HOW TO TRAIN

Training smarter by targeting individual strengths and needs can take you to new levels of performance. In this chapter, we provide all the information you need to make your training show—and keep showing—solid results. We share tools to help you draw up bespoke training plans and provide a range of programs that can guide you, session by session, from your couch all the way to advanced marathoning.

WHY TRAIN?

The simplicity of running is one its greatest pleasures. You can pull on a pair of running shoes, head out the door, and just go. However, using a structured, goal-orientated training plan can improve performance, reduce injury risk, and make running even more enjoyable. It is worth considering the benefits.

AVOID INJURY

Because most running-related injuries result from overtraining, planning your workouts is a key factor in preventing injury. A training plan not only allows you to schedule the intensity of your workouts, it also helps you build in adequate time for recovery after long or hard runs. Incorporating easy days or weeks into your schedule will help your body adapt to the stresses of training and reduce the likelihood of getting injured. The drills, warm-ups, and stretches that are part of a structured workout also help prevent injury.

PERSONALIZE

Structuring and planning your training allows you to discover what works for you as an individual. When you follow a training program, you will have a record of the workouts you have done, which makes it easier to look back at what worked well for you and what did not. You can use this knowledge to make suitable adjustments to your training programs in the future.

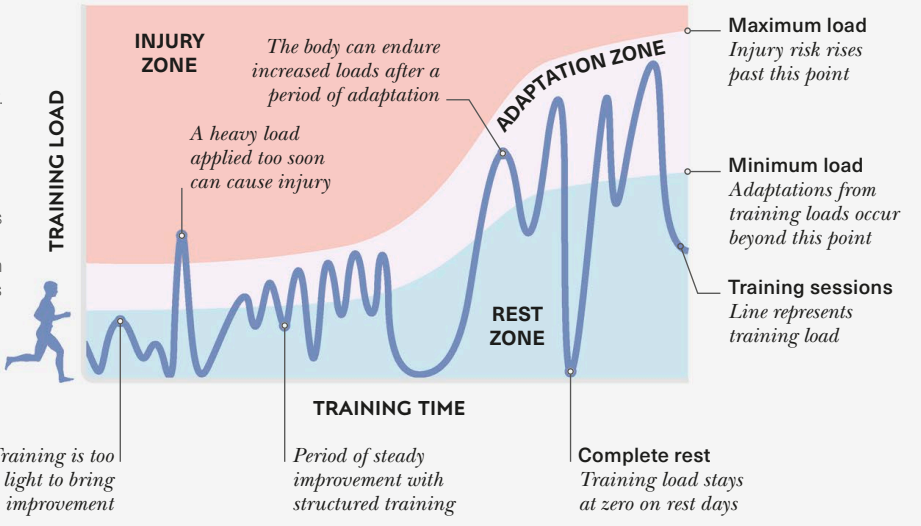
BENEFITS OF TRAINING

IMPROVE YOUR FORM

Consciously practicing your running form (see pp.74–75) will bring improvements and help you maintain good form even when running at a fast pace or if fatigued. When practiced with drills (see pp.84–89), your form becomes more natural and relaxed, which leads to better running economy (see p.165). Additionally, as you become fitter through structured training, your body makes beneficial adaptations that increase your lactate threshold, your VO_2 max, and endurance.

Training to adapt

To improve your performance, a training plan introduces workouts of increasing intensity. This places your body under the stress it needs to promote physical adaptations such as increased lactate threshold and VO_2 max (see p.37). However, it is important to balance increased load with rest and repair, and an efficient training plan schedules in recovery time. This chart illustrates the broad principles of applying training load.



COMPETE

If you want to race and improve your times, you will have a much better chance of success if you follow a structured program to target a specific race. Targeted workouts can help develop your speed and teach you to pace yourself, while planning your training in phases will prepare you to perform at your peak on the day.

STAY MOTIVATED

It can be difficult to stay motivated to run without a reason to keep striving. Following a training program provides you with a purpose for every workout, whether easy or hard. You have a reason to run at a specific pace, to run a specific distance, and to enjoy your easy runs as well. Many of us fall into a rut or reach a plateau if we do not have a way to monitor our progress; a training program helps you notice improvement, which is motivating in itself.

ADD VARIETY

A good training plan will include workouts that vary in pace and distance, so there are fast, slow, short, and long runs. When you engage in varied, purposeful training and progressively higher training loads over time, your running form, speed, and fitness improves while keeping training varied and engaging.

YOUR **TRAINING GOALS**

Before you begin a training program, first consider what you want to achieve through training. Whether you are a complete beginner who is eager to train for your first race or an experienced runner who wants to take their training to the next level, it is useful to define some goals.

NEW TO RUNNING

If you are new to running or returning to it, setting a goal time or distance will give you something to work toward and measure your progress against. To achieve your goal, you will also need to attain a minimum level of fitness.

ACHIEVABLE GOALS

It is important to keep your first goals realistic—for example, running continuously for 3 miles or for 30 minutes. If your eventual goals are ambitious, such as completing your first marathon, break them down into a series of targets or into A, B, and C goals to organize your priorities.

DEVELOPING FITNESS

Even if your ultimate goal is to run a marathon, your first objective should be to build up to a minimum base of aerobic and anaerobic fitness (see below). Before starting a structured training program for the first time, you should be capable of doing short, hard sprints and easy continuous running over longer distances. When you can do both of these workout types, you can progress toward race-specific training. If you have not run before, the Beginner 5 km walk-run program (see pp.190–191) is a good place to start.

BUILDING A BASE
Before progressing to workout types that are more race-specific, establish a base level of aerobic and anaerobic fitness with easy continuous running (see p.180) and sprints (see p.188). The examples here show the workouts you should be able to complete before starting the Beginner 10 km program (see pp.192–193).

Aerobic base

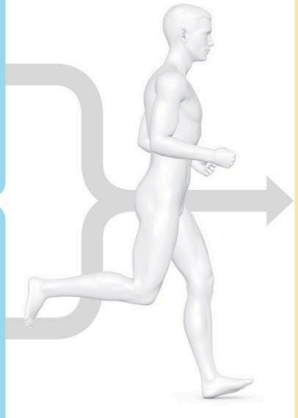
Practice continuous running until you can complete these three workouts per week:

- Two 2-mile runs
- One 3-mile run

Anaerobic base

Practice strides (see p.87) until you can comfortably perform this workout 2–3 times per week:

- Four repetitions of **30-second strides** alternated by **1 minute walk**



Race-specific training

After you have established a base of fitness, you can start using a structured training program, which will include workouts such as:

- **Longer easy continuous runs** (see p.180)
- **Fast continuous runs** (see pp.181–183)
- **Interval training** (see pp.184–185)
- **Hill training** (see p.186)

FOUNDATION FITNESS

TRAINING FORM

TRAINING **FOR A RACE**

Once you have chosen a goal race distance, set a realistic time frame for reaching it, taking your current level of fitness into account.

INCREASING LOAD

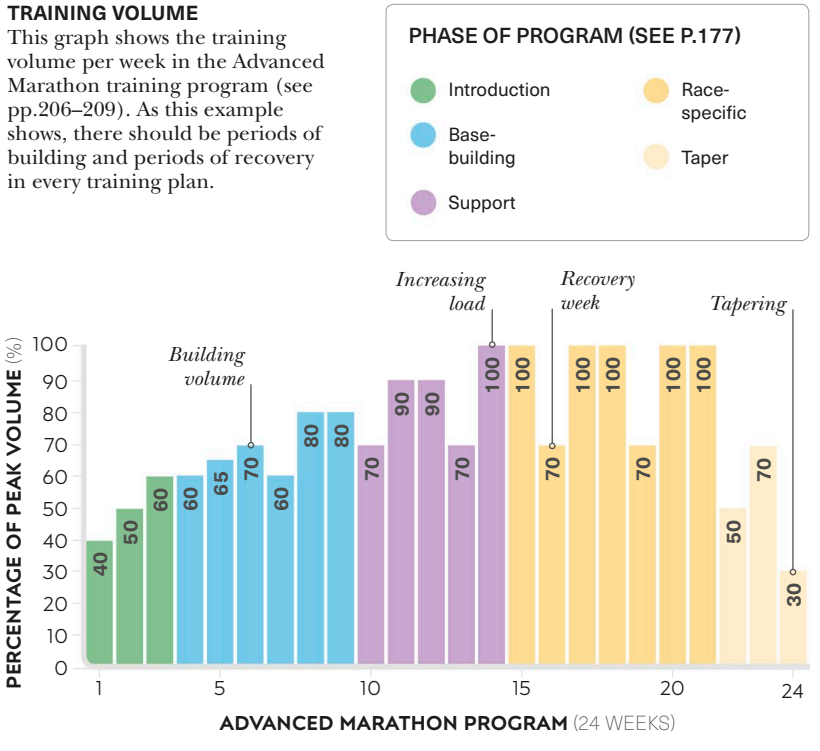
When training for a race, your goals are to build volume by increasing the overall distance you run and to improve speed by increasing the intensity of your workouts.

Aim to increase your training load by 10–15 percent per week. The exact amount will depend on factors such as your training history and resilience, so it is important to keep monitoring your training load (see pp.168–169). Your highest loads should be undertaken 3–4 weeks prior to race day or 2–3 weeks prior for shorter races. After this point, you should "taper," or decrease training enough to ensure your body is fresh and ready to perform on race day.

PLANNING FOR RECOVERY

Following a race, give your body a period of active recovery by doing low-impact cross-training (see p.187) before preparing for another race. If you intend to run several races throughout the year, design a seasonal plan so that you peak for the important races and do not overreach. For complete recovery, it is also vital to have down periods during the year, or times when you focus on different types of running or alternative activities altogether.

TRAINING VOLUME
This graph shows the training volume per week in the Advanced Marathon training program (see pp.206–209). As this example shows, there should be periods of building and periods of recovery in every training plan.



ADVANCING YOUR TRAINING

You can advance your training by increasing the distance or the intensity of your workouts, or both.

As you progress, you will find that you can do the same training but with less effort, which is a sign of improved running economy (see p.165) and should result in improved race performance. Keep track of your training (see pp.168–169) and adjust your targets as you see improvements or if your workouts feel less challenging.

KEEPING UP MOMENTUM

Training usually follows a steplike progression. Increasing your training load will take effort at first, but as you become accustomed to it, your body will make physical adaptations (see p.159). Maintain your training level at a plateau until your body has absorbed the training load, then increase it once again.

ADDRESSING WEAKNESSES

Make sure to include all workout types (see pp.180–186) in your training plan. We tend to avoid workouts that address our weaknesses and are drawn to those that reveal our strengths. This becomes a self-fulfilling prophecy. It is a good idea to work on your weaknesses early in a training plan so that you are not scrambling to address a limitation in the weeks before a race.

ASSESSING YOUR **FITNESS**

It is important to assess your fitness at the beginning of a training regimen and then monitor its improvement as you continue. Fitness is measured by the level of intensity at which you can exercise and determines the appropriate level of workout for you. There are several methods you can use to measure intensity.

Health check

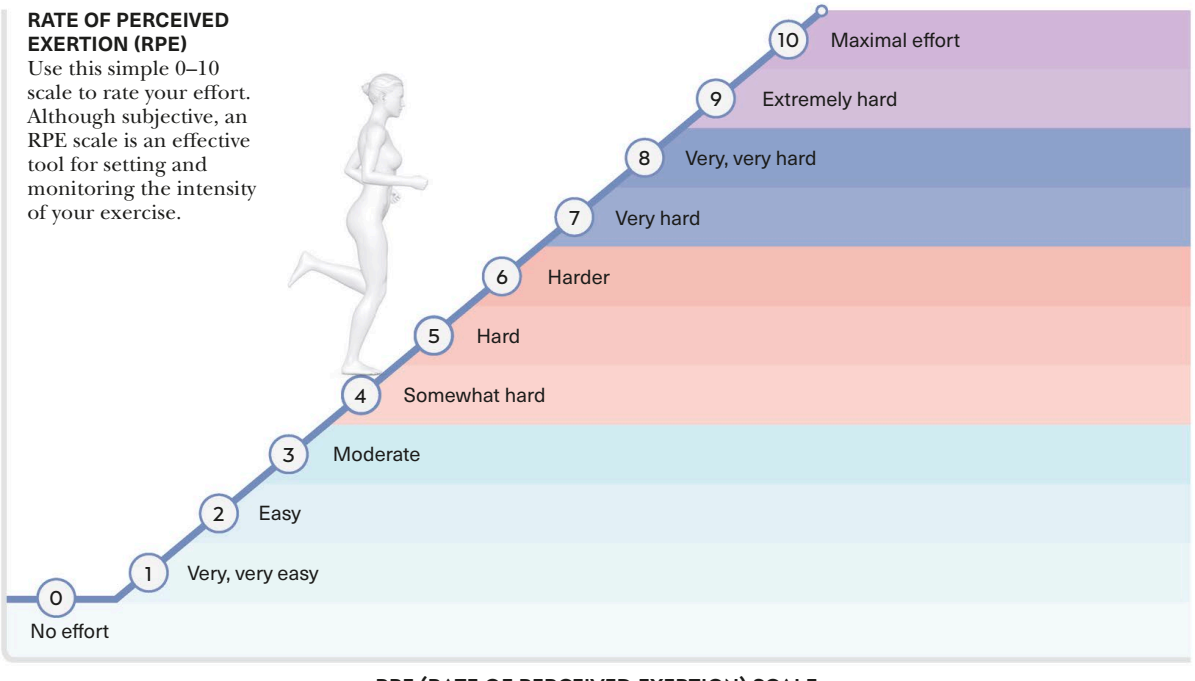
Get a health check-up if you are new to running or returning to it, especially if you have high blood pressure, diabetes, or heart or kidney disease. Also consult your physician if you have symptoms such as pain in the neck, chest, jaw, or arms; shortness of breath; dizziness or faintness; ankle swelling; or pain not relieved by rest.

MONITORING **EXERTION**

While high-tech equipment can measure intensity, simply rating exertion based on how you feel is proven to be highly effective.

The subjective effort you perceive as you exercise is directly related to how hard your heart and aerobic respiratory system are working. The fitter you are, the more intensely you can exercise at a low rate of perceived exertion (RPE). You should plan and monitor intensity on every run to ensure you train at the correct level and allow for adequate recovery.

RATE OF PERCEIVED EXERTION (RPE)
Use this simple 0–10 scale to rate your effort. Although subjective, an RPE scale is an effective tool for setting and monitoring the intensity of your exercise.



RPE (RATE OF PERCEIVED EXERTION) SCALE

MONITORING **YOUR HEART RATE**

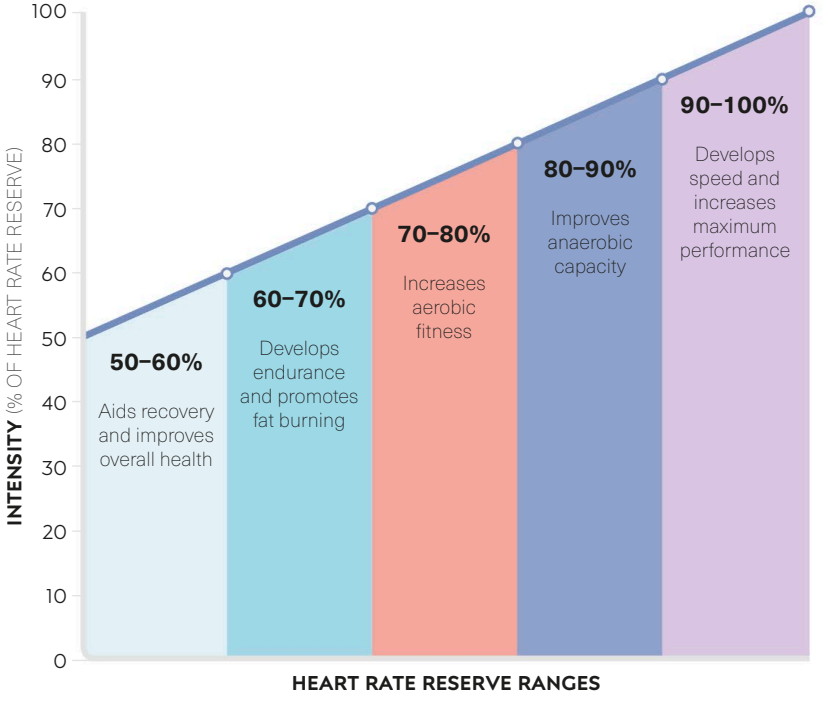
Heart rate elevates in a linear relationship with increasing effort, making it a good measure of exercise intensity.

Heart rate can indicate fitness if you track it over time. For example, if your pace at a given heart rate increases, it indicates that the pace is no longer as stressful as it once was. However, heart rate can be affected by fatigue, heat, terrain, and other variables, so use RPE alongside it during workouts.

HEART RATE IN TRAINING

During workouts, you can use a wrist or chest strap heart rate monitor to measure "heart rate reserve" (HRR). This is the range available to you for exercise and is the difference between your resting heart rate (RHR) and your maximum heart rate (see right). A higher resting heart rate can alert you to overtraining. The chart below shows the benefits of running at different percentages of heart rate reserve. Use the chart and formula below to calculate a target heart rate for a workout. For example, if your heart rate reserve is 110, your resting heart rate is 70, and your desired workout intensity is 85 percent of your heart rate reserve, (110 x 0.85) + 70 gives you a target heart rate of 163.5.

(HRR × PERCENTAGE OF INTENSITY) + *RHR* = **TARGET HEART RATE**



Heart rate calculations

The heart is a muscle that becomes stronger with training. The lower your resting heart rate, the more efficient your heart is and the fitter you are. Maximum heart rate can help you monitor exertion.

CALCULATING YOUR RESTING HEART RATE

Before you get out of bed in the morning, take your pulse. Record this for several days to get a reliable average reading.

RESTING BEATS IN 10 SECONDS × *6* = **RESTING HEART RATE** (RHR)

CALCULATING YOUR MAXIMUM HEART RATE

The formula below provides an easy way to calculate your maximum heart rate. However, to account for your genetics and fitness level, a treadmill test (see p.167) is more accurate.

220 – YOUR AGE = **MAXIMUM HEART RATE** (MHR)

CALCULATING YOUR HEART RATE RESERVE

To find out your heart rate reserve, use the simple calculation below. Your heart rate reserve may increase as your fitness improves.

MHR – RHR = **HEART RATE RESERVE** (HRR)

Running power

You can buy wearable technology that estimates "running power" as a metric of intensity, but these have limitations. "Power" is used in cycling to calculate effort by measuring the mechanical power output of the legs. However, unlike in cycling, the relationship between mechanical power and metabolic energy consumption changes with conditions in running. For example, as you run uphill, the contribution of elastic energy from tendons decreases; on downhill runs, your muscles do less push-off and perform a braking action as you descend. Running-power meters are not able to measure these changes reliably, because they use estimates instead of true power readings.

MONITORING **PACE**

The pace of your workout is another measure of intensity, since increasing your speed involves increasing your effort.

A training program prescribes workouts at different goal paces to improve body systems such as aerobic efficiency and lactate clearance. A goal pace is the estimated speed in minutes per km or mile you must run to achieve a goal race time. Paces for longer distances are relatively slower than for short ones, because you must sustain them for longer. Doing workouts at different paces reveals your strengths and weaknesses. For example, if you can achieve a 5-km-pace workout but struggle with a half marathon–pace workout, this suggests you need to improve your endurance.

CALCULATING PACES

Online calculators can help you work out your goal paces over a range of distances (and are fairly accurate). They work by extrapolating from a recent race time or goal time you are training to achieve or your average time over a certain distance. During a workout, using a GPS device is the easiest way to measure your pace, but you can also feel your pace through effort (see opposite).

The chart below shows paces based on sample marathon goal times for different runners.

Pace calculator

	BEGINNER	IMPROVING RUNNER	ADVANCED RUNNER	ELITE RUNNER
MARATHON GOAL TIME	04:30:00	03:45:00	03:00:00	*WORLD RECORD* 02:01:39
Marathon pace	10:18/mile	8:35/mile	6:52/mile	4:39/mile
Half marathon pace	9:48/mile	8:10/mile	6:32/mile	4:25/mile
Lactate threshold pace	9:17/mile	7:52/mile	6:24/mile	4:25/mile
10-km pace	9:16/mile	7:43/mile	6:10/mile	4:10/mile
5-km pace	8:55/mile	7:26/mile	5:57/mile	4:01/mile
3-km pace	8:27/mile	7:03/mile	5:38/mile	3:48/mile
1500-m pace	7:55/mile	6:35/mile	5:16/mile	3:34/mile
800-m pace	7:12/mile	6:00/mile	4:48/mile	3:14/mile

COMPARING **RPE, HEART RATE, AND PACE**

Because they all measure effort, you can compare rate of perceived exertion (RPE), heart rate, and pace to assess your day-to-day and long-term fitness.

The relationship between RPE, heart rate, and pace is relative, since one runner's pace at RPE 4 will be different from another's. By keeping a record of your RPE, average heart rate, and average pace for each workout, you can learn what effort corresponds to a specific pace—for example, what 6:30 min/mile or your 10-km pace feels like and what heart rate range these paces fall into. However, expect regular fluctuations in pace; if you are ill, fatigued, or stressed, your workout will feel harder.

Fitness will improve your pace at a particular heart rate or RPE score, or the pace will feel easier and result in a lower heart rate. If a pace feels harder and your heart rate increases, this can be a sign of fatigue or overtraining.

RPE AND PACE
The table shows approximate RPE scores for a range of paces. Because elite runners can run half marathon and 10 km paces harder and faster than recreational runners, this is reflected in the equivalent RPE.

RPE–pace equivalents

RPE	DESCRIPTOR	PACE/EFFORT
0	No effort	Sedentary
1	Very, very easy	Walking
2	Easy	Easy pace
3	Moderate	Marathon pace/half marathon pace (recreational)
4	Somewhat hard	Half marathon pace (elite)/lactate threshold pace/10-km pace (recreational)
5	Hard	10-km pace (elite)
6	Harder	5-km pace
7	Very hard	3-km pace
8	Very, very hard	1500-m pace
9	Extremely hard	800-m pace
10	Maximal effort	Sprinting/final exertion at the end of a race

Running economy

The more economically a runner moves, the less oxygen they use at a given speed. A number of variables affect running economy, including genetics, environmental conditions, weight of clothing and shoes, fitness levels, and biomechanics. You can modify these last two factors through training, which is why improving your fitness and your running form (see pp.74–75) helps you run more efficiently at your goal pace.

