Hanson's Coaching Services, LLC

Training Schedule

20 Weeks

40-60 miles/week

Marathon

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Training philosophies for the 20 week, 40-60 week marathon schedule:

Over the last few years, I have found that many people have run one marathon and have peaked out at about 40 miles per week. This schedule is for those who have probably run at least one marathon and are now looking to improve on their current performances. This schedule provides the bridge to handling slightly higher mileage that will allow for a better marathon performance.

1. The weekly mileage of this particular schedule provides a stronger aerobic stimulus. This type of weekly mileage is much more appropriate for the average person looking to run, not just complete, a marathon. The marathon is some 98% aerobic effort and requires a certain amount of general aerobic work. This weekly mileage is doable for the average person, while providing a training stimulus to improve current performance.
2. With this schedule, the gradual increase in mileage will still provide ample room to improve general running capacity, but also will allow us to do more volume in certain workouts and long runs.
3. The final philosophy is to build the runner's ability to handle different types of structured workouts. With this kind of weekly mileage, I have found that much more is possible with providing a better overall training environment.

Phases of the training segment:

1. Base. The Base phase can be stated as building the foundation, or base, to your training. It is the platform from which all other training will anchor to. There is nothing special to the base phase, simply easy running with slightly increasing mileage each week.
2. Transitional. It is difficult to completely switch gears from just easy running to doing workouts a couple times a week. So, the transitional phase bridges the gap between easy and workouts.
3. Threshold intro. Since I have found that many people tell me that they run their marathon pace every day, I try to introduce paces that are slightly faster than goal marathon pace. The reason the easy days tend to be faster, usually comes down to the lack of weekly mileage to tire and/or not knowing what their true marathon goal is. This phase incorporates mileage increases and faster running to help allow the body decide what easy pace really is and what marathon pace should be.
4. Race specific. This is simply putting a slight emphasis on race specific running, such as longer long runs at faster paces and runs done entirely at goal marathon pace.
5. Taper. This is the time to allow the body to recover from the work it has done over the last several months. Fitness gains are minimal at this time and recovery is the key to running your best on race day. The recovery comes mainly from a decrease in training volume, while intensity remains relatively constant.

Important note on altering the schedule:

The schedule provided is certainly not the end all-be all for your training, but it provides a clear template to training within a certain mileage range. I realize that not everyone runs

their long runs on Sundays and that sometimes you want to do a speed workout on Thursday with your track club, instead of Tuesday by yourself. That is fine with me, however keep these in guidelines in mind.

1. Keep an easy, or off, day in between workouts.
2. Do the same type of workout that is prescribed for the week.
3. Try to keep the mileage similar to what is prescribed for the week.

Tips for choosing your segment goal:

Choosing a feasible goal for longer races, such as a marathon, can help ensure success for the race, as well as provide a better racing experience. Choosing a goal can be complicated because there are a lot of factors to consider. The easiest way to approach this is to use a race equivalency chart. This chart can show you what you may have the ability to run based on other race distances you have completed. You will want to use recent races to get a more accurate depiction of your current fitness. You may notice that as your race distances go up, your performances become better than what was suggested by a shorter race, or the opposite. You may want to follow this trend to help choose a more appropriate goal. The longer the race, the more accurate the race equivalent time will be. Using a race equivalency chart is useful for taking longer races and predicting your abilities in shorter distances to. A training aspect to remember with using these charts is that reasonable training must be achieved. This means that training for a marathon is considerably different than training for a 5k. So, if you have been training for 5k races all summer and want to run a marathon in a few weeks, your goal for the marathon shouldn't be what the chart states is equivalent. To reach that suggested goal, ample time and proper training would be needed.

For those of you who are really even running with any sort of structure for the first time, this may be a little tricky. To be honest, I would dedicate at least two months of easy mileage running before undertaking the 18 week schedule presented in this packet. This way, you can reasonably build to a mileage level, followed with a few shorter races to obtain a general idea of what marathon goal you should have. Even if you are running just to finish, you should find some frame of training reference. Otherwise, your training is likely to be too general and you may find yourself less than prepared. In a perfect world, you would dedicate maybe 6 months of training and racing progressively longer distances to really know what kind of marathon you would be capable of.

Example:

Your 5k time suggests a 3 hour marathon is an equivalent performance, but your 10k time predicts a 2:45 marathon. Finally, the half-marathon you ran a couple months ago suggests a 2:40 marathon. With this being the trend, training for a 2:40 marathon is probably more appropriate goal than a 3:00 marathon.

Race Equivalency Chart

Mile	2 Mile	5 k	10k	15 k	10 Mile	Half-Mar.	25 kilometer	Marathon
12:59	27:43	45:00	1:33:29	2:24:51	2:36:38	3:28:01	4:10:24	7:18:42
12:16	26:10	42:30	1:28:17	2:16:49	2:27:56	3:16:27	3:56:29	6:54:19
11:32	24:38	40:00	1:23:06	2:08:46	2:19:14	3:04:54	3:42:35	6:29:57
11:24	24:19	39:30	1:22:03	2:07:09	2:17:29	3:02:35	3:39:48	6:25:04
11:15	24:01	39:00	1:21:01	2:05:33	2:15:45	3:00:16	3:37:01	6:20:12
11:06	23:42	38:30	1:19:59	2:03:56	2:14:00	2:57:58	3:34:14	6:15:20
10:58	23:24	38:00	1:18:56	2:02:19	2:12:16	2:55:39	3:31:27	6:10:27
10:49	23:06	37:30	1:17:54	2:00:43	2:10:32	2:53:20	3:28:40	6:05:35
10:40	22:47	37:00	1:16:52	1:59:06	2:08:47	2:51:02	3:25:53	6:00:42
10:32	22:29	36:30	1:15:49	1:57:30	2:07:03	2:48:43	3:23:06	5:55:50
10:23	22:10	36:00	1:14:47	1:55:53	2:05:18	2:46:24	3:20:19	5:50:57
10:14	21:52	35:30	1:13:45	1:54:17	2:03:34	2:44:06	3:17:32	5:46:05
10:06	21:33	35:00	1:12:42	1:52:40	2:01:49	2:41:47	3:14:45	5:41:12
9:57	21:15	34:30	1:11:40	1:51:03	2:00:05	2:39:28	3:11:58	5:36:20
9:48	20:56	34:00	1:10:38	1:49:27	1:58:21	2:37:10	3:09:11	5:31:27
9:40	20:38	33:30	1:09:35	1:47:50	1:56:36	2:34:51	3:06:25	5:26:35
9:31	20:19	33:00	1:08:33	1:46:14	1:54:52	2:32:32	3:03:38	5:21:42
9:22	20:01	32:30	1:07:31	1:44:37	1:53:07	2:30:14	3:00:51	5:16:50
9:14	19:42	32:00	1:06:28	1:43:01	1:51:23	2:27:55	2:58:04	5:11:58
9:05	19:24	31:30	1:05:26	1:41:24	1:49:38	2:25:36	2:55:17	5:07:05
8:56	19:05	31:00	1:04:24	1:39:47	1:47:54	2:23:18	2:52:30	5:02:13
8:48	18:47	30:30	1:03:21	1:38:11	1:46:10	2:20:59	2:49:43	4:57:20
8:39	18:28	30:00	1:02:19	1:36:34	1:44:25	2:18:40	2:46:56	4:52:28
8:30	18:10	29:30	1:01:17	1:34:58	1:42:41	2:16:22	2:44:09	4:47:35
8:22	17:51	29:00	1:00:15	1:33:21	1:40:56	2:14:03	2:41:22	4:42:43
8:13	17:33	28:30	59:12	1:31:45	1:39:12	2:11:44	2:38:35	4:37:50
8:04	17:14	28:00	58:10	1:30:08	1:37:28	2:09:26	2:35:48	4:32:58
7:56	16:56	27:30	57:08	1:28:31	1:35:43	2:07:07	2:33:01	4:28:05
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Training Terms:
The following contains descriptions for training days (ex. easy days, long runs, etc) and how to approach them.

