TRAIN YOUR BRAIN FOR MARATHON SUCCESS

Every marathon runner dreads "hitting the wall" or being overwhelmed by fatigue before the finish line is reached. This isn't the result of some type of functional breakdown within the muscles, says Matt Fitzgerald, rather it is down to the brain. The good news is that it can be overcome with a little thought.

Fatigue is seldom, if ever, caused exclusively by events that occur within the muscles. This was a revolutionary new theory extrapolated by the Nobel Prize winning author Archibald Hill in 1924. Tim Noakes, a professor of exercise and sports science at the University of Cape Town, took up this argument in the 1990s and maintained that "the rising perception of discomfort produced by exhausting exercise progressively reduces the conscious desire to over-ride this control mechanism, which, if it were to be reduced, would lead to the recruitment of more motor units. Thus the presence of conscious over-ride would be undesirable because it would increase or maintain the exercise intensity, thereby threatening homeostasis…as exercise performance is centrally regulated by the central nervous system, then fatigue should no longer be considered a physical event but rather a sensation or emotion."

In other words, a central governor in the brain regulates exercise in regard to a neurally calculated safe exertion by the body. The brain reduces its electrical stimulation of the muscles and produces feelings of discomfort to prevent any real damage from happening to the muscles or other organs. While more contemporary scientists have suggested that fatigue is due to a failure within the muscles – a "limitation" such as lactic acid build which impairs the muscle and acts as a "catastrophe" – I believe that if exercise fatigue were caused exclusively within the muscles, then fatigue would occur despite a constant – or even increasing – level of stimulation from the brain. In other words, the brain would continue to shout "Move!" at the

muscles but the muscles would not move because they couldn't. But this is not what happens. There are mechanisms that enable the brain to continuously monitor muscle glycogen levels, muscle pH balance, core body temperature, dehydration, muscle damage and other important factors that could lead to irreparable harm if exercise continued for too long. When one or more of these signals informs the brain that a problem is imminent, the brain responds by reducing muscle activation and producing feelings of fatigue. Training improves your fatigue resistance largely by raising the threshold for these warning signals. For example, by increasing the running pace you can sustain without losing pH balance in your muscles you may improve your 5km race time – not because you are able to run faster before your muscles become too acidic to function, but because you can run faster before your brain senses an unacceptable increase in muscle acidity. All of this is very interesting. But does it have any practical implications for your training? Is it possible to use the new, brain-centred model of exercise fatigue to train better? I believe so.

How it works

Running is almost always initiated with an anticipated endpoint in mind – either a total distance or a total duration, or both. In the case of a marathon, this endpoint usually has a dual nature: the distance of 26.2 miles and a goal finishing time. The brain uses this anticipated endpoint to calculate the maximum amount of muscle activation you can sustain from start to finish without a loss of homeostasis in the muscles or other organs. This calculation is based on fatigue set points (such as the maximum core body temperature that is allowable without organ damage), physiological feedback (such as chemical signals indicating the amount of glycogen available in the muscles), past experiences (such as explicit knowledge of past performance limits) and environmental factors (such as air temperature). Throughout exercise, the amount of muscle activation continually changes based on ongoing

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communication between the brain, the body and the environment. This is called teleoanticipation. Your brain already knows whether or not you will hit the wall from the moment the starting gun sounds. Therefore, the objective of training is essentially to calibrate your teleoanticipation mechanism to ensure that your brain does not receive any red-flag feedback signals while you run at your goal pace during the marathon.

Get real results

The best way to guarantee that you will avoid the wall and achieve your goal time in a marathon is by using a training plan that culminates in a very challenging and highly race-specific peak workout, which makes the challenge of the marathon itself as familiar as possible to your brain and body when it comes.

Obviously, this peak workout must be timed well in the build up to a marathon. An appropriate peak workout format would consist of one hour easy plus 4 x 3km on/1km off, where the on segments are run at your goal marathon pace and the off segments are run at your goal marathon pace, plus 15 seconds per mile.

The long run that you do on the weekend preceding your peak workout – which should fall two weeks before race day – should be similar in format but a little easier. The workout before that should be a little easier still and so forth. The rest of your training should simply provide the necessary support to gradually increase your fitness level so you can handle the increased challenge of each long run.

The brain train programme

Here is a sequence of 11 long runs that you can use to train your brain for marathon success:

1. 1hr at easy run + 10mins uphill at goal marathon pace
2. 30mins easy
   10mins at goal marathon pace
   1min easy
   10mins at current half-marathon pace
   1min easy
   10mins at half-marathon/10km pace
3. 90mins easy + 20mins at goal marathon pace
4. 30mins easy
   15mins at current half-marathon pace
   3mins easy
   15mins at current half-marathon pace
   160mins easy
5. 2hrs easy + 20mins at goal marathon pace
6. 30mins easy
   15mins at goal marathon pace
   1min easy
   15mins at current half-marathon pace
   1min easy
   10mins at half-marathon/10km pace
   5mins easy
7. 10kms easy + 10x 1min on, 1min off
   On = goal marathon pace – 10secs/km
   Off = goal marathon pace + 1min/km
8. 2hrs easy
   20mins at marathon pace + 20secs/km
   20mins at goal marathon pace
9. 10kms easy + 10x 1km on, 1km off
   On = goal marathon pace – 5secs/km
   Off = goal marathon pace + 45secs/km
10. 1hr easy + 5x 2km on, 1km off
    On = goal marathon pace
    Off = goal marathon pace + 30secs/km
11. 1hr easy + 4x 3km on, 1km off
    On = goal marathon pace
    Off = goal marathon pace + 15secs/km

Matt Fitzgerald is a senior producer for Competitor Running (www.running.competitor.com) and author of numerous books on endurance sports training and nutrition, including *Brain Training for Runners.* fn