TRAINSMARTER

PART 2: DEVELOPING RUNNING ROBUSTNESS

Part 1 focussed the demands of running and the effects of loading on our body. We also looked at training errors and personal characteristics that could contribute to overload on the musculoskeletal system leading to pain and injury. We also looked at the different structures (bone, muscle, tendon and joint) and how they respond to overload and injury. In part 2 we will explore the principles of developing resilience against injury. Strategies to develop mobility and strength not only now, but for a long career in running and training. A good place to start is always at the beginning – the warm up!

Being able to attain a full range of movement does not mean that you are able to use that range effectively

Why do we warm up?

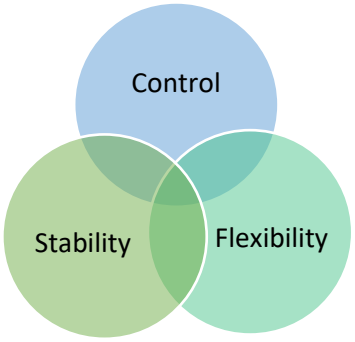
"Because the body is designed to move, it makes sense to prepare it to move"

The effects of activity on subsequent performance can either be positive, negative or have no effect at all. The main aims of warming up prior to training or competition is to maximize your subsequent performance and to reduce your risk of injury. Therefore, the structure of a warm up should focus on activities that have positive effects on performance that can be included in a time efficient manner. There is however, one exception to this; and these are activities that have a medium or long-term benefit to the athlete (even in the absence of immediate positive benefits). This notion is taken from the RAMP method of warming up developed by Prof. Ian Jeffreys and will form the basis of this part of the article.

Warm up – a new way of thinking!

The warm up should be divided into specific components (refer to my earlier article on warming up – November 2019). The first part - the RAISE phase consists of gradually increased cardiovascular exercise aimed at raising your heart rate and respiratory rate. This also has the added benefits of providing the optimal environment for faster neural activation and therefore faster muscle contractions; and also increased muscle tissue elasticity which allows more efficient movement. The net effect from the raise phase is an overall increase in your body temperature.

The second phase of the warm up should focus upon ACTIVATION and MOBILITY of muscle and joints. The focus is not on developing flexibility but on joint mobilization and actively moving the body through movement patterns required for the forthcoming activity. This has greater benefits than stretching alone as it requires joint stability, motor control and flexibility leading to improvements in motor learning which can be directed specifically to the demands of running or a sport. Co-ordinated movements of multiple joints through full range of movement reflects how our bodies are designed to move and not as individual anatomical structures. This has the immediate effect of preparing the athlete for the upcoming run or race without losing the temperature related benefits of the raise phase of the warm up and also contributes to long term athletic development (LTAD).



This provides a logical and time efficient progression leading to activity; performed regularly this can allow large quantities of targeted practice to be achieved on the key movement patterns with no increase in training time or load. In this way, static stretching can be omitted from your warm up as they contribute little to skill development, are less time efficient and temperature related benefits gained in the raise phase maybe lost.

Strength training:

Resistance training is widely used among athletes, fitness training and in rehabilitation after injury. The goals of resistance training are to increase strength, increase muscle size and increase tolerance to load. It is the increased tolerance to load that builds stability, control and movement efficiency required in running, resulting in robustness and increased resilience against injury.

Running requires co-ordinated interaction between multiple joints of the body. Each of these joints has the ability to absorb energy and then recycle it into a rapid propulsive force required for running.

Interaction between these joints determines the distribution of the stresses of the GRF when we land (see part 1). Mobility, stability and control around these joints is essential to distribute load therefore minimizing the risk of injury. A joint with a poor capacity to absorb forces (i.e. stiffness, poor stability or control) may place increased demands upon structures elsewhere, leading to overloaded tissue and subsequent injury.

Working against resistance will have several benefits leading to an overall improvement in running economy, reduce the demands and load upon the musculoskeletal system and increase resilience against injury. These include:

1. increase control and stability around a joint
2. increase resistance to the onset of fatigue.
3. increasing the capacity of the muscles and tendons around a joint to absorb forces and recycle this energy to generate greater forces (this will be covered in greater detail in a future article).

How do we implement strength training?

There are two principles taken from the world of strength and conditioning to consider when implementing strength training. These are the principle of *specificity* and the principle of *progressive overload*.