Easy Days:

From my experience, easy days have been an issue of perplexity, both from an athlete's and a coach's perspective. Even now, my personal philosophies are just rounding into shape. I think the hardest thing is I see a lot of is the Midwestern attitude that, "If it's not hard it's not right." It's almost as if people think they are taking shortcuts if they aren't sore after they are done running. I respect that thought process, but it is unnecessary, can be harmful, or at the very least, unproductive in the long term.

Easy runs make up a large portion of a person's training schedule- up to 60% of one's weekly mileage. So, one must recognize their importance. First, let's examine the physiological benefits of easy runs. Easy runs promote a ton of cellular adaptations, with the most prominent being the strengthening of the heart. Face it, the heart is a muscle, and stressing that muscle will strengthen it. The benefits of a stronger heart allows for more blood to be pumped with each beat, or a greater stroke volume. If you recall, VO_{2max} is determined be heart rate and what stroke volume. Stroke volume is simply amount of blood that the heart pumps with each ventricular contraction. So, just by running easy, you can improve your VO_{2max}. This is known as a central improvement. The following are all peripheral improvements, as they occur in the exercising muscles themselves. The biggest event here is the development of mitochondria. These organelles are often referred to as the "powerhouse" of the cell. This is because the energy needed for muscle contraction is produced and released from these. Easy running is the best way to not only increase the size of the mitochondria, but also the number of these organelles; as well as the distribution of them. The benefits of the first two are obvious, but a better distribution of mitochondria means that more of the muscle fibers are being fed energy. Besides improvement with the mitochondria, there is also an increase in oxidative enzyme capacity. This simply means that when oxygen is being delivered to the mitochondria at a higher rate, it can be processed a lot faster. Finally, there is an increase in perfusion of the blood vessels in the exercising muscles. Basically, vessels are "shut down" if there is not a great use of them. With easy running, there is a greater demand for blood flow to the exercising muscles and these capillaries open up for use.

I always like this analogy when describing the above processes. Think of the heart as a factory that has just expanded to increase its production (blood and oxygen). This product flows down to the distribution centers (mitochondria), but runs into some problems. For one, the highway system (capillaries) is backed up, so alternate routes open up to allow for increase in traffic. However, once getting to the said distribution centers, it has another problem- there's not the capability to handle the increases in delivery, so the distribution centers expand in size and develop greater efficiency (oxidative enzyme capacity). Yet, despite these efforts, the mitochondria still can't handle all of the increased flow of product, so more distribution centers are needed. Even these fill to capacity, but there's no more room at the present location, but there is some vacant land (muscle in need of more mitochondria) around them. That land is taken and the process continues (greater distribution of mitochondria).

That seems like a lot of improvement from an easy run, and it is. This is why easy days need to have their importance. It's a crucial area of running improvement. That is why you can take a beginning runner getting in 15 miles a week, build them up to 30 miles a week over the course of a few months, and you'll see so much improvement. All without doing any type of structured workout. That leads to the final thought of this segment. That is, easy runs are the most effective way to increase mileage. First add easy miles to the weekly goal over a reasonable time frame. I'd say no more than 5-10% every 3-6 weeks, but this can vary greatly with more experienced runners. Once you get to where you would like to be for mileage, then add workout mileage (keeping total mileage the same).

Paces for Easy Runs

The pacing for easy runs always becomes a hot topic for athletes and there is a lot of confusion. Some experts say that there are these “physiological dead zones” where you may actually blending training zones, most likely, easy running and threshold areas. Most likely, that is about marathon pace for most people. I personally don’t believe in these dead zones, but I also don’t think running marathon pace every day is considered an easy run. That’s usually where the problem arises, when you say that if you run just slower than marathon pace it’s considered easy. Well, it’s not, because you have to consider many different factors. The main reason is that you are setting yourself up for injury. As soon as you give someone a range of intensities, they don’t even look at the lower end, only the speed limit, and just like driving down the highway; they cheat that down a little. If you run that hard every day, there is bound to me more structural damage and stress to the lower limbs. Also, you’ll become too tired to run your workouts at desired pace. So, it just doesn’t make sense to push the envelope every day. I also get the argument from slower marathoners that they run their easy days faster than their marathon goal pace. This means a couple things to me. The most common is that they just simply don’t have the endurance to run a marathon at a faster pace. With these runners, it is likely that marathon pace may be an “easy” pace for them, but I would still steer clear of running that pace every day. The other factor may be that the runner needs to set a faster marathon goal. It is probably some combination of these factors in beginning runners and slower marathoners. In either case, many times after the runner builds a higher weekly mileage total, the paces begin to work themselves out.

My recommendations are these. An easy run should not be faster than 30 seconds slower than marathon pace. Ideally, 45 seconds to 2 minutes slower than marathon goal pace. For shorter distance specialists, 1 minute slower than 10k pace or slower should be your guideline. The best thing to do is recognize what constitutes as an easy run. All warm-ups and cool downs and recovery runs (the next run after a workout) should all be dealt as easy runs. Recovery runs and cool-downs should be taken particularly easy, meaning being on the slower side of the recovery pace. Easy days between workouts should be in the middle of the spectrum. Long runs can be on the faster side of the spectrum, because this is often considered a workout and should be treated as one. However, the big thing with these ideas is to also consider how you are feeling. I don’t mean that if you are feeling good for the first few weeks of a training segment to hammer every easy day. Rather, I mean if you are starting to feel the fatigue of training, to not cut out workouts, but to make sure your easy days are truly easy. Often, just going easier for a week, or two, can lead to big improvements in the way one feels during a hard segment.

In the end, easy runs need to be respected as a source of running improvement. It goes with the same adage that one needs to know the purpose of each and every run. This helps maximize the benefit of your training without needless setback.

Long Runs

Long runs are a staple of all training regimens, but reading through a lot of text and research, not a lot of time or effort seems to have been spent on the topic. Let's try to clear up some issues and put some definition into long runs. Unfortunately, it may not be a simple task. The best place to begin is to look at the benefits of long runs. Mainly, long runs increase glycogen storage. Long runs put us on the brink of exhausting glycogen stores in the body, and the body recognizes this situation as being bad. The exercising muscles will trigger the increase in storage capacity. The typical person can carry roughly 2,000 kcalories of carbohydrate. When you run, you burn anywhere from 90-140 kcals per mile, depending on pace, weather, intensity, terrain, and other factors. A large percentage of those kcals are coming from the utilization of that stored glycogen. After doing some quick math, it becomes apparent that carbohydrate stores can deplete relatively quickly. Another adaptation along these lines is that not only will the long run trigger the body to store more glycogen, but it will also help itself utilize a large source of energy- fat. In comparison to our small stores of carbohydrate, we have large stores of fat energy in our bodies, and average of 20,000 kcals worth. So, not only will you increase the amount of primary fuel stores, but you will also increase the ability to use the secondary fuel source of fat. Physiologically, those are the main benefits, however, long runs will also build strength in the running muscles. Long runs end up building cardiovascular fitness (endurance) and strength, which are the two main components for racing well.