Vertical oscillation (see p.71)
Limiting your upward "bounce" improves running economy

Step frequency (see p.70)
Increasing step frequency (cadence) reduces vertical oscillation

Footstrike (see p.72)
Efficient footstrikes absorb and transfer energy to push off

BIOMECHANICAL VARIABLES

FITNESS TESTS

Conducting fitness tests allows you to establish goals at the beginning of your training program and monitor improvements. To track your progress, you can repeat these tests, but the best way to measure your gains is to compete in a race. Lactate threshold (see pp.34–35) and VO_2 max (see p.37) are both good measures of fitness, which you can establish using one of the following field tests.

Calculating a benchmark LT pace

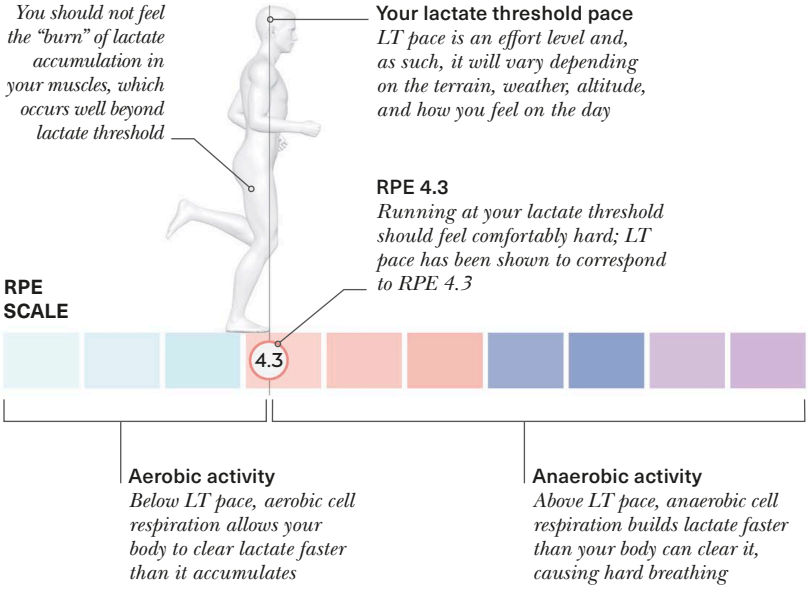
Although actual lactate threshold can vary from day to day, it is useful to use a benchmark LT pace for workouts where you need to run relative to LT pace—for example, 25 sec/mile slower than LT pace. You can generate an estimated LT pace by entering a recent race result into an online pace calculator (see p.164) or perform the following 30-minute time trial.

After a proper warm-up, gradually increase your pace to a level that is the fastest you can maintain for the full 30 minutes, then start the stopwatch. Measure your pace with a GPS device, or run on a treadmill or a measured track and calculate how far you run during the 30 minutes. Your current LT pace is 30 minutes divided by your total distance run. For example, if you run 5 miles in 30 minutes, your average LT pace is 6:00 min/mile.

Determining lactate threshold pace

Your lactate threshold (LT) pace is the highest possible speed you can run without causing an accumulation of blood lactate in your muscles. Training at LT pace raises this threshold, and your body adapts to perform aerobic cell respiration—which clears lactate—at faster paces.

Lactate threshold pace should stay just within the aerobic range of activity, which should feel like a "comfortably hard" pace that you could sustain for around 1 hour in race conditions. (LT pace is also called 1-hour race pace.) In order to train at your LT pace, you need to be able to recognize and monitor it so you can track improvements over time. Lactate threshold can be measured in a laboratory, but another simple way is to use the RPE scale (see p.162).



RPE AND LACTATE THRESHOLD
Learn to feel when you are running at LT pace. It is a specific effort level reached by running as fast as you can without having to breathe hard. If you are breathing too hard, slow down.

*The 0–10 RPE scale has a **direct** and **reliable relationship** with the lactate threshold and can be used to judge LT pace **on any run***

VO_2 max: treadmill test

This method to test VO_2 max requires you to run on a treadmill at a constant speed while the slope increases at 1-minute intervals, until you can no longer keep the pace. You will be pushing your body to its limits, so have an assistant adjust the treadmill slope for you. Use the total time you run to calculate your VO_2 max.

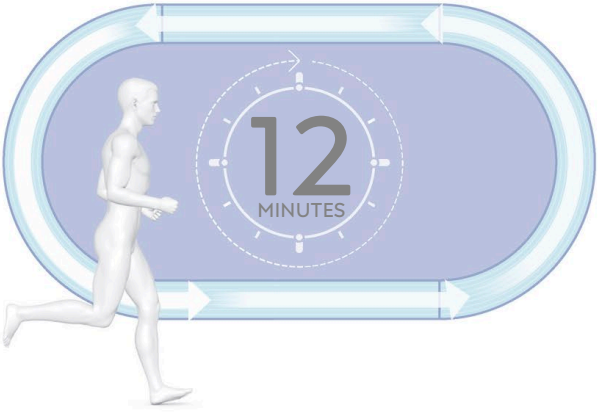
TIME MINUTES	SLOPE DEGREES
0	0°
1	2°
2	4°
3	6°
4	8°
5	10°
6	11°
7	12°
8	13°
9	14°
10	15°
11	16°
12	17°
13	18°
14	19°
15	20°

$$(42 + \text{TOTAL TIME RUN}) \times 2 = VO_2 \text{ MAX}$$

PERFORMING THE TEST
Set the treadmill to 7.02 mph (11.3 kph) and a slope of 0°. Every minute, the assistant increases the gradient according to the chart above. End the test when you cannot continue.

VO_2 max: Cooper test

This test, developed by Dr. Ken Cooper in 1968, offers a simple way to measure aerobic fitness. To complete it, simply run as far as you can in 12 minutes and use the total distance you have run to calculate your VO_2 max score using the formula below (using either the km or miles formula, as appropriate).



$$(22.35 \times \text{TOTAL DISTANCE IN KM}) - 11.29$$

OR

$$(35.96 \times \text{TOTAL DISTANCE IN MILES}) - 11.29 = VO_2 \text{ MAX}$$

PERFORMING THE TEST
This test should be performed on a flat surface; a 440-yard (400-m) athletic track is ideal. Set your timer to count down from 12 minutes, run as far as possible, and record the total distance.

TRACKING YOUR TRAINING

Most runners are good at tracking certain elements of their training either by keeping a log or recording their progress using a social media platform. Similarly, tools such as GPS watches, heart rate monitors, and other wearable devices can provide a wealth of information. There are various ways to benefit from this data.

WHY GATHER DATA?

Data can give you objective information about how your body is responding to training. If you collect the right data, it can both show areas of improvement and reveal which areas of training need more focus.

Collecting data is important for monitoring your health as well. It can provide information about how your body is handling the training load and can alert you when you are at risk of overtraining or injury.

DATA TO RECORD

With the use of wearable devices (see box, opposite), you are able to gather a huge amount of data from your training. However, more is not always better—the key is to record the types of data that will help you monitor your training load (see opposite), such as volume and intensity, and to observe your body's response to training through pain and fatigue scores. In addition, record which workout types (see pp.180–186) you do each week. Each has different benefits, so this will ensure you are including the right ingredients in your training.

Types of data

RPE, HEART RATE, AND PACE

Recording these factors (see pp.162–165) allows you to gauge the intensity, or effort level, of individual workouts. Over time, this data provides information about your fitness level, especially if you observe whether your heart rate or rate of perceived exertion (RPE) increases or decreases in relation to a given pace.

DISTANCE OR TIME

Monitoring these factors allows you to measure your volume. Not all miles are equal. Some runs are long and slow, while others are short and fast. A hill run may be shorter in distance than a flat run but take more time. In terms of gauging the physical toll of training, recording time is useful, but if training for a race, recording distance is also important.

PAIN SCORE

Being attuned to any pain will allow you to pick up on patterns, which may help identify an injury early and aid in diagnosis and treatment. If you have any pain, record its location, its nature (using descriptors such as sharp, achy, tight), and its intensity. A simple scoring system of 0–10 will give you a very clear idea.

FATIGUE SCORE

Fatigue is one of the first warning signs of overtraining syndrome. Rating how tired you feel after each workout (using a simple 0–10 scoring system) allows you to recognize rising fatigue levels and helps assess if you should include more recovery time in your training schedule.

MONITORING YOUR **TRAINING LOAD**

Training load refers to the total measure of stress applied to the body over time, which depends on the frequency, intensity, duration, and type of activity you do. Monitor your training load by giving each workout a score using the formula below. For example, if you perform hill runs at an effort rating of RPE 8 for 20 minutes, your training load score for the workout is 160. Record one internal and one external load (see below) consistently in order to aggregate the scores and track load over time.

Internal and external loads

Training load can be divided into two types: internal and external. External training load is an objective measure of volume, such as running 10 miles in distance or 60 minutes in duration. Internal training load represents the effort you put in to complete the workout, such as an average heart rate of 165 or an RPE of 4.

INTERNAL LOAD
× EXTERNAL LOAD
= TRAINING LOAD

Using tech to monitor progress

A wearable sensor such as a GPS-enabled wristwatch can be very convenient for collecting and logging multiple metrics. These devices can collect data about external training loads (such as distance, time, and elevation gain) and internal loads (such as heart rate and breathing rate). Some devices give real-time feedback, and many are paired with an online platform that can be used to track data longitudinally over time.

Other wearable devices can measure biomechanical variables such as cadence, impact, and vertical oscillation, which can be useful if you know how to interpret the data. However, be cautious about becoming too reliant on data at the cost of learning to run by feel.

Observing the changes

Two athletes may respond differently to the same training load, so it is important to regularly monitor yours. You can use pain and fatigue scores to observe whether your training load is improving your running or causing strain on your body. The body responds to the stress of the training load either by getting stronger or by breaking down, so any increases in load must be appropriate. Doing too much too soon may cause injury, but doing too little will not bring improvements.

SIGNS OF OVERTRAINING

Overtraining syndrome causes a sudden decline in performance, coordination, or strength, and fatigue that is not relieved by short rest. Signs include raised heart rate or RPE during workouts, elevated resting heart rate, appetite changes, weight loss, insomnia, irritability, lack of concentration, and depression. It is treated by reducing training load significantly or complete rest for weeks or months. Prevent it by spreading your training throughout the year and monitoring your overall training load.

SIGNS OF IMPROVEMENT

The foremost sign of improvement, and often the most important for many runners, is faster race times. Additionally, if your average heart rate decreases at a given pace or if your RPE score becomes lower because the pace feels easier to you, it is a sign of improved fitness. Similarly, your pace at a given heart rate or RPE rating becomes faster as you become fitter. Other signs include a lower resting heart rate and the ability to manage higher weekly training loads.

TRAINING **TIPS**

At some point, either in your training or in a race, you will experience the urge to give up. Whether it is due to the pain in your legs, the doubt in your mind, or the overwhelming sense of fatigue, overcoming this sensation can be a defining moment for a runner and one that can make you stronger.

DEALING WITH PAIN

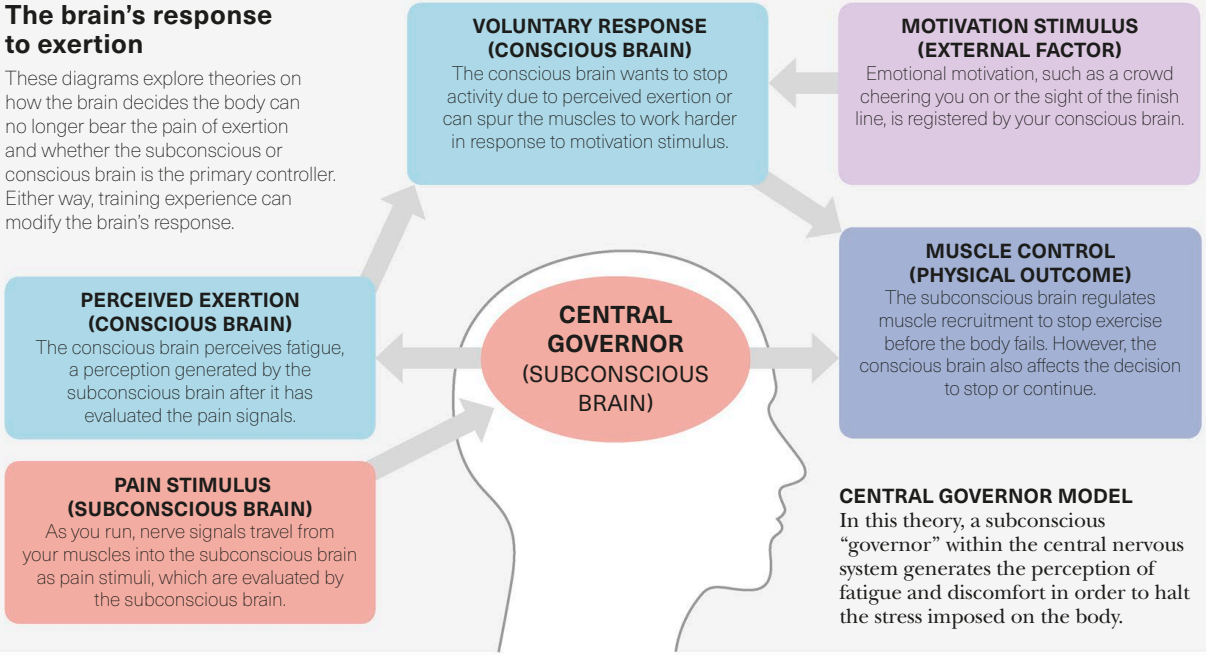
The pain of exertion is part of the running experience. It can take many forms: aching muscles deprived of glycogen, joints tested by repeated impacts, and running-related ailments ranging from blisters to stomach troubles.

In a race between two runners of seemingly equal physical talent, one runner's ability to overcome pain can give them an edge. Training is the best way to achieve this. Both trained and untrained runners have similar pain thresholds and will experience pain at the same point, but trained runners tend to have a higher pain tolerance and can withstand this pain for longer before easing off. How you feel pain doesn't alter, but training improves your ability to cope with it because your subconscious brain learns that your body can withstand the stress being placed on it (see below).

You can also affect pain consciously by using distraction techniques. Studies have shown that listening to fast-paced music while running can help you push your body further while your brain is occupied elsewhere.

The brain's response to exertion

These diagrams explore theories on how the brain decides the body can no longer bear the pain of exertion and whether the subconscious or conscious brain is the primary controller. Either way, training experience can modify the brain's response.



STAYING **MOTIVATED**

The motivation to train can come from a number of different sources. Learning to identify what motivates you to run, and to race, and reinforcing those motivations helps keep you on track to reach your goals.

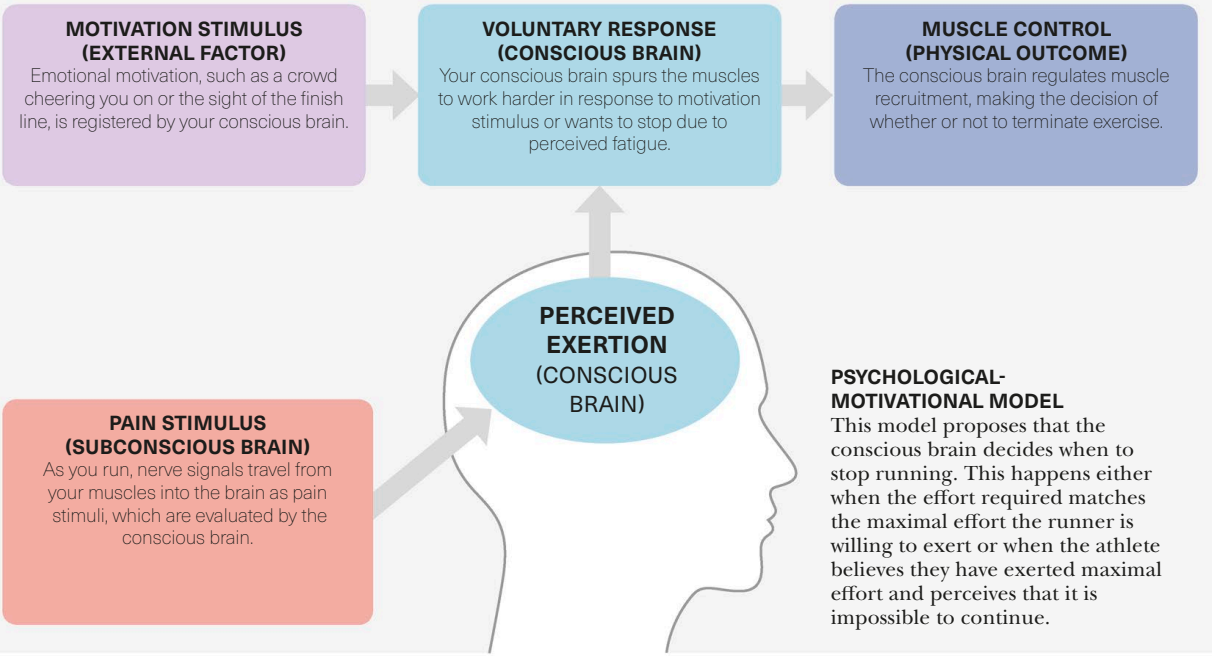
A number of factors affect our motivation. In a race, the cheering of your family in the crowd or the anticipation of running a personal best can push you to dig a bit deeper into your energy reserves. In training, noticing the objective signs of improvement and completing challenging workouts in preparation for your race can motivate you to maintain your training load.

Visualizing yourself crossing the line and reaching your goal can help motivate you to train on a cold, wet day. One way to motivate yourself is to expect the pain and fatigue before it arrives and then embrace it when it does, knowing that pushing through it will only make you stronger for future workouts and races. Another more immediate and practical tool might be positive self-talk. Studies have shown that when things get tough, telling yourself, "You can do this" or "You can work through the pain" can improve your race performance.

Recognizing when you have dug deep enough and given your maximum effort is also important, so that you can give yourself adequate recovery time and avoid burnout (see right).

Recovery and burnout

No athlete can sustain intense training indefinitely regardless of ability, experience, or mental toughness. You need to build recovery periods into your training schedule (see pp.174–175) or you risk burning out. The effects can include injury, poor training (leading to poor performance), low mood and sleep disorders, and illness. Proper recovery is important for allowing your body time to adapt to the training stimulus and get stronger, faster, and more efficient. However, recovery doesn't necessarily mean complete rest. Active recovery—such as light cycling, pool running, or swimming—is best, as it keeps your muscles and joints moving, but in a way that does not stress your body. That being said, sleep is the most powerful, evidence-based recovery tool.



PSYCHOLOGICAL-MOTIVATIONAL MODEL
This model proposes that the conscious brain decides when to stop running. This happens either when the effort required matches the maximal effort the runner is willing to exert or when the athlete believes they have exerted maximal effort and perceives that it is impossible to continue.

NUTRITION

Good nutrition is fundamental to your training. The primary nutrients to plan around are carbohydrates (essential for building up sufficient energy stores) and proteins (which help regenerate and repair muscle tissue after training).

Glycogen, which your body creates from carbohydrates, provides your primary fuel source during running. Your carbohydrate intake should therefore calibrate with your training load (see below).

It is best to maximize protein absorption and use by distributing your consumption of it through the day; aim to eat ½–¾ oz (15–20 g) of protein 4–6 times a day. Lean animal protein is best, but plant sources (such as soy, legumes, and nuts) are also good.

POSTWORKOUT REFUELING

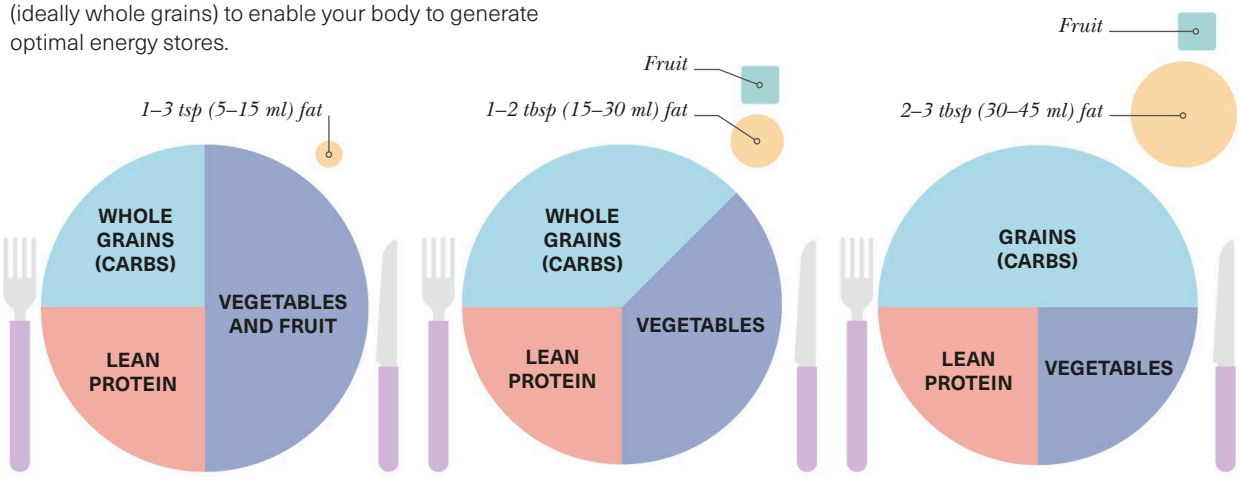
Following hard training sessions, it is important to eat foods that will help your body recover and refuel. Within 2 hours of a workout, aim to consume 1.5 g carbohydrate, 0.3 g protein, and 0.3 g fat per 2 pounds of your body weight. During the taper phase of training (see p.177), when energy expenditure is lower and you are trying to optimize body weight before a race, reduce the carbohydrate quantity to 1 g per 2 pounds of your body weight.