Specificity

If you were a javelin thrower, it makes since to include exercises that would increase your ability to throw the javelin further, stabilize muscles around the throwing arm to increase stability at the joints to minimize injury. This type of exercise would not be suited to a middle distance or longer distance runner. Among runners, the principle of specificity refers to the implementation of focussed exercises that will enhance your ability to run better. Below, I have highlighted some of the considerations when designing a strength training program to enhance your running.

- *Time efficiency:* Runners like to run. Therefore, exercises that can easily be incorporated into your running schedule and do not impede on your training schedule are more likely to be performed regularly.
- It is very important to train the deeper *stability muscles* and the large mobility muscles together. Incorporating exercises that hit both together are critical.
- *Functional:* The human body moves through three planes (forwards and backwards, side to side and rotation left and right). Therefore, ensuring that your resistance training reflects how your body is designed to move will have a greater effect. Avoid machines that restrict movement pathways as these do not train the stability muscles necessary for functional movements.
- Running requires you to load your legs alternately, therefore exercises focussed on *single leg* activities are preferred as these will train the stabilizing muscles of the hip and lumbar spine better.
- Running also requires *upper body strength*. Unsure you include some upper body work in your program. Exercises that train the legs and arms at the same not only saves time but replicates functional activities and incorporates the core.
- Maintain good form, include a broad range of movement patterns and don't rush. Skip strength training at your peril!

Try jumping as high as you can on two feet by bending your knees and exploding upwards. Now, before making the big jump, perform two or three smaller jumps to build up to the explosive jump.

The principle of overload

This is very simple. Your body needs a stimulus to adapt. If the load is less then you can happily deal with you will not adapt. If the load is too great, then you will overload the system and risk injury. Recall the training variables from part 1 – frequency, intensity, volume and type of training. These can all be manipulated to provide the stimulus for training adaptation. Exposure to a progressive overload with adequate recovery between sessions will allow your body to adapt to the load and get stronger. It is unwise to increase more than one training variable within a session. For example, if you are used to running on a flat route for 4 miles, then increasing to a 6-mile

hilly route would be too great and you may risk overload. The general advice is to increase training variables by 10 percent weekly.

Runners should always remember, the aim of strength training is not to increase maximum strength and muscle mass but to increase your tolerance to load and evenly distribute the load across all joints of the body, increase your resistance to fatigue, co-ordinate stability muscles with the larger mobility muscles, thereby increasing your running robustness and reducing injury risk.

Plyometric training

Plyometric training has many advantages to runners and can considerably boost your performance and reliance against injury. However, requires specialist instruction, assumes a high level of strength training history and if implemented wrongly, may lead to injury.

Plyometric training takes advantage of the stretch-shortening cycle (SCC). To understand this, have a go at this exercise: **(make sure you are fully warmed up before attempting this. Avoid it if you have an injury).**

You should have jumped higher on the second explosive jump; this is because your tendons were undergoing a stretch that enables them to recycle stored energy and transfer it to your explosive jump (rather like a pogo stick)!

One of the effects of lower limb plyometric training is an increase in leg stiffness. Greater tensile forces in the muscle and tendons as a result of plyometric training will increase the transfer of power and make movement more efficient (compare legs made from plasticine to those made out of carbon fibre!). I will discuss plyometric training in a later article, but for now, it is more important to gain a good strength base.

SUMMARY

In part 1 we looked at load and how this affects our running. We also looked at training errors that may lead to musculoskeletal injury. Normal running biomechanics were discussed as well as common deviations from normal and how they affect our gait and may lead to injury. Muscle, tendon, joints and bone were contrasted, and common injuries were discussed. Part 2 looked at how to develop running robustness nin order to increase running economy and performance but also reduce risk of injury. We looked at how to warm up not only for the subsequent run but also for long term development and prevention of injury and how flexibility training alone may not provide enough adaptations to increased range of movement and may also contribute to injury. We highlighted the importance of regular control and stability training and how this can be incorporated into your warm up session. The principles of specificity and progressive overload taken from strength and conditioning theory highlighted the importance of distribution of forces across the musculoskeletal system by means of strength training and how this can reduce load on specific tissue. Plyometric training was discussed in brief but should be included here as it can make a big difference to your running outcomes. Have a look at these videos and download the training exercises to start your strength and conditioning routine. Look out for a future article on core strength training. *Nic*