come across in my half-a-dozen odd years of alpine climbing. My hope is to spur some creative thought if you are aspiring to work towards bigger and harder alpine climbs. As you will see, my personal approach is not very scientific and has not been developed with outside input from anyone packing a long list of credentials. I am a climber, and a relatively lazy one at that. I hate the gym and like to get by with as little effort as is possible. That having been said, alpine climbing - particularly larger scale climbs and expeditions - requires an almost super human level of physical fitness. The reality is that a great deal of preparation and physical output in the days and months leading up to your climb is absolutely necessary if you hope to do well, be safe, and have fun in the mountains.

There are a number of variables that can and should affect the specific exercises and activities that you use in your training efforts. The guidelines listed below should serve as a basic framework into which more specific activities can be meshed after some careful consideration and thought. I will speak more on this below.



Pulling a loaded sled while carrying a heavy pack on Denali's West Buttress route requires physical strength and endurance. Matt Anderson

Overview:

1. Timing: When to start training, and summary of the timeline of training.
2. Outside Activities: Activities for when you can get outside (during the week or on the weekends).
3. Inside/Gym Activities: Gym and cardio exercises for during the work week and when you can't get outside. Some discussion of weights, repetitions, and strategy.
4. Sample Weekly Schedule and thoughts on Rest Days
5. Goals and Targets
6. A Quick Note on Diet
7. Considering your Goal
8. Results, Analysis, and Conclusion

1. Timing

One of the most important questions in a training program is when to start. How soon is too soon, (it's never too soon!) and how late is too late? Ideally, we would all train year-round and plan for a peak in this training just a little before our climb. However, factors such as a job, family, and just plain old lack of motivation can make training and maintaining a high level of fitness year-round nearly impossible for most people. Over the last few seasons, my goals in climbing have centered around peaks in Alaska, and I have consistently planned these trips to start in the last week of April. As a result, my summers have been fairly low key with regard to climbing and I have focused the majority of my physical conditioning in the winter and spring in order to reach peak fitness by the time it comes to board the plane and head north.

To put the following guidelines in perspective, the notes below assume some base level of fitness. For most reasonably healthy folks with some basic level of fitness, a handful of months is enough to take training to the next level and prepare for a major climb. If you have been sitting on the couch for the last three years and hope to climb Denali next spring, you will need a longer training program than I am outlining here.

For an expedition or climbing goal that is scheduled to start in late April or early May, I begin seriously training in December (daily and weekly schedule to follow). This allows me four to five months to slowly work back into activities like weight training, but it's not such a long period of time so that I find myself really losing interest and getting bored with the workouts and routines. A period of four to five months allows a gradual and structured approach to the training, but it isn't so long that most folks stall out on a plateau in their progress and/or bottom out on their strength, endurance, and interest in the program.

It may seem overly simple, but my training can be summarized in two categories: (1) going to the gym a lot, and (2) and going climbing as much as I can. Obviously there are a lot of subcategories or choices of activities at the gym and in the mountains, but I don't have the time and honestly don't care to go much beyond that simple strategy. Use of this approach the last few years has yet to fail me and has always afforded me the physical condition I have needed to accomplish my goals.



Mountain biking can be a fun and effective component to your training regime. Coley Gentzel

2. Outside Activities

To put it plainly, your goal in exercising outside and on the cardio machines should be to kick your butt - aerobically and anaerobically - for as long and as hard as you can, keeping in mind certain thresholds and your own personal safety of course. (Remember when I warned you that this wasn't going to be scientific? Well I wasn't kidding.) When you are first getting started, it probably won't take much time at a high level of activity to wear you out. As you get further into your training schedule and get into better shape, these thresholds will increase, and you will be able to go farther and harder before reaching a point of exhaustion.

It's no big secret that climbing is the best training for climbing. Once again considering reality, most of us don't have the opportunity to get into the mountains on a regular basis as part of a training program. The next best option is to try to simulate the physical challenges that you would encounter on such an adventure. Here is a list of activities that you can do outside to save yourself from the doldrums of indoor training:

Hiking: Uphill, with a pack on, for a few hours at a time.

Hiking or Climbing in Snow: If you live near the snow, go for hikes or snowshoe in it. Again uphill, preferably with at least a moderately sized pack.

Stairs: Run or hike them. If you can find a long set, put your pack on and do some laps. You can gradually increase laps, increase weight in the pack, and decrease your lap time.

