The assessment of pressure profiles in made to measure compression garments

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INTRODUCTION

- Compression garments (CG) are compressive forms of clothing made from elastin and nylon materials that provide an external pressure on the body.

- Athletes are increasingly using CG's as an ergogenic aid to improve exercise performance and recovery.

- Existing research has typically used commercially available 'off the shelf' CG's with standard sizing which may not provide an optimal fit and suitable pressure profile for different body compositions.

- Existing research has failed to consistently quantify the pressures and pressure gradients elicited by CG's.

- The aims of the current study were:

  (1) Produce two different made-to-measure, lower body CG's, which provide prescribed pressures and pressure gradients.
  (2) Provide a novel pressure assessment to assess pressures and gradients exerted by a CG.

METHODOLOGY

- Ten male, recreational runners (age 24.3 ± 4.6 years, stature 181.5 ± 1.84 cm, body mass 75.7 ± 3.8 kg) volunteered for the study.

- A minimal pressure control (CON) garment and graduated pressure bilateral (BILAT) garment were manufactured using scanned lower body 3D models and prescribed pressures.

- Pressures were assessed using a 13 camera motion capture system (Qualisys, SE), 9 (one wand) reflective markers and a Kikuhime pressure sensor (Medigroup, Melbourne, Australia).

- The pressure sensor was placed posteriorly between the skin and garment and measured at intervals along the length of the leg. Pressure was measured at approximately 5 cm intervals and the location of each measurement site established using 3D data from a 'wand' marker.

Figure 1. Schematic of the methodology beginning with a 3D scan, manufacturing the garments using the 3D model and subsequent assessment of pressure.

RESULTS

- Root mean squared differences between predicted and actual pressure for the CON garment was 2.0 mmHg and 2.1 mmHg for the left and right legs, respectively.

- Root mean squared differences between predicted and actual pressure for the BILAT garment was 2.1 mmHg and 2.2 mmHg for the left and right legs, respectively.

- For the CON garment, modelled pressure at the ankle was 14 mmHg and 13 mmHg in the left and right leg respectively and the pressure reduction was 10 mmHg and 7 mmHg.

- For the BILAT garment, the modelled pressure at the ankle was 27 mmHg and 28 mmHg in the left and right leg respectively and the pressure reduction was 24 mmHg and 23 mmHg.
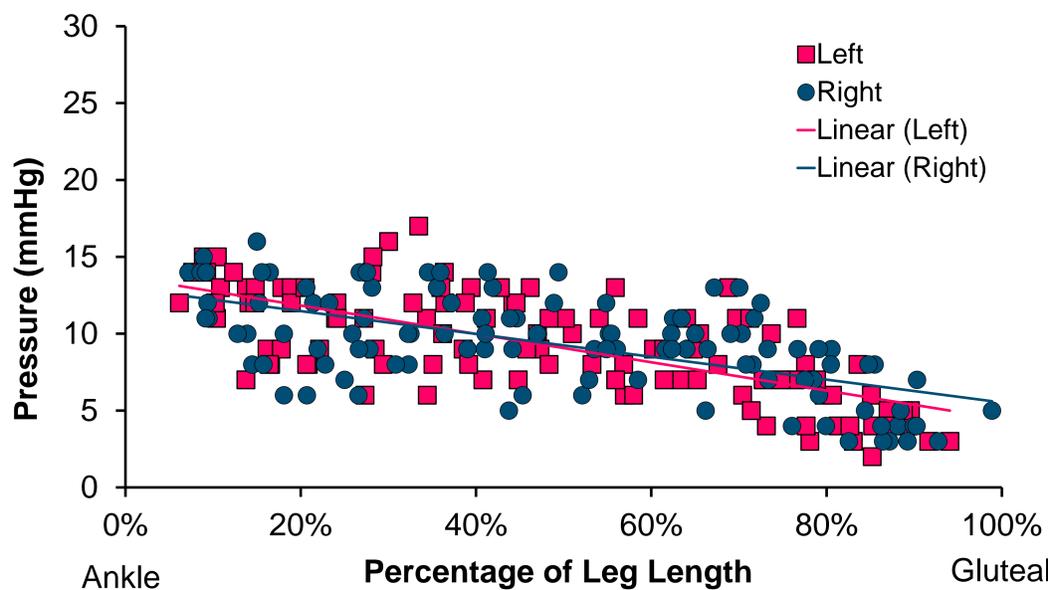
Figure 2. Measured pressure and pressure gradient (pressure profile) for each participant in the control garment condition.
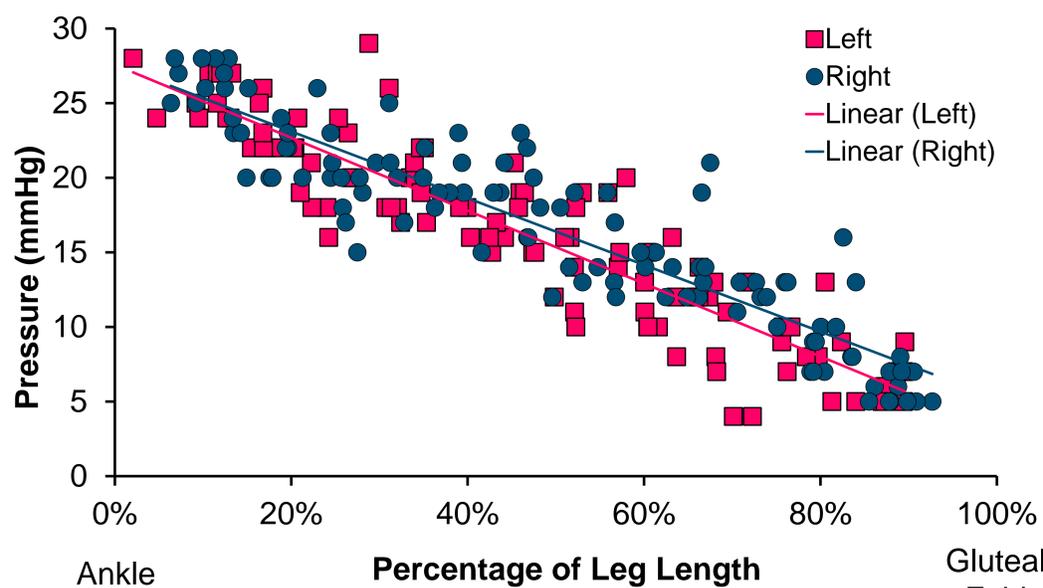
Figure 3. Measured pressure and pressure gradient (pressure profile) for each participant in the bilateral garment condition.

CONCLUSION

(1) Made-to-measure CG's can elicit closely prescribed pressures and pressure gradients between participants and different CG conditions.
(2) The novel pressure assessment method showed accurate pressures and pressure gradients along the length of the posterior leg.