How does walking influence plantar foot temperature changes in younger and older adults? - Implications for people with diabetes

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Aims: Foot temperature monitoring is effective for reducing foot ulcer risk in people with diabetes. Continuous monitoring of foot temperatures might therefore offer a potential preventative strategy, but we first need to understand the fundamental influence of daily activity. Therefore, in healthy volunteers we aimed to investigate: i) how foot temperature changes with walking cadence; ii) how this varies at different locations across the foot; iii) if foot temperature change is related to foot pressures.

Methods: Eighteen healthy volunteers (ten 30-40 years: 33.4±2.4 years; eight >40 years: 54.1±7.7 years) were recruited. Foot temperature and pressure data were recorded during walking on a treadmill at three different cadences (80, 100, 120 steps/min). Temperature and pressure data were recorded continuously during walking, using custom-made insoles with temperature sensors embedded at customized locations and in-shoe pressure sensors. Statistical analysis was done using statistical parametric mapping (SPM).

Results: The plantar foot temperature increased during walking in both age groups (30-40 years: 4.62±2.00^{o}C, >40 years: 5.49±2.30^{o}C), with the rise inversely proportional to initial foot temperature (30-40 years: R^2=-0.669, >40 years: R^2=-0.816). Foot temperature changes during walking were not different between the two age groups, or the different foot locations and did not depend on vertical pressures. Walking cadence affected the rate of change of plantar foot temperature but not the final measured value after 45-minutes walking and no association between temperature change and vertical pressure was found.

Conclusions: These results inform our fundamental understanding of how foot temperature changes during walking and lay the foundations for future work in people with diabetes.