UNIVERSITI MALAYA

ORIGINAL LITERARY WORK DECLARATION

Name of Candidate: **LER HUI YIN**  
(I.C/Passport No: **810825-05-5394**)

Registration/Matric No: **VHA080003**

Name of Degree: **Doctor of Philosophy**


Field of Study: **Exercise Physiology**

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ABSTRACT

This thesis investigated the effect of hypohydration during prolonged exercise in the heat and the adjustments in the thermoregulatory and cardiovascular control. Four inter-related studies were undertaken. Study One was an observational field study designed to determine the hydration status and practices of elite Kenyan runners (n=11) during competitive distance running events in a tropical environment. Our results show that the elite endurance runners completed their races in warm, very humid climatic conditions with ~3% body weight (BW) loss. They completed their races as the fast finishers in this present study but ran slower than they were capable because of the prevailing heat and humidity. Interestingly, they were able to compensate well by increasing the sweating rate regardless of the amount of fluid ingested or percentage of BW loss in warm conditions. Study Two investigated the effects of hypohydration and simulated hyperhydration on running economy. It was demonstrated that (1) hypohydration did not reduce the oxygen cost of running proportionally with the BW deficit incurred (D3 and D4) and (2) simulated hyperhydration did not increase the oxygen cost of running proportionally with the added gross weight of the runners (AW3 and AW4). Thus despite incurring a decrease in BW, none of the runners in the present study gained any beneficial effect in running economy with hypohydration. The additional oxygen cost was minimised during simulated hyperhydration trials with the added weight evenly distributed around the torso which may be offset by an added contribution from the series and parallel elastic component of muscles and tendons at no additional metabolic cost. In Study Three, the effects of hypohydration on prolonged treadmill running performance in the well controlled hot and cool conditions of a climatic chamber were investigated in 8 male runners. A diuretic (Lasix® 1 mg /kg BM) was used to induce ~3% BW deficit. Mild dehydration (~4.5% BW loss) was shown to have a significant effect on endurance performance in hot conditions.
However, this level of dehydration did not adversely affect endurance performance in cool conditions. Study Four addressed the question of whether enhanced heat shock protein (HSP) expression induced via glutamine supplementation is beneficial in offsetting the deleterious effect of hypohydration on exercise performance. The study further investigated whether alanyl glutamine administration offsets the reported prolonged exercise-induced decrease in plasma glutamine concentration. The present study demonstrates alanyl-glutamine ingestion confers protection and enhances plasma HSP 72 expression. Furthermore, ingestion of alanyl-glutamine was associated with an increased time to exhaustion during hot and hypohydrated conditions. In conclusion, this thesis showed that hypohydration (~ 3% BW) placed the circulatory and thermoregulatory systems under considerable physiological strain during prolonged exercise performance in the heat. However, the alanyl-glutamine ingestion conferred protection and enhanced plasma HSP 72 expression which improves thermotolerance in the heat.
ABSTRAK

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PREFACE

Results culminating from the studies of this thesis which have been presented at scientific conferences:


* Awarded Young Investigator Award (YIA) Travel Grant


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<tr>
<td>yr</td>
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