No Positive Effects of Running with Sports Compression Socks on Leg Muscle Oxygen Saturation or Muscle Injury Biomarkers

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We have no financial conflicts to disclose
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Background
During the past years, exercise compression socks (CS) have been claimed to increase performance during running in athletes at all levels, with a positive effect on muscle function. However, there are conflicting data on how CS affect muscle function, in terms of oxygenation and muscle breakdown, and whether or not CS may be beneficial in healthy individuals.

Purpose
To examine the effect of CS on the tibialis anterior muscle, in terms of - changes in the intramuscular pressure (IMP) and muscle tissue oxygenation (TOI) - effects on serum biomarkers for muscle damage in healthy runners during a 10-km treadmill run.

Materials and Methods
Twenty healthy runners:
10 men and 10 women; median age 27 (22–35) years, median BMI 22 (17-26) kg/m².
Two identical 10 km treadmill runs, one session with CS and one with regular socks.
There were 4-21 days between the sessions.
Each runner acted as their own control.

Results
The Δ change in median serum myoglobin concentration measured before and after running was significantly higher when CS were used: 58 (9–210) µg/L as compared to 38 (0–196) µg/L with no CS (P = 0.04).
No difference in post-running serum CK concentration was observed between using CS and not using CS.

Running session with CS

Running session without CS

IMP and muscle TOI in the anterior compartment of one leg were continuously measured before, during, and after the running sessions.
Blood samples were collected just before and directly after running sessions and analyzed for myoglobin and creatine kinase (CK).

Conclusion
Wearing exercise compression socks during and following a 10-km treadmill run elevated intramuscular pressure and reduced muscle tissue oxygenation in the anterior compartment of the lower leg in healthy runners.
The use of exercise compression socks did not prevent exercise-induced muscle damage, as measured by serum biomarkers.
Background

During the past years, exercise compression socks (CS) have been claimed to increase performance during running in athletes at all levels, with a positive effect on muscle function\textsuperscript{1}. However, there are conflicting data on how CS affect muscle function, in terms of oxygenation and muscle breakdown, and whether or not CS may be beneficial in healthy individuals\textsuperscript{2-7}.
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<table>
<thead>
<tr>
<th>Running session with CS</th>
<th>Running session without CS</th>
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</thead>
<tbody>
<tr>
<td>Rest supine (2 min)</td>
<td>Rest supine (2 min)</td>
</tr>
<tr>
<td>CS applied (1 min)</td>
<td>Rest standing (1 min)</td>
</tr>
<tr>
<td>CS removed (1 min)</td>
<td>Warm-up running 8 km/h (5 min)</td>
</tr>
<tr>
<td>Running 10-12 km/h (50-60 min)</td>
<td>Running 10-12 km/h (50-60 min)</td>
</tr>
<tr>
<td>Rest standing (1 min)</td>
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</tr>
<tr>
<td>Rest supine (1 min)</td>
<td>Rest supine (5 min)</td>
</tr>
</tbody>
</table>

Schematic diagram of study protocol for running sessions with and without CS.
IMP and muscle TOI in the anterior compartment of one leg were continuously measured before, during, and after the running sessions.

Blood samples were collected just before and directly after running sessions and analyzed for myoglobin and creatine kinase (CK).
Results

The Δ change in median serum myoglobin concentration measured before and after running was significantly higher when CS were used: 58 (9–210) µg/L as compared to 38 (0–196) µg/L with no CS ($P = 0.04$).

No difference in post-running serum CK concentration was observed between using CS and not using CS.
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Running with CS increased the mean IMP 22 ± 3.1mmHg ($p < 0.001$)

Changes in IMP before, during, and after running with or without CS. Values expressed as mean ± SE (n = 20).

* = $p < 0.001$ between the two running sessions  † = $p < 0.01$ between the two running sessions.
Changes in TOI before, during, and after running with or without CS. Values expressed as mean ± SE (n = 20).

* = $p < 0.001$ between the two running sessions
† = $p < 0.05$ between the two running sessions

The mean TOI was $11 \pm 1.8\%$ lower when running with CS ($p < 0.001$)
Conclusion

Wearing exercise compression socks during and following a 10-km treadmill run elevated intramuscular pressure and reduced muscle tissue oxygenation in the anterior compartment of the lower leg in healthy runners.

The use of exercise compression socks did not prevent exercise-induced muscle damage, as measured by serum biomarkers.
References