Andrew Edwards · Anthony Leicht
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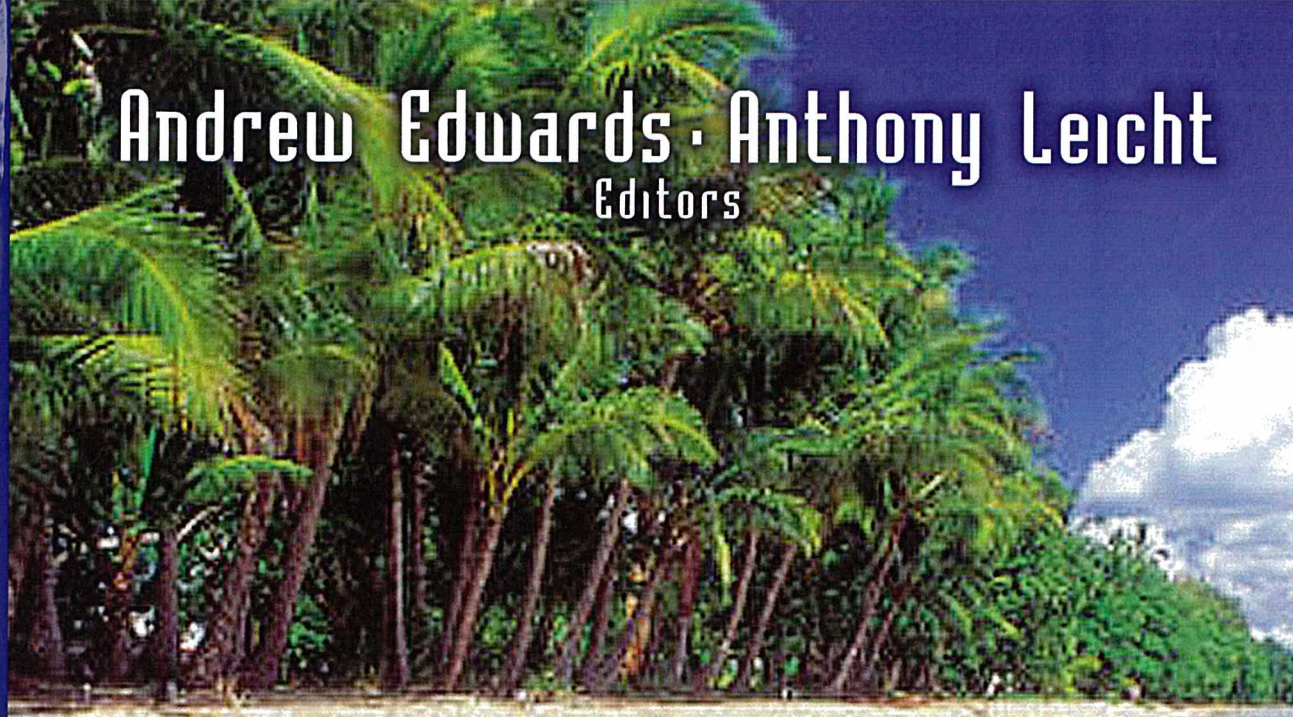

Science of Sport, Exercise and Physical Activity in the Tropics

SPORTS AND ATHLETICS PREPARATION, PERFORMANCE, AND PSYCHOLOGY

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SPORTS AND ATHLETICS PREPARATION, PERFORMANCE, AND PSYCHOLOGY

SCIENCE OF SPORT, EXERCISE AND PHYSICAL ACTIVITY IN THE TROPICS

ANDREW EDWARDS
AND
ANTHONY LEICHT
EDITORS

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CONTENTS

Editors Details and Page (List) of Scientific Reviewers		**vii**
Introduction	*Anthony S. Leicht*	**ix**
Chapter 1	Understanding the Body's Physiological Capacity to Dissipate Heat during Challenges to Human Heat Balance – A Calorimetric Perspective *Glen P. Kenny*	**1**
Chapter 2	Interactions between Exercise, Thermal Stress and the Immune System *David B. Pyne*	**11**
Chapter 3	Exercise in the Heat: What Does the Brain Tell Us? *Romain Meeusen and Bart Roelands*	**19**
Chapter 4	The Central Mechanisms of Pacing and Performance *A. M. Edwards and R. C. J. Polman*	**29**
Chapter 5	The Regulation of Pace during Prolonged Exercise in the Heat: Influence on Optimal Pacing Strategies *Chris R. Abbiss*	**35**
Chapter 6	Influence of Intervals of Radiant Heat on Performance and Pacing Dynamics during Rowing Exercise *Patrick J. Lander, Ronald J. Butterly, Andrew M. Edwards and Lee Ingle*	**43**
Chapter 7	Football Performance in the Heat *Julien D. Périard and Sébastien Racinais*	**55**
Chapter 8	Seasonal Variations in Fitness in Female Soccer Players: The Use of Small Sided Games for Fitness *Sarah R. Hervert, Glen B. Deakin and Kelly Sinclair*	**65**

Chapter 9 Finding Your Carbohydrate and Fluid Sweet-Spot – Practical and Academic Considerations **75**
Gregory R. Cox

Chapter 10 Triathlon in the Tropics – South Pacific Style **83**
Humpress Harrington, Lucy Taolo and David MacLaren

Chapter 11 Physiological Responses to Design Adaptations in Firefighting PPC during Simulated Firefighting Tasks **91**
Anthony Walker, Christos Argus, Matthew Driller and Ben Rattray