Fueling before a run

Prerun meals should be high in carbohydrates to provide adequate fuel; pasta, rice, and other starches are ideal. After eating, you should allow 2–3 hours before working out to stop you from feeling bloated or getting a cramp. For runs longer than 90 minutes, or when muscle glycogen stores are low, you should take on approximately 1–2 oz (30–60 g) of carbohydrate per hour to maintain circulating glucose levels. This can be achieved through a combination of easily absorbed sports drinks; energy gels; or light, easily digestible, carbohydrate-rich foods such as energy bars. It is important to experiment with your nutrient sources—both the variety and intake levels—while you are still in training in order to find your optimal fuel intake for race day.

Changing nutrient needs

The harder you train, the more calories you will need to fuel your runs. Depending on the training phase (see p.177), your daily food intake should be 25–50 percent carbohydrates (ideally whole grains) to enable your body to generate optimal energy stores.



EASY TRAINING
For light training—for example, in an introduction or taper phase—your total daily intake of carbohydrates need only be 25 percent, with fruits and vegetables making up the difference.

MODERATE TRAINING
As training increases—for example in the base-building or support phases of training—increase carbohydrate and fat intake. Additionally, fruit is recommended as a good source of carbohydrates.

HARD TRAINING OR RACE DAY
In a hard-training phase—such as the race-specific phase—carbohydrates should make up half of your daily food intake to allow your muscles to store more glycogen. This is known as "carb loading."

HYDRATION

There is no doubt that hydration is important when it comes to endurance running. It regulates body temperature through sweating, is essential to the transport of nutrients, and aids in releasing energy and removing waste products that are created by energy conversion.

Traditional wisdom had it that you should drink as much as possible prior to exercise. We now know that you do not need to drink copious amounts of water before a workout in order to stave off dehydration. Also untrue is the old belief that thirst signals indicate that you are already dehydrated. While drinking to thirst may not replace all the fluid lost during exercise (it is normal to lose up to 2–3 percent of your body weight during training sessions, or more during races), it is safer than the danger of overhydration (see box, right).

HYDRATION STRATEGIES

During a workout, responding to internal signals to drink when you are thirsty should be sufficient to keep you hydrated. If you sweat heavily during a run, or if it is a hot day, you may need to take in more fluids before a workout, but this should be weighed against the discomfort of having too much fluid in your stomach while running.

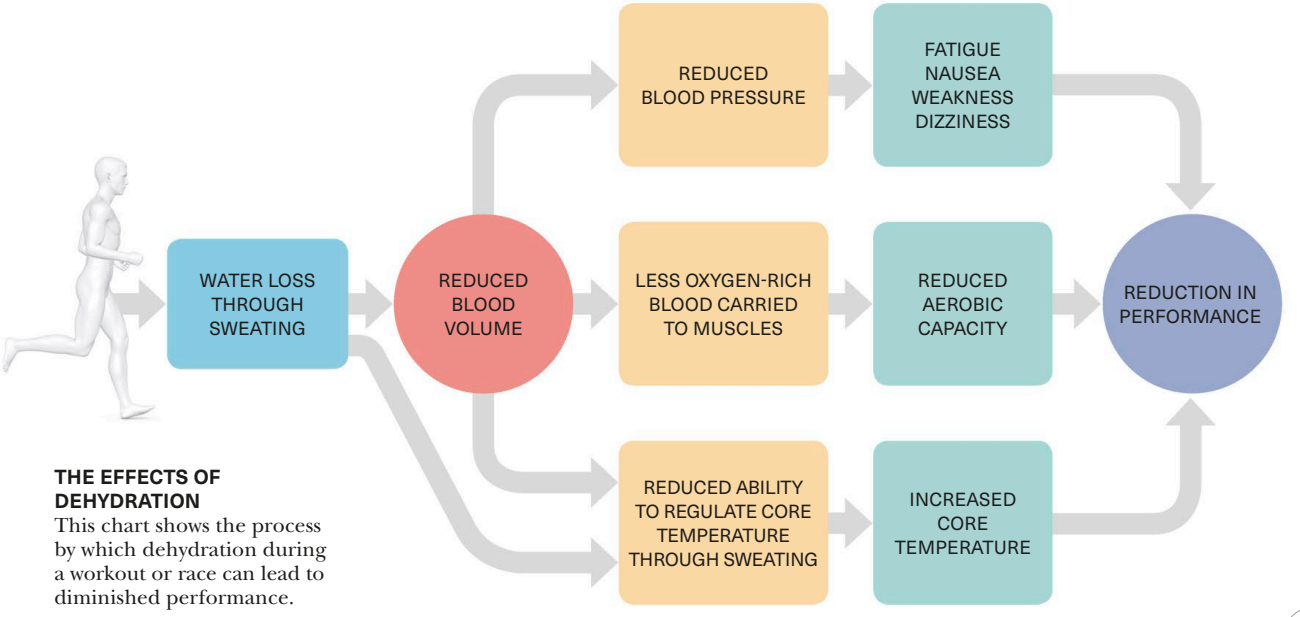
Sodium levels

Overhydration can be as dangerous as dehydration. During exercise, we lose sodium through sweating (known as electrolyte depletion). Drinking excessively during exercise dilutes the already depleted sodium levels in your blood. This can lead to sleep disruption and the potentially life-threatening condition Exercise Associated Hyponatremia (EAH). Symptoms include headaches, fatigue, nausea or vomiting, muscle spasms, and seizures.

Sports drinks contain electrolytes and therefore don't deplete the sodium levels in your blood in the same way that drinking water does. However, even drinking sports drinks to excess can dilute sodium levels.

Dehydration

Sweating during exercise will cause a certain amount of water loss from the body. If too much water is lost, however, it can affect your core temperature and energy supply to the muscles.



THE EFFECTS OF DEHYDRATION
This chart shows the process by which dehydration during a workout or race can lead to diminished performance.

RECOVERY AND REGENERATION

Scheduling recovery time is a vital part of training. It allows your body to renew energy reserves and cements the physiological adaptations that your body makes in response to training load.

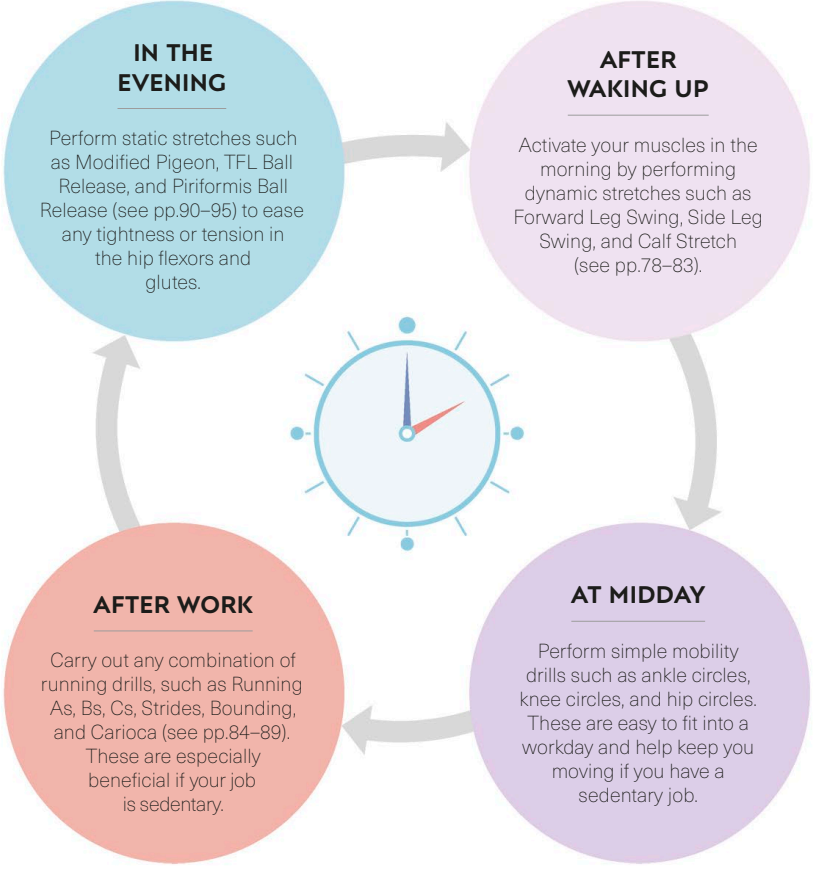
"Active" recovery with low-impact, low-intensity activities between your main workouts keeps your muscles and joints mobile (see below). Massage, practicing mental resilience, and ensuring good sleep quality are other key ways to help the body recover.

A few other tools and therapies have shown positive effects on perceived postexercise muscle soreness: compression garments; cold water immersion (immersing legs in icy water for 10–15 minutes postexercise); contrast baths (immersing the legs alternately in tubs of warm and cold water for 20–30 minutes); and cryotherapy (applying cold, such as an ice pack, to muscles). Hyperbaric therapy, electrostimulation, and other trends, however, have little evidence to support their usefulness.

> ***Proper recovery** is as important as, if not even **more important** than, training itself*

Mobility

After a hard training session, it can be tempting to stay fairly sedentary until your next workout. However, keeping your body mobile while still allowing it to recover—known as active recovery—can provide benefits, including an increase in your body's ability to clear metabolites such as blood lactate, improved muscle function, and reduced postexercise soreness. On days that are not scheduled for your key workouts (see p.179), keep your recovery time active with cross-training (see p.187); "recovery" runs at an easy pace (see p.180); or an exercise routine to keep your joints, muscles, and tendons moving (see right). All of these activities should be low in impact and intensity compared to your key workouts.



MOBILITY ROUTINE
You can build exercises into your daily routine at different times of day to keep your body mobile.

Massage

As your training load increases, you are likely to feel muscle tightness and stiffness in a number of areas of your body. One way to deal with this is to schedule regular massage therapy during your training.

Massage may help relax muscle tissue and reduce postexercise soreness. Although evidence suggests that it does not increase blood flow or help with removal of metabolic waste products (both often said to be benefits of massage), the positive psychological effects of massage are consistently reported in scientific studies. These include improvements in perceived recovery and perceived muscle soreness.

Massage also has an effect on the nervous system by helping activate the parasympathetic nervous system (see p.42), which is responsible for subduing the stress responses generated by working out and racing.

If you are unable to see a massage therapist regularly, consider self-massage. There are a number of tools available, such as foam rollers and lacrosse-style therapy balls, which can be used to target specific areas where you feel muscle tension. See also the TFL and Piriformis Ball Release stretches on pages 92–95.

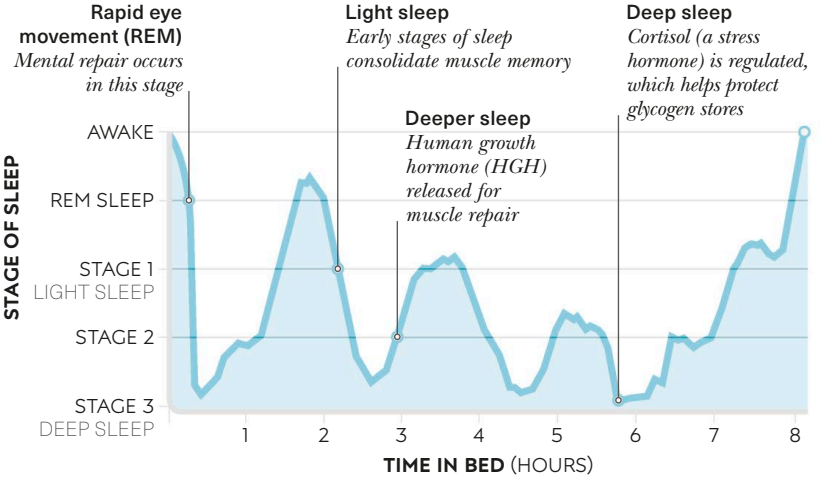
Meditation

Practicing meditation can primarily benefit runners by aiding relaxation and stress relief. This in turn helps ensure restful sleep so your body can repair efficiently.

In addition, meditation encourages you to practice mental focus, which can boost willpower and self-discipline when you must motivate yourself to keep up your training regimen. It may also help increase your mental resilience when battling frustration, pain, stress, and tough training days and bolster you during racing challenges.

Sleep

The quality and quantity of sleep is the most important recovery factor for any runner. In fact, sleep deprivation can impact the performance of distance runners more than some other athletes. Suboptimal sleep affects the immune and endocrine systems—impacting recovery and training adaptation—and can also result in impaired cognitive function, increased pain perception, changes in mood, and altered metabolism. Endurance training has been shown to suppress immunity, so good sleep hygiene (see right) is vital to allow the immune system to recover. If sleep is cut short, the body does not have time to repair and consolidate memory. This can result in increased injury risk due to slower reaction times.



Sleep hygiene

Proper sleep hygiene can enhance sleep quality and quantity. Try the following habits and practices:

- Keep the bedroom dark, quiet, and cool at 66–70°F (19–21°C)
- Ensure your bed and pillow are comfortable
- Avoid backlit screens in the hour before bedtime
- Avoid caffeine later in the day
- Go to bed and wake up at the same time every day
- Create a nightly routine that starts 30 minutes before bedtime to prepare your body for sleep
- Use relaxation or breathing techniques (see Meditation, above) if you are anxious or have difficulty falling asleep.

SLEEP FOR RECOVERY
There are distinct stages of sleep, and we pass through each one several times a night. Each is essential for recovery.

CHOOSING AND USING A TRAINING PLAN

What makes a training program effective is whether it is the right stimulus for a runner at their current level of fitness and training. There are both beginner and advanced training programs included in this book, designed to give you a structure of key workouts that you can build upon and adapt if you wish.

TYPES OF PROGRAMS

The training programs in this chapter include beginner programs for 5 km, 10 km, half marathon, and marathon, as well as advanced programs for 10 km, half marathon, and marathon.

BEGINNER PROGRAMS

If you have not run before, have not run for long time, or are returning to training after injury, you can start with the Beginner 5 km Program. This is designed in a walk-run format to gradually build up the length of time you can run continuously. Once you have graduated from completing your first 5 km run, you may choose to work toward longer distances.

There is no rule that you need to continue progressing in distance, however. Many runners prefer to stick to shorter distances and work on improving their finishing time. That said, if your body is able to absorb the training load for each successive distance level, it can be satisfying to continue. Over their 12-week time frames, the beginner programs primarily focus on your ability to complete the target distance.

ADVANCED PROGRAMS

The advanced programs are suitable for those who have already completed a race at the goal distance and are looking to improve their finishing time.

Compared to the beginner programs, the advanced training programs include more overall volume and intensity, as well as more variety and complexity of workouts. In order to build up to a higher level of fitness over the course of the programs, they progress over 24 weeks rather than just 12 weeks. This longer time period allows for an introduction phase (see opposite) within these programs, and there is time to focus on achieving particular goals in each phase, with shifts in the types of workouts being performed.

PROGRAM PROGRESSION
Each of the 12-week beginner programs (5 km, 10 km, half marathon, and marathon) progress from where the previous program finished. This means it is possible to follow these 4 programs all the way through from a starting point of no running to completing a marathon within 48 weeks.

BEGINNER 5 KM PROGRAM
WEEKS 1–12
(see pp.190–191)

BEGINNER 10 KM PROGRAM
WEEKS 13–24
(see pp.192–193)

BEGINNER HALF MARATHON PROGRAM
WEEKS 25–36
(see pp.198–199)

BEGINNER MARATHON PROGRAM
WEEKS 37–48
(see pp.204–205)

TRAINING **PHASES**

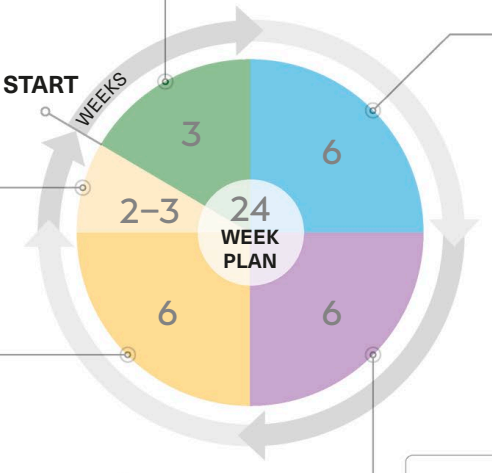
The training programs in this book are divided into phases. The phases gradually shift from a focus on developing general aerobic and anaerobic fitness toward workouts that are specific for your target event. The cycle here shows the typical number of weeks spent in each phase in a 24-week program.

INTRODUCTION PHASE

Start with an introduction phase if you have just completed a hard race or training period. (This phase appears in advanced programs only.) The aim of this phase is to refresh you physically and mentally before rebuilding your general running volume to a level that allows for more focused training to begin. The programs allocate 3 weeks to this phase, but it can be extended by weeks, months, or even a rest from running, depending on your level of fatigue.

TAPER

At the end of the race-specific phase is the taper before your race. You cannot perform at your best when your level of training fatigue is at its highest, even though your fitness may be at its peak. On the flip side, you cannot perform your best if your fitness has dropped too far. The art of the taper is therefore to perform workouts that allow you to arrive at the starting line as fresh as possible while simultaneously offering enough volume and intensity to maintain your fitness.



BASE-BUILDING PHASE

For both beginners and advanced runners, the focused training begins in this phase. The goal is to increase your aerobic volume; gradually introduce intensity; and improve running skills such as form, strength, power, cadence, and sprinting ability. This is the best phase to work on your own weaknesses, whether that is speed, strength, or endurance. Regardless of the end distance being targeted, the goal of this phase is to become a fitter, faster, and stronger overall runner.

RACE-SPECIFIC PHASE

This is the phase that focuses on the specific demands of your target race with peak workouts and long runs. Your capacity to run both fast and long should now be developed, and the emphasis is on making your goal race pace feel as efficient as possible. The workouts mainly target the dominant energy system that will be utilized during your target race. In the advanced programs, you will have reached peak volume (see p.188) in the support phase and adapted to it, leaving you with more energy to put into the workouts.

SUPPORT PHASE

The main goal of this phase is to prepare you for the race-specific phase to come. The support phase builds upon the general fitness established in the previous phase and begins to focus on workouts that support the race distance and pace that you are training toward. There are workouts faster than your goal race pace designed to make your actual goal race pace feel more comfortable by comparison. There are also slower workouts that help build your endurance and your ability to sustain your goal race pace over the target distance.

TRAINING **PRINCIPLES**

These principles should inform the structure of a successful training plan. They are proven effective for all runners, from recreational to elite, and understanding them will help you get the most from your training program and workouts.

WELL-ROUNDED FITNESS

Focus on improving overall general fitness with anaerobic and form-training workouts, as well as aerobic running fitness, to become a more well-rounded runner.

PROGRESSIVE ADAPTATION

Gradually introduce different training stimuli to promote physical adaptations by changing the volume, intensity, or frequency of workouts.

INCREASE INTENSITY

Make workouts harder in one of four ways: increasing the pace, increasing the distance or duration of a run at a given pace, increasing the ratio of fast to slower running, or running recovery sections faster.

INCREASE VOLUME

Progressively increase the volume of running to a predetermined peak over the course of a training program, with some weeks decreasing in volume to allow your body to absorb the training load.

OPTIMIZE TRAINING LOAD

Your training load should increase at a rate that your body can absorb and benefit from. Monitor for signs of overtraining (see pp.168–169) and adjust if needed.

WORKOUT **TYPES**

Performing a variety of workout types will help make you a well-rounded runner, as well as help you become stronger and fitter.

The workouts in the programs range from short sprints to longer aerobic-based running. Four main categories of workout are described: easy continuous running, fast continuous running, interval training, and hill training (see pp.180–186). This is one system of categorizing workouts—you may come across others. Each of these workout types provides different benefits in terms of increasing endurance, speed, and strength.

In addition, there are form-focused interval workouts that help improve your running form (see p.188).

INDIVIDUALIZATION

Due to the range of types, you may find some workouts more difficult than others. If a pattern emerges, you may identify that you are an endurance-based runner rather than a speed-based runner, or vice versa. The training programs should not be seen as set in stone. This means that if you identify a weakness early in your training cycle, you can shift the emphasis of your training by choosing workout types that address your weakness.

Depletion training

This type of training involves running in a glycogen-depleted state in order to improve the body's ability to metabolize fat. This is useful for race events that last longer than 90 minutes (the average length of time that muscle glycogen can provide you with fuel when running).

The easiest way to achieve this glycogen-depleted state is to schedule your run before breakfast (ensuring at least 10 hours of fasting overnight). After a depletion run, it is important to replenish muscles with a high-carbohydrate recovery meal.

Depletion training is stressful and should be undertaken with caution. Introduce it early in the training cycle and begin with just one session per week; you can add more as your body adapts. Reduce or omit these runs completely in the taper period.

PLANNING YOUR TRAINING

The programs in this book show three key workouts per week: two shorter, more intense workouts and one longer run.

These key workouts should be the most stressful training stimuli of your week. Only three are scheduled per week to allow at least one recovery day between each key workout. Depending on your level of experience, fitness, and available time, a recovery day could involve full rest, cross-training (see p.187), or easy continuous running (see p.180). However, keep in mind that any recovery day activity should be easy enough that you feel ready to run the distance and effort prescribed in your next key workout.

Performing the three key workouts each week will serve you well, but if you want to train more often than 3 days a week and add to the key workouts in your schedule, bear in mind that it is easier to recover from multiple short runs than from a smaller number of long runs. Compared to the longest run of the week, your second-longest run should be no more than half its distance or duration, and any remaining runs should not be more than one-third.

