

The effects of ice vest pre-cooling on skin blood flow at rest and during exercise in the heat

Price, M. and Maley, M

Published PDF deposited in [Curve](#) November 2015

Original citation:

Price, M. and Maley, M. (2015) The effects of ice vest pre-cooling on skin blood flow at rest and during exercise in the heat. *Extreme Physiology and Medicine* , volume 4 (Supplement 1): A127. DOI: 10.1186/2046-7648-4-S1-A127

BioMed Central

<http://dx.doi.org/10.1186/2046-7648-4-S1-A127>

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.

Copyright © and Moral Rights are retained by the author(s) and/ or other copyright owners. A copy can be downloaded for personal non-commercial research or study, without prior permission or charge. This item cannot be reproduced or quoted extensively from without first obtaining permission in writing from the copyright holder(s). The content must not be changed in any way or sold commercially in any format or medium without the formal permission of the copyright holders.

CURVE is the Institutional Repository for Coventry University

<http://curve.coventry.ac.uk/open>

MEETING ABSTRACT

Open Access

The effects of ice vest pre-cooling on skin blood flow at rest and during exercise in the heat

Mike Price^{1*}, Matthew Maley²

From 15th International Conference on Environmental Ergonomics (ICEE XV)
Portsmouth, UK. 28 June - 3 July 2015

Introduction

Ice vest pre-cooling has been shown to lower rectal temperature during intermittent exercise in hot conditions but only after 40 min of exercise [1]. The authors suggested that the ice vest may have initiated a strong local cutaneous vasoconstrictor response reducing skin blood flow [2] and thus the cooling potential, until increases in body temperature and skin blood flow occurred later in exercise. Therefore, the purpose of this study was to determine whether ice vest pre-cooling reduces skin blood flow during intermittent exercise in the heat compared to a no cooling control.

Methods

Eight male participants volunteered to take part in the study. Following preliminary tests for peak oxygen uptake and peak power output on a cycle ergometer participants undertook either ice vest pre-cooling in cool conditions (mean (SD) air temperature 19.7 (0.4) °C) for 20 min (PRE; using Arctic Heat cooling vests) or a no cooling control (CON) prior to 5 min seated rest in the heat and 45 min of intermittent cycling in the heat (mean (SD) air temperature 35.4 (0.4) °C, 26.3 (4.1) % RH). Participants undertook two further trials involving no exercise to determine the reliability of the cooling procedure. Rectal (T_{re}) and aural (T_{au}) temperature, mean skin temperature (T_{ms} ; [3]), skin blood flow (SkBF; Laser Doppler at the bicep, chest, back and thigh) and ratings of perceived thermal strain (RPTS) were recorded throughout the trial. Data were analysed using two-way analysis of variance with repeated measures on both factors (trial \times time) using SPSS v17.0.

Results

Back skin temperature was cooler following PRE (20.3 (5.0) °C) than for CON (30.3 (1.6) °C; $P < 0.05$) but demonstrated greater intra and inter-individual variation during PRE (~5.0°) when compared to CON (~1.6°C). T_{au} and T_{re} increased by similar amounts during exercise for both PRE and CON (T_{au} ~1.2 °C, T_{re} ~0.6 °C; $P > 0.05$). However, T_{au} was cooler from 5 to 25 min of exercise during PRE ($P < 0.05$) whereas T_{re} was cooler only at 45 min of exercise during PRE. T_{ms} and RPTS were significantly lower during the pre-cooling period (27.1 (2.6) °C; 2.6 (0.8) °C) compared to CON (30.9 (1.0) °C; 3.6 (0.8) °C, respectively; $P < 0.05$) but did not differ during exercise in the heat. RPTS values were consistent between and within participants. Although no trial \times time interactions were observed for SkBF sites a main effect for trial for the back site indicated a decrease in SkBF during the pre-cooling period (-40 (26) %) when compared to CON (9 (45) %; $P < 0.05$).

Discussion

Ice vest pre-cooling resulted in decreased T_{au} and T_{re} , but at different time points, during intermittent cycle exercise in the heat. Back skin temperature responses to cooling were varied and likely explained by the closeness of fit of commercially available ice vests with subsequent effects on local skin blood flow.

Conclusion

The delay in reducing T_{re} following ice vest pre-cooling may be a result of deep body temperature measurement site rather than changes in local skin blood flow per se.

* Correspondence: mike.price@coventry.ac.uk

¹Department of Applied Science and Health, Coventry University, Coventry, CV1 5FB, UK

Full list of author information is available at the end of the article

Authors' details

¹Department of Applied Science and Health, Coventry University, Coventry, CV1 5FB, UK. ²Extreme Environments Laboratory, Department of Sport and Exercise Science, University of Portsmouth, Portsmouth, UK.

Published: 14 September 2015

References

1. Price MJ, Boyd C, Goosey-Tolfrey VL: **The physiological effects of pre- and mid-event cooling during intermittent running in the heat in elite female soccer players.** *Applied Physiology, Nutrition and Metabolism* 2009, **34**(5):942-949.
2. Petrofsky JS, Al-Malty AM, Prowse M: **Relationship between multiple stimuli and skin blood flow.** *Med Sci Monit* 2008, **14**(8):CR399-405, 2008 Aug.
3. Ramanathan NLA: **A new weighting system for mean surface temperature of the human body.** *J Appl Physiol* 1964, **19**:531-534.

doi:10.1186/2046-7648-4-S1-A127

Cite this article as: Price and Maley: The effects of ice vest pre-cooling on skin blood flow at rest and during exercise in the heat. *Extreme Physiology & Medicine* 2015 **4**(Suppl 1):A127.

**Submit your next manuscript to BioMed Central
and take full advantage of:**

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Submit your manuscript at
www.biomedcentral.com/submit