Psychologically, long runs simulate the marathon experience. I remember in college that we would race on Saturday, or do a workout, only to come back on Sunday and do a long run of 16-20 miles. Now, we were only racing 8 kilometers during cross country and that was a huge benefit for us (We were ranked in the top 25 in NCAA Division I for 3 out of 4 years I ran). Why? Honestly, we knew what it felt like to be in a tired state, but forced to put in a solid effort. Now, with the Hanson's training method we sometimes receive some criticism regarding our long run policy. A lot of that has to do with some misguided information and a lack of really looking into training program structure. First of all, many publications have stated that we only believe in 16 mile long runs, which just isn't true. Here are the facts; first of all, many beginning marathon programs are designed to get someone across the finish line. That is fine, but we believe that if someone decides to run the marathon, wouldn't they want to give it their best effort? So, while some programs have someone take the day off before and after a 20 mile long run and just easy days for the preceding days before and after a 20 mile long run. So, in a 7 day time frame, someone may have only run 3-4 of those days, with only one those days being a quality day. On top of that, the one quality day was a huge percentage of the total mileage for those seven days. With our schedules, 16 miles work out to be a smaller percentage of the weekly mileage, with no rest days directly before the long run or after. This promotes the feeling of what it's going to be like during the marathon without sacrificing a whole week's worth of training for a single run. Now, with that said, 16 miles isn't a set in stone number either. For us, it works for the mileage that most of our people are running, especially beginning marathoners. More advanced runners are running more mileage and doing so at a faster clip. We have no problem adjusting their long runs accordingly. In the

end it’s not about 16 or 20 miles as set numbers. You have to account for experience, pace, mileage, and event. Anything over 90 minutes can constitute as a long run as that is the time threshold to recognize the training benefits of the long run. On the other hand, going too long can be detrimental to training. This is because going for that long of a time can lead to becoming slower overall, especially going for ultra long distances like 25-30 miles. Going too long also increases the risk of injury because your muscles simply become too fatigued to act as the proper shock absorption. All of these factors can lead to a decreased ability to handle other weekly workouts, which will end up hindering overall fitness.

Long Run Guidelines

The following guidelines should help out when designing training plans. The first is to keep a time frame in mind, as it’s more important to accumulate time spent on your feet than it is to run a certain pace. It is commonly accepted that 90 minutes is the threshold for gaining benefits. On the upper end, 2.5 hours is usually the upper limit before becoming potentially detrimental. Many people will look at this schedule and ask, "Why are there no 20 mile long runs?" The simplest answer is that a 20 mile long run for someone running 40 miles per week just doesn't make sense. It is agreed by most, that the long run shouldn't exceed 30% of one's weekly mileage. Also, as a factor of time, a 20 mile run will pass the point of diminishing return. For example, if a runner runs 9:00 per mile, then a 20 mile run would take 3 hours. For the most part, anything over 2.5 hours is creating more damage than desirable training effect. Meanwhile, a 16 mile run at the same pace is 2.4 hours, maximizing the desired training effect of long runs.

VO_{2max} (Speed):

VO_{2max} has been the classic measure of aerobic fitness for a number of years, but recently has lost some if it’s reputation as the best predictor for endurance performance. Let’s start with what VO_{2max} is, which has been defined several ways. For the runner’s sake, VO_{2max} can be defined as the maximal amount of oxygen consumed by exercising muscles, and is usually termed as milliliters of oxygen per kilogram of body weight per minute (ml/kg/min). VO_{2max} is the best predictor of performance for races between 1500 meters and 5k, but loses some of that reliability as the race distance goes above 30 minutes to complete.

Now that we know by definition what VO_{2max} is, what really is it and what affects it? Well, it comes down to how well your heart can pump oxygenated blood to exercising muscles and how well the muscles can extract that oxygen for use. There are two main variables that affect the heart’s ability to pump blood. The first is your maximum heart rate (HRmax). Unfortunately, there isn’t anything that training can do to improve this. In fact, it is a common adaptation for trained runners to have a lower maximum heart rate. This is because, the heart, like any other muscle becomes stronger and more efficient with training. This means it doesn’t have to work as hard to pump the same amount of blood as it did when it was less “trained.” The other thing to remember, is that as we age

our maximum heart rate tends to decrease. However, despite popular belief, the rate of decline isn't as linear as once thought. Keep this in mind, as I researched age prediction formulas for HRmax, I found that the popular 220-Age=HRmax equation was never actually studied. It was a nice round equation that was close to what was studied, so that's what stuck. The main point you need to take is that, yes, there is an age decrement in maximum heart rate, but this decline is less in more fit people than it is in unfit people. The second variable to the heart's pumping capacity is what is termed the stroke volume. This is essentially the amount of blood pumped from the left ventricle with each heart stroke (beat). This can be altered with training, and in fact, this is the major adaptation to endurance training. As mentioned before, the heart is like any other muscle in the body. When it is stressed, it adapts. With endurance training, it becomes a stronger muscle. I remember in college, I was always the guinea pig for being hooked up to the electrodes for stress testing. I remember my classmates being freaked out because my ECG showed a classic sign of congestive heart failure. If you are unfamiliar with CHF, it causes a large increase in the thickness of the left ventricle of the heart because it is trying desperately to pump blood to the body, but the volume of the left ventricle actually becomes smaller. It is a viscous circle for these poor patients. Well, endurance training makes your left ventricle become thicker so that it can force a lot of blood out to the body, but in a healthy person, this thickness doesn't affect the left ventricle volume, unless there is actually an increase in volume.

The adaptations to the heart represent the central adaptations to endurance training. There are also peripheral adaptations that occur within the muscles. Blood moving from the heart travels from the aorta to arteries to arterioles to capillaries. It is at the capillaries, where some of these adaptations occur. The capillary is the last point where a blood cell is oxygenated before it drops off the oxygen and then begins its ascent through the venous system back to the heart. Anyway, at the capillary level, endurance training causes a greater density of capillaries to the exercising muscles. There become more capillaries for oxygenated blood to go through and drop off its oxygen contents, meaning that oxygen is delivered faster and at higher rates. The proportion of oxygen extracted by the muscles from your arterial blood comes from this increase of capilarization at the exercising muscles. With that said, if you exercise your arms on an arm ergometer, you'll increase the VO_{2max} in your arms and cause this cappilarization at the site of the arms, but it will do nothing for your running.

Training to improve VO_{2max}:

You often hear of the term "Interval Training." In our sense, interval training is specified for training for VO_{2max}. Interval training can mean anything from quarter mile repeats on the track, to an old college workout of mine: 5x5 minutes, go farther on each one. The main point to remember is to understand that the ultimate purpose is to increase your VO_{2max}, or aerobic capacity. Pace is critical in any workout, don't defeat the purpose of the workout by cheating the pace down. The desired pace should correlate with 95-100% of VO_{2max}. Now, I know what you're thinking: I can't go faster than 100% VO_{2max}, right? It's physically impossible? No, you can exceed 100% VO_{2max}, because you can generate energy anaerobically, or without oxygen. However, when you do this, you'll end up having to slow down later in the workout, because the increase in lactic acid will be too

much, forcing you to slow down. When you do something like this, here's what happens. Let's say you are running 4x1 mile at 5:00. You run the first one in 4:48, way too fast, and exceeding your VO_{2max} pace. You didn't get the desired benefit out of that interval. The next one is 4:50, so the same thing happens, but this time it hurt a little more. The next one is 5:08, too slow. You didn't even run as fast as VO_{2max} pace, but it hurt just as much. Now, completely exhausted, you slog home the last one in 5:20, and while you feel like you want to lie down on the side of the track, you did absolutely zero work at VO_{2max} pace and therefore, wasted a workout. You have done nothing to improve that physiological system.

The next factor to remember is that it takes about two minutes of running to reach your VO_{2max}, making longer intervals more beneficial. These longer intervals allow for greater time accumulated at VO_{2max}. If a person were to run 400 meter intervals at, let's say. 1:30 per 400, then after the first one, the runner hasn't reached VO_{2max}. Then, they take a jog recovery and run another 400 hard. Now, since the person isn't starting from a resting state, the next 400 will allow the person to reach VO_{2max} for a short period of time, however it is brief. To accumulate a significant amount of time at your desired intensity, you'd either have to shorten the recovery, or run longer intervals. To be the most efficient with your training, it is probably wiser to lengthen the distance of your intervals to last in duration of 3-6 minutes. This will give you the most time accumulated at VO_{2max}. In general, this means 1,200 meters to 1600 meter intervals for men and 1,000 meters to 1200 meters for women. The amount of mileage per week should be 8% of one's weekly mileage, up to a 10k limit. So, if your weekly mileage is below 55 miles/week, then your goal should be 8%. If above that, 6 miles a week should be your limit. The number of intervals run depends mainly on the distance of the intervals, weekly mileage, and the point in the segment when the intervals are run. As far as recovery goes, when running shorter intervals, the recovery should be shorter. Remember our discussion above. If you aren't reaching your VO_{2max} within the distance of the interval, then the rest needs to be short in order to keep the heart rate and intensity high throughout the workout. If the interval distance is longer, a mile, for instance, then the rest can be anywhere from 50-90% of the interval distance. With my athletes there are a couple ways to handle this. The first is to separate the rookies and the veterans. The rookies will need more rest to get through the beginning segment workouts, while the veterans can handle shorter recovery. The second is to then begin the segment with longer recoveries (80-90% of interval time), but as the segment and fitness levels progress, keep the interval intensity the same, but decrease recovery time. When thinking about the frequency of performing these workouts you must consider what the person is training for, their training history, and the point of the training segment. When training for a mile to 5k, the VO_{2max} intervals are more important. However, when looking at beginning running, just increasing their mileage and running consistency will improve their times. Intervals should be introduced gradually into the training segment. It may be useful and more productive to have these runners train though a segment of base mileage with small dosages of interval training before introducing them to fully structured training programs. With novice runners who have training experience, these intervals should have more of a presence. In my view, this is the population that will benefit the most form these intervals. They have an aerobic base developed and need to take the next step towards improved fitness. Advanced

runners also need these intervals for shorter distances, but the purpose is different. Yes, it still revolves around improving VO_{2max}, but novice runners have more room to improve these numbers, while advanced runners have really improved their VO_{2max} over years, and what they gain will be much smaller percentages. For them, 1-2% can mean the difference between competing and being an "also ran." The greatest benefit they will receive will be longer efforts at goal pace, with shorter rests. The goal there would be to feel comfortable at race pace. So, with shorter races, mile to 10k, the frequency should be once a week. When that race distance starts getting up towards the half marathon on up, that frequency backs down to once every 1-3 weeks. The main reason is that the importance of improving VO_{2max} backs off for more favorable race characteristics like improving anaerobic or lactate threshold.

Lactate/Anaerobic Threshold (Strength):

Lactate and anaerobic threshold are often used interchangeably, although they mean slightly different processes. For our purposes, let's focus on lactate threshold. You will often see many different see many different definitions of lactate or anaerobic thresholds. Some of which are fine when describing mass populations, but there can be great variations among individuals. In this text, lactate threshold is the point at which lactic acid begins accumulating faster than what is cleared from the bloodstream. Daniels described blood lactate as a function of how much lactic acid is being produced by the exercising muscles and the rate at which it is being cleared by the muscles, heart, and liver. As much as VO_{2max} is important for shorter races, Lactate Threshold (LT) is as important for any race lasting over 30 minutes and is the most important physiological marker for performance in those events. The LT represents the ability for the heart to transport oxygen to the muscles, as well as, the rate at which your muscles can produce energy aerobically. Lactic acid is produced by the muscles (not just exercising muscles, because even at rest there is some lactic acid in the blood stream) and is used by the heart, liver, muscles, and kidneys. The most important aspect to remember is that LT represents the point at which exercise cannot be continued "forever." This is because once the LT is crossed, the lactate production causes an enzyme that produces aerobic energy is slowed, which in turn disrupts calcium being taken up by the muscles. Remember that calcium is needed for muscle contractions to occur. So, when this occurs you have a slowing of energy delivered to the muscle and a reduced ability for the muscle to contract. In English, you slow down. When racing shorter distances, it is inevitable because you are racing near maximum effort for a short duration. However, once you go past 30 minutes, the speed that you are sunning simply cannot be maintained. With that, one can see why having a high LT and selecting a race pace under LT for longer races becomes important. Another important factor is that LT can improve steadily over years of training, unlike VO_{2max}, which will plateau and eventually decline as we age.

Training to improve LT:

There are a few ways to monitor the proper intensity for completing threshold workouts. If you monitor your exercise intensity based from heart rate, then when completing

threshold workouts you should be in the 88-92% HRmax range. Other guidelines include running at a pace that you could maintain for an hour racing. It may be a wide range, depending on ability. For slower runners, it may be 10k race pace, while for elite runners, the pace may be closer to half marathon pace. If going by how you feel, the main factor here is that it will be hard to hold a conversation. Pace is so critical in these sessions. The goal of threshold workouts is to stress the body's ability to clear lactic acid. If you run too fast, then the blood lactate increases throughout the run, causing too much stress on our desired effects. If you run too slowly, then there is a steady decrease in the blood lactate after an initial rise.

The duration of LT workouts can vary greatly, especially, because there are different forms of LT workouts. The most popular for is the tempo run. Daniels' states that 20 minutes is the ideal distance, however, that appears to be for shorter race distances (5k and 10k). As the length of the race lengthens, the distance of the tempo can increase. However, when considering the distance of one's tempo run, the volume shouldn't be more than 10% of the weekly mileage. So, a 5k runner running 50 miles per week would benefit more from a 3 mile tempo run, while a marathoner getting in 80 miles per week would benefit more from an eight mile tempo run. I also believe that for marathoners a longer tempo run, 10-12 miles, may provide a training benefit, while putting some disregard to the percentage rule of training volume.

Let me explain myself a little better. When running longer tempo runs many runners slow as the distance increases. When a tempo run reaches an hour or longer, that pace needed to stimulate the threshold creeps up closer to marathon goal or race pace. This, in some extent, makes one wonder, "Isn't a tempo run a steady run at a pace you could hold for a one hour race?" Yes, that is correct, but the key is a race. Training is a little different. Running 30 minutes at 10 mile race pace is not as exhausting as running an hour race. When running for the 30 minutes, the lactate threshold is crossed, but it steadies itself and the run is over before it creeps up too high and causes exhaustion. If you were to run that pace for the full hour, the blood lactate levels would have time to continue to climb until they reach the point where you have to stop. So, as the time of the tempo reaches 45 minutes, an hour, and higher, you can accomplish the same the desired effect by running a slower pace. When an hour is crossed, marathon pace closely coincides with threshold. That is why for marathoners, long tempo runs at marathon pace can benefit both physiologically, as we just mentioned, but also mentally. Tempo runs are hard, especially longer ones. What better way to build patience, practice running pace, and dealing with mental fatigue than putting yourself out in a similar situation?