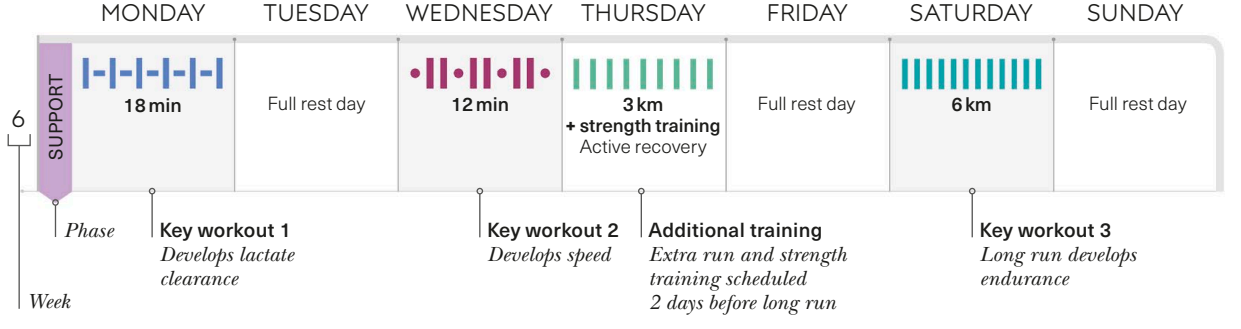
KEY

- Short run
- Medium run
- Long run
- Progression run
- Pace-change run
- Anaerobic capacity training
- Hill run

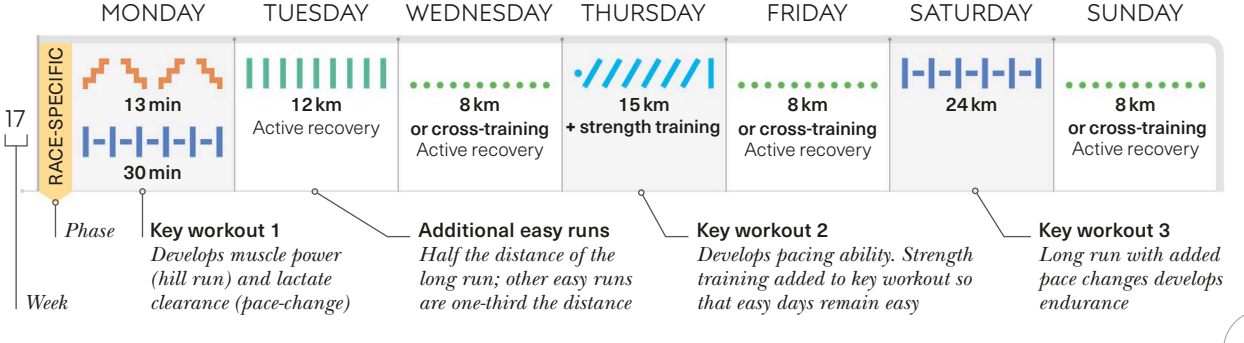
STRUCTURING YOUR WEEK

The examples below show how to fit extra sessions in between key workouts, if you choose. It is best to stick to easy continuous runs and cross-training.

BEGINNER RUNNER



ADVANCED RUNNER



What to record

- Distance
- Duration
- Average pace
- RPE score

The subjective effort of these runs should be the focus more than the pace. Make sure they are "easy."

EASY CONTINUOUS RUNNING

This type of training is performed at the lowest effort level of all workout types and makes up the bulk of training volume for distance runners. Depending on distance or duration, easy continuous runs are classified in this book as "short," "medium," or "long," which are definitions relative to your experience.

DISTANCE AND RECOVERY RUNS

The purpose of easy continuous running is to build a strong aerobic base without placing too much extra load on top of the more intense workouts in a training program.

BENEFITS

The cumulative volume of easy continuous running improves endurance; increases capillaries and mitochondria (see pp.34–35); and, in the case of long runs, gives you confidence that you can complete the distance of the target event.

HOW TO DO IT

These runs are done at "easy pace," which means they should be run as slowly as needed to maintain good form and relaxation throughout the session. They should also help you achieve adequate recovery before your next workout, so it is helpful to set a pace or effort limit (for example, no higher than 70 percent of heart rate reserve) to ensure they remain easy.

At the start of a program, the long run should build up to a set distance. Once this is achieved, you can increase the training load with pace variations (making them fast continuous runs) or increase the distance without intensity.

Types and frequency

These three types of easy continuous running workouts are described in terms of relative distance or duration. Bear in mind that as you progress, what was once a "long" run may become a medium run. How frequently you do these three types of easy continuous running will depend on your level of experience, training phase, and distance target. Some elite runners perform one easy continuous run a day.

SHORT RUNS

Compared to the longest run in your training plan, short runs are usually one-third the distance or duration (or less).

Short runs are typically scheduled in between more challenging efforts, either to begin or finish a workout, or on a recovery day for advanced runners (which is termed a "recovery run"). Short runs may also be a workout in their own right in a light training week.

MEDIUM RUNS

These runs are between one-third and half the distance or duration of the longest run in your training plan.

These runs can be done once a week in addition to the weekly long run. Follow with at least 1 day of rest or a recovery run (see short runs). This "extra" run is particularly useful for marathoners, as it helps increase aerobic volume, especially if you run only 3–4 times a week.

LONG RUNS

This is the longest run of the week. It can be defined as any run that is 50 percent of the distance or duration of the longest run in your training plan, or more.

Include one long run per week, particularly during the base-building phase. Later in the program, long runs can evolve into fast continuous runs by including pace variations, especially for half marathoners and marathoners.

What to record

- Distance
- Duration
- Average pace of fast sections
- Average pace of slower sections
- Average pace of overall run
- RPE score

For each of the three types of fast continuous runs, it is useful to track your pace and overall training load.

FAST CONTINUOUS RUNNING

These runs are done faster than easy pace but not so fast or sustained that you need to stop or walk to recover. Therefore, there is an element of control involved in this type of training. The three basic types of fast continuous runs are tempo runs, progression runs, and pace-change runs.

TEMPO RUNS

Tempo runs are even-paced runs, typically run at speeds from lactate threshold pace at the faster end to a little under marathon pace at the slower end (see box). Tempo runs are sometimes preceded or followed by a short, easy run for warm-up or recovery.

BENEFITS

These workouts teach you how to run at a constant, sustainable pace or effort over a set distance or duration. Besides racing, no other workout develops an awareness of pace as efficiently as a tempo run. They also increase aerobic capacity and the rate of lactate clearance.

HOW TO DO IT

Complete these runs at an even pace or effort for the whole run. The first tempo runs in your program may be slower than goal pace (the speed you are trying to achieve) so that you can start at a manageable effort level and pace. This is known as "date pace"—the pace you can sustain at the current date. As your fitness improves, the pace of the tempo run can progress to goal pace.

Effort-based and distance-based paces

On average, lactate threshold (LT) pace correlates to the pace you can maintain for 1 hour in a competition. This is why LT pace is sometimes called 1-hour race pace. Because marathons and half marathons (for most runners except elite) take much longer than an hour to complete, marathon and half marathon paces are slower than LT pace, so that they can be sustained over a longer distance. Similarly, half marathon pace is usually faster than marathon pace, because it is a shorter event. Your training program will contain various distance-based paces (not just the goal pace for your target event) so that you run relatively slower or faster as appropriate for the workout. (See pp.164–167 for how to calculate paces for training purposes.)

Example

The examples below show the typical distance or duration for tempo runs at the following efforts and paces.

LACTATE THRESHOLD

Run at or faster than your lactate threshold pace (see pp.166–167) for 20–40 minutes.

HALF MARATHON PACE

Run at half marathon goal pace for 5–10 miles.

MARATHON PACE

Run at marathon goal pace for 8–16 miles.

PROGRESSION RUNS

These runs increase in pace or effort incrementally over the course of the run. For example, a 30-minute run can increase in pace every 6 minutes.

BENEFITS

Progression runs teach you how to feel your pace and increase it, even when you are tired. Physiologically, these workouts increase the oxygen uptake in a higher percentage of muscle fibers, accelerating turnover by engaging first the slow-twitch muscles fibers, then the fast-twitch fibers (see p.19) in the later stages of the run.

HOW TO DO IT

These runs are typically performed at a slower average pace compared to an equivalent tempo run due to the demands of acceleration on the muscles and aerobic system. The duration or distance of a progression run tends to be split into 2–5 segments; these are assigned paces that increase by 5–15 sec/mile per segment. The overall average pace is as important as that of the individual segments, so the first progression runs in your program can be relatively easy overall and become faster as your fitness improves.

Examples

The examples below show the typical pace or effort for runs of the following durations and distances.

30-MINUTE PROGRESSION

Run 5 segments of 6 minutes each, averaging 8–16 sec/mile slower than your lactate threshold (LT) pace (see p.166).

This example starts at 24 sec/mile slower than LT pace and ends at 8 sec/mile faster than LT pace.

5 x 6-min runs
@ 24 sec < LT
+ @ 16 sec < LT
+ @ 8 sec < LT
+ @ LT
+ @ 8 sec > LT

10-MILE PROGRESSION

Run 5 segments of 2 miles each, averaging 15 sec/mile slower than your half marathon goal pace.

This example starts at 45 sec/mile slower than half marathon pace and ends at 15 sec/mile faster than half marathon pace.

5 x 2-mile runs
@ 45 sec < HMP
+ @ 30 sec < HMP
+ @ 15 sec < HMP
+ @ HMP
+ @ 15 sec > HMP

16-MILE PROGRESSION

Run 4 segments of 4 miles each, averaging 16 sec/mile slower than your marathon goal pace.

This example starts at 40 sec/mile slower than marathon pace and ends at 8 sec/mile faster than marathon pace.

4 x 4-mile runs
@ 40 sec < MP
+ @ 24 sec < MP
+ @ 8 sec < MP
+ @ 8 sec > MP

Frequency

Fast continuous runs can be performed up to three times per week, depending on your level of experience, training phase, and goal distance. During the base-building phase (see p.177), a short and a long easy continuous run can evolve into a tempo, progression, or pace-change run. In later phases, race preparation will determine the number of these progression runs needed per week.

5 KM GOAL DISTANCE

When your target distance is 5 km, a good guide is to include fast continuous runs up to twice a week during the base-building phase, once a week during the support phase, and once every 2 weeks during the race-specific phase.

10 KM GOAL DISTANCE

For this target distance, you will benefit from including tempo, progression, or pace-change runs up to twice a week. These fast continuous runs can be done throughout the base-building, support, and race-specific phases.

PACE-CHANGE RUNS

As the name suggests, pace-change runs involve alternating between slower and faster paces during a continuous run. They can be done over any distance or duration, and the pace variations can be structured or spontaneous.

BENEFITS

These runs teach the body to run fast without complete recovery. If the fast sections are run faster than lactate threshold, causing lactate to build up, the slow-twitch muscles that are activated in the slower sections clear the lactate accumulation. This improves your muscles' ability to use lactate as fuel.

HOW TO DO IT

When you begin pace-change runs, there may be only 5–10 minutes of fast running within your continuous run. As your fitness improves, you can increase the volume or the pace of the fast sections, the volume of the overall run, or the pace of the slower "recovery" sections. Being able to keep the pace of the recoveries close to the fast pace or to decrease their duration indicates that your muscles have improved their ability to clear lactate.

Examples

The examples below show typical workouts from a range of training programs.

LACTATE THRESHOLD (LT) PACE

Run for 30 minutes, alternating 3 minutes at 15 sec/mile faster than LT with 2 minutes at 25 sec/mile slower than LT.

30 min
⤮ **3 min** @ 15 sec > LT with
2 min @ 25 sec < LT

HALF MARATHON-SPECIFIC

Run for 10 miles, alternating 2 miles at half marathon pace with 0.5 mile at 50 sec/mile slower than half marathon pace.

10 miles
⤮ **2 miles** @ HMP with
0.5 mile @ 50 sec < HMP

FARTLEK

Meaning "speed play" in Swedish, fartlek runs are less structured than other pace-change runs, with the pace variations done spontaneously as you run.

A typical fartlek run might last for 45 minutes, alternating between hard, fast sections that last 15 seconds to 3 minutes and easy recovery sections. The recoveries should last 1–2 times the duration of the fast sections.

6-MILE GOAL-SPECIFIC

Run for 6 miles, alternating 1.5 miles at 10-km goal pace with 0.5 mile at 50 sec/mile slower than 10-km goal pace.

6 miles
⤮ **1.5 miles** @ 10km with
0.5 mile @ 50 sec < 10km

MARATHON-SPECIFIC

Run for 15 miles, alternating 2.5 miles at marathon goal pace with 0.5 mile at 40 sec/mile slower than marathon goal pace.

15 miles
⤮ **2.5 miles** @ MP with
0.5 mile @ 40 sec < MP

HALF MARATHON GOAL DISTANCE

When you are training for a half marathon, a good rule of thumb is to include fast continuous runs up to twice a week during the base-building and support phases. You can increase this to up to three times a week during the race-specific phase.

MARATHON GOAL DISTANCE

Do fast continuous runs up to twice a week during base-building and up to three times a week in later phases. To improve speed, reduce these workouts in the support phase and focus on VO_2 max training (see p.184). If your 5 km and 10 km race times are fast, focus on fast continuous running to improve your running economy and ability to clear lactate.

What to record

- RPE score for each repetition
- Average time or pace of each repetition
- **Individual time or pace for each repetition** (Note whether the paces were consistent or whether the pace increased or slowed down throughout the workout.)

The focus of interval training is the intensity of the fast sections, so keep track of the repetitions.

INTERVAL TRAINING

Also known as repetition training, interval training involves alternating periods of fast running with periods of recovery. The fast sections are intense, and the recoveries are light. It is performed at various intensity levels, but anaerobic capacity and VO_2 max are most important for distance runners.

VO_2 MAX TRAINING

The intensity of these workouts is lower than anaerobic capacity interval training (see opposite) but higher than lactate threshold. Long fast sections alternate with relatively short recovery periods, which are of equal or half the duration of the fast sections.

BENEFITS

VO_2 max training improves the heart's ability to pump a higher volume of blood and the muscles' capacity to absorb more oxygen, thereby increasing your VO_2 max. It improves speed over 5-km and 10-km distances and helps marathoners who are slower over short distances and are plateauing at their marathon pace. Marathoners with fast 5-km and 10-km race times will be better served with training that is closer to lactate threshold.

HOW TO DO IT

The intensity of these workouts typically correlates with RPE 6–7, a heart rate reserve of 91–94 percent, or 3-km to 5-km race pace. The hard sections last between 20–2000 m (or 30 seconds to 6 minutes in duration).

Example

This shows repetitions for 3-km pace, but 5-km pace is also common.

3-KM PACE REPETITIONS

In this example, 4800 m is divided into 6 repetitions. Each recovery is equal in duration to each fast run (shown by 1 circle). If you average 2.5 minutes per run, each recovery would be 2.5 minutes of walking.

Frequency

As a general rule, you should not begin sustained anaerobic capacity or VO_2 max workouts until the support phase (see p.177), after you have laid a foundation of strength and good running mechanics in the base-building phase. Doing longer hill repeats (see p.186) of 30 seconds to 4 minutes will help in this respect. How frequently you should include interval training in your regime depends on your goal distance.

5 KM GOAL DISTANCE

Anaerobic capacity Perform 10–30-second effort-based reps once a week during the base-building phase. During the support phase, do longer reps every second week.

VO_2 max During the support phase, perform 3-km pace reps every second week. As you prepare for your race in the race-specific phase, perform reps at 3-km pace or 5-km pace (or both) every week.

10 KM GOAL DISTANCE

Anaerobic capacity Perform 10–30-second effort-based reps once a week during the base-building phase. During the support phase, switch to 1500-m pace reps every second week.

VO_2 max During the support phase, perform reps at 3-km pace or 5-km pace every second week. As you prepare for your race in the 10-km race-specific phase, perform reps at 5-km pace every second week.

Intensity and recovery

Interval training and pace-change runs (see p.183) both alternate fast running with slower recoveries. However, interval training is focused on the intensity of the fast sections, while in pace-change runs, the pace of the recovery sections is equally important.

The rest periods in interval training are much slower than in pace-change runs, allowing your muscles to recover at a faster rate. This lets you do a high volume of fast, intense running within a shorter space of time, which improves the ability of your muscles to clear lactate. Interval training should be done on an even, level surface to allow you to maximize your pace as you train.

The two types of interval training recommended for distance runners—anaerobic capacity training and VO_2 max training—are both anaerobic workouts during which lactate builds up in the muscles (see pp.34–35). Therefore, the recovery intervals need to be slow enough to clear the lactate in preparation for the next high-intensity section.

ANAEROBIC CAPACITY TRAINING

This type of interval training is performed at a level of intensity that results in very high levels of lactate in the muscles. Short fast sections are interspersed with longer recovery periods lasting 2–4 times the duration of the fast sections.

BENEFITS

This workout helps increase the amount of energy produced by the anaerobic energy system. The high effort involved in anaerobic capacity training has a direct effect on improving speed over shorter distances, so it benefits 5-km and 10-km goal distances most. For half marathon and marathon training, hill reps at 100 percent intensity (see p.186) may be more beneficial.

HOW TO DO IT

Perform the fast sections at the fastest pace you can maintain without slowing down as the workout progresses. This will result in a heart rate value close to 100 percent by the end of the workout and an RPE of 8–9. (Only flat-out sprinting and the final burst in a race have a higher RPE score.)

Example

This shows intervals for 800-m pace, but 1500-m pace is also common.

800-M PACE REPETITIONS

In this example, 1600 m is divided into 4 repetitions. Each recovery is 4 times the duration of each fast run (shown by 4 circles). If you average 1 minute per run, each recovery would be 4 minutes of walking.

HALF MARATHON GOAL DISTANCE

Anaerobic capacity Perform short 10–30-second effort-based reps once a week during base-building. You do not need longer reps unless doing a 5-km or 10-km race in the same cycle. If so, discontinue them by the marathon race-specific phase.

VO_2 max In the support phase only, perform reps at 5-km pace every second week. Add in reps at 3-km pace if you are competing in a 5-km or 10-km race during the course of the training cycle.

MARATHON GOAL DISTANCE

Anaerobic capacity Perform 10–30-second reps once a week during base-building. Don't do longer reps unless you are racing 5 km or 10 km while marathon training, but end them by marathon race-specific phase.

VO_2 max To improve speed over 5 km and 10 km, perform reps at 3-km pace and 5-km pace every second week. Those racing 5 km or 10 km while marathon training, perform VO_2 max intervals in the support phase, but end them by marathon race-specific phase.

What to record

- Average pace of repetitions
- Heart rate for each uphill run
- RPE score for each uphill run
- **Pace for each uphill run** (Note whether they were consistent or if they increased or decreased throughout the session.)

As long as you use the same hill, monitoring pace helps track improvement. Record your heart rate and RPE to gauge effort.

HILL TRAINING

You can perform hill training either by running up and down a gradient or over rolling terrain. It can be done at any effort and duration. You can perform intervals, fast continuous runs, and even long runs on hills. Unless you only race on the flat, hill training is a must to prepare you fully for your target event.

HILL RUNS

The increased effort required by hill training improves aerobic and muscular conditioning, race preparation, and running form.

BENEFITS

Hill training engages a high percentage of muscle fibers, leading to increased muscular power. In particular, it strengthens muscles around the knee, as uphill running works the calves, hamstrings, and glutes, while downhill running puts more emphasis on the quadriceps. Hill training is a great way to improve the elements of good running form (see pp.74–75). Emphasizing tall posture, a slight forward lean, a high cadence, and striking the ground beneath your center of mass helps you overcome ground resistance running uphill while also

Examples

These examples show the typical duration of repetitions and recoveries for hill workouts of different intensities. Use these examples as a guide if you wish to convert a workout from level to hilly terrain.

UPHILL SPRINTS

↑ **8–15-sec** run @ 100i
+ ↓ **2-min** walk
x4–10

Sprint uphill at 100 percent intensity (RPE 10) for 4–10 repetitions lasting 8–15 seconds each, with full recovery (typically 2 minutes or more walking) between each sprint.
Ideal incline: **10–20%**

DOWNHILL SPRINTS

↓ **15–30-sec** run **+**
↑ **45 sec–2-min** walk
3–10 min

This workout is good for improving running form. Perform 15–30-second runs downhill for a total of 3–10 minutes. Uphill recoveries should last 3–4 times the duration of the downhill run.
Ideal incline: **3–8%**

HILLS AT ANAEROBIC CAPACITY

↑ **15-sec–2-min** run @ AC **+**
↓ **45-sec–6-min** jog
3–16 min

Perform 15-second to 2-minute runs uphill for a total of 3–16 minutes. Downhill recoveries should last 3 times the duration of the uphill run.
Ideal incline: **5–10%**

HILLS AT VO_2 MAX

↑ **30-sec–6-min** run @ VO_2 **+**
↓ **1–12-min** jog
9–36 min

Perform 30-second to 6-minute runs uphill for a total of 9–36 minutes. Downhill recoveries should last twice the duration of the uphill run.
Ideal incline: **5–10%**

HILLS AT LACTATE THRESHOLD

↑ **1–8-min** run @ LT
+ ↓ **1–12-min** walk
20–40 min

Perform 1–8-minute runs uphill for a total of 20–40 minutes. Downhill recoveries should ideally be of equal duration, which is very challenging but helps improve lactate clearance.
Ideal incline: **3–6%**

Frequency

For most runners, the extra intensity and workload of hill runs will mean replacing another key workout.

HILL RUNS

As hard workouts, hill runs should count among your three key weekly workouts (see p.179), so you would not generally perform them more than three times a week. However, if you do run between key training days, keep any extra hill runs very easy. If you are training for a hilly event, consider converting more of your workouts to hill training.

decreasing impact forces as you run downhill. Performing vigorous, short-hill sprints can also increase heart stroke volume (the amount of blood pumped by the heart in a single contraction).

HOW TO DO IT

Find a hill of the right incline and distance for your workout. If the hill is not long enough, decrease the duration of the uphill sections and increase the number of reps. If you do not have access to a hill or an inclined treadmill, you can increase the resistance of the workout by running on a soft surface, such as sand or grass. Paces are difficult to translate from flat to hilly terrain, so these workouts are best done by effort (perhaps assisted by a heart rate monitor) rather than pace. For any given workout, run at the best effort you can maintain without having to slow down as the session progresses. At the end of the workout, you should feel as though you could give 10 percent more if you had to.

CROSS-TRAINING

Any sport or exercise that you do in addition to running is known as cross-training. Engaging in other forms of exercise is an effective way to perform "active recovery," which gives your body a break from the toll of running while still maintaining your fitness and adding variety to your training program.

Cross-training enables you to maintain aerobic fitness while reducing the stress of impact on your joints, muscles, and tendons. This is useful for recovery days and for rehabilitation, if you are returning to training after injury.

