

# CHANGE *YOUR* TRAINING

Put down that weight! Slowly. Because you're going to get stronger by doing that than you will by picking it up. Find out more about how eccentric training can boost your performance

Words: Rachel Ifans

**W**hen we move, we contract our muscles. During the contraction, the muscles either shorten, lengthen or stay the same. When they lengthen, it's called an eccentric contraction and that's the movement we're focussing on in this feature.

If it already sounds a bit confusing to the hobbyist runner to whom Biology GCSE is confined to the dusty annals of the past, don't worry. We spoke to Tony Kay, professor of biomechanics from the University of Northampton and he had a simple way of explaining it. He says: "A good way to think of it is that if you're moving down, it's an eccentric contraction and if you're moving up, it's concentric."

Let's consider squats as they're easy to visualise: on the way down, you're working eccentrically, using your muscles to prevent you collapsing into the ground. You then shorten the muscle in a concentric contraction to pull back up.

Tony says the same rule of thumb can be used when it comes to running. "Running up a hill is a predominantly concentric exercise," he says. "Because when you plant your foot on the ground, you have to drive yourself to move your body up the hill, contracting your quadriceps, calf muscles and glutes to move your body forward and up."


"If you run back down the hill, exactly the same muscles will be working but this time they will be

lengthening in order to put the brakes on. This is eccentric contraction."

But why is eccentric training a good thing to be doing? If you're in the gym doing some strength and conditioning work, it's likely you're concentrating more on the weight you can lift rather than the load you can lower, but this is a mistake. Tony explains: "I won't get into the Molecular Physiology of it but we are actually about 1.3 to 1.6 times stronger when the muscle lengthens – during eccentric contractions."

"We see this every day when we're picking up heavy objects. Even though the bag of shopping weighs exactly the same, it's a lot easier to put it down





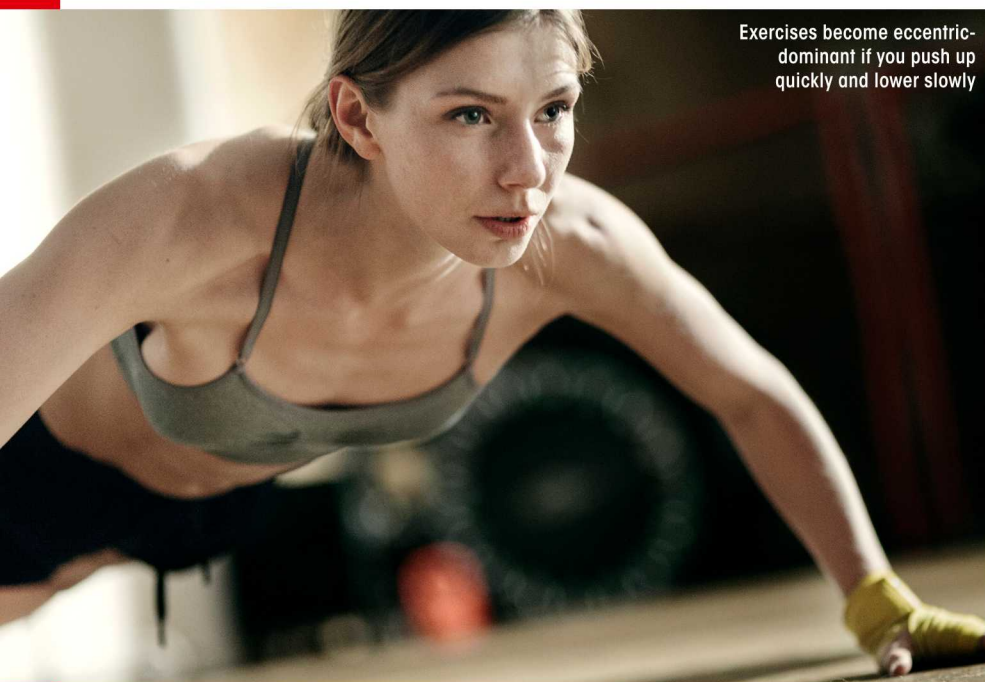
// When you run downhill, exactly the same muscles are working but this time they will be lengthening in order to put the brakes on. This is eccentric contraction //

because we are stronger when our muscles work eccentrically.”

Tony says that whenever we do exercises to failure, whether it be squats, chest presses or running, we will always fail on the way up. We’ll never fail on the way down because we’re stronger on the way down than we are on the way up.

This is all good info to mull over in the gym when deadlifts are killing you and dumbbells are making you speechless, but how does knowing this help your running? »





Exercises become eccentric-dominant if you push up quickly and lower slowly

## THE BENEFITS

### Strength

Studies show that when you train the muscles eccentrically rather than concentrically, you get much bigger increases in strength and muscle size. “In simple terms,” says Tony, “this is because you can do more eccentric training than you can concentric training so you get a greater level of strength adaptation.”

Think of the gym again, he says. “You’ve no doubt seen people who train with a partner. They are probably doing an exercise called negatives, which is essentially an eccentric-dominant training method, and means your partner helps you on the way up, because you’re weaker, and then steps away so you can lower the weight on your own.”

In simple terms, doing negatives allows you to get more repetitions out because, as soon as you fail on the way up, your partner will step in to help so you’re able to do several more reps.

Sometimes, you see people lifting too heavy a weight at the gym; they use momentum to get it up and then they just drop it really quickly. By dropping the weight on the eccentric phase, which is the most important, they’re wasting most of the exercise, Tony says. If they were to just reduce the weight, they could bring the weight up, and then slowly lower it – and in doing so get much greater adaptations.