On the flipside, there are often threshold intervals run to stimulate the system. These are easier, both mentally and physically, because there are short rests in between the intervals. However, the total mileage from these types of workout because of the jog recoveries. I have seen many different types of these intervals, all with success. The main factor is performing the proper intervals for the right racing distance. For 5-10k runners, I would again use the 10% rule, but with a minimum of 4 miles of threshold intervals and a max of 10 miles.

Daniels' describes shorter intervals of 3-15 minutes of duration, with a rule of one minute easy for every 5 minutes hard. So, for a 5 minute LT interval, you'd receive 1 minute easy jogging recovery. This short recovery allows for blood lactate levels to remain fairly constant throughout the workout. Some sample workouts would be 5x1 mile at LT pace with 1 minute jog recoveries. This would be for faster runners. For slower runners, a workout may include 8-10x1k at LT pace, with 30 seconds to one minute jog recovery. For longer races, like the marathon, the length of these intervals can increase greatly. I have seen workouts such as 3x5k and 2x10k at LT pace for marathoners. With the Hanson's-Brooks Distance project we have done similar type workouts. Our core workouts consisted of 6-8x1.5 miles, 3x3 miles, 2x4 miles, 2x5 miles, and 2x6 miles all run at 10 seconds faster than marathon goal pace.

Threshold workouts are often less demanding than faster VO_{2max} intervals. As a result, I have seen a lot of athletes turn these workouts into races. Runners hammer these workouts early in the segment only to find they are tired or hurt later in the segment. When reading literature, I came across this quote that I find should be the motto of all endurance athletes, "When a workout begins to feel easier, use that feeling to support the idea that your are more fit. Then, prove that you are getting better in a race, not a workout." J. Daniels.

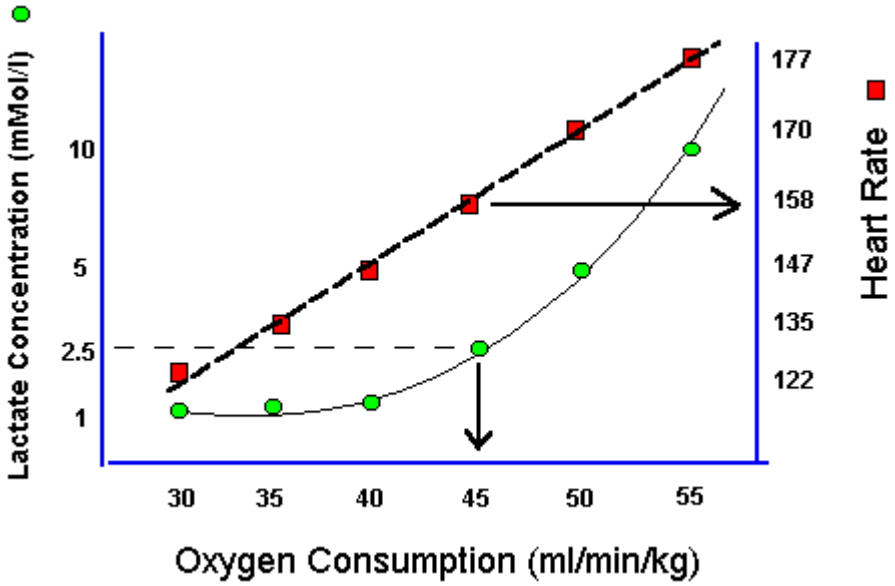
Tempo Runs:

Tempo runs are a vital part to training for races of any distance. However, like with any race, how you approach the training needs to be looked at closely. We all know that our aerobic capacity increases for all of us for the first couple years of training, regardless of age. However, after this point, if performance is to continue to improve, where does it come from? The answer is, through the increase of our Lactate Threshold (LT). LT increases aren't the only area, but it does provide a large piece of the puzzle. First of all, let's look at what tempo runs mean. The traditional sense of tempo runs have frequently been described as running for 20 minutes, or so, at 15k to half marathon pace. That is a pace most of us can hold for an hour. At this pace, there is a steady rise in lactate production, and an imbalance occurs. Production exceeds clearance, which forces us to slow our pace. With this pace, there is significant lactate in the blood, which will provide a great training stimulus. I believe that tempo runs of these time lengths are great for shorter races and for certain phases of training for longer races. However, when you look at most good marathoners, you notice one common trait: Long tempo runs of 8-15 miles. These tempo runs couldn't be run at the same pace, because the pace would be too fast as they approached the hour mark. Running those paces would mean asking an athlete to run a personal best in the half marathon in order to complete a workout. The stress would be too great. However, if you slow the pace down, very close to marathon pace, you still stimulate the LT, albeit a slower at a slower rate. This allows runs of 60-90 minutes to be completed that are marathon specific. Why do this, you ask? Well, that's a good question. The first is that ideally, your marathon race pace is just under your LT, so if you practice running longer distances at that pace you will:

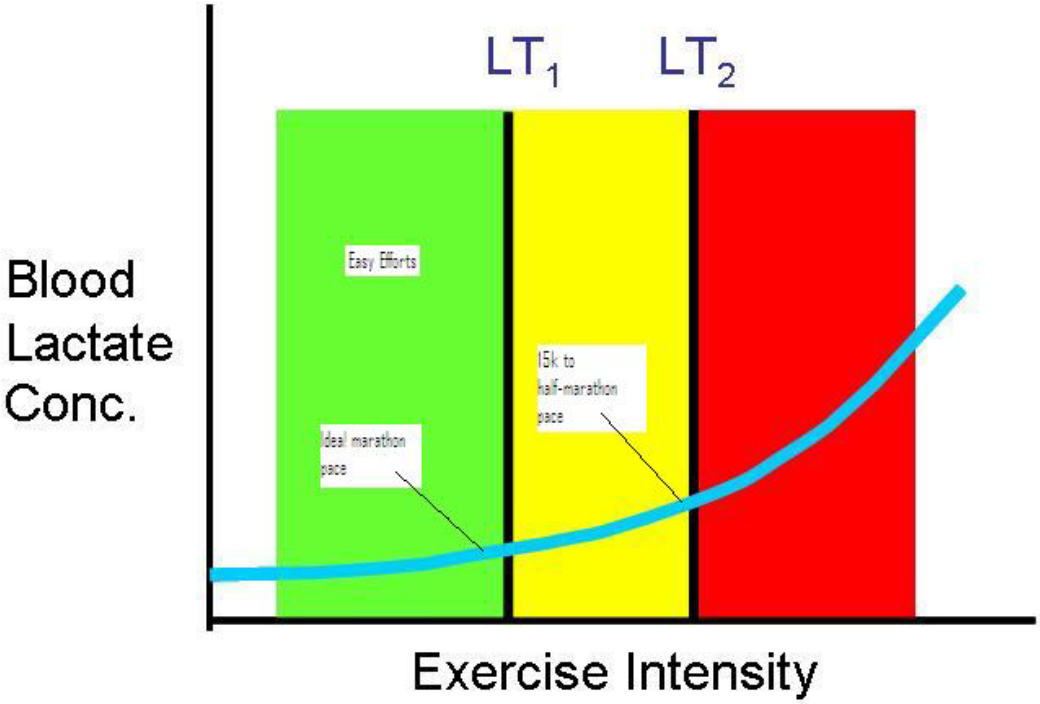
1. Learn marathon pace
2. Learn marathon pace effort

3. Provide the greatest amount of time in significant blood lactate producing zone to provide the greatest training stimulation
4. I believe that these “less intense” efforts are easier to recover from, allowing more training efforts in the week.