VARIETY AND RECOVERY

In older athletes or those with musculoskeletal conditions, cross-training helps reduce the impact on the body while maintaining training load. In younger runners, maintaining variety is important to reduce injury risk and burnout.

Multidirectional activities, such as soccer and basketball, build strength and flexibility in multiple planes and help prevent overuse injuries by adding variation to the repetitive motion of running. However, take care not to incur injuries through cross-training. Strength training (see pp.96–155) also helps prevent injury while improving performance.

RETURNING FROM INJURY

Choose types of cross-training that address your needs without aggravating your injury. For example, pool running is great when impact is the main concern; cycling or using an elliptical are other good options.

Try to mirror what you would be doing in running. For example, replace long, slow runs with long, slow pool runs or bike rides. For interval sessions, take a distance-based session (for example, 6 x 800 m) and convert it to time (for example, 6 x 3 minutes), then aim for the same intensity as the distance-based session in the pool or on the bike or elliptical. This will afford you many of the same cardiovascular benefits as running.

HOW OFTEN SHOULD I CROSS-TRAIN?

Some runners need a break from the impact of running, while others enjoy a change in routine, so the frequency of cross-training should be specific to your individual needs. In general, it is best to perform cross-training on recovery days when you do not have a key workout scheduled.

THE TRAINING PROGRAMS

The programs in this book each recommend three key workouts per week. Symbols are used to denote each workout type, as well as details of distance or duration, pace or effort, duration of recovery sections, and number of repetitions. Each program also includes a graph showing training volume.

THE WORKOUTS

All the programs (except for the Beginner 5 km walk-run program) include workouts from each of the four broad categories described on pp.180–186. In this way, all the key areas of fitness are targeted.

Longer workouts are usually easy continuous runs to develop your endurance or fast continuous runs that improve aerobic capacity, lactate clearance, and pacing. The shorter, more intense workouts are often comprised of speedwork in the form of interval training and hill training, which helps improve muscular and aerobic conditioning.

DYNAMIC WARM-UPS

Some programs prescribe a dynamic warm-up, which is a full sequence of fluid motions that is beneficial for muscle activation and injury prevention. A complete dynamic warm-up routine should consist of dynamic stretches (see pp.78–83), form drills (see pp.84–86 and p.89), and relaxed sprinting or "strides" (see p.87).

STRIDES, SPRINTS, AND ACCELERATIONS

While these are all types of short-interval training, their purpose is neurological and mechanical, as are form drills. Strides are short, fast runs that should be relaxed and performed with good form. Sprints should be high cadence, focusing on a high stride rate rather than a long stride length. Perform accelerations on the flat. Each run should gradually increase in speed to reach 100 percent intensity.

ACTIVATION SESSIONS

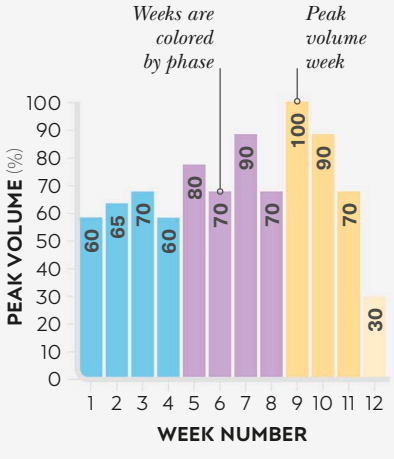
These sessions are designed to activate your muscles 1–2 days before a long run, hard workout, or race. The exercises used stimulate a large percentage of muscle fibers, which helps dispel sluggishness, but are short enough not to induce significant fatigue.

Training volume

These graphs show each program's training volume, which is measured in kilometers per week. Some programs suggest that your exercise level should be at 60 percent of the peak week before you begin. For example, if the peak volume is 100 km per week, you should be able to run 60 km per week.

If you are doing more training than the three key workouts listed, use the graph's volume percentages to scale your training, and progress gradually.

GRADUAL INCREASES
Each program increases in volume and intensity gradually to help you avoid overtraining.



EFFORT AND PACES

For each of the workouts in the programs, there are effort or pace suggestions. Training at a range of paces broadens your running skills and improves fitness at the same time.

The suggested paces are often based on a goal distance, so to use the programs, you will need to work out your goal paces for various distances. An online pace calculator can be used to generate relatively accurate paces based on a personal best time in a race or on a realistic target time based on your current running ability. It is easiest to follow the workouts with the aid of a GPS monitor that can measure your pace during a run.

However, bear in mind that the suggested paces are targets only—maintaining good form and relaxation should be the priority. If you overreach to achieve a goal pace, you will not absorb the training load as effectively as you would have if you had run at a controlled effort. Make it your aim to finish each workout feeling like you could run 10 percent farther at the same pace if you had to.

Nondistance paces

As well as distance-based paces, the following effort-based paces are used regularly in the programs.

Easy pace should be easy enough to achieve recovery. A good guide is to set a limit of 70 percent heart rate reserve (see p.163) or to run at least 20 percent slower than your lactate threshold (LT) pace (see p.166). To calculate this, convert your LT pace to seconds and then multiply by 1.2.

Steady pace is an instruction for the recovery sections of pace-change runs. A steady pace recovery section is performed as close as possible to the pace of the fast section (ideally less than 45 sec/mile slower than the preceding fast section).

KEY TO WORKOUT SYMBOLS

Walk-run program *(pp.190–191)*

Walk

Run

Easy continuous runs *(p.180)*

Short run

Medium run

Long run

Fast continuous runs *(pp.181–183)*

Tempo run

Progression run

Pace-change run

Interval training *(pp.184–185)*

Strides

Sprints

Accelerations

Anaerobic capacity training

VO_2 max training

Hill training *(p.186)*

Hill run

Other

Dynamic warm-up

Shorthand symbols

- Alternate between paces
- ↑ Uphill run/walk/jog
- ↓ Downhill run/walk/jog
- └ x 4 ┘ Number of repetitions
- > Run faster than given pace
- < Run slower than given pace
- @ Run at a given pace

Pace and effort notations

- E Easy pace (RPE 2)
- S Steady pace
- LT Lactate threshold pace (RPE 4.3)
- MP Marathon pace
- HMP Half marathon pace
- 10km 10-km pace
- 5km 5-km pace
- 3km 3-km pace
- 1500m 1500-m pace
- 800m 800-m pace
- VO_2 VO_2 max effort (RPE 6–7)
- AC Anaerobic capacity effort (RPE 8–9)
- 100i 100 percent intensity (RPE 10)
- ○ Recovery walk/jog half the duration of the run
- ● Recovery walk/jog equal to the duration of the run
- ●● Recovery walk/jog twice the duration of the run
- ●●●● Recovery walk/jog four times the duration of the run

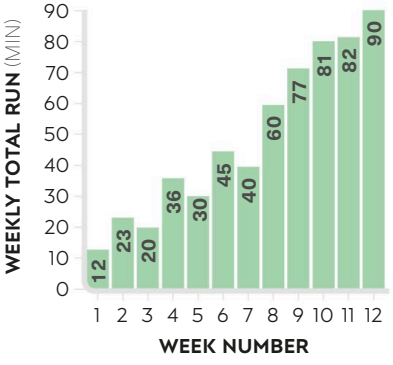
BEGINNER 5 KM PROGRAM

If you are completely new to running, this walk-run program will build your capacity to run from 1 minute at a time to 30 minutes continuously within 12 weeks. Those returning to training after injury can also use this program but may be able to progress more quickly, or start at a later week. Plan your return to running with a physical therapist so your progress can be monitored.

PROGRAM GOALS

This program aims to help you achieve a target distance of 5 km. Running continuously for 30 minutes will cover 5 km if your pace is 6:00 min/km or faster. If it is slower than this, you can achieve 5 km by extending the program. For example, if your pace is 7:00 min/km, aim for a run of 35 minutes. In addition, you could extend the duration of your workout by performing for an extra 10 minutes.

Begin each session with 5 minutes of walking to warm up. Perform the run sections at easy pace (easy enough to carry a conversation while you are running). Do not hesitate to repeat a workout or a week if you do not feel ready for the next level. Take at least 1 day of rest, or do cross-training, between each walk-run workout.



TOTAL RUN TIME PER WEEK
This graph shows how the total time you will be running (versus walking) builds up over the 12-week program.

FOR KEY TO WORKOUT SYMBOLS SEE PP.188–189

WEEK NUMBER	WORKOUT 1	WORKOUT 2	WORKOUT 3
1	1 min + 9 min x3 30 min *(run total 3 min)*	1 min + 7 min x4 32 min *(run total 4 min)*	1 min + 5 min x5 30 min *(run total 5 min)*
2	1 min + 4 min x6 30 min *(run total 6 min)*	1 min + 3 min x7 28 min *(run total 7 min)*	1 min + 2 min x10 30 min *(run total 10 min)*
3	2 min + 9 min x3 33 min *(run total 6 min)*	2 min + 8 min x3 30 min *(run total 6 min)*	2 min + 6 min x4 32 min *(run total 8 min)*
4	2 min + 4 min x5 30 min *(run total 10 min)*	2 min + 3 min x6 30 min *(run total 12 min)*	2 min + 2 min x7 28 min *(run total 14 min)*

WEEK NUMBER	WORKOUT **1**	WORKOUT **2**	WORKOUT **3**
5	3 min + 7 min x3 30 min *(run total 9 min)*	3 min + 6 min x3 27 min *(run total 9 min)*	3 min + 5 min x4 32 min *(run total 12 min)*
6	3 min + 4 min x4 28 min *(run total 12 min)*	3 min + 3 min x5 30 min *(run total 15 min)*	3 min + 2 min x6 30 min *(run total 18 min)*
7	4 min + 6 min x3 30 min *(run total 12 min)*	4 min + 5 min x3 27 min *(run total 12 min)*	4 min + 4 min x4 32 min *(run total 16 min)*
8	4 min + 3 min x4 28 min *(run total 16 min)*	4 min + 2 min x5 30 min *(run total 20 min)*	4 min + 1 min x6 30 min *(run total 24 min)*
9	5 min + 1 min x5 30 min *(run total 25 min)*	6 min + 1 min x4 28 min *(run total 24 min)*	7 min + 1 min x4 32 min *(run total 28 min)*
10	8 min + 1 min x3 27 min *(run total 24 min)*	9 min + 1 min x3 30 min *(run total 27 min)*	10 min + 1 min x3 33 min *(run total 30 min)*
11	12 min + 1 min x2 26 min *(run total 24 min)*	14 min + 1 min x2 30 min *(run total 28 min)*	18 min + 1 min + 12 min x1 31 min *(run total 30 min)*
12	20 min + 1 min + 10 min x1 31 min *(run total 30 min)*	24 min + 1 min + 6 min x1 31 min *(run total 30 min)*	30 min

BEGINNER 10 KM PROGRAM

This program prepares you to complete 10 km in your first race. Before starting, you should be capable of a continuous 3-mile run, be running 3 times a week, and have built up an exercise volume equivalent to 60 percent of the program's peak volume.

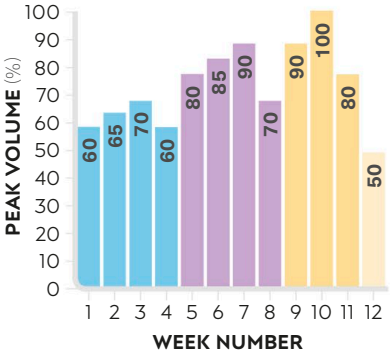
In this program, any workout beginning with a pace other than easy should be preceded by a 10-minute easy run and a dynamic warm-up.

PROGRAM GOALS

Weeks 1–4 focus on base-building by increasing the distance of the long run. Perform the 30-second stride workouts in a form-focused but relaxed way, to create an easy, efficient stride. Recover in week 4.

In the support phase, the program intensifies with pace-change runs, interval training, and hill training. Like the strides, the hill reps should be done with form and relaxation as the main goals. Week 8 is a recovery week, with easier workouts and a shorter long run.

Weeks 9–12 are race-specific, with longer pace-change and intervals workouts. During the taper in week 12, reduce any easy runs or cross-training to less than 50 percent of your usual volume.



TRAINING VOLUME PER WEEK
The training volume builds gradually, peaking in week 10. Weeks 4 and 8 are recovery weeks, and week 12 is tapered.

FOR KEY TO WORKOUT SYMBOLS SEE PP.188–189

WEEK NUMBER		WORKOUT 1	WORKOUT 2	WORKOUT 3
BASE-BUILDING	1	15 min + 30-sec strides + 1-min walk x6 + 5 min	15 min + 30-sec strides + 1-min walk x6 + 5 min	3 miles
	2	20 min + 30-sec strides + 1-min walk x8 + 5 min	20 min + 30-sec strides + 1-min walk x8 + 5 min	4 miles
	3	25 min + 30-sec strides + 1-min walk x10 + 5 min	25 min + 30-sec strides + 1-min walk x10 + 5 min	4.5 miles
	4	15 min + 30-sec strides + 1-min walk x4 + 5 min	15 min + 30-sec strides + 1-min walk x4 + 5 min	3 miles

WEEK NUMBER		WORKOUT 1	WORKOUT 2	WORKOUT 3
5	SUPPORT	**15 min** ⤮ **1 min** @ LT with **4 min** @ E, end with **5-min** walk + **30-sec** strides + **1-min** walk — x4	**2 miles** + ↻ + **30-sec** run @ AC + ↓ **90-sec** walk — x6	**4.5 miles** *Finish the last* **half mile** @ LT *if you are feeling strong*
6	SUPPORT	**18 min** ⤮ **2 min** @ LT with **4 min** @ E, end with **5-min** walk + **30-sec** strides + **1-min** walk — x4	**1 min** @ 3km + **1-min** walk — x10	**5 miles** *Finish the last* **half mile** @ LT *if you are feeling strong*
7	SUPPORT	**24 min** ⤮ **4 min** @ LT with **4 min** @ E, end with **5-min** walk + **30-sec** strides + **1-min** walk — x4	**2.5 miles** + ↻ + **30-sec** run @ AC + ↓ **90-sec** walk — x8	**5 miles** *Finish the last* **mile** @ LT *if you are feeling strong*
8	SUPPORT	**15 min** ⤮ **1 min** @ LT with **4 min** @ E, end with **5-min** walk + **30-sec** strides + **1-min** walk — x4	**15 min** + ↻ + **30-sec** strides + **1-min** walk — x6 + **5 min**	**4 miles**
9	RACE-SPECIFIC	**24 min** ⤮ **6 min** @ LT with **2 min** @ E, end with **5-min** walk + **30-sec** strides + **1-min** walk — x4	**3 min** @ 5km + **90-sec** walk — x6	**5.5 miles** *Finish the last* **1.5 miles** @ LT *if you are feeling strong*
10	RACE-SPECIFIC	**20 min** ⤮ **8 min** @ LT with **2 min** @ E, end with **5-min** walk + **30-sec** strides + **1-min** walk — x4	**2.5 miles** + ↻ + **30-sec** run @ AC + ↓ **90-sec** walk — x10	**5.5 miles** *Finish the last* **2 miles** @ LT *if you are feeling strong*
11	RACE-SPECIFIC	**20 min** @ LT, end with **5-min** walk + **30-sec** strides + **1-min** walk — x4	**4 min** @ 5km + **2-min** walk — x3 + **2 min** @ 3km + **2-min** walk — x3	**4 miles**
12	TAPER	**15 min** ⤮ **1 min** @ LT with **4 min** @ E, end with **5-min** walk + **30-sec** strides + **1-min** walk — x4	**15 min** + ↻ + **30-sec** strides + **1-min** walk — x6 + **5 min** 2–3 days before race	RACE DAY

ADVANCED 10 KM PROGRAM

If you have competed in 10 km races before, this program is designed to help you improve your race times by building up the intensity and duration of the workouts. You should be able to run continuously for 10 miles before starting this program.

In this program, any workout that begins with marathon pace or faster (see pp.188–189) should be preceded by a 2-mile easy run and a dynamic warm-up.

INTRODUCTION PHASE

This phase prepares you for the base-building phase by building up to 60 percent of peak volume. This may take longer than three weeks, depending on your starting point, so repeat a week if needed.

BASE-BUILDING PHASE

Weeks 4–9 will raise aerobic volume, introduce aerobic intensity, and improve your running skills. Workout 1 focuses on interval training on hills and on the flat. Workout 2 consists of short and medium fast continuous runs with increasing intensity, while the long runs of workout 3 increase in volume and aerobic intensity.

SUPPORT PHASE

In week 10, workouts 1 and 2 are lighter to aid recovery. Weeks 11–15 continue to increase aerobic volume and aim to improve your speed endurance, lactate threshold speed, and ability to clear lactate. In workout 1, the short and medium runs become more difficult, and longer hill workouts at VO_2 max effort are added. Workout 2 introduces VO_2 max and anaerobic-capacity intervals. Workout 3 expands the time spent at half marathon pace (HMP) and increases the pace of the steady recoveries during these runs.

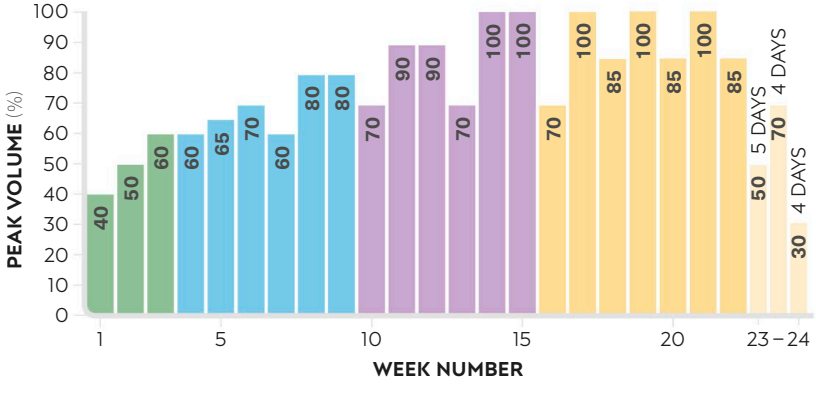
RACE-SPECIFIC PHASE

Following lighter workouts in week 16 to aid recovery, weeks 17–24 prepare you to run at goal race pace and keep lactate levels relatively low so that your muscles can clear any accumulated lactate quickly. Workouts 1 and 2 consist of pace-change runs at 10 km, fast continuous runs that increase in duration, short-hill sprints to maintain power, and interval training to maintain speed. For workout 3, during pace-change runs at HMP, keep the steady pace sections as close to HMP as possible.

TAPER

The 13-day taper in weeks 23 and 24 is divided into 3 parts: an initial 5-day taper kick-starts your recovery after the peak training phase; the next 4 days increase the load slightly to include workouts that maintain your fitness without stressing your body; and a final 4-day taper during which you should perform only an activation session before your race.

FOR KEY TO WORKOUT SYMBOLS SEE PP.188–189



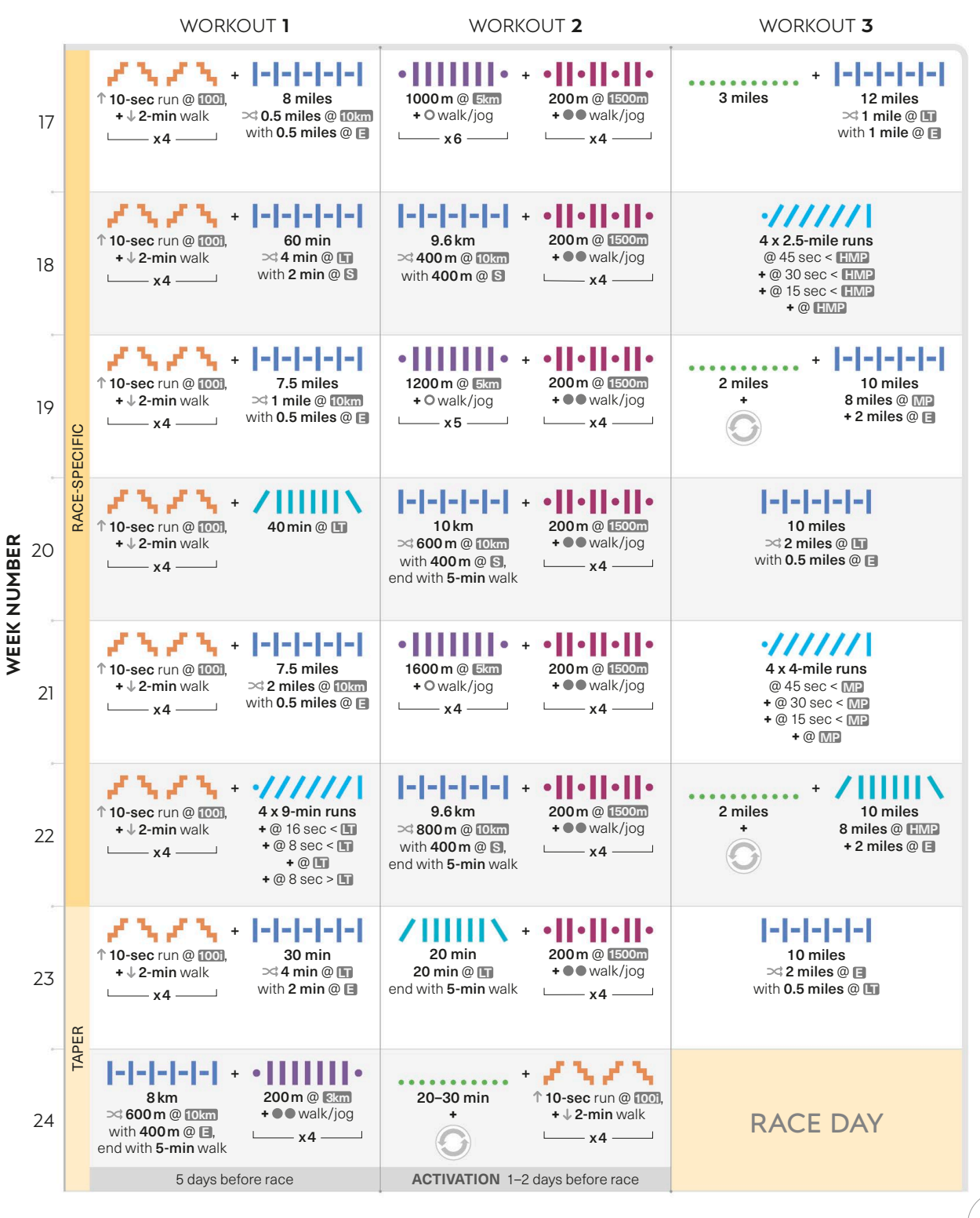
PHASE OF PROGRAM

- Introduction
- Base-building
- Support
- Race-specific
- Taper

TRAINING VOLUME PER WEEK
Training volume peaks in week 14 and is maintained (not increased) until a 13-day taper, which is split into 3 parts.