Mountain Biking: Ride a bike uphill over rough terrain for a few hours at a time. This is great cardio, aerobic, and muscular training. Wear a helmet!

Climbing: Rock climb and do some ascents of peaks and routes appropriate for your skill and comfort level if at all possible. Some form of climbing or mountaineering as preparation for a bigger climbs is absolutely necessary and worth extra time and expense if need be. The benefits are not only physical but mental as well. It takes most people a while to settle into the "climbing" mindset and to get used to the more serious environment that the mountains present. Any time that you can spend in this environment prior to your big trip will make your adjustment - once on the climb - go a lot faster.

Skiing: Alpine touring and telemark skiing are great ways to get some uphill mileage and have fun while you are doing it. The climbing motion on skis is very ergonomic and works most of the same muscles that hiking uphill does.

**The following activities are good for general fitness but not recommended as stand-alone training activities:

Swimming: The primary benefits for climbing are aerobic and cardiovascular conditioning.

Running: Also good benefits for aerobic and cardiovascular conditioning, but if you can run on trails and, most importantly add hills, you will achieve some relevant muscular development as well. It should be noted that the running motion uses muscles in very different ways than climbing and hiking. Balancing any sort of running with other forms of muscular training is key to achieving proper muscular fitness. Over the years we have had many climbers join our basic

level trips who have not trained with heavy packs or by hiking uphill and almost without exception, these folks have had a very hard time with the physical aspects of mountaineering. In some cases these climbers were world class athletes, marathon runners, and Ironman competitors. Running of flat terrain is simply not the same as hiking or running hills.



It's no secret that hiking with a pack is great training for climbing!
Coley Gentzel

3. Indoor/Gym Activities

Here is a list of the exercises I do at the gym. I will list a few more that may apply to your needs based on your climbing goals and will talk later about a timing schedule, weights, durations, and so on.

Group 1:

- Bench Press: Your typical weight bench and bar
- Incline Bench: Bench Press on an inclined bench
- Decline Bench: Bench press on a declined bench
- Flies: Sitting chest flies on a Nautilus type machine
- Dips: Tricep dips either on a machine or dips bar. Weight assistance is ok.
- Tricep Extensions: Sitting extension over your head with dumbbells
- Tricep Pull-Downs: Standing tricep extensions pulling from face level to waist level.
- Ab Crunches: Using a machine or sit-up bench at incline
- Leg Raises/Crunches: Lift your legs either bent or straight legged to waist level.
- Calf-Raises: Using a machine of some sort or squat rack.

Group 2:

- Pull-Ups: Using a machine or pull-up bar. Weight assistance is ok.
- Lat Pull-Downs: Seated pull-downs with wide bar.
- One Arm Pull-Downs: Seated pull-downs with narrow bar or one-hand grip attachment.

- Dumbbell Curls: The most basic weight lift invented.
- Bar Curls: Using a flat or bent bar.
- Shrugs: Standing with dumbbells, typical shoulder shrug.
- Shoulder Raises: Standing with dumbbells, raising arms outward to shoulder level.
- Machine Rows. Sitting and pulling towards chest.
- Inclined Sit Ups: Sit-ups on a bench at incline for added resistance.
- Squats: Using free weight or a machine.

Other:

- Quad and Hamstring Curls
- Lunges: Start with regular lunges and add weight as strength increases.
- Grip Machine: Can be helpful for ice and rock climbing.

Cardio:

- Stairmaster
- Treadmill at incline

All gym sessions should start with a cardio warm-up of some sort to get the blood flowing, muscles loosened up, and body generally ready to go. Keep the intensity low and don't get tired on this warm-up. Then move on to your weight training session, and on alternating days do the exercises in Group 1 and Group 2. After the weight training, do a longer cardio session to target cardio-fitness and to move blood through your recently broken down muscles. Stretching after a workout is always a good idea. Stretching the muscle groups that you just got done working on and additionally antagonist muscle groups can help prevent soreness in the following days. I have read and been told repeatedly that stretching prior to warming up and getting your blood flowing and muscles loose is not a good idea. The exception to this would be stretching in the day following a workout to loosen sore and tight muscles.