Take a look at these graphs:



Graph 1: Traditional LT curve



Graph 2: A better model of what is really going on. Keep in mind that at LT1, your blood lactate levels will slowly rise, so that even by the end of the marathon, you will be nearing LT2.

Specifically, the benefits gained from training at LT:

1. Increased number and size of mitochondria:
    a. + mitochondria = more aerobic energy = + O2 consumption @ LT = increased LT pace.
    b. LT is crossed at greater speeds, meaning you can run faster without crossing LT.
2. Increased aerobic enzyme activity:
    a. + enzymes = faster chemical reactions = aerobic energy produced quicker = + efficiency of the mitochondria
    b. It takes less to produce and sustain production of aerobic energy
3. Increased capillirization:
    a. + capillaries = + delivery of O2 and removal of waste (CO2 & lactic acid) = energy to be produced at a high rate.
    b. The metabolic highways go from 2 lanes to 4 lanes with more on and off ramps.
4. Increased myoglobin (O2 carriers in the muscle- think hemoglobin)
    a. + myoglobin content = + O2 delivery to mitochondria = + energy production
    b. Think, delivery trucks have doubled their delivery rates to the factories

I know what you are thinking. This looks a lot like the benefits from easy days and long runs. Correct. Hopefully, this will make clear a common myth people believe. That is that there is a pure aerobic and anaerobic zone. There's not. Even when above LT, you are still producing energy through aerobic pathways. Even on easy days, there is a slight rise in blood lactate levels, it's usually just not enough to exceed clearance capabilities.

Running Economy:

There are three main components to improving running performance. Two are commonly known, VO_{2max} and Lactate Threshold. The third is relatively unknown and is running economy. Running economy is described as the amount of oxygen needed to run a certain pace. One can think of running economy as fuel economy for the body, with VO2 being the fuel. If one runner needs 50 ml/kg/min of oxygen to run six minute miles and another runner needs 55 ml/kg/min, then the first runner would be more economical than the second. In novice runners, the other two mentioned factors, especially VO_{2max}, play more of a role in performance, but as the runner become more and more fit, these factors become more and more similar between the groups. This is when the role of running economy steps up.

Running economy plays a critical role when comparing runners of similar physiological capacities. Let's use our example from above. Assume now that they are racing a marathon and they are together from the start. Also assume that they have the same lactate threshold of 53 ml/kg/min. The first runner is running underneath their LT, while the second runner is slightly above their LT. This means that the second runner will accumulate lactic acid faster than the first, forcing the second runner to tire and slow down first.

Training to Improve Running Economy:

There is no clear cut method of improving running economy. However, two popular theories exist. The first is through the use of repeats. These are faster and shorter versions of intervals. For runners competing in events from the 5k and up, a good rule of thumb is to run 6 seconds faster than interval pace per 400 meters. The duration for each repeat should be less than two minutes, which means about 600 meters for most of us. The amount of volume should be no more than 5% of weekly mileage with an upper limit of 5 miles a week. Recovery for each repeat is critical. There is no exact time per repeat, but it should be enough to allow you to run the desired pace for each repeat. This is important because the theory behind repeat training is to become comfortable at speeds faster than 5k pace, as well as running fast to minimize wasted motions. If recovery is too short, then poor form from being too tired will negate the purpose of the repeat session. This first method will probably develop better running economy faster than the below method, however, since developing comfort in running faster speeds isn't a main concern with marathon type training, this method is probably better for 5-10k athletes.

The second common theory behind developing running economy is better suited for marathon type athletes and even beginning runners. The theory is that through the accumulated mileage run and time spent running will improve running economy. The human body is very good at discovering what works in given situations. In endurance events, a main concern is conserving energy. For example, many have heard of the "marathoner shuffle." This is a prime example of the body finding methods to conserve energy. Someone with this gait pattern tends to have a shorter stride and the legs don't lift as high or kick as far back. Why? Because it is more efficient at those speeds to have the

foot strike closer towards the body and return back faster (shorter stride with a higher turnover). It conserves energy and makes a marathoner more efficient. This exactly why it may be good for beginning runners, as well, because beginning runners need to be careful as to what they add to their training regimen. Adding repeats to a new runner's schedule may only result in doing too much speed work and putting to much stress on the musculature of the lower legs. However, easy running is much more tolerated and over time will not only provide desired cardiovascular benefits, but will give the body time to adapt to stressful events (distance running) and adapt to that situation. With many beginning runners, there is a tendency to over stride, which causes the heel to land first. This will cause two reaction forces that are less than desirable. The first is a braking force that will go behind the foot. This does as the name implies, it puts a braking force on the runner's motion, or slows a runner down. Also, because the foot strike is so far in front of the body, that when the push-off of the foot occurs, it's more underneath the body. This means that there is more of an up and out (bounding) motion occurring. This wastes a lot of energy to move forward. The other force is a large landing force several times the person's body weight that goes straight up the leg. This is why many beginning runners will experience shin splints. However, through the accumulation of mileage and time, the body recognizes that it's not a good situation and not very efficient. You will see that as a runner progresses, their stride will shorten to the point where the foot land nearly flat footed, nearly directly underneath the body. This does a couple things. First, it minimizes that braking force. Secondly, it ensures that the body is being propelled forward with less upward motion. With the foot landing underneath the body, more of the foot is utilized for shock absorption. This minimizes that landing force going up the leg. It is this method that will require a person to be willing to be patient and may require a more conscious effort; it will greatly improve many aspects of running for the long term.

Strides can be the bread and butter for a runner of any ability. Strides help maintain speed in veterans, build speed in beginning runners, and increase stride efficiency in all runners. They are also very easy to incorporate into training. At the end of an easy run, or a nice flat area towards the end of your run, is the best time to perform strides. Simply increase speed over a time of 10 to 15 seconds, up to 95-100% effort. The emphasis should be on proper form- running tall, relaxed, arm carriage, and leg drive. You may be tense the first few times, but with practice, these will become easier. You should jog lightly until you feel completely recovered before performing the next stride.

Running economy is critical to running performance, more so as the runner improves in performance. However, it still has not been the focal point of distance running research and remains a somewhat blurry aspect of training. Many factors are involved, along with many systems- biomechanical, physiological, etc., making focused research difficult. However, it is a trainable ingredient to endurance performance.