WEEK NUMBER		WORKOUT 1	WORKOUT 2	WORKOUT 3
1	INTRODUCTION	30 min	30 min	6 miles
2	INTRODUCTION	40 min +	40 min +	7.5 miles
3	INTRODUCTION	50 min +	50 min +	9 miles
4	BASE-BUILDING	30-sec sprint + 60–90-sec walk x8	30 min ⤮ 1 min @ 15 sec > LT with 2 min @ E	9 miles ⤮ 7.5 miles @ E with 1.5 miles @ HMP
5	BASE-BUILDING	↑ 10-sec run @ 100% + ↓ 2-min walk x5 + 30-sec sprint + 60–90-sec walk x5	30 min 10 min @ 60 sec < LT + 8 min @ 45 sec < LT + 6 min @ 30 sec < LT + 4 min @ 15 sec < LT + 2 min @ LT	10 miles ⤮ 2.5 miles @ E with 0.5 miles @ LT
6	BASE-BUILDING	↑ 10-sec run @ 100% + ↓ 2-min walk x8 + 30-sec sprint + 60–90-sec walk x4	50 min 30 min @ E + 10 min @ LT + 10 min @ E	5 x 2-mile runs @ 90 sec < HMP + @ 75 sec < HMP + @ 50 sec < HMP + @ 25 sec < HMP + @ HMP
7	BASE-BUILDING	↑ 15-sec run @ 100% + ↓ 2-min walk x8 + 30-sec accelerations + 60–90-sec walk x4	30 min ⤮ 90 sec @ 15 sec > LT with 90 sec @ E	12 miles 4 miles @ E + 4 miles @ MP + 4 miles @ E
8	BASE-BUILDING	↑ 15-sec run @ 100% + ↓ 2-min walk x10 + 30-sec accelerations + 60–90-sec walk x4	5 x 6-min runs @ 60 sec < LT + @ 45 sec < LT + @ 30 sec < LT + @ 15 sec < LT + @ LT	2 miles + 10 miles ⤮ 0.5 miles @ LT with 1.5 miles @ E

		WORKOUT 1	WORKOUT 2	WORKOUT 3
9	BASE-BUILDING	↑ 15-sec run @ 100i, + ↓ 2-min walk — x10 + 30-sec accelerations + 60–90-sec walk — x6	50 min 20 min @ E + 20 min @ LT + 10 min @ E	4 x 3-mile runs @ 90 sec < MP + @ 60 sec < MP + @ 30 sec < MP + @ MP
10	SUPPORT	30 min ⤮ 4 min @ LT with 2 min @ E, end with 5-min walk + 30 sec @ 3km – 1500m, 1-min walk — x4	20–30 min + + ↑ 10-sec run @ 100i, + ↓ 2-min walk — x4 ACTIVATION	9 miles 3 miles @ E + 3 miles @ HMP + 3 miles @ E *or substitute with a 3–5 km race*
11	SUPPORT	↑ 15-sec run @ 100i, + ↓ 2-min walk — x4 + ↑ 1-min run @ VO_2, + ↓ 2-min jog — x12	300 m @ 1500m + ●● walk/jog — x5 + 200 m @ 800m + ●●●● walk/jog — x5	2 miles + 12 miles ⤮ 0.5 miles @ LT with 1 mile @ E
12	SUPPORT	↑ 15-sec run @ 100i, + ↓ 2-min walk — x4 + 21 min ⤮ 1 min @ 15 sec > LT with 2 min @ S	800 m @ 3km + ● walk/jog — x5 + 200 m @ 1500m + ●● walk/jog — x4	5 x 2-mile runs @ 60 sec < HMP + @ 45 sec < HMP + @ 30 sec < HMP + @ 15 sec < HMP + @ HMP
13	SUPPORT	↑ 15-sec run @ 100i, + ↓ 2-min walk — x4 + ↑ 90-sec run @ VO_2, + ↓ 3-min jog — x8	400 m @ 1500m + ●● walk/jog — x5 + 200 m @ 800m + ●●●● walk/jog — x5	14 miles 3 miles @ E + 8 miles @ MP + 3 miles @ E
14	SUPPORT	↑ 15-sec run @ 100i, + ↓ 2-min walk — x4 + 4 x 6-min runs + @ 45 sec < LT + @ 30 sec < LT + @ 15 sec < LT + @ LT	1000 m @ 3km + ● walk/jog — x4 + 200 m @ 1500m + ●● walk/jog — x4	10 miles ⤮ 1.5 mile @ LT with 0.5 miles @ E
15	SUPPORT	↑ 15-sec run @ 100i, + ↓ 2-min walk — x4 + ↑ 2-min run @ VO_2, + ↓ 2-min jog — x6	600 m @ 1500m + ●● walk/jog — x4 + 200 m @ 800m + ●●●● walk/jog — x5	4 x 4-mile runs @ 75 sec < MP + @ 50 sec < MP + @ 25 sec < MP + @ MP
16	RACE-SPECIFIC	30 min ⤮ 4 min @ LT with 2 min @ E, end with 5-min walk + 30 sec @ 3km + 1-min walk — x4	20–30 min + + ↑ 10-sec run @ 100i, + ↓ 2-min walk — x4 ACTIVATION	10 miles 2.5 miles @ E + 5 miles @ HMP + 2.5 miles @ E *or substitute with a 5–8 km race*


WORKOUT 1
WORKOUT 2
WORKOUT 3
WEEK NUMBER
RACE-SPECIFIC
TAPER
17
↑ 10-sec run @ 100i, + ↓ 2-min walk x4
+
8 miles ⤮ 0.5 miles @ 10km with 0.5 miles @ E
1000 m @ 5km + walk/jog x6
+
200 m @ 1500m + walk/jog x4
3 miles
+
12 miles ⤮ 1 mile @ LT with 1 mile @ E
18
↑ 10-sec run @ 100i, + ↓ 2-min walk x4
+
60 min ⤮ 4 min @ LT with 2 min @ S
9.6 km ⤮ 400 m @ 10km with 400 m @ S
+
200 m @ 1500m + walk/jog x4
4 x 2.5-mile runs @ 45 sec < HMP + @ 30 sec < HMP + @ 15 sec < HMP + @ HMP
19
↑ 10-sec run @ 100i, + ↓ 2-min walk x4
+
7.5 miles ⤮ 1 mile @ 10km with 0.5 miles @ E
1200 m @ 5km + walk/jog x5
+
200 m @ 1500m + walk/jog x4
2 miles +
+
10 miles 8 miles @ MP + 2 miles @ E
20
↑ 10-sec run @ 100i, + ↓ 2-min walk x4
+
40 min @ LT
10 km ⤮ 600 m @ 10km with 400 m @ S, end with 5-min walk
+
200 m @ 1500m + walk/jog x4
10 miles ⤮ 2 miles @ LT with 0.5 miles @ E
21
↑ 10-sec run @ 100i, + ↓ 2-min walk x4
+
7.5 miles ⤮ 2 miles @ 10km with 0.5 miles @ E
1600 m @ 5km + walk/jog x4
+
200 m @ 1500m + walk/jog x4
4 x 4-mile runs @ 45 sec < MP + @ 30 sec < MP + @ 15 sec < MP + @ MP
22
↑ 10-sec run @ 100i, + ↓ 2-min walk x4
+
4 x 9-min runs + @ 16 sec < LT + @ 8 sec < LT + @ LT + @ 8 sec > LT
9.6 km ⤮ 800 m @ 10km with 400 m @ S, end with 5-min walk
+
200 m @ 1500m + walk/jog x4
2 miles +
+
10 miles 8 miles @ HMP + 2 miles @ E
23
↑ 10-sec run @ 100i, + ↓ 2-min walk x4
+
30 min ⤮ 4 min @ LT with 2 min @ E
20 min 20 min @ LT end with 5-min walk
+
200 m @ 1500m + walk/jog x4
10 miles ⤮ 2 miles @ E with 0.5 miles @ LT
24
8 km ⤮ 600 m @ 10km with 400 m @ E, end with 5-min walk
+
200 m @ 3km + walk/jog x4
20–30 min +
+
↑ 10-sec run @ 100i, + ↓ 2-min walk x4
RACE DAY
5 days before race
ACTIVATION 1–2 days before race

BEGINNER HALF MARATHON PROGRAM

This program trains you to complete a first half marathon. Before starting, you should be capable of a continuous 6-mile run, be running 3 times a week, and have built up an exercise volume equivalent to 60 percent of the program's peak volume.

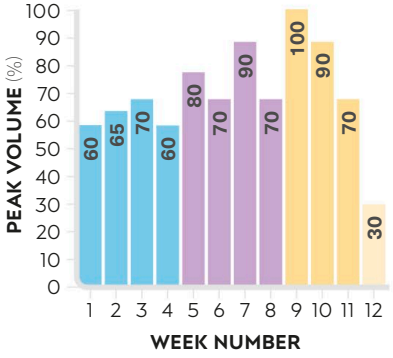
In this program, any workout starting faster than easy pace should be preceded by a 10-minute easy run and a dynamic warm-up.

PROGRAM GOALS

During base-building in weeks 1–4, the aims are to build volume via long runs, introduce intensity with short and long pace-change runs, and improve form with strides, sprints, and hill workouts.

Weeks 5–8 (support phase) introduce interval training at 3 km pace and 1500 m pace. Easy continuous runs are longer, and the ratio of fast to easy pace running becomes harder.

Weeks 9–12 are race-specific. The long runs and fast continuous runs both become longer and the ratio of fast to easy pace running increases. Interval training shifts to 5 km pace. Begin the 7–8-day taper in week 12 the weekend before your race, after the long run in week 11.

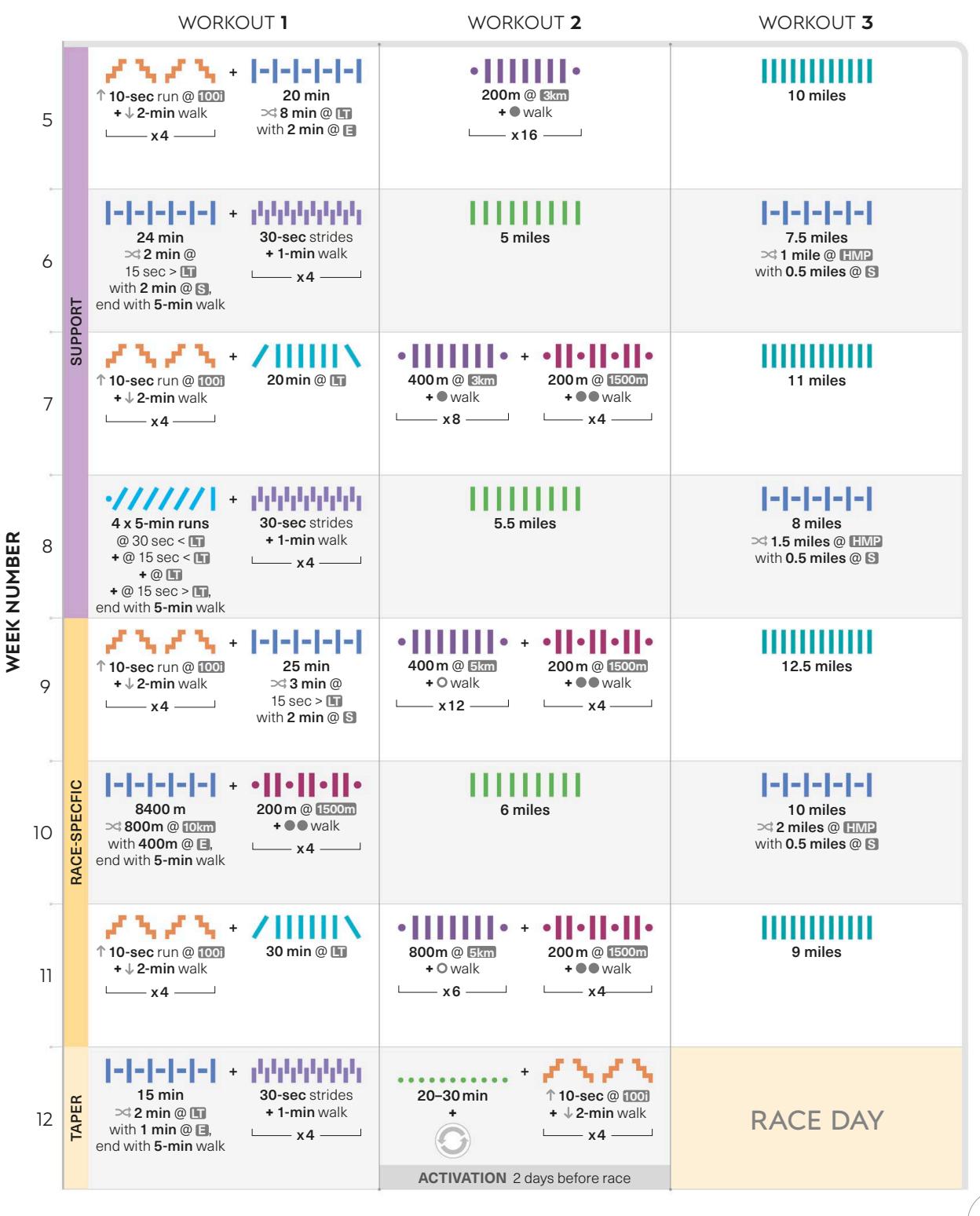


TRAINING VOLUME PER WEEK
The training volume builds to a peak in week 9. Week 12 drops to 30 percent volume, so you are fresh for your race.

FOR KEY TO WORKOUT SYMBOLS SEE PP.188–189

WEEK NUMBER	WORKOUT 1	WORKOUT 2	WORKOUT 3
1	18 min ⤭ 2 min @ LT with 4 min @ E, end with 5-min walk + 30-sec strides + 1-min walk x4	↑ 10-sec run @ 100i + ↓ 2-min walk x2 + 30-sec sprint + 60–90-sec walk x6	6 miles
2	18 min ⤭ 1 min @ 15 sec > LT with 2 min @ E, end with 5-min walk + 30-sec strides + 1-min walk x4	3 miles	7.5 miles ⤭ 2 miles @ E with 0.5 miles @ HMP
3	24 min ⤭ 4 min @ LT with 4 min @ E, end with 5-min walk + 30-sec strides + 1-min walk x4	↑ 10-sec run @ 100i + ↓ 2-min walk x4 + 30-sec sprint + 60–90-sec walk x8	9 miles
4	24 min ⤭ 2 min @ 15 sec > LT with 2 min @ E, end with 5-min walk + 30-sec strides + 1-min walk x4	4.5 miles	8 miles ⤭ 0.5 miles @ HMP with 0.5 miles @ S

BASE-BUILDING


WORKOUT 1
WORKOUT 2
WORKOUT 3
WEEK NUMBER
SUPPORT
RACE-SPECIFIC
TAPER
5
6
7
8
9
10
11
12
↑ 10-sec run @ 100i
+ ↓ 2-min walk
x4
20 min
⤮ 8 min @ LT
with 2 min @ E
200m @ 3km
+ ● walk
x16
10 miles
24 min
⤮ 2 min @
15 sec > LT
with 2 min @ S,
end with 5-min walk
30-sec strides
+ 1-min walk
x4
5 miles
7.5 miles
⤮ 1 mile @ HMP
with 0.5 miles @ S
20 min @ LT
400 m @ 3km
+ ● walk
x8
200 m @ 1500m
+ ●● walk
x4
11 miles
4 x 5-min runs
@ 30 sec < LT
+ @ 15 sec < LT
+ @ LT
+ @ 15 sec > LT,
end with 5-min walk
5.5 miles
8 miles
⤮ 1.5 miles @ HMP
with 0.5 miles @ S
25 min
⤮ 3 min @
15 sec > LT
with 2 min @ S
400 m @ 5km
+ ○ walk
x12
12.5 miles
8400 m
⤮ 800m @ 10km
with 400m @ E,
end with 5-min walk
6 miles
10 miles
⤮ 2 miles @ HMP
with 0.5 miles @ S
30 min @ LT
800m @ 5km
+ ○ walk
x6
9 miles
15 min
⤮ 2 min @ LT
with 1 min @ E,
end with 5-min walk
20–30 min
+
↑ 10-sec @ 100i
+ ↓ 2-min walk
x4
ACTIVATION 2 days before race
RACE DAY

ADVANCED HALF MARATHON PROGRAM

This program is ideal when you have completed a major race and want to prepare for the next half marathon. Over 24 weeks, this training program aims to help you reach your goal race time.

In this program, any workout that begins with marathon pace or faster (see pp.188–189) should be preceded by a 2-mile easy run and a dynamic warm-up.

INTRODUCTION PHASE

Your goal in this phase is to recover from the previous race and achieve 60 percent of peak training volume before starting the next phase. This may take longer than three weeks, so repeat a week if needed.

BASE-BUILDING PHASE

In weeks 4–9, workout 1 improves running skills with short sprints (on hills and on the flat); workout 2 introduces aerobic intensity with short and medium fast continuous runs; and workout 3 builds aerobic volume and intensity with long fast continuous runs.

SUPPORT PHASE

Recover in week 10 with lighter sessions for workouts 1 and 2. Weeks 11–15 aim to improve your aerobic volume, speed endurance, lactate threshold speed, and lactate clearance. For workout 1, the pace-change and progression runs become harder, and longer hill workouts are introduced. Workout 2 introduces VO_2 max and anaerobic capacity intervals. The long runs for workout 3 are designed to help you practice half marathon goal pace.

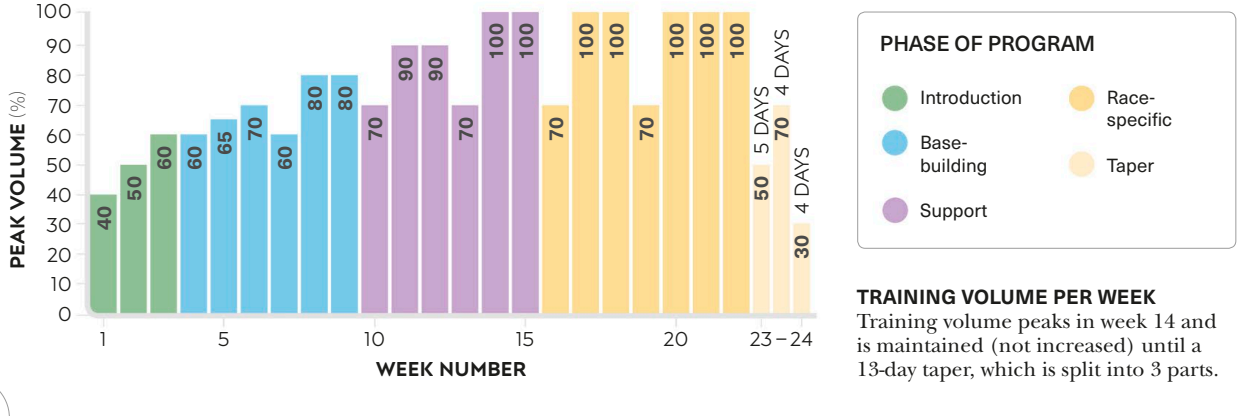
RACE-SPECIFIC PHASE

Lighter workouts in week 16 will help you recover before weeks 17–22, during which you will spend longer running at goal race pace. Workout 1 increases the difficulty of the pace-change runs to improve your ability to clear lactate from the muscles and includes short sprints to maintain power. Workout 2 contains short-hill sprints and medium fast continuous runs that increase in intensity. Workout 3 focuses on long runs at half marathon pace (HMP); aim to keep the steady pace sections of these runs as close to HMP as possible.

TAPER

The 13-day taper in weeks 23 and 24 is divided into 3 parts: an initial 5-day taper kick-starts your recovery after training at peak volume in weeks 20–22; the next 4 days increase the load slightly to include workouts that maintain your fitness without stressing your body; and a final 4-day taper during which you should perform only an activation session before your race.

FOR KEY TO WORKOUT SYMBOLS SEE PP.188–189



TRAINING VOLUME PER WEEK
Training volume peaks in week 14 and is maintained (not increased) until a 13-day taper, which is split into 3 parts.