Chapter 12 The CoolMe™ Vest - Idea to Application **103**
Glen B. Deakin, Robert Ennis-Thomas and William Armstrong

Chapter 13 Developments in 'Lifestyle Medicine' and Implications for Tropical Conditions **111**
Garry Egger

Chapter 14 Physical Activity Behaviour in the Tropics **123**
Remco Polman, Fiona Ling and Erika Borkoles

Chapter 15 Clinical Exercise Physiology Placement Supervision Processes and Practices: Where Are We and Where to Next? **137**
Rebecca Sealey, Jacqueline Raymond, Herb Groeller, Kieron Rooney, Meagan Crabb and Kerrianne Watt

Chapter 16 Clinical Exercise Physiology Placement Supervision Resources and Training Needs: Where Are We and Where to Next? **149**
Rebecca Sealey, Jacqueline Raymond, Herb Groeller, Kieron Rooney, Meagan Crabb and Kerrianne Watt

Chapter 17 A University-Based Clinical Exercise Facility that Serves as a Clinical, Teaching and Research Space **163**
S. Selig, N. Saunders, N. Mundell, L. Conway, A. Wallis, J. Gardner and S. Fraser

Index **173**

INTRODUCTION

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In 2012, the Earth's population was estimated to be approximately 7 billion, with humans living in all corners and environments. A significant proportion (40% or 2.8 billion persons) has been reported to live within the Tropics, a region extending from the Tropic of Cancer (23.4° N) south to the Tropic of Capricorn (23.4° S). This equatorial region typically experiences the highest average temperatures (20-35° C), rainfalls (4-8 $mm \cdot day^{-1}$) and day length (10-13.5 hours) on the planet. These climatic characteristics subsequently provide a unique environment for vegetation, wildlife and humans.

To date, examination of tropical life has been based largely on country, climate or health. For example, high temperatures and humidity within the tropics encourage a range of wildlife including insects that act as carriers of disease. Subsequently, a main focus of tropical research has been communicable disease such as Chagas disease, Dengue, African Trypanosomiasis, Leishmaniasis, Lymphatic Filariasis, Malaria, Onchocerciasis and Schistosomiasis. Prevalence of these diseases and their health outcomes have been a major priority for the World Health Organisation with the following factors impacting prevalence and treatment rationales: increased occupation of tropical regions, greater international travel, climate change, socioeconomic status, and access to health care. The extent of this subject is further exemplified through a recent PubMed search using the term tropical disease. This search identified approximately 17,000 articles focussing on tropical diseases. In contrast, a similar search using the term tropical exercise or sport identified only 400 articles, approximately 2% of that identified for tropical diseases. This disparity clearly highlights the scarcity of tropic focussed research for the exercise and sport science profession in a region inhabited by almost half of the world's population and which provides quite different climatic challenges to temperate environments.

Despite this minimal research focus, there have been many studies that have examined tropical issues indirectly. For example, the influence of heat and cooling has been an area of growing interest for at least the past 20 years. Most exercise physiology textbooks now contain a separate chapter(s) identifying the impact of heat on the physiological responses prior to, during and post exercise. Further, the impact of cooling prior to, during and post-

exercise has been examined for rehabilitation and/or exercise performance objectives, though much still remains to be elucidated, particularly surrounding the issues of performance in humid environments. These foci though highlight the growing interest in tropical themes with further studies needed to enhance the current knowledge base. Likewise, development of exercise and sport professionals is needed to manage the health and performance of the population. This issue is especially apparent with the 2014 FIFA Soccer World Cup and the 2016 summer Olympics Games being held in the tropical city of Rio de Janeiro, while the 2022 FIFA soccer world cup will be hosted by Qatar. With such major elite sporting events being held in tropical and hot environments, it places increased priority on examining appropriate coping mechanisms, training and recovery techniques which are specific to these conditions. Although many sport scientists are now employed to assist athletes with performance during hot and/or humid environmental conditions, much still remains to be considered and examined. Some examples include:

- What impact does a tropical environment have on physical activity levels?
- How can humans perform optimally in very hot and humid conditions?
- What other tropical aspects impact on health and well-being?
- With such paucity of research in this area, are sports science practitioners currently sufficiently aware of the impacts of tropical conditions to appropriately advise athletes?

With impending climatic changes, expansion of humans into uninhibited tropical regions and a growing population worldwide, the impact of the Tropics will be substantial in the future.

Given the unique environment that the Tropics provides and the need for focussed research in this area, the Science of Sport, Exercise and Physical Activity in the Tropics (SSEPAT) conference was held in Cairns Australia, November 28-30, 2013. This meeting encompassed the multidisciplinary aspects of sport, exercise and physical activity within tropical climates, involved speakers from abroad (e.g., Canada, Qatar) and local (e.g., Australia), and topics such as environmental physiology, nutrition, immune function, rural/remote/indigenous physical activity, pre-cooling, pacing in sports, and clinical exercise physiology. Significant discussion and debate was held amongst attendees with invited speakers and delegates invited to contribute to the first text focussing on these topics. The result was the current text which highlights key aspects of the meeting and provides impetus for further research involving exercise, sport and physical activity in the tropics.

The reader is directed to several key themes and highlights from the meeting as follows:

- Dissipation of heat and heat balance (Chapter 1). This chapter describes the physiological response to maintain body temperature including the use of whole body calorimetry.
- Heat stress and immune function (Chapter 2). This chapter highlights the impact of exercise on immune function with practical strategies also discussed.
- Pacing and performance (Chapters 3-6). These chapters investigate the impact of heