

REGIONAL FOOT SWEAT RATES DURING A 65-MINUTE UPHILL WALK WITH A BACKPACK

Alison L. Fogarty¹, Rebecca Barlett¹, Vincent Ventenat², George Havenith¹
¹Loughborough University, United Kingdom, ²Centre de Recherche DECATHLON,
Villeneuve d'Asq - France.

Contact person: G.Havenith@lboro.ac.uk

INTRODUCTION

As recently demonstrated by Taylor *et al.* (2006), all regions of the foot participate in thermoregulatory sweating when under sufficient thermal and exercise loading. Their measurements were taken using capsules during one-legged cycling with the measurements taken on the passive foot only, assuming equal sweat rates in the passive foot to the contralateral active foot. The reason for using the passive foot is the problem that the capsules cannot easily be used inside footwear, and that the capsule connection tubing is difficult to keep in place on moving feet. The current study therefore made an attempt to investigate local sweat rates of an active foot while walking uphill for 65 minutes. Furthermore, during the present study walking boots and socks were worn. To our knowledge, no other study has measured sweat rates on an exercising foot.

METHODS

Nine regularly active males completed a 65-min uphill treadmill walk (5 km.hr⁻¹, 10% grade) carrying a 15-kg backpack with ambient conditions of 25.9 ±0.6°C and 48.6% relative humidity. Sweat rates were measured using an absorption method developed in our laboratory. Briefly, proportional patches of a non-woven absorbent material were applied to pre-determined zones for 10 minutes on the right foot. The foot was divided into 6 zones: 3 plantar regions (toes, mid-sole and heel), and three dorsal regions (medial, central and lateral). A 5 x 2.5cm patch was also taped to the forehead. Sweat rates were calculated from the change in mass of the patches before and after application and expressed in g.m⁻².hr⁻¹. Sweat rate was measured for 10 min, 3 times during the trial: at 0 min, 30 min and 50 min. Local foot temperatures were estimated from infra-red thermal images of the towel-dried skin taken at baseline and after each sweat sampling period. Cardiac frequency (f_c) was measured every 15 sec, whereas auditory canal temperature (T_{au}) was measured at the start and end of the trial.

RESULTS

Cardiac frequency averaged 127.13 beats.min⁻¹ and T_{au} increased by an average of 0.5°C. The local foot temperatures were uniform across the zones, starting at 29.4°C and stabilising at 34.9°C by the end of the trial. Foot sweat rates increased from 212 to 416 and 366 g.m⁻².h⁻¹ and forehead ranged from 150 to 598 and 638 g.m⁻².h⁻¹ across the 3 sample periods. Forehead sweating was lower than all foot samples at the first sample but had the highest sweat rate for the 2nd and 3rd samples. For the 2nd and 3rd samples, the sweating pattern was similar with all plantar regions producing less sweat than the dorsal regions (33% and 66% of total foot sweat respectively). These percentages concur with Taylor *et al.* (2006) who reported 30% and 70% of foot sweat being produced on the plantar and dorsal regions respectively. There was a tendency for sweating to be slightly reduced towards the end of the walking period, especially on the dorsal regions, which may indicate hidromeiosis.

DISCUSSION

There was a consistent sweating pattern with the dorsal regions having a higher sweat rate than the plantar regions, although all regions exhibited a tendency towards hidromeiosis by the end of the trial.

REFERENCES

Taylor, N. A. S., Caldwell, J. N., Mekjavic, I. B. 2006. The sweating foot: local differences in sweat secretion during exercise-induced hyperthermia. *Aviat. Space. Environ.* 77, 1020-7.