

## Compression and sports

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### Introduction

Sportsmen are healthy people who theoretically do not suffer from disabling chronic venous disorders. In these subjects, wearing compressions is not helpful. But the search for a better performance pushed the sporting world to look for devices that can improve muscle performance especially at the calf. The use of compression stockings (CS) is widespread. Their usefulness should be demonstrated. This is the purpose of this abstract. The expected effects of wearing compression stockings during or after sport are: i) improved performance and recovery; ii) acceleration of blood flow; iii) increase of oxygen supplied to the muscles; iv) elimination of toxins.

### Clinical studies of sports performance

Evidence from clinical trials is paradoxically poor. Only one study showed an improvement of performance after sub maximal running.<sup>1</sup> It studied the contribution of CS after a run on a treadmill. Jump height has been improved with less fatigue and better feeling of comfort.

After short duration sprints from 10 to 60 m, no real improvement on performance could be shown.<sup>2-5</sup>

In endurance racings, only one study<sup>3</sup> showed a discreet effect of CS (18-20 mmHg) after running on the treadmill, the running time and lactate levels. All other studies<sup>6-9</sup> did not show a conclusive difference (cycling, running and netball).

A compression garment on the upper body<sup>10</sup> also did not show improved performance among kayakers.

### Effects on paraclinical parameters

During endurance races,<sup>11</sup> no significant difference in VO<sup>2</sup> max, blood lactates and O<sup>2</sup> consumption was found.

Concerning the cardio-respiratory function, one study showed a significant effect on oxygen consumption, O<sub>2</sub> pulse, and local blood flow. However, these improvements appear

trivial to athletes, as they did not correspond to any improvement in endurance running performance. Other published studies did not find any particular effects.<sup>12-14</sup>

Concerning temperature, 3 studies<sup>2,7,15</sup> showed that wearing CS increased skin temperature but not body temperature.

### Effects on proprioception and muscle oscillations

A study<sup>16</sup> demonstrated improved proprioception, which can be explained by stimulating cutaneous receptors and decreasing muscle oscillations during vertical jumps.

But such findings are questionable among runners.

### Clinical studies during recovery

During the recovery phase after a race of endurance there is clearly a positive effect on symptoms (fatigue, swelling, muscle pain) if CS are worn during the race.<sup>13,17,18</sup> Positive effects of CS, wearing on the post-exercise pain, persist for 48 to 72 h after exercise. Wearing CS also improves muscle performances during the recovery phase with positive effects on jump height 24 to 96 h after exercise.

### Effects on lactate

In a study,<sup>19</sup> the authors compare the kinetics of lactate wearing a CS (18 mmHg at the ankle and 8 mmHg at the calf) versus no CS.

Under CS, 15 min after exercise, the lactate levels were lower with CS than without CS. But if CS are removed just after the effort, lactate levels were higher in the CS group than in the group without CS. This means that CS retained lactate in the muscle.

### After a marathon

In a case-control study,<sup>20</sup> after a marathon-run the authors showed a positive effect of wearing CS for 48 h on muscle fatigue and swelling.

### A surprising finding

A recent study<sup>21</sup> demonstrates that wearing CS reduces muscle oscillations and inflamma-

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tory lesions assessed by muscle biopsy 48 h after a race of 40 min on a treadmill. These data could explain the beneficial effects of CS observed during recovery.

### What can we conclude from these studies?

Published studies are very different and it is difficult to give clear conclusions. It seems obvious that CS wearing has no effect on performance during a sprint.

The effects appear marginal during an endurance effort.

However, there is sufficient evidence to claim that CS wearing has an effect on pain during recovery up to 48 h after exercise. The exact mechanisms are discussed (reduction of inflammatory lesions, improving venous flow, etc.). New studies are needed among amateur runners to study new generations of CS.

Partsch and Mosti<sup>22,23</sup> have shown that in venous patients conventional graduated CS improve the calf muscle pump slightly, but that higher pressure over the calf (*progressive CS*) is more effective. Similarly, stiff bands wrapped over the calf with a pressure of 30-40 mmHg narrow deep veins and lead to an increase of the ejection fraction of the calf pump in healthy sports people.

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