Strength Training for Distance Running

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Runners have always had a very uncertain relationship with strength training. The most obvious reason as to why is that runners love to run. It's so easy to throw on your trainers in the morning or after work and get out on the road or trails. But more endurance runners are recognising the crucial part strength training has to play in injury prevention, injury rehabilitation and also running economy.

Injury Prevention/Rehabilitation

Running-related injuries have been reported as affecting up to 85% of runners, whether it be the recreational or more serious competitor. Running requires much greater velocities of the joints of the body compared to walking.As a result, the ground reaction force (GRF) or pressure exhibited up through the body can be between two to three times that experienced by walking. If these forces overload any of the major stabilising muscle groups involved in running, such as the lumbo-pelvic musculature and core, or propulsive groups such as quadriceps, hamstrings and the calf muscles (soleus and gastrocnemius), the person runs the risk of developing your classic running injuries such as anterior knee pain, ITB syndrome, shin splints, achilles and gluteal tendinopathies, and plantar fascitis to name a few. These propulsive and impact forces in a running gait can be higher for the recreational runner, who are also the most likely not to engage in any concurrent strength training. Developing a comprehensive strength, flexibility and balance program by identifying the runner's weaknesses throughout the kinetic chain will both prevent injury and also effectively rehabilitate running-related injuries.

VO2 Max, Lactate Threshold & Running Economy

Running performance is largely dependent on VO2 max, lactate threshold, and running economy. I've found many runners have been worried about whether by training the anaerobic system too often via strength training, they may have a negative effect on the aerobic system. VO2 max concerns the maximum rate of oxygen able to be utilised in a maximal test whilst the lactate threshold (LT) is the limit at which blood lactate cannot be converted back to energy and will occur at a certain exercise intensity. Both are considered crucial to running performance and research shows that whilst there is no identifiable improvement in either from strength training, they are not hindered either.

Running economy on the other hand is the relationship between VO2 and velocity. If two runners move at the same velocity, but one runner requires less oxygen to be utilised, then they are said to have better running economy. A combination of heavy weight training, endurance strength and explosive strength training have been proven to improve running economy significantly and even increase the distance runner's time to exhaustion.

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Periodisation and Post-Activation Potentiation

Periodisation has been explained in a previous article on the In Balance blog called 'Strength Training in Sport' which I urge you to check out for some more specific ideas on structuring your workout (http://ibphysio.com.au/strength-training-for-sport/). But briefly periodisation is a way to structure your resistance training so that you can manipulate your results to fit in with whatever goals you have in your chosen sport (in this case running). It should move from general to specific training. If you are in marathon training, your running plan will be quite organised, building in its intensity and distance as you move closer to the marathon. Your strength training should mimic this, with a program moving from higher repetitions and lower weights in the early stages to build general endurance, to higher weight and lower repetitions, moving into more explosive movements to build power.

Post-activation potentiation (PAP) is a term used to describe the concept that by activating a muscle to near maximal velocity, its subsequent voluntary contractions will be increased in power for an amount of time. Whilst plyometric training has long been a concept for increasing the rate of force development in runners, PAP is a more recent development looking at acute power increase before an event. I like to describe it to my patients as a waking up of the muscle before they go running. By waking up the neuromuscular system in those target areas like the gluteals and quadriceps, we can increase performance and reduce the likelihood of injury. Performing a good warm-up before a run is common knowledge, but there is more and more research going in to whether strength and explosive movements 3-12 minutes before a run can positively impact your running performance. Exercises such as single leg squats, jump squats, running drills and staggered sprints performed to a pre-fatigue level have been shown to be effective in this.

Take home message

- Strengthening should target areas of weakness which can be identified by your physiotherapist. The commonly weak areas include your gluteals, calves, hamstrings, quadriceps and core.
- Weight training at the gym can be beneficial on machines like the leg press or leg extension but should be transferred to functional movements that mimic running movements such as squats, Romanian deadlifts, lunges, calf raises and weighted step ups. This is by no means an exhaustive list.
- Structure and time your strength program to coincide with your running program. Try and build neuromuscular endurance followed by heavier weight followed by explosive plyometric type exercises. An example using the back squat (low weighted/high repetitions followed by heavier weight/lower repetitions followed by squat jumps).
- If you are struggling to improve those race times, then strength training may be the way forward for you.
- Strength is crucial, but without suitable running technique to go with it, you may continue to have problems with both performance and injury. Stay tuned for my running technique piece a bit later in the year.

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