Compression garments: Do they really work?

Compression garments are becoming increasingly popular on the sporting scene, but is there any scientific evidence to support their use? In this article Jess Hill and Dr Charlie Pedlar consider the benefits offered for performance and recovery, and the potential underlying mechanisms.

Introduction

Athletes and their coaches are continuously searching for training aids that enhance both performance and recovery. We are constantly being bombarded with advertisements for the latest article of sporting apparel with claims of special new functions guaranteed to improve various aspects of athletic performance. Compression garments are such an item that are now used widely across the sporting arena – but do they really work?

Compression garments – characterised by their highly elastic properties – have recently been developed by a number of manufacturers, creating a whole new category of sports clothing. Compression garments typically focus on the lower limbs (including full-length leggings and socks) or the upper body (including sleeves and various tops). Whilst the compressive functions themselves are very similar, the mechanical properties may vary from garment to garment. For example, leggings are often graduated – exerting the highest degree of pressure at the ankle with the pressure gradually decreasing towards the top of the leg. The pressure exerted by the average graduated lower limb compression garment is approximately 22 mmHg at the ankle decreasing to about 18 mmHg at the thigh.

The key benefits associated with the use of compression garments were initially recognised in clinical settings where tissue compression is used in the treatment of a number of circulatory and inflammatory disorders, including chronic venous insufficiency, lymphedema and deep vein thrombosis. The compressive force of some medical stockings is considerably higher than the compressive force of commercially available sports garments with a degree of compression ranging between 30-40 mmHg, however these should be worn only as advised by a doctor. Due in large part to commercial promotion, the use of compression garments is growing in popularity in sport and exercise settings, where it believed that the compressive properties of the garments will enhance performance and aid recovery following strenuous training and competition. An unpublished review of the literature, from our laboratory, relating to these garments reveals that their effectiveness is highly questionable.

Mechanisms

Quantification of the exact mechanisms explaining how compression garments may have a beneficial effect on performance and recovery is currently lacking. However, it is suggested that the garments may be effective in reducing the swelling and inflammatory processes associated with muscle damage (Kraemer et al., 2004). This, perhaps, is because compression of the limb creates an external pressure gradient reducing the space available for swelling (Davies et al., 2009). Mechanical damage to the muscle fibres triggers a chain of events that can result in an increased osmotic pressure within the tissue. This increase in pressure is thought to cause an efflux of fluid from the capillaries of the muscle, into the interstitial spaces (Kraemer et al., 2004). The application of compression may attenuate this change in osmotic pressure subsequently reducing the degree of inflammation, the circulation of inflammatory markers and the sensation of pain (Kraemer et al., 2004).

A number of other claims that may explain improved performance and recovery have been proposed. These include reduced muscle oscillation and enhanced muscle pump function thought to reduce venous pooling, improve venous return and enhance the removal of metabolites. As a result of these claims the use of compression garments is continuing to grow in popularity although the scientific evidence to support their efficacy is very limited at present.

Evidence for improved performance

Manufacturers claim that compression garments provide ergogenic benefits during training and athletic performance, these proposed benefits include an increase in strength and power as well as improved endurance performance. Advantages are thought to be achieved via a number of mechanisms, which include increases in muscle oxygenation resulting from improved blood flow to the muscle and reductions in muscle oscillation thought to reduce the severity of fatigue.

Literature has demonstrated that compression garments may help to maintain repeated jump performance and may also improve jump height (Doan et al., 2003). Research has also demonstrated that the use of compression garments can reduce
concentrations of blood lactate when worn both during and after strenuous exercise. However, research indicating improved performance of other performance factors such as isolated sprint performance and repeated sprint performance is limited. Evidence supporting the use of compression garments on improved endurance performance is highly conflicting. Most research indicates that compression garments do not enhance overall endurance performance. Although some research indicates the use of compression garments may improve economy. For a complete review of the literature please refer to MacRae et al. (2011).

Evidence for improved recovery
Exercise induced muscle damage is a common experience for athletes from a wide range of backgrounds undertaking unaccustomed exercise comprising eccentric contractions and is associated with a number of negative symptoms, which include a reduced ability to produce force, a decreased range of motion, inflammation and pain. It is claimed that compression garments can attenuate the negative symptoms associated with muscle damage by providing dynamic immobilisation achieved through mechanical support to the injured tissue and a reduction in motion of the limb (Kraemer et al., 2001).

Research has indicated that when compression sleeves are worn for 3 days, following a bout of damaging exercise, there is a reduction in blood concentrations of the muscle damage marker creatine kinase. Attenuations in muscle soreness, decreased range of motion, and swelling have also been observed, along with an accelerated recovery of strength (Kraemer et al., 2001). It was proposed that the compression sleeve may have attenuated tissue damage occurring as a result of mechanical and chemical stress (Kraemer et al., 2001). However, other studies that support this contention are few and far between.

Another possibility that may explain improvements in both performance and recovery is the placebo effect. Studies on compression rarely control for placebo effect, this may be partly due to difficulties in blinding the experimental groups. Studies investigating recovery from exercise induced muscle damage often use perceived muscle soreness as a marker of delayed onset muscle soreness. However, this is a subjective marker and can certainly be influenced by placebo effect. It is possible that subjects have predetermined opinions on the effectiveness of compression garments and these views may affect certain variables that are assessed.

Conclusions
Existing knowledge on the efficacy of compression garments in enhancing performance and improving recovery is both limited and conflicting. The inconsistent nature of the current research could be due to several factors primarily relating to the heterogeneity of the study design, these factors may include, the type of garment used, the duration of application, the type of activity being performed and the training status of the participants. The exact mechanisms behind the physiological and biochemical responses of wearing compression garments have yet to be established in relation to enhancing performance and recovery. Despite the variation in research findings the use of compression garments remains popular amongst athletes during both training and competition. Further investigation into the effects of wearing compression garments and identification of the underlying mechanisms is necessary in order to quantify their use as either a performance aid or a recovery modality.

The athlete perspective – Q&A with Andrew Osagie

London 2012 Olympic 800 m finalist Andrew Osagie tells us about his own personal use of compression garments.

How much training do you undertake on an average week?
About 25-30 miles of running and about 15-25 miles of cross training (cycling and cross trainer).

As a frequent user of compression garments, what type do you wear?
I usually wear the calf length compression socks.

When would you usually wear these compression socks?
When I’m competing, I wear them between rounds, but otherwise it’s usually only after intense training sessions. I will put them on as soon as possible after competing or training and will keep them on for as long as possible – taking them off before I go to bed. I also wear them leading up to a race and keep them on right up until the start line. If I have to fly to an international meet, I will wear them during the flight too.

What physical benefits do you feel you get from wearing the compression garments?
The main benefit I feel is that my legs don’t feel as heavy – particularly between rounds.

Do you ever wear your compression garments whilst training?
I never wear them during training. For me, personally, I felt they hindered my training. When I did use them I seemed to get more tired towards the end of my sessions. That said, I think they are great for recovery.

Andrew Osagie specialises in the 800 m event and represented Great Britain in the 2012 Olympic Games making the world record-breaking 800 m final won by David Rudisha. His time of 1:43.77 would have won Olympic Gold in the previous three Olympics.

References