The Schedule:

20 Week Marathon: 40-60 Miles/Week

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 1 Base	Monday	Easy	6 miles	0	6	
	Tuesday	Easy	6 miles	0	6	
	Wednesd	Off	Day Off	0	0	
	Thursday	Easy	6 miles	0	6	
	Friday	Easy	6 miles	0	6	
	Satuday	Easy	6 miles	0	6	
	Sunday	Long	10 miles	0	10	Longest run of the week
				Total: 40 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 2 Base	Monday	Easy	6 miles	0	6	
	Tuesday	Easy	8 miles	0	8	Finish w/ 6x10 second strides
	Wednesd	Off	Day Off	0	0	
	Thursday	Easy	8 miles	0	8	
	Friday	Easy	6 miles	0	6	Finish w/ 4x30 second build-ups
	Satuday	Easy	6 miles	0	6	
	Sunday	Long	11 miles	0	11	Longest run of the week
				Total: 45 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 3 Base	Monday	Easy	6 miles	0	6	
	Tuesday	Easy	8 miles	0	8	Finish w/ 6x10 second strides
	Wednesd	Off	Day Off	0	0	
	Thursday	Easy	8 miles	0	8	
	Friday	Easy	6 miles	0	6	Finish w/ 4x30 second build-ups
	Satuday	Easy	6 miles	0	6	
	Sunday	Long	11 miles	0	11	Longest run of the week
				Total: 45 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 4 Transitional	Monday	Easy	6 miles	0	6	Finish w/ 6x10 second strides
	Tuesday	Speed	12x400 @ Current 5k pace w/ 200 meter jog recovery	2 miles each	8	
	Wednesd	Off	Day Off	0	0	
	Thursday	Easy	8 miles	0	8	
	Friday	Easy	4 miles	0	4	
	Satuday	Easy	6 miles	0	6	Finish w/ 4x30 second build-ups
	Sunday	Long	13 miles	0	13	
				Total: 45 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 5 Transitional	Monday	Easy	6 miles	0	6	
	Tuesday	Easy	6 miles	0	6	Finish w/ 6x10 second strides
	Wednesd	Off	Day Off	0	0	
	Thursday	Tempo	4 miles @ Goal MP	2 miles each	8	
	Friday	Easy	6 miles	0	6	
	Satuday	Easy	6 miles	0	6	Finish w/ 4x30 second build-ups
	Sunday	Long	13 miles	0	13	
				Total: 45 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 6 Transitional	Monday	Easy	6 miles	0	6	Finish w/ 6x10 second strides
	Tuesday	Threshold	5x1 mile @ Current 1/2 marathon pace w/ 400 meter jog recovery	2 miles each	10	If you don't have a current 1/2 marathon result, you can use 10-20 seconds faster than goal MP per mile.
	Wednesd	Off	Day Off	0	0	
	Thursday	Easy	6 miles	0	6	
	Friday	Easy	8 miles	0	8	Finish w/ 4x30 second build-ups
	Satuday	Easy	5 miles	0	5	
	Sunday	Long	15 miles	0	15	
				Total: 50 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 7 Threshold Intro	Monday	Easy	6 miles	0	6	Finish w/ 6x10 second strides
	Tuesday	Speed	6x800 @ current 5k pace w/ 400 meter jog recovery	2 miles each	8	
	Wednesd	Off	Day Off	0	0	
	Thursday	Threshold	4x1.5 mile @ current 1/2 marathon pace with 1/2 mile jog recovery	2 miles each	12	If you don't have a current 1/2 marathon result, you can use 10-20 seconds faster than goal MP per mile.
	Friday	Recovery	4 miles	0	4	
	Satuday	Easy	5 miles	0	5	Finish w/ 4x30 second build-ups
	Sunday	Long	15 miles	0	15	
				Total: 50 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 8 Threshold Intro	Monday	Easy	6 miles		6	Finish w/ 6x10 second strides
	Tuesday	Speed	5x1k @ current 5k pace w/ 400 meter jog recovery	2 miles each	8	
	Wednesd	Off	Day Off	0	0	
	Thursday	Tempo	6 miles @ Goal MP	2 miles each	10	
	Friday	Easy	6 miles	0	6	
	Satuday	Easy	5 miles	0	5	Finish w/ 4x30 second build-ups
	Sunday	Long	15 miles		15	
				Total: 50 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 9 Threshold Intro	Monday	Easy	6 miles	0	6	Finish w/ 8x10 second strides
	Tuesday	Speed	6x800 @ current 5k pace w/ 400 meter jog recovery	2 miles each	8	
	Wednesd	Off	Day Off	0	0	
	Thursday	Threshold	2x2 miles @ current 1/2 marathon pace w/ 1/2 mile jog recovery	2 miles each	8	
	Friday	Recovery	6 miles	0	6	
	Satuday	Easy	5 miles	0	5	Finish w/ 4-6x30 second build-ups
	Sunday	Long/ Tempo	15 miles	0	15	First 4 miles easy, next 8 miles @ goal MP, cool down last 3 miles
				Total: 50 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 10 Race Specific	Monday	Easy	8 miles	0	8	Finish w/ 8x10 second strides
	Tuesday	Threshold	5x1 mile @ Current 1/2 marathon pace w/ 400 meter jog recovery	2 miles each	10	
	Wednesd	Off	Day Off	0	0	
	Thursday	Tempo	6 miles @ Goal MP	2 miles each	10	
	Friday	Recovery	8 miles	0	8	
	Satuday	Easy	8 miles	0	8	Finish w/ 4-6x30 second build-ups
	Sunday	Long	16 miles	0	16	
				Total: 55 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 11 Race Specific Work	Monday	Easy	8 miles	0	8	Finish w/ 8x10 second strides
	Tuesday	Speed	5x1k @ current 5k pace w/ 400 meter jog recovery	2 miles each	8	
	Wednesd	Off	Day Off	0	0	
	Thursday	Threshold	3x2 miles @ current 1/2 marathon pace w/ 1 mile jog recovery in between	2 miles each	12	
	Friday	Recovery	6 miles	0	6	
	Satuday	Easy	6 miles	0	6	Finish w/ 6x30 second build-ups
	Sunday	Long/ Tempo	16 miles	0	16	First 4 miles easy, next 8 miles @ Goal MP, cool down last 4 miles
				Total: 56 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 12 Race Specific Work	Monday	Easy	8 miles	0	8	Finish w/ 8x10 second strides
	Tuesday	Threshold	2x3 miles @ current 1/2 marathon pace w/ 1 mile jog recovery in between	2 miles each	11 miles	
	Wednesd	Off	Day Off	0	0	
	Thursday	Progress-ion run	8 mile progression run	2 miles each	12 miles	Begin @ moderate pace, cut 10 seconds per mile. Last 3 miles should be Goal MP, Current 1/2 marathon pace, current 10k pace, respectively.
	Friday	Recovery	6 miles	0	6	
	Satuday	Easy	6 miles	0	6	Finish w/ 6x30 second build-ups
	Sunday	Long	16 miles	0	16	Moderate effort.
				Total: 55 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 13 Race Specific Work	Monday	Easy	8 miles	0	8	Finish w/ 8x10 second strides
	Tuesday	Speed	6x800 @ current 5k pace w/ 400 meter jog recovery	2 miles each	8	
	Wednesd	Off	Day Off	0	0	
	Thursday	Threshold	6x1 mile @ current 1/2 marathon pace w/ 400 meter jog recovery in between	2 miles each	11	
	Friday	Recovery	6 miles	0	6	
	Satuday	Easy	6 miles	0	6	Finish w/ 6x30 second build-ups
	Sunday	Long/ Tempo	16 miles	0	16	First 3 easy, next 10 @ Goal MP, cool down last 3
				Total: 55 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 14 Race Specific Work	Monday	Easy	6 miles	0	6	Finish w/ 8x10 second strides
	Tuesday	Threshold	3x2 miles @ current 1/2 marathon pace w/ 1 mile jog recovery in between	2 miles each	12	
	Wednesd	Off	Day Off	0	0	
	Thursday	Tempo	8 miles @ Goal MP	2 miles each	12	
	Friday	Recovery	6 miles	0	6	
	Satuday	Easy	6 miles	0	6	Finish w/ 6x30 second build-ups
	Sunday	Long	18 miles	0	18	Moderate Effort
				Total: 60 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 15 Race Specific Work	Monday	Easy	8 miles	0	8	Finish w/ 8x10 second strides
	Tuesday	Speed	5x1k @ current 5k pace w/ 400 meter jog recovery	2 miles each	8	
	Wednesd	Off	Day Off	0	0	
	Thursday	Progress-ion run	8 mile progression run	2 miles each	12 miles	Begin @ moderate pace, cut 10 seconds per mile. Last 3 miles should be Goal MP, Current 1/2 marathon pace, current 10k pace, respectively.
	Friday	Recovery	6 miles	0	6	
	Satuday	Easy	8 miles	0	8	Finish w/ 6x30 second build-ups
	Sunday	Long/ Tempo	18 miles	0	18	First 3 easy, next 10 @ Goal MP, cool down last 3
				Total: 60 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 16 Race Specific Work	Monday	Easy	6 miles	0	8	Finish w/ 8x10 second strides
	Tuesday	Threshold	2x3 miles @ current 1/2 marathon pace w/ 1 mile jog recovery in between	2 miles each	11	
	Wednesd	Off	Day Off	0	0	
	Thursday	Tempo	8 miles @ Goal MP	2 miles each	12	
	Friday	Recovery	6 miles	0	6	
	Satuday	Easy	8 miles	0	8	Finish w/ 6x30 second build-ups
	Sunday	Long	18 miles	0	18	Moderate effort
				Total: 61 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 17 Race Specific Work	Monday	Easy	8 miles	0	8	Finish w/ 8x10 second strides
	Tuesday	Speed	12x400 @ Current 5k pace w/ 200 meter jog recovery	2 miles each	8	
	Wednesd	Off	Day Off	0	0	
	Thursday	Threshold	6x1 mile @ current 1/2 marathon pace w/ 400 meter jog recovery in between	2 miles each	11	
	Friday	Recovery	8 miles	0	8	
	Satuday	Easy	8 miles	0	8	
	Sunday	Long/ Tempo	18 miles	0	18	First 3 easy, next 12 @ Goal MP, cool down last 3 miles.
				Total: 61 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 18 Taper	Monday	Easy	5 miles	0	5	Finish w/ 8x10 second strides
	Tuesday	Speed	8x400 @ current 5k pace w/ 400 meter jog recovery	2 miles each	8	
	Wednesd	Off	Day Off	0	0	
	Thursday	Tempo	8 miles @ Goal MP	2 miles each	12	
	Friday	Off	Day Off	0	0	
	Satuday	Easy	5 miles	0	5	Finish w/ 4-6x30 second build-ups
	Sunday	Med. Long	12 miles	0	12	Moderate Effort
				Total: 42 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 19 Taper	Monday	Easy	5 miles	0	5	Finish w/ 8x10 second strides
	Tuesday	Threshold	2x2 miles @ current 1/2 marathon pace w/ 1 mile jog recovery in between	2 miles each	9	
	Wednesd	Off	Day Off	0	0	
	Thursday	Tempo	8 miles @ Goal MP	2 miles each	12	Important day, 10 days out from race. Last day to gain significant fitness!
	Friday	Easy	4 miles	0	4	
	Satuday	Off	Day Off	0	0	
	Sunday	Easy	4 miles	0	4	
				Total: 34 miles		