Weights and Repetitions: Climbing and mountaineering require far more endurance than they do sheer strength. I won't put a number on how much weight should be used, nor will I go too far into strategy about sets and reps, but I will say that, as a general rule, you should use less weight and do more sets and reps than a typical weight training program would include. Our target here is overall fitness and longevity of performance rather than sheer strength, explosive power, or building muscle mass.

I shoot for four sets in most exercises and increase progressively in weight for the first three, then do either a cool-down or burn out to failure session on the last set. Ten reps per set seems about right, but a few more or a few less is fine as long as you are pretty consistent.

4. Sample weekly schedule

Saturday - Outside/endurance
Sunday - Outside/endurance
Monday - Gym: Group 1
Tuesday - Gym: Group 2
Wednesday - Climbing wall/rest day
Thursday - Gym: Group 1
Friday - Gym: Group 2



**Backcountry skiing is a great way to stay in shape throughout the winter.
Matt Anderson.**

5. Goals and Targets

All of this sounds well and good, but you should have some concrete goals to shoot for in order to gauge your progress and evaluate your physical abilities as you get closer to the climb. I am sure at one point or another we have all felt like we have been in really good shape and probably the fittest guy or gal on the block, only to be left in the dust by some unassuming passerby. Were they just really, really fit? Or were you not quite as fit as you thought? There is a lot of subjectivity in these things, and so setting some concrete goals or targets can help you gauge accurately how you are progressing in your training.

Again taking Denali as an example, a typical day shuttling expedition supplies on the West Buttress will see you covering about 6-7 miles round trip, half of which will be with a 50-pound pack on your back and towing a sled with as much as 80 pounds of gear in it. Now bear in mind

that you don't really want to set your sights on an average day. An average day should feel, well, average. You don't want to feel destroyed after a couple of fairly average days on a three-week trip. Your sights should be set on the hardest day of the trip, plus a little bit more as a margin of safety, should unforeseen difficulties arise. Here are a few things to shoot for:

- Gain 4000 feet of elevation in under 4 hours with a moderate pack (40lbs)
- Gain 3000 feet of elevation in under 4 hours with a heavier pack (50+lbs)
- Gain 2000 feet of elevation in under 3 hours with a very heavy pack (60lbs)
- Increase speed and resistance on cardio machine for an hour without reaching a threshold of exhaustion. Shoot for 2500 feet in an hour.
- Ride your mountain bike for 2-3 hours at a time, climbing a few thousand feet of elevation in the process. Maintain a constant "all-day pace" while climbing.
- Complete day hikes and moderate climbs that involve 8+ miles of hiking and 4000+ feet of elevation gain.
- Complete climbs and overnight outings with moderate to large backpacks on.
- Mountain Running

General Month-to-Month Overview and Strategy for a Major Climbing Goal in May:

December: Ease back into the gym scene and start setting the base for weight training and cardio.

January: You should be seeing some progress with regard to strength and endurance, cardio should be coming along.

February: Now you are feeling good and your strength and endurance are solid. You can mash on the cardio machines well and push yourself when hiking and climbing.

March: You should now be moving past a good level of fitness and not only feel but see some physical results and products of your training.

April: This should be the time to peak and start to taper down your weight training while maintaining a high level of cardio activity until you pack your duffels and board the plane.

May: Reap the benefits of all of your hard training and accomplish your goal!

6. A Quick Note on Diet

The sky is the limit on how seriously you want to take your diet. There are countless resources to reference when trying to come up with a plan for proper nutrition and eating right for your goal. I don't change much with regard to diet as I enter my serious training period other than to utilize a recovery/electrolyte drink and up my protein intake after exercise. Some people say that cutting down on or eliminating caffeine is a good idea. I personally think the idea is to lose your tolerance or desensitization to caffeine before your trip, so that when you do partake while in the mountains, the effects are greater than they would otherwise be. I tend to scale it back prior to a trip and then happily jump off the wagon once in the mountains. A nice caffeinated beverage can be just the ticket for those cold alpine starts.

Just prior to heading into the mountains and in preparation for burning tons of calories with minimal intake, I will eat some fatty and very rich foods to try and build up some stores. Although tempting, don't do this too far in advance lest you compromise your training and/or burn it off before it comes time for your trip.



