Less spring, less speed – Peter Sandery

The energy required to move the skeleton and hence to enable you to run, comes from processes in your muscles. Not all of the chemical energy that is contained in the "raw fuel" mix of carbohydrate, fat and protein that may be used to generate that energy in response to different demands is turned into kinetic energy or energy of motion. Some is converted into heat energy. This isn't a bad thing in normal daily activities as it maintains a healthy body temperature. One of the issues with age and muscle mass loss is a decrease in the ability to regulate body temperature. Running at speed isn't "normal" and the amount of heat generated increases and this must be dissipated to prevent tissue damage, which is why we perspire and in doing so, lose water and essential minerals.

Muscle fibres contain contractile proteins, long chain molecules that move over each other to shorten the fibre and hence generate force. This is the active process that moves the long bones of the legs which in turn results in a running motion when done in a coordinated fashion. The fibres also contain connective tissue that effectively holds the fibres together and which comes together at each end of a muscle to form the tendons that attach the muscle to bones. This connective tissue is elastic, that is, it has the capacity to resist deformation, but if it is deformed will revert to its normal shape when the deforming force is removed. This assumes, of course that the deforming force is not so great that it exceeds the elastic limit of the tissue. If this happens, injury results to the connective tissue and possibly to the contractile tissue of the muscle as well. Similar connective tissue forms the ligaments, which connect bone to bone and limit the range of movement of bones to minimise the risk of injury to soft tissue or the bones themselves.

As we take each stride, there will be times when a driving muscle is lengthening or being stretched. When this happens elastic energy is stored in the stretched connective tissue. When the stretching force is removed, the stretched connective tissue will contract and this will contribute energy to the overall contraction function of the muscle. This contribution, in a young, well-trained athlete may be as much as 25% of the force generated by a muscle.

So much for the anatomy lesson. The practical implication of this for the masters athlete is that, with age, the elasticity of connective tissue decreases. This appears to be mainly due to changes in the structure of that tissue, with more cross linkages occurring. The accumulated effects of injuries may also contribute to the decreased elasticity as repairs are made by the body to various tears in soft tissue. Combined with loss of muscle fibres and loss of contractile protein mass in retained fibres, the overall effect is less bounce in the stride, less force generated by each muscle.

For a practical demonstration of how much "spring" you can generate, try activities like: Standing jumps: starting with your feet together, see how far you can jump horizontally (bunny hop). How far can you go bunny hopping continually? Stand beside a wall and see how high you can jump vertically, squatting down and then swinging your hands up to touch the wall as high up as you can. How far off the ground do your feet move? My guess is that few runners over 40 could slam dunk a basketball.

Hopping: how far can you hop on one foot? How many hops can you do on one foot? Are you equally good (or bad) on left and right legs?
Bounding: how far can you bound on each foot (i.e., what is your maximum stride length)? How good are you at bounding up a flight of stairs?

These reality checks can be a bit depressing, but all is not doom and gloom. As with most activities, you can get better at them through targeted training. While some physical degradation is inevitable, you can maximise the efficiency of what you have left by incorporating exercises such as hopping, skipping, jumping and bounding in your training. Focus on developing quick, explosive movements and then aim for maximum elevation or forward movement. The body responds to demands and if you allow a particular demand to decrease, associated abilities inevitably decrease over time. You only notice these changes when you keep a record of what you can do – which is usually a more accurate yardstick than what you think you can do. Teach your children/grandchildren to play hopscotch, skip rope, spring vertical jump, etc and do it with them (but it might pay to get in a bit of practice first).