WEEK NUMBER		WORKOUT 1	WORKOUT 2	WORKOUT 3
1	INTRODUCTION	30 min	30 min	6 miles
2	INTRODUCTION	40 min +	40 min +	7.5 miles
3	INTRODUCTION	50 min +	50 min +	9 miles
4	BASE-BUILDING	30-sec sprint + 60–90-sec walk x8	30 min ⤮ 1 min @ 15 sec > LT with 2 min @ E	3 miles + 6 miles ⤮ 0.5 miles @ LT with 1 mile @ E
5	BASE-BUILDING	↑ 10-sec run @ 100i + ↓ 2-min walk x5 + 30-sec sprint + 60–90-sec walk x5	50 min 30 min @ E + 10 min @ LT + 10 min @ E	4 x 2.5-mile runs @ 1 min 40 sec < HMP + @ 1 min 15 sec < HMP + @ 50 sec < HMP + @ 25 sec < HMP
6	BASE-BUILDING	↑ 10-sec run @ 100i + ↓ 2-min walk x8 + 30-sec sprint + 60–90-sec walk x4	30 min 10 min @ 60 sec < LT + 8 min @ 45 sec < LT + 6 min @ 30 sec < LT + 4 min @ 15 sec < LT + 2 min @ LT	2.5 miles + 7.5 miles ⤮ 2 miles @ 30 sec < HMP with 0.5 miles @ E
7	BASE-BUILDING	↑ 15-sec run @ 100i + ↓ 2-min walk x8 + 30-sec accelerations + 60–90-sec walk x4	30 min ⤮ 90 sec @ 15 sec > LT with 90 sec @ E	2 miles + 8 miles ⤮ 0.5 miles @ LT with 0.5 miles @ E
8	BASE-BUILDING	↑ 15-sec run @ 100i + ↓ 2-min walk x10 + 30-sec accelerations + 60–90-sec walk x4	50 min 20 min @ E + 20 min @ LT + 10 min @ E	6 x 2-mile runs @ 90 sec < HMP + @ 75 sec < HMP + @ 60 sec < HMP + @ 45 sec < HMP + @ 30 sec < HMP + @ 15 sec < HMP

ADVANCED HALF MARATHON

WEEK NUMBER		WORKOUT 1	WORKOUT 2	WORKOUT 3
9	BASE-BUILDING	↑ 15-sec run @ 100i + ↓ 2-min walk x 10 + 30-sec accelerations + 60–90-sec walk x 6	5 x 6-min runs @ 60 sec < LT + @ 45 sec < LT + @ 30 sec < LT + @ 15 sec < LT + @ LT	2 miles + 10 miles ⤮ 2 miles @ 30 sec < HMP with 0.5 miles @ E
10	SUPPORT	30 min ⤮ 4 min @ LT with 2 min @ E, end with 5-min walk + 30 sec @ 3km–1500m + 1-min walk x 4	20–30 min + ACTIVATION + ↑ 10-sec run @ 100i + ↓ 2-min walk x 4	8 miles ⤮ 0.5 miles @ HMP with 0.5 miles @ S *or substitute with a 5–8 km race*
11	SUPPORT	↑ 15-sec run @ 100i + ↓ 2-min walk x 4 + ↑ 1-min run @ VO_2 + ↓ 2-min jog x 12	1000m @ 5km + walk/jog x 6 + 200 m @ 1500m + walk/jog x 4	12 miles 2 miles @ E + 8 miles @ 30 sec < HMP + 2 miles @ E
12	SUPPORT	↑ 15-sec run @ 100i + ↓ 2-min walk x 4 + 20 min ⤮ 1 min @ 15 sec > LT with 2 min @ S, end with 5-min walk	800m @ 3km + walk/jog x 5 + 200 m @ 1500m + walk/jog x 4	5 x 2.5-mile runs @ 1 min 40 sec < HMP + @ 1 min 15 sec < HMP + @ 50 sec < HMP + @ 25 sec < HMP + @ HMP
13	SUPPORT	↑ 15-sec run @ 100i + ↓ 2-min walk x 4 + ↑ 90-sec run @ VO_2 + ↓ 3-min jog x 8	1200m @ 5km + walk/jog x 5 + 200 m @ 1500m + walk/jog x 4	9 miles ⤮ 1 mile @ HMP with 0.5 miles @ S
14	SUPPORT	↑ 15-sec run @ 100i + ↓ 2-min walk x 4 + 4 x 6-min runs @ 45 sec < LT + @ 30 sec < LT + @ 15 sec < LT + @ LT	1000m @ 3km + walk/jog x 4 + 200 m @ 1500m + walk/jog x 4	14 miles 2 miles @ E + 10 miles @ 25 sec < HMP + 2 miles @ E
15	SUPPORT	↑ 15-sec run @ 100i + ↓ 2-min walk x 4 + ↑ 2-min run @ VO_2 + ↓ 4-min jog x 6	1600m @ 5km + walk/jog x 4 + 200 m @ 1500m + walk/jog x 4	4 x 3-mile runs @ 75 sec < HMP + @ 50 sec < HMP + @ 25 sec < HMP + @ HMP
16	RACE-SPECIFIC	30 min ⤮ 4 min @ LT with 2 min @ E, end with 5-min walk + 30 sec @ 3km + 1-min walk x 4	20–30 min + ACTIVATION + ↑ 10-sec run @ 100i + ↓ 2-min walk x 4	10 miles ⤮ 1.5 miles @ HMP with 0.5 miles @ S *or substitute with a 10–15 km race*

		WORKOUT 1	WORKOUT 2	WORKOUT 3
17	RACE-SPECIFIC	**30 min** ⤭ **2 min** @ 15 sec > LT with **3 min** @ S, end with **5-min** walk + **30 sec** @ 3km – 1500m **+ 1-min** walk x 6	↑ **10-sec** run @ 100i **+** ↓ **2-min** walk x 4 + **60 min** ⤭ **3 min** @ LT with **3 min** @ S	**2.5 miles** **+** *(optional)* + **12.5 miles** **10 miles** @ 15 sec < HMP **+ 2.5 miles** @ E
18	RACE-SPECIFIC	**8 miles** ⤭ **0.5 miles** @ 10km with **0.5 miles** @ E, end with **5-min** walk + **30 sec** @ 3km – 1500m **+ 1-min** walk x 6	↑ **10-sec** run @ 100i **+** ↓ **2-min** walk x 4 + **35 min** @ LT	**5 x 3-mile runs** @ 80 sec < HMP **+** @ 60 sec < HMP **+** @ 40 sec < HMP **+** @ 20 sec < HMP **+** @ HMP
19	RACE-SPECIFIC	**30 min** ⤭ **3 min** @ 15 sec > LT with **3 min** @ S, end with **5-min** walk + **30 sec** @ 3km – 1500m **+ 1-min** walk x 6	↑ **10-sec** run @ 100i **+** ↓ **2-min** walk x 4 + **4 x 9-min runs** @ 24 sec < LT **+** @ 16 sec < LT **+** @ 8 sec < LT **+** @ LT	**10 miles** ⤭ **2 miles** @ HMP with **0.5 miles** @ S
20	RACE-SPECIFIC	**7.5 miles** ⤭ **1 mile** @ 10km with **0.5 miles** @ E, end with **5-min** walk + **30 sec** @ 3km – 1500m **+ 1-min** walk x 6	↑ **10-sec** run @ 100i **+** ↓ **2-min** walk x 4 + **60 min** ⤭ **4 min** @ LT with **2 min** @ S	**2.5 miles** **+** *(optional)* + **12.5 miles** **10 miles** @ 10 sec < HMP **+ 2.5 miles** @ E
21	RACE-SPECIFIC	**30 min** ⤭ **3 min** @ 15 sec > LT with **2 min** @ S, end with **5-min** walk + **30 sec** @ 3km – 1500m **+ 1-min** walk x 6	↑ **10-sec** run @ 100i **+** ↓ **2-min** walk x 4 + **40 min** @ LT	**5 x 3-mile runs** @ 45 sec < HMP **+** @ 35 sec < HMP **+** @ 25 sec < HMP **+** @ 15 sec < HMP **+** @ HMP
22	RACE-SPECIFIC	**7.5 miles** ⤭ **2 miles** @ 10km with **0.5 miles** @ E, end with **5-min** walk + **30 sec** @ 3km – 1500m **+ 1-min** walk x 6	↑ **10-sec** run @ 100i **+** ↓ **2-min** walk x 4 + **4 x 9-min runs** @ 16 sec < LT **+** @ 8 sec < LT **+** @ LT **+** 8 sec > LT	**9 miles** @ HMP
23	TAPER	**30 min** ⤭ **4 min** @ LT with **2 min** @ E, end with **5-min** walk + **30 sec** @ 3km – 1500m **+ 1-min** walk x 4	↑ **10-sec** run @ 100i **+** ↓ **2-min** walk x 4 + **20 min** @ LT	**10 miles** ⤭ **2 miles** @ E with **0.5 miles** @ HMP
24	TAPER	**5 miles** ⤭ **0.5 miles** @ HMP with **0.5 miles** @ E, end with **5-min** walk + **30 sec** @ 3km **+ 1-min** walk x 6	**20–30 min** **+** + ↑ **10-sec** run @ 100i **+** ↓ **2-min** walk x 4	RACE DAY
		5 days before race	**ACTIVATION** 1 or 2 days before race	

BEGINNER MARATHON PROGRAM

This program prepares you for a first marathon. Before starting, you should be capable of running 13 miles continuously, be running at least 3 times a week, and have built up an exercise volume equivalent to 60 percent of the program's peak volume.

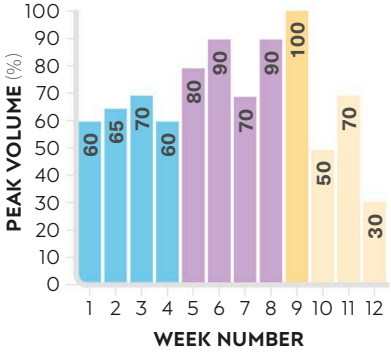
In this program, any workout beginning with a pace other than easy should be preceded by a 10-minute easy run and a dynamic warm-up.

PROGRAM GOALS

During base-building, weeks 1–4, long runs increase in intensity and distance, while strides, sprints, and hill training are introduced to improve speed and power.

In weeks 5–8, the support phase introduces anaerobic capacity and VO_2 max intervals to improve lactate clearance. The volume of fast continuous and long runs increases to help improve your endurance.

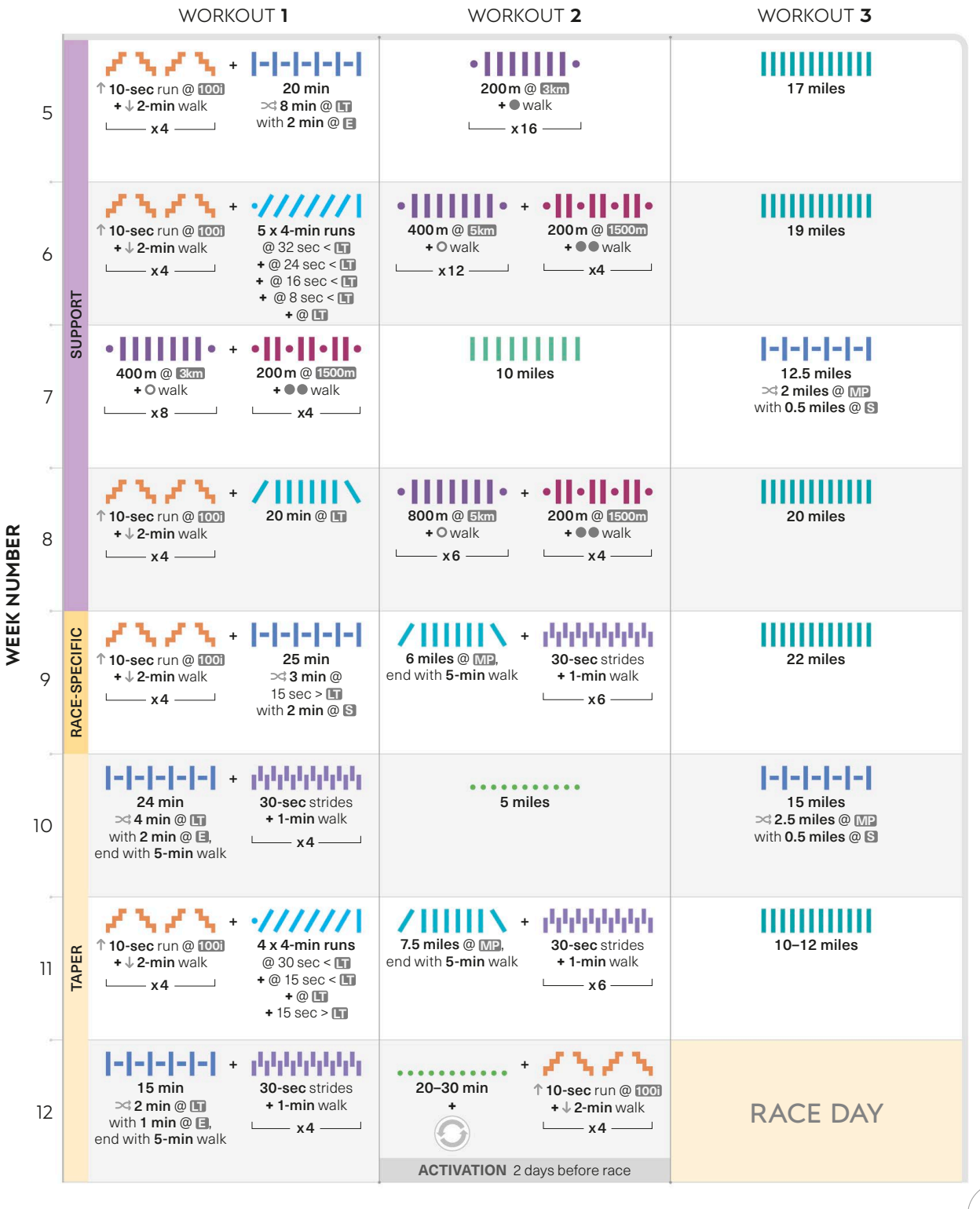
The race-specific phase, weeks 9–12, focuses on aerobic intensity, with workouts ranging from marathon pace to slightly faster than lactate threshold pace. Allowing time for rest and recovery before the race are the main goals in the final three weeks.



TRAINING VOLUME PER WEEK
The training volume builds gradually to a peak in week 9. A long taper period allows adequate recovery before racing.

FOR KEY TO WORKOUT SYMBOLS SEE PP.188–189

WEEK NUMBER	BASE-BUILDING	WORKOUT 1	WORKOUT 2	WORKOUT 3
1		18 min ⤭ 2 min @ LT with 4 min @ E, end with 5-min walk + 30-sec strides + 1-min walk x4	30-sec sprint + 60–90-sec walk x8	13 miles
2		24 min ⤭ 2 min @ 15 sec > LT with 2 min @ E, end with 5-min walk + 30-sec strides + 1-min walk x4	6 miles	10 miles ⤭ 0.5 miles @ MP with 0.5 miles @ E
3		24 min ⤭ 4 min @ LT with 4 min @ E, end with 5-min walk + 30-sec strides + 1-min walk x4	↑ 10-sec run @ 100i + ↓ 2-min walk x4 + 30-sec sprint + 60–90-sec walk x6	15 miles
4		↑ 10-sec run @ 100i + ↓ 2-min walk x4 + 24 min ⤭ 2 min @ 15 sec > LT with 2 min @ S	7.5 miles	12 miles ⤭ 1 mile @ MP with 0.5 miles @ S


WORKOUT 1
WORKOUT 2
WORKOUT 3
WEEK NUMBER
SUPPORT
RACE-SPECIFIC
TAPER
5
↑ 10-sec run @ 100i
+ ↓ 2-min walk
x4
+
20 min
⤮ 8 min @ LT
with 2 min @ E
200 m @ 3km
+ ● walk
x16
17 miles
6
↑ 10-sec run @ 100i
+ ↓ 2-min walk
x4
+
5 x 4-min runs
@ 32 sec < LT
+ @ 24 sec < LT
+ @ 16 sec < LT
+ @ 8 sec < LT
+ @ LT
400 m @ 5km
+ ○ walk
x12
+
200 m @ 1500m
+ ●● walk
x4
19 miles
7
400 m @ 3km
+ ○ walk
x8
+
200 m @ 1500m
+ ●● walk
x4
10 miles
12.5 miles
⤮ 2 miles @ MP
with 0.5 miles @ S
8
↑ 10-sec run @ 100i
+ ↓ 2-min walk
x4
+
20 min @ LT
800 m @ 5km
+ ○ walk
x6
+
200 m @ 1500m
+ ●● walk
x4
20 miles
9
↑ 10-sec run @ 100i
+ ↓ 2-min walk
x4
+
25 min
⤮ 3 min @
15 sec > LT
with 2 min @ S
6 miles @ MP,
end with 5-min walk
+
30-sec strides
+ 1-min walk
x6
22 miles
10
24 min
⤮ 4 min @ LT
with 2 min @ E,
end with 5-min walk
+
30-sec strides
+ 1-min walk
x4
5 miles
15 miles
⤮ 2.5 miles @ MP
with 0.5 miles @ S
11
↑ 10-sec run @ 100i
+ ↓ 2-min walk
x4
+
4 x 4-min runs
@ 30 sec < LT
+ @ 15 sec < LT
+ @ LT
+ 15 sec > LT
7.5 miles @ MP,
end with 5-min walk
+
30-sec strides
+ 1-min walk
x6
10–12 miles
12
15 min
⤮ 2 min @ LT
with 1 min @ E,
end with 5-min walk
+
30-sec strides
+ 1-min walk
x4
20–30 min
+
+
↑ 10-sec run @ 100i
+ ↓ 2-min walk
x4
RACE DAY
ACTIVATION 2 days before race

ADVANCED MARATHON PROGRAM

If you have completed a major race, this program is tailored to prepare you for the next one. Over the course of 24 weeks, it aims to improve your race time.

In this program, any workout that begins with marathon pace or faster (see pp.188–189) should be preceded by a 2-mile easy run and a dynamic warm-up.

INTRODUCTION PHASE

This phase helps you recover from the last major race. Build up to 60 percent of peak training volume with easy continuous runs and dynamic warm-ups before starting the next phase. This may take longer than three weeks, so repeat a week if needed.

BASE-BUILDING PHASE

Weeks 4–9 will increase aerobic volume, introduce aerobic intensity, and improve your running skills. Workout 1 introduces short sprints on hills and on the flat for interval training. Workout 2 consists of short to medium fast continuous runs that increase in intensity. The long runs of workout 3 become fast continuous runs that increase in volume and aerobic intensity.

SUPPORT PHASE

Recover in week 10 with lighter sessions for workouts 1 and 2. Weeks 11–15 aim to continue increasing aerobic volume and improve speed endurance, lactate threshold speed, and lactate clearance. In workout 1, VO_2 max intervals are introduced, recovery sections of the pace-change runs get faster, and hill runs become longer. In workout 2, the fast continuous runs become longer or faster in pace. Workout 3 increases the volume of the long runs, with more running at marathon pace.

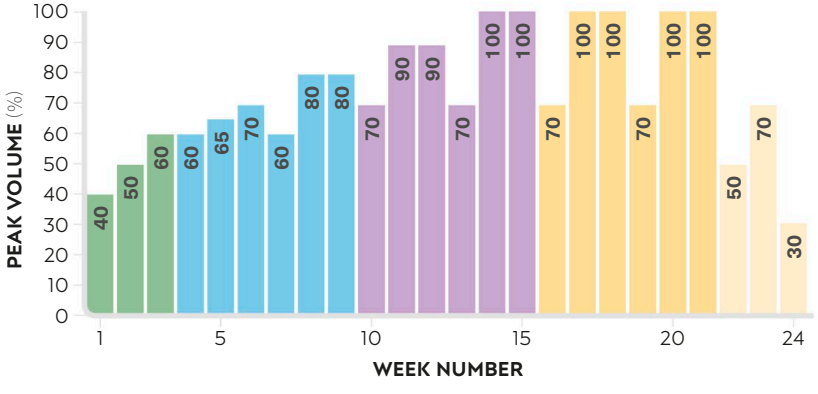
RACE-SPECIFIC PHASE

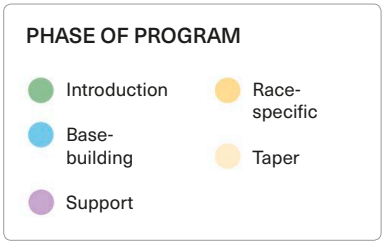
This phase begins with lighter workouts in week 16 to aid recovery, then focuses on aerobic intensity with paces between marathon pace and slightly faster than lactate threshold (LT) pace. The short fast continuous runs of workout 1 focus on LT pace; for workout 2, the fast continuous runs get longer, becoming medium to long runs; while the workout 3 long fast continuous runs are at marathon goal pace. In weeks 17, 19, and 21, make sure you leave 2–3 days of recovery between marathon tempo runs for workout 2 and long runs for workout 3.

TAPER

The 3-week taper should kick-start recovery after the peak training weeks. Week 22, the initial taper, drops to 50 percent training volume; week 23 maintains your fitness with workouts that do not overly stress the body; and week 24 prevents sluggishness with a couple of easy workouts before your race day.

FOR KEY TO WORKOUT SYMBOLS SEE PP.188–189

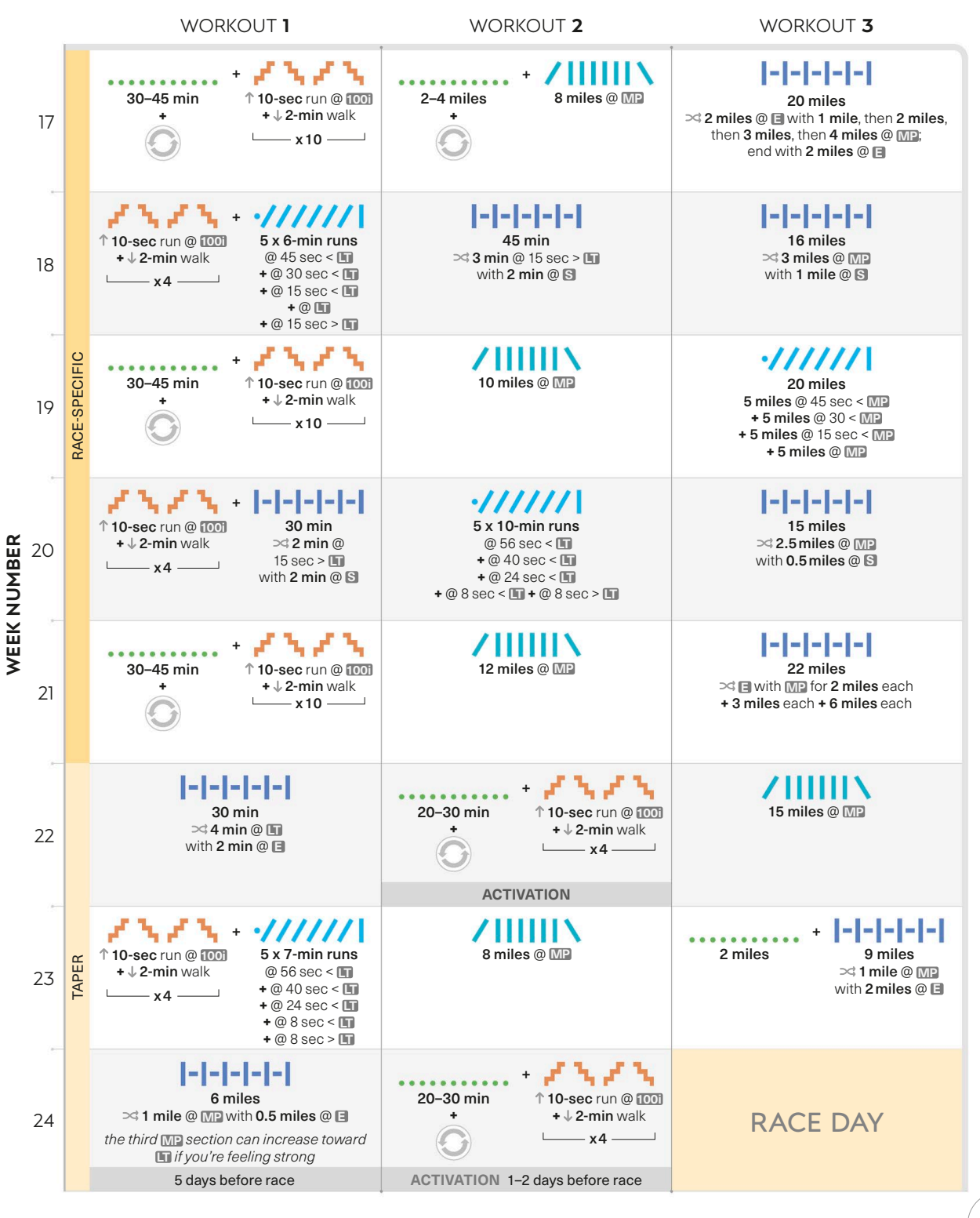




TRAINING VOLUME PER WEEK
You will reach peak training volume by week 14, which is maintained (not increased) in the race-specific phase.