Steep climbing on Peru's Alpamayo requires a huge amount of sustained effort and commitment. Andrew Wexler

7. Considering Your Goal

As I have mentioned a few times now, your exact training program should be tailored to you individually, and to what you are hoping to accomplish. The schedules listed above were created to help me train for technical climbing in a cold weather, glaciated environment at moderate altitudes. My goal in working out is to achieve a very good level of overall fitness, extremely good cardio-vascular and endurance shape, and then to focus on the more specific muscle groups that might need additional attention, in my case upper body and calf muscles for technical climbing. For more moderate mountaineering and glacier travel, larger muscle groups like quads, back, and core strength would be some key areas on which to focus more specific training. When planning and carrying out weight training exercises, try to come as close to simulating what you will be doing on your climb as you can.

For a few examples of how your training strategy might vary based on your objective, I would like to take a moment to review several common expeditionary targets as well as to provide some more general thoughts on rock and alpine rock related programs.

On [Denali expeditions](#) most climbers are under-prepared in a few key areas. The length of the days, endurance required, and muscle groups specific to pulling sleds and walking on snow for

long periods of time seem to be the areas where most of the trouble lies. For climbers heading to Denali, I would recommend training for long days of moderate pace but high workload (big pack, lots of elevation gain) and then encourage some activity-specific training like lunges (works hip flexors for sled pulling) and hiking up hill over rough terrain (simulates walking on snow and uneven surfaces) in combination with strength training like squats and calf raises.

[Aconcagua](#) is another great example of an expedition where climbers are carrying heavy packs day-in and day-out. The differences between this climb and Denali are that climbers do not pull sleds and they spend a lot less time on snow and ice. Though you'll be preparing for this trip during the northern hemisphere's winter season, it will be best to spend as much time as possible on rough hiking trails with a large pack on rather than focusing on snow shoeing or backcountry skiing. Aconcagua is notorious for leading to fatigue; since it is a long trip at very high altitude, building up endurance will be one of your primary goals.

For a trip like the [Ecuador Volcanoes](#), climbers do not need to be accustomed to climbing all day - day after day - with a heavy pack. Instead they need be able to gain a lot of elevation over the course of single long days, which are interspersed with days of moderate activity. Almost all climbs in Ecuador are from a hut high on the mountain, and so we spend very little time with heavy loads (usually less than an hour over a few miles). Despite the ease of getting to the hut, summit days in Ecuador are very long, typically involving over 3000 feet of elevation gain on very rough and glaciated terrain. Being able to move quickly and keep a quick pace with light packs is much more important for this style of climbing. Being at altitude, an extremely high level of cardio and aerobic fitness will benefit you greatly.

For climbers preparing for moderate alpine rock climbs, their goal should be to keep a consistent uphill pace all day when hiking and then to be comfortable transitioning into a higher angle environment where core, leg, and arm muscles are used to climb moderate rock for a few hours. To train for activities like this, climbers can hike or spend time on treadmills and Stairmasters in combination with some high rep low-weight training on specific muscle groups (calves, arms, core), combined with climbing at a rock gym and training on pull-up and pull-down machines.



Members of an AAI Bolivia Expedition climbing 20,000-foot Huayana Potosi. Andrew Wexler

8. Results, Analysis, and Conclusion

Climbers who have gone through this planning, training, implementation process a few times will likely have an easier go of it than people training for and hoping to tackle their first large-scale objective. I encourage everyone to keep journals and notes on things like training routines, timing, gear lists, and calendars. I have found these notes incredibly useful for planning future trips. As your experience grows but memories of details fade, it can be hard to remember when exactly you started training, what activities you did to train, and what sort of gear you took along last time. By keeping good notes and documenting all aspects of your expedition or climb, you can save yourself a lot of effort when it comes time to prepare again. If you make a calendar or schedule, save it and pull it out the next time.

This practice ties very closely into the post-trip evaluation process. After your training efforts and climbing trip have come to an end, spend a little time reflecting on how things went and on how well you think you prepared, and consider what you could have or should have done differently. After every trip I try and think, even if it's informally, what I could have done without for gear, and what I wish I had along and didn't. I consider the strategy and approach I took and review and how things on the climb went compared to what I had planned for. I also consider my physical condition (or lack thereof), and then most importantly, I jot a few quick notes down in a journal so I can share with others or reference the notes myself the next season or years down the road. Another benefit of doing something like this is to take an occasional walk down memory lane by looking at notes from over the years, reliving some excellent adventures in the process.

In conclusion, I wish you all the best in your training efforts and hope that they are well rewarded with many summits and enjoyable adventures in the mountains.