Schedule Phase	Day	Training Focus	Workout	Warmup/ Cooldown	Mileage	Notes
Week 20 Race Week	Monday	Easy	4 miles	0	4	Finish w/ 8x10 second strides
	Tuesday	Easy	4 miles	0	4	
	Wednesd	Speed	8x400 @ current 5k pace w/ 400 meter jog recovery	2 miles each	8	
	Thursday	Off	Day Off	0	0	
	Friday	Easy	4 miles	0	4	
	Satuday	Easy	3 miles	0	3	
	Sunday	Race	Marathon	10:00 Warm-up	27.2	
				Total: 40 miles		

Training Pace Guide:

The chart below is a guide to choosing the right paces for all of your training, depending on your current race fitness or goal race time.

Reference Table for Training Paces								
Goal Marathon Time	**Recovery**	**Easy Aerobic**	**Easy Aerobic**	**Moderate Aerobic**	**Marathon**	**1/2 Marathon Threshold**	**10k Threshold**	**5k VO2**
5:00	**14:22**	**13:32**	**12:41**	**12:16**	**11:27**	**10:59**	**10:30**	**10:04**
4:45	13:43	12:55	12:05	11:41	10:52	10:26	9:58	9:34
4:30	**13:02**	**12:16**	**11:28**	**11:05**	**10:18**	**9:53**	**9:27**	**9:04**
4:15	12:22	11:38	10:52	10:29	9:44	9:20	8:55	8:33
4:00	**11:42**	**11:00**	**10:15**	**9:53**	**9:09**	**8:47**	**8:24**	**8:03**
3:50	11:15	10:34	9:51	9:29	8:46	8:25	8:03	7:43
3:45	**11:01**	**10:21**	**9:39**	**9:18**	**8:35**	**8:14**	**7:52**	**7:33**
3:40	10:48	10:08	9:27	9:06	8:23	8:03	7:42	6:58
3:35	**10:34**	**9:55**	**9:14**	**8:53**	**8:12**	**7:52**	**7:31**	**6:50**
3:30	10:19	9:41	9:02	8:42	8:01	7:41	7:21	7:03
3:25	**10:06**	**9:28**	**8:49**	**8:29**	**7:49**	**7:30**	**7:10**	**6:53**
3:20	9:53	9:16	8:38	8:18	7:38	7:19	7:00	6:43
3:15	**9:38**	**9:02**	**8:25**	**8:05**	**7:26**	**7:08**	**6:49**	**6:33**
3:10	9:25	8:49	8:13	7:54	7:15	6:57	6:39	6:23
3:05	**9:11**	**8:36**	**8:01**	**7:42**	**7:03**	**6:46**	**6:28**	**6:12**
3:00	8:57	8:23	7:48	7:29	6:52	6:35	6:18	6:02
2:55	**8:43**	**8:10**	**7:36**	**7:17**	**6:40**	**6:24**	**6:07**	**5:52**
2:50	8:28	7:56	7:23	7:05	6:29	6:13	5:57	5:42
2:45	**8:15**	**7:43**	**7:11**	**6:53**	**6:18**	**6:02**	**5:46**	**5:32**
2:40	8:00	7:30	6:58	6:41	6:06	5:51	5:36	5:22
2:35	**7:46**	**7:17**	**6:46**	**6:29**	**5:55**	**5:40**	**5:25**	**5:12**
2:30	7:32	7:03	6:34	6:17	5:43	5:29	5:15	5:02
2:25	**7:18**	**6:50**	**6:21**	**6:05**	**5:32**	**5:18**	**5:04**	**4:52**
2:20	7:03	6:36	6:08	5:52	5:20	5:07	4:54	4:42
2:15	**6:49**	**6:23**	**5:56**	**5:40**	**5:09**	**4:56**	**4:43**	**4:32**
2:10	6:35	6:09	5:43	5:28	4:57	4:45	4:33	4:22
All paces are per mile								