

Injury prevention – the key to successful performance (Part 1)

In this first edition I hope to provide readers with a basic guide on injury prevention. If I was to ask you all how injury had affected you or your performance, I am sure that everyone could remember at least one episode that prevented you from achieving your aspirations. These are stories that we encounter on a day to day basis as physiotherapists and many injuries are potentially avoidable with a basic understanding of correct preventative strategies. In part 1, the relevant evidence for stretching, warm up and warm down will be discussed.

Stretching is a technique used to improve flexibility and can be aimed at the active constraints, the muscle and tendon complex and passive constraints; namely the joint, capsule and ligaments. It is acknowledged that there is much conjecture in research about the physiological effects of stretching, whether it improves performance and whether it prevents injury.

The physiological effects of stretching

It is generally accepted that stretching causes an increase blood flow and temperature within the muscle, therefore creating an optimum environment for enzymes essential in allowing the muscle to contract faster and more forcefully. The increased blood flow allows improved oxygen up take by the muscle and the removal of waste products that are produced as a consequence of muscle contraction. The increased flexibility allows the absorption of greater forces, more effective storage and usage of elastic recoil and greater energy delivery during contraction. The triple jump is an excellent example of the need for absorption of stress and the use of elastic recoil.



However, on the down side, it has also found that there is a raised level of creatine kinase following stretching, a chemical released during tissue damage.

The effects of stretching on strength

There is evidence to suggest that a course of stretching to address a specific muscle group (based on hamstrings, pectorals and deltoids) can cause a significant improvement in strength. However, 3 separate studies have found that directly following a stretch, there is a 7-28% (depending on the study) reduction in muscle strength and the effects can last more than an hour. This questions the principle of vigorous stretching during warm up for training and competition.

The effects of stretching on performance

Athletes require sufficient flexibility to achieve optimum movement patterns for their activity. A good example is from the sport of athletics and is

well demonstrated in the picture of Colin Jackson below. If a high hurdler did not maintain hamstring (lead leg), hip flexor and quadriceps length (trail leg); it would have been difficult for him to have performed at the elite level.

How many and for how long?

There is always debate about how long and how often a muscle should be stretched. The research suggests that the optimum length should be 30 seconds. This was more beneficial than 15 seconds and 60 seconds provided no further benefit. The optimum frequency was found to be 4 repetitions and in one study, it was found that benefits of a single 30 second stretch can last for 1.5 hours.



Static, dynamic or ballistic?

It is generally accepted that ballistic or bouncing stretches are ineffective and creates a considerable amount of micro trauma and muscle soreness. Static stretching has been shown to improve stretch tolerance, reduce muscle stiffness and produce muscle changes which would tend to reduce the risk of injury but was found to be comparable to active stretching when performed 2 x 30 seconds twice a day. PNF stretching provides the greatest improvement in range of motion. Dynamic stretching involves stretching, muscle contraction, control and movement rehearsal and is a good way of progressing from static stretching to sporting activity. It is therefore useful in warm up.

Why warm up?

The evidence suggests that warm up can reduce muscle strain injury by increasing blood flow and temperature in the area prior to activity. It also optimally prepares the athlete from the point of view of practicing specific movement patterns. It was found in on elastic stiffness reduced significantly with 10 minutes of jogging at 60% and the same effect was achieved with 5 x 30 second stretches with 30 seconds in between.

Ice baths

The use of ice baths for recovery has been the subject of much debate over the last 5-10 years with Paula Radcliffe being one of their biggest advocators. In 2007, an Australian group of researchers reported that there were no significant differences between two groups (one group were treated with an ice bath and one group were used as a control) with regards to changes in most pain parameters, tenderness, isometric strength, swelling, single leg hop test or serum CK over time. There was a significant difference in pain on sit-to-stand at 24 hours, with the intervention group demonstrating a greater increase in pain than control group. This study has been reported on by a number of national newspapers within the last year.

Summary



Most of the scant research available is based on subjects with restricted flexibility and there is very little available evidence on cohorts of “normals”. In my experience of working with athletes, stretching is a very personal thing. Some find that it is an essential component of their conditioning while others find that it has negative effects on performance. I would therefore not advocate a vigorous and systematic static stretching programme for all muscle groups especially immediately before training and competition. If there are areas that have

been found to be restricted or frequent cause pain and soreness, it may be worth integrating stretching in to your training programme.

The key points:

1. The positive evidence for stretching is greater than the negative in terms of physiological effects
2. Stretch relevant muscle groups for 30 seconds and repeat 4 times
3. Do not stretch vigorously immediately before exercise
4. Do not stretch in the acute stage of an injury
5. Stretching during warm up is optional but if carried out should be performed gently and after a short period of aerobic exercise
6. Use an active and specific warm up to match the movement patterns of the sport. This may consist of a combination of static and dynamic stretching.
7. Ice baths during recovery are likely to be ineffective

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