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Effect of exercise on the lower limbs skin temperature of elderly people

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Abstract

The aim of this study was to analyse the lower limb skin temperature (Tsk) of elderly people after a training session. The Tsk of the lower limbs from 66 active elderly was measured by infrared thermography before and after a circuit training session using 28 regions of interest (ROIs) from anterior and posterior areas. Significant differences were observed between the two sexes and time points. The analysis by sex of the anterior area shows that men had a significantly higher Tsk at both the initial and final time points in several ROIs. Comparing the two time points, only a significant difference was observed Achilles tendon areas.

1. Introduction

Considerable scientific evidence has confirmed that regular physical activity and strength and resistance training improve functional skills (VO2 and strength) and lead to a noticeable increase in strength in the lower limbs of older adults [1]. Previous reports have recorded exercise-related temperature changes in both muscle and skin by direct measurements [2,3]. Increases in body temperature due to heat production occur especially in active muscles, causing an inversion of the temperature gradient between muscles and arterial blood [4]. The advent of infrared thermography (IRT) has made it possible to visualize the skin temperature (Tsk) of the human body over large areas of interest (ROIs) and thus to directly quantify the effects of exercise[4], changes in air flow and changes in skin blood flow on the skin surface [5].

In this study, we aimed to analyse the skin temperature (Tsk) of the lower limbs in elderly people before and after physical activity to determine the acute skin thermal response to exercise and the relationship between this response and muscle activation.

2. Methods

A quasi-experimental design with 66 elderly people divided into two groups was used: 19 men and 47 women (n = 66); age: 75.3±7.2 years ranged from 63 to 94 years; body mass: 69.86±9.18 kg; height: 154.14±8.22 cm; BMI: 29.44±3.95 kg/m2). All the participants were active persons who participated twice per week in the morning activities of the community physical and recreational programme “Mayores en forma” from the municipality of Leganes.

Following the directions of the TISEM consensus document [6], the Tsk of the lower limbs was recorded by a FLIR T335 thermal imager, before and after a circuit training session, selecting 28 regions of interest (ROIs) from anterior and posterior thermograms with the Thermacam Recorder of FLIR (Fig 1).

The training protocol consisted of a 50-minute standard, fully directed and supervised training session including i) a 15-minute warm-up, ii) a main 30-minute component with dynamic activities, including self-resistance strengthening exercises for the whole body in a circuit of 4 sets of 8 exercises (20 minutes of activity and 15 seconds of recovery after each exercise) with 2 minutes of active recovery (soft stretching) between sets, and iii) a 5-minute cool-down. Descriptive and inferential statistics were used at the 95% level of significance ($p<0.05$).

3. Results

A summary of the differences observed between the two sexes and time points can be seen in Fig. 2.

Comparing the two time points, in the anterior area, only significant differences ($p<0.05$) were observed in the right ($p=0.003$) and left ($p=0.002$) ankle. In the posterior area, it was observed that the Tsk of men was significantly higher than that of women at both the initial and final time points, except for in the right ($p=0.067$) and left ($p=0.087$) Achilles tendon.

The analysis by sex of the anterior area shows that men had a significantly higher Tsk at both the initial and final time points, except for in the right anterior external leg ($p=0.089$), right ankle ($p=0.0258$) and left ankle ($p=0.698$).

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4. Conclusions

We can conclude from our data that men presented a higher Tsk than women did before and after exercise. In general, the Tsk is higher after exercise, but a decrease in specific areas of the adductor and anterior and posterior thigh was observed only in men.

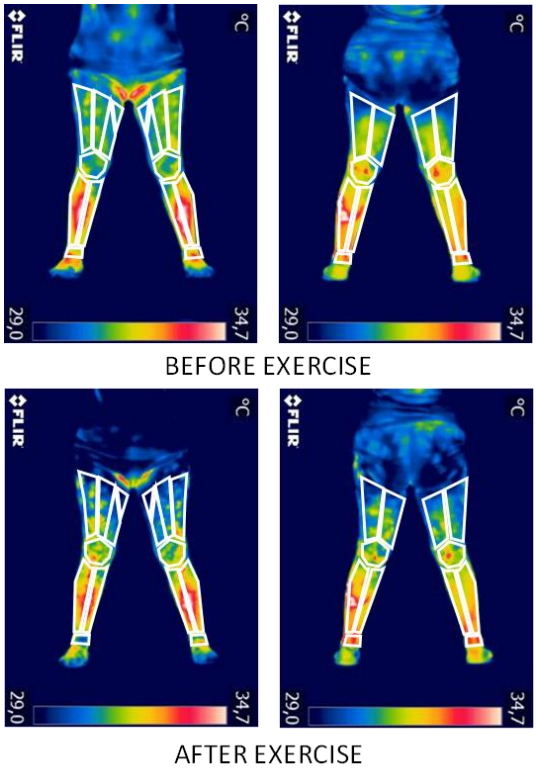

Fig. 1. *The selected ROIs in the anterior and posterior views before and after exercise*

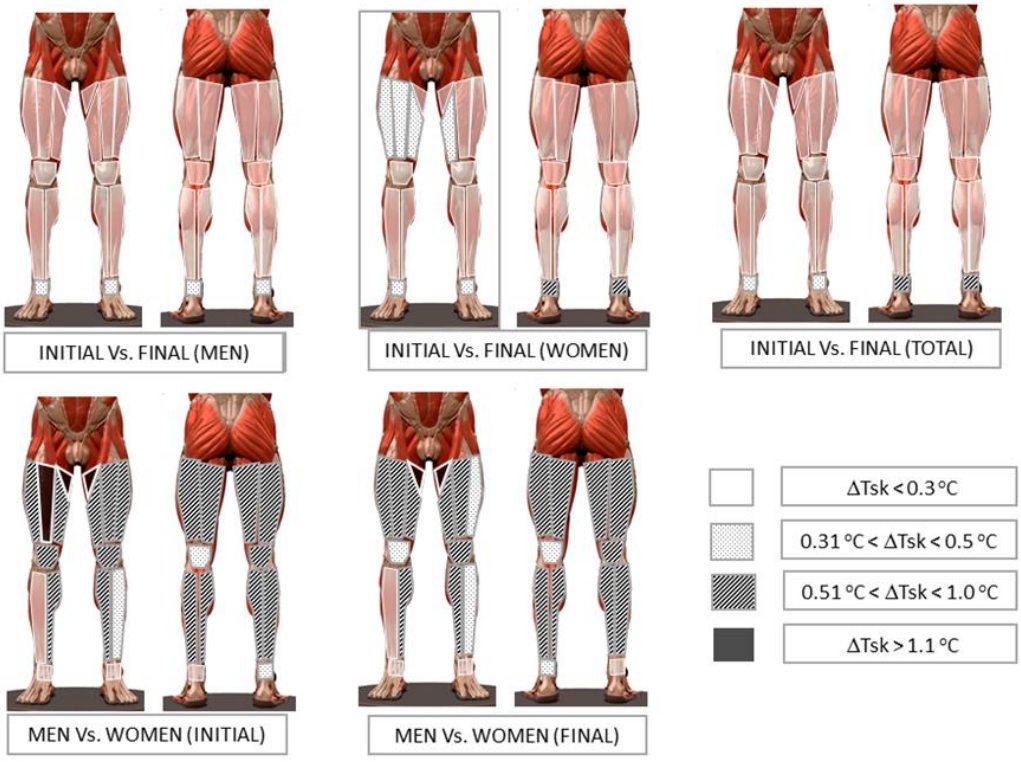

Fig. 2. *Schematic representation of the thermal skin changes in men and women before and after exercise*

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