WEEK NUMBER		WORKOUT 1	WORKOUT 2	WORKOUT 3
1	INTRODUCTION	**30 min**	**30 min**	**8 miles**
2	INTRODUCTION	**40 min** +	**40 min** +	**9 miles**
3	INTRODUCTION	**60 min** +	**60 min** +	**10 miles**
4	BASE-BUILDING	**30-sec** sprint + **60–90-sec** walk x8	**30 min** ⤮ **1 min** @ 15 sec > LT with **2 min** @ E	**12 miles** ⤮ **3 miles** @ E with **1 mile** @ MP
5	BASE-BUILDING	↑ **10-sec** run @ 100i + ↓ **2-min** walk x5 + **30-sec** sprint + **60–90-sec** walk x5	**30 min** **10 min** @ 60 sec < LT + **8 min** @ 45 sec < LT + **6 min** @ 30 sec < LT + **4 min** @ 15 sec < LT + **2 min** @ LT	**13 miles** **5 miles** @ E + **3 miles** @ 30 sec < MP + **5 miles** @ E
6	BASE-BUILDING	↑ **10-sec** run @ 100i + ↓ **2-min** walk x8 + **30-sec** sprint + **60–90-sec** walk x4	**50 min** **30 min** @ E + **10 min** @ LT + **10 min** @ E	**10 miles** **3 miles** @ 60 sec < MP + **2.5 miles** @ 45 sec < MP + **2 miles** @ 30 sec < MP + **1.5 miles** @ 15 sec < MP + **1 mile** @ MP
7	BASE-BUILDING	↑ **15-sec** run @ 100i + ↓ **2-min** walk x8 + **30-sec** acceleration + **60–90-sec** walk x4	**30 min** ⤮ **90 sec** @ 15 sec > LT with **90 sec** @ E	**15 miles** ⤮ **4 miles** @ E with **1 mile** @ MP *MP sections can increase toward LT if you're feeling strong*
8	BASE-BUILDING	↑ **15-sec** run @ 100i + ↓ **2-min** walk x10 + **30-sec** acceleration + **60–90-sec** walk x4	**5 x 6-min runs** @ 60 sec < LT + @ 45 sec < LT + @ 30 sec < LT + @ 10 sec < LT + @ LT	**9 miles** **3 miles** @ E + **6 miles** @ 30 sec < MP

		WORKOUT 1	WORKOUT 2	WORKOUT 3
9	BASE-BUILDING	↑ 15-sec run @ 100i + ↓ 2-min walk x10 + 30-sec acceleration + 60–90-sec walk x6	50 min 20 min @ E + 20 min @ LT + 10 min @ E	15 miles 7.5 miles @ 60 sec < MP + 5 miles @ 45 sec < MP + 2.5 miles @ 30 sec < MP
10	SUPPORT	30 min ⤮ 4 min @ LT with 2 min @ E	20–30 min + ↑ 10-sec run @ 100i + ↓ 2-min walk x4 ACTIVATION	12 miles ⤮ 1 mile @ MP with 1 mile @ S *or substitute with 10 km race*
11	SUPPORT	↑ 15-sec run @ 100i + ↓ 2-min walk x4 + ↑ 1-min run @ VO_2 + ↓ 2-min jog x6 + 1 min @ 3km + 1-min walk/slow jog x6	40 min ⤮ 6 min @ 15 sec > LT with 2 min @ E	16 miles 3 miles @ E + 10 miles @ 10 sec < MP + 3 miles @ E
12	SUPPORT	↑ 15-sec run @ 100i + ↓ 2-min walk x4 + 2 min @ 5km + 1-min walk/slow jog x10	30 min ⤮ 1 min @ 15 sec > LT with 2 min @ S	4 x 3-mile runs @ 72 sec < MP + @ 48 sec < MP + @ 24 sec < MP + @ MP
13	SUPPORT	↑ 15-sec run @ 100i + ↓ 2-min walk x4 + ↑ 90-sec run @ VO_2 + ↓ 3-min jog x8	5 x 6-min runs @ 45 sec < LT + @ 30 sec < LT + @ 15 sec < LT + @ LT + @ 15 sec > LT	16 miles ⤮ 2 miles @ E with 2.5 miles, then 2 miles, then 1.5 miles, then 1 mile @ MP; end with 1 mile @ E
14	SUPPORT	↑ 15-sec run @ 100i + ↓ 2-min walk x4 + 3 min @ 5km + 90-sec walk/slow jog x6	48 min ⤮ 10 min @ 10 sec > LT with 2 min @ E	12 miles ⤮ 2 miles @ MP with 1 mile @ S
15	SUPPORT	↑ 15-sec run @ 100i + ↓ 2-min walk x4 + ↑ 2-min run @ VO_2 + ↓ 4-min jog x6	30 min ⤮ 90 sec @ 15 sec > LT with 90 sec @ S	19 miles 3 miles @ E + 13 miles @ 10 sec < MP + 3 miles @ E
16	RACE-SPECIFIC	30 min ⤮ 4 min @ LT with 2 min @ E	20–30 min + ↑ 10-sec run @ 100i + ↓ 2-min walk x4 ACTIVATION	5 x 3-mile runs @ 60 sec < MP + @ 45 sec < MP + @ 30 sec < MP + @ 15 sec < MP + @ MP *or substitute with half marathon race*


WORKOUT 1
WORKOUT 2
WORKOUT 3
WEEK NUMBER
RACE-SPECIFIC
TAPER
17
30–45 min + ↑10-sec run @ 100i + ↓2-min walk x10
2–4 miles + 8 miles @ MP
20 miles
⤮ 2 miles @ E with 1 mile, then 2 miles, then 3 miles, then 4 miles @ MP; end with 2 miles @ E
18
↑10-sec run @ 100i + ↓2-min walk x4 + 5 x 6-min runs @ 45 sec < LT + @ 30 sec < LT + @ 15 sec < LT + @ LT + @ 15 sec > LT
45 min
⤮ 3 min @ 15 sec > LT with 2 min @ S
16 miles
⤮ 3 miles @ MP with 1 mile @ S
19
30–45 min + ↑10-sec run @ 100i + ↓2-min walk x10
10 miles @ MP
20 miles
5 miles @ 45 sec < MP + 5 miles @ 30 < MP + 5 miles @ 15 sec < MP + 5 miles @ MP
20
↑10-sec run @ 100i + ↓2-min walk x4 + 30 min
⤮ 2 min @ 15 sec > LT with 2 min @ S
5 x 10-min runs @ 56 sec < LT + @ 40 sec < LT + @ 24 sec < LT + @ 8 sec < LT + @ 8 sec > LT
15 miles
⤮ 2.5 miles @ MP with 0.5 miles @ S
21
30–45 min + ↑10-sec run @ 100i + ↓2-min walk x10
12 miles @ MP
22 miles
⤮ E with MP for 2 miles each + 3 miles each + 6 miles each
22
30 min
⤮ 4 min @ LT with 2 min @ E
20–30 min + ↑10-sec run @ 100i + ↓2-min walk x4
ACTIVATION
15 miles @ MP
23
↑10-sec run @ 100i + ↓2-min walk x4 + 5 x 7-min runs @ 56 sec < LT + @ 40 sec < LT + @ 24 sec < LT + @ 8 sec < LT + @ 8 sec > LT
8 miles @ MP
2 miles + 9 miles
⤮ 1 mile @ MP with 2 miles @ E
24
6 miles
⤮ 1 mile @ MP with 0.5 miles @ E
the third MP section can increase toward LT if you're feeling strong
20–30 min + ↑10-sec run @ 100i + ↓2-min walk x4
RACE DAY
5 days before race
ACTIVATION 1–2 days before race

RACING TIPS

Being prepared for race day will allow you to capitalize on all the hard work you have put in during training. Taking in the right fuel before the race, checking that your hydration levels are optimal, and putting a race strategy into action are all steps that can help you achieve your best.

> *Most people begin running for **health** and **fitness** but, once they **gain experience**, often want to **improve** their performance in **races***

NUTRITION

Ensuring you have proper fuel levels before and during the race is essential to power your body for the intense efforts ahead.

PRERACE CARB LOADING

In the days before a race, meals should be high in carbohydrates in order to build up stores of glycogen in your muscles. Your body will use this for fuel during the race.

For races longer than 90 minutes, have a big lunch the day before (about 18 hours before the race) to allow time to process the carbohydrates. Follow with a light dinner of simple carbohydrates and hydrate with a sports drink. Avoid high-fiber foods. For shorter races, eat a carbohydrate-filled dinner. If your race is not in the morning, eat light meals of simple carbohydrates throughout the day.

Top up glycogen stores with a small meal 2–3 hours before the race. If you experiment with optimal food and portion size in training, your prerace meal will not be new.

DURING THE RACE

Your body can store only a limited amount of fuel, and you will need to replenish during races that last longer than 90 minutes. Aim for approximately 2 oz (60 g) of carbohydrate intake per hour using easily absorbed sports drinks, gels, or similar foods. Determine your optimal intake during training (see box, below).

RACE SUPPLEMENTS

Legal performance-enhancing supplements may provide marginal gains but should never be a substitute for proper training and nutrition. For distance runners, caffeine and nitrate (found in beet juice) are two recommended supplements. However, test your tolerance of them during training, as they do not suit everyone.

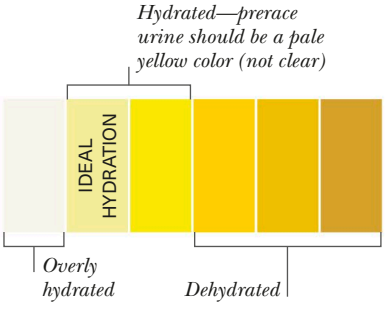
Gut motility

Gastrointestinal complaints affect up to 70 percent of long-distance runners. During intense exercise, blood is directed away from your gut and toward your working muscles, which impairs your gut's ability to process food while you are running. Your gastrointestinal tract will be more able to absorb and process nutrition during a race if you have practiced taking on nutrition during your training sessions.

HYDRATION

How much you drink before and during a race will depend on environmental factors and the length and intensity of the race.

Drinking to thirst signals is better than overhydrating before and during the race. If you are well-hydrated (see hydration test, below) and it is not a hot day, you should not need to drink much in the race. Many runners drink excessively, which can result in gastrointestinal issues and hyponatremia (see p.173). Ensure you replenish electrolytes lost through sweating during the race, and not just water. In longer races, fluid intake is often paired with fueling in the form of sports drinks. Experiment with how many and what type of calories you can absorb this way during training before trying it in a race.

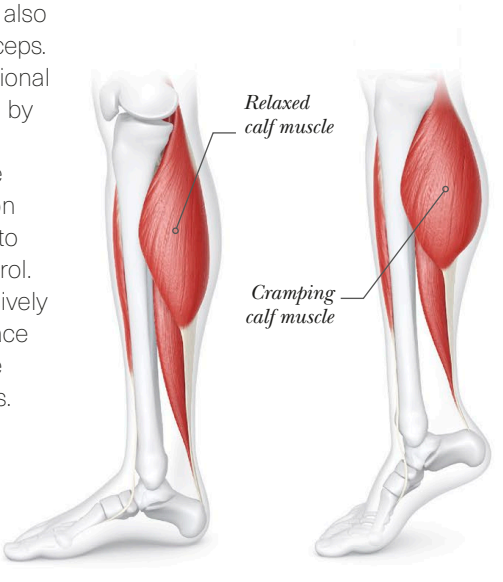


HYDRATION TEST
Urine color is a good indicator of hydration. Use this color chart to assess your hydration levels before the race.

MUSCLE CRAMPING

Cramps are painful, involuntary muscle contractions that can incapacitate you if they happen during a race. Calf and foot cramps are the most common, but they also occur in hamstrings and quadriceps. New research refutes the traditional theory that cramps are caused by dehydration. Current theories suggest that fatiguing exercise causes sustained motor-neuron firing, resulting in cramps due to abnormal neuromuscular control. For immediate treatment, passively stretch the muscle (hold it in place or use the floor to maintain the stretch) until the cramping stops.

INVOLUNTARY CONTRACTION
A cramped calf muscle contracts suddenly and forcefully, causing the heel to plantarflex.



Racing in a different time zone

If you are traveling to race in a time zone that is more than 3 hours different to your original time zone, jet lag can cause decreased performance. This can be more severe the more time zones you cross, if you travel in an easterly direction, if you are an older adult, or if you lack travel experience. The following tips can help your body clock synchronize with a new environment.

Go for an easy jog shortly after arrival. This helps you acclimatize and wakes your brain up after the flight.

Expose yourself to light at your destination, whether in the evening when traveling west to later time zones or in the morning when traveling east to an earlier time zone.

Avoid light at your destination if you have traveled more than 8 time zones, either by wearing sunglasses until the late morning if traveling east or avoiding early evening sunlight if traveling west.

Keep hydrated but avoid alcohol before and during the flight. Eat meals according to your destination's time zone to help your body clock adjust.

Take short-acting sedatives to aid sleep, caffeine to keep you awake, or the sleep hormone melatonin to help you fight jet lag.

Adjust your sleep schedule 1–2 days in advance of traveling. Go to bed 1–2 hours before your usual bedtime if traveling east or 1–2 hours later if traveling west.

RACE **STRATEGY**

Before your race, set some A, B, and C goals. Your A goal should be what you can achieve if all goes to plan and conditions are good. Your B goal should be a backup, and your C goal should be something that you can still be proud of if your race does not go according to plan.

The best way to ensure that you perform well on race day is to know what your body is capable of and how to pace appropriately. Of course, you will have learned these by following a structured training program. You should also have prepared for the terrain, for example, by doing hill training to gear up for a hilly course.

However, unpredictable weather conditions or terrain may prevent you from following your plan. If this is the case, adjust your race strategy to suit the course and conditions so that you run by effort (in other words, by what you know your goal pace feels like) rather than continuing to hold onto a predetermined pace.

Why you may race faster than you train

If you have prepared well and tapered your training effectively, you should reach race day well rested and in an energy-rich state.

Heightened feelings of excitement on race day cause the sympathetic nervous system's "fight-or-flight" response (see p.42) to release a surge of adrenaline, which allows your body to perform at a higher level than in training. The simple motivation of it being a race and not just another workout can also have a dramatic effect on your performance.

Planning your race

One useful strategy is to divide the race into four phases: Pace, Position, Drive, Kick. Each phase has a goal that you can match to your overall plan. You may decide to pace yourself evenly or to start slower and increase pace later. This will depend on the terrain, conditions, and belief in your ability to hold a chosen pace.

PACE

AIM: *Settle into your planned pace*

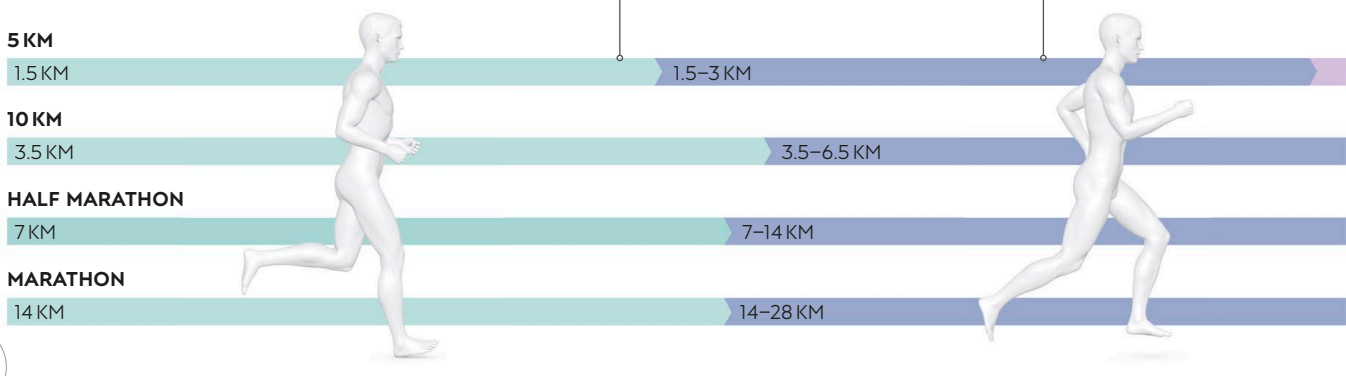
- **Have in mind a starting pace** (or effort) that you know you can sustain.
- **At the starting line**, it is easy to get swept up in the excitement and start too fast. This can interfere with your pacing early in the race, so it is important to stay calm, run your own race, and settle into your pace.
- **Get comfortable** at your planned pace and monitor how your perceived effort is matching up with your planned pace. Try not to pay too much attention to what is going on around you.

POSITION

AIM: *Find a good position for your strategy*

- **Look around you**. If there are people running at your pace, latch onto a group to reduce the mental burden and share the pacemaking.
- **If your goal is to win** or place well, play to your strengths. Runners with good speed may choose to "sit and kick" by staying behind the leader and speeding past them at the end. A runner with good endurance may choose to lead and increase the pace, exhausting other competitors until they cannot keep up.

RACE BREAKDOWN
Split your race distance into stages at which you can implement your strategy. Divide the first three phases equally, but the final "Kick" should be saved for the last stretch.



Race recovery

Competing in a race takes maximal effort, and you should plan to take a couple of days to a couple of weeks off training to recover, depending on the length and intensity of the race. Your recovery should be active, but make sure your activities are low in impact and intensity (see p.174).

The training program leading up to a race, especially a marathon, can take its toll both mentally and physically. Take care of any ailments that may have cropped up during the build-up or in the race. Use this time to catch up on work, social engagements, and other things that may have taken a back seat in your life while you focused on race preparations. Most importantly, make sure you reward yourself for all the hard work you have put in and what you have achieved.

Deciding when to return to training will depend on how your body is feeling in the aftermath of the race. You should start with easy continuous running until you feel your legs have recovered, then add some strides or short sprints to your workouts to activate your neuromuscular system. Build this recovery time into your seasonal plan (see p.161).

DRIVE

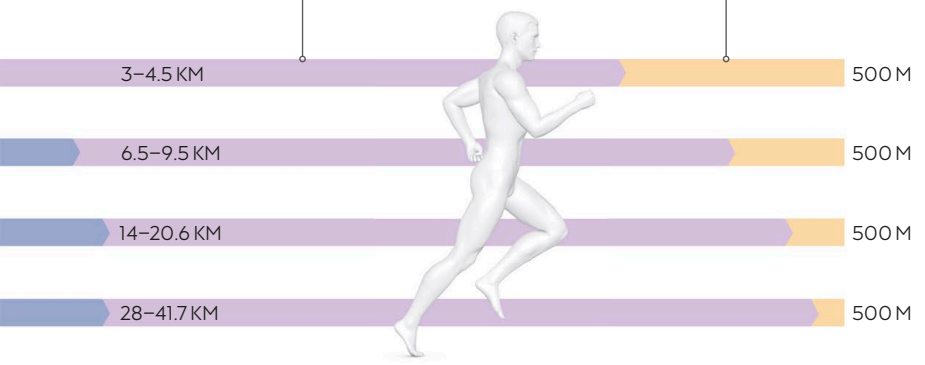
AIM: *Maintain your plan and set yourself up for a big finish*

- **As you fatigue**, focusing on relaxation signals and practicing self-talk can help get you through those tough moments when you want to quit.
- **Dig deep** into your energy reserves and increase your pace—if you are able to—or at least maintain your pace. Push yourself for a personal best or top placing.

KICK

AIM: *Finish as fast as possible*

- **Use that last rush** of adrenaline and motivation to sprint for the finish line.
- **Prepare to accelerate** when you reach the last 500 m of the race. In a shorter race, you may be able to "kick" up the pace for up to 400 m. At the end of a marathon, you may only be able to sprint the last 100 m.



Racing highs and lows

Your body can react to the exertion of racing in extreme ways. You may be lucky, or unlucky, enough to experience these two phenomena.

Runners' high, a feeling of euphoria induced by long-distance running, is a legend told by runners around the world. Until recently, there was little science to explain this phenomenon. Now, advances in brain imaging can verify that endurance running sets off a flood of hormones in the brain. Known as endorphins, these hormones are associated with mood uplift and elation. This endorphin release appears to be an example of a neurological "reward" response to intense aerobic activity, which is likely part of our evolutionary history.

The "wall" is a physiological state caused by depleting glycogen stores in the liver and muscles. When this happens, you may feel sudden and extreme fatigue, heaviness, loss of coordination in the legs, blurry vision, and a lack of concentration. Most marathon runners can relate to "hitting the wall" in the later stages of a race. While the condition can be mitigated by adequate fueling (see p.210) and pacing, recent research suggests that your physiology and metabolism actually change after approximately 90 minutes of running, making what seemed to you like a sustainable pace now difficult to maintain.