### Flexibility

Tony recently published a systematic review and meta-analysis that showed large increases in flexibility as a result of eccentric training. He explains: “One of the things that limits flexibility is that our perception of pain tells us when to stop. We’ve discovered that after eccentric training for several weeks, our tolerance to muscle tissue loading (we would call it stretch tolerance) goes up and we become more flexible.”

### Less injury risk

“By lengthening the muscle fibres and increasing flexibility, we become less susceptible to injury,” Tony explains. Although DOMS is not an injury, Tony admits that eccentric training can cause more post-exercise pain than concentric training – at least at the outset.

He says: “Eccentric training is the type of exercise that creates soreness the next day but the good news is that the stimulus you need for the muscle to adapt is the same thing that protects you from that sensation the next time you do it.” This means the pain won’t last for long. And, Tony says: “If you slowly ease your way into this type of exercise, you can actually do it without too much pain, and as you build up, you’ll be protecting yourself from future DOMS.”

### Post menopause

Eccentric exercise has been shown to improve bone density to a greater degree

than concentric exercise. Recent research by Chen et al with older females saw them split into two groups. One group walked upstairs and the other downstairs. Tony says: “The test showed improvements in strength and muscle mass, which is what we’d expect, but those walking down the stairs also demonstrated a whole host of greater cardiovascular, muscular and skeletal benefits, including positive changes to bone density, lipid profiles, resting pulse rate, blood pressure, and blood sugars.”

He explains: “For people who want cardiovascular adaptations to get aerobically fitter, of course they need to do cardio or concentric work too. If you’re older and can’t do the cardio work, or if you have issues such as diabetes and high cholesterol levels, the downstairs walking has shown improvements in blood lipids and insulin resistance without stressing the cardiovascular system.” It’s a way for older people to keep exercising without having to do the cardio stuff they find too hard.

### How often and how much??

Eccentric training sounds great but how much do you need to do to see a benefit? Well, of course it depends on how much exercise you do ordinarily, says Tony.

“If you’re not doing much to begin with, you don’t need to do much to create an eccentric overload. If, however, you’re a marathon runner, you’re already highly adapted, so to gain further adaptation, you will probably need more exercise at a much greater volume.

“That said, one of my PhD students found that doing eccentric-dominant exercise once a week is just as effective as twice a week,” Tony reveals. “Of course, if you find it easier to do, and you enjoy it, you’re more likely to do it more – that’s the secret to any successful exercise.”

Tony concludes: “Some of the exercises we do for older adults are leg press exercises. They come in and do them for 10 minutes once a week and we still see a 50% increase in strength after about six to 12 weeks.” That’s a huge improvement and could mean a massive lifestyle change for people who had thought exercise was beyond them.

Back to running though. We’ve put together some solo and partner-work eccentric exercises over the page.







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Adapt your calf raises to suit your capacity and build load and reps gradually

## HOW TO DO IT

# ECCENTRIC-DOMINANT EXERCISES

Eccentric exercise sounds amazing but the only hitch is that it's quite difficult to do on your own. Tony explains: "To do purely eccentric exercise at home is hard but there are ways you can make an exercise eccentric-dominant and still see a significant benefit."

We've put together two sets of eccentric-dominant exercises. The first set can be done by yourself and the second set are negatives and require a partner with whom you can work.

# SOLO SET

- **Standing up from a chair.** A simple one that Tony uses with his older adults and is vital for independence in old age is a good one to start with. Start by sitting on a chair or sofa. Stand up as quickly as you can and then take three to five seconds to sit back down. Repeat to failure. Using your arms to help you get up (but only on the way up) is fine because it reduces the load on the leg muscles in the concentric phase.
- **Calf raises.** Rise up on your toes quickly and then lower your heels to the floor as slowly as you can. To reduce the concentric load, you can do the upwards motion on both feet so that you're sharing the body mass between two muscles and then swap to one leg to lower. Alternate the leg that you lower on or, to make it harder, lower on one leg repeatedly until failure then swap to the other side.
- **Press ups.** Again, you can just adapt your normal press-up to lower slowly and quickly bring yourself up – it works the same whether you do a full press-up or one with your knees on the floor. Or you can do a mix: slowly lower yourself down with your knees off the ground, then drop your knees gently onto the ground for the push back up.

By dropping your knees, you effectively reduce the load of the body thus making it easier. As we are weaker on the way up, this lets us do

more repetitions before failure so makes us stronger.

It also helps with motivation as some people can't do any press-ups without dropping their knees. Doing eccentric-dominant repetitions may eventually get them strong enough so they can take their knee off in both directions which is good for motivation and the enjoyment of the exercise.

- **Walk up, run down.** This one is simple and perfect for runners. For one of your runs each week, incorporate a hill, even if you're not usually a hill runner. Walk briskly up the hill and run back down. Even though you're not running up the hill, there's still a real benefit in running back down. Repeat the hill as many times as you can.

# PARTNER WORK

- **Sit ups.** Get in a normal sit-up position but with your arms stretched out in front of you towards your knees. Your partner can be kneeling by, or sitting on, your feet. On the way up, take your partner's hands and pull on them to reduce the effort in the abs, then on the way down let go so you control it yourself. Repeat until you can't do any more.

from the weight but not taking it from you completely.

- **Bicep curls.** Very similar to sit-ups. Get your partner to take the weight or at least support your arm while you pull the weight up and then get them to let go so you can lower the weight by yourself slowly. Increase load and reps gradually.

- **Weighted squats.** Hold a dumbbell under your chin while you lower into a squat, and then get your partner to take it from you as you come back up. Repeat for as long as you can. You can also do this with the partner taking some of the strain

- **Leg raises.** Lie on your back. Ask your partner to support you behind the calves on the way up and let go on the way down. They need to be kneeling, not bending over, so they aren't in danger of straining their back. 🚫

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If you've seen people working in pairs in the gym, it's likely they are doing negatives