Introduction

Foot temperature monitoring is effective for reducing foot ulcer risk in people with diabetes [1]. Heat/Temperature is one of the markers of inflammation and soft tissue injury [1].

Why – what is the mechanic explanation?

Heat/Temperature is one of the markers of inflammation and soft tissue injury [1].生物発熱

What kind of foot temperatures?

A difference in temperatures of the same location in contralateral feet indicates a higher risk of ulceration in the foot with the higher temperature [1].

What are the other factors affecting DFU?

Some factors that contribute to diabetic foot ulceration [2].

Methods

Foot temperature and pressure data from 18 healthy volunteers (ten 30-40 years: 33.4±2.4 years; eight >40 years: 54.1±7.7 years) walking on a treadmill at three different cadences (80, 100, 120 steps/min) recorded.

Arrangement of sensors in the foot

Inside with temperature sensors (TMP35, Analog devices)

Pressure Sensor (F-Scan, Model 3000E TekScan Inc.)

Temperature sensors (TMP35, Analog Devices)

Foot

Socks

battery packs

Canvas shoe (Slazenger, Model No. 245033)

A participant wearing the system

Canvas shoe (Slazenger, Model No. 245033)

Experimental protocol

Reaching

Standing

Sitting

Walking

Temperature and Acceleration Data

10m

10m

15m

45min

20min

Protocol

Data Recorded

10s recordings every 5 m

Every 1min

Pressure Data

Body Temperature (every 10 mins)

Results

1. The plantar foot temperature increased during walking in both age groups (30-40 years: 4.62±2.00°C; >40 years: 5.49±2.30°C).

2. The temperature rise inversely proportional to initial foot temperature (30-40 years: $R^2$=0.669; >40 years: $R^2$=0.816).

3. Foot temperature changes during walking were not different between the two age groups, or the different foot locations but only depended on the walking cadence.

4. Walking cadence affected the rate of change of plantar foot temperature but not the final measured value after 45-minutes walking.

Mean (SD cloud) Temperature Rise: The rate of temperature change differs between walking cadences, but the final recorded temperatures are similar.

Paired t-tests: Difference in temperature rise between speeds 100 steps/min and 120 steps/min only until about 23 mins. The (inverse) relationship is stronger in the >40 years age group as compared to the 30-40 years age group.

For details see: NR Prabhav et al. Gait & Posture 2017; 52:272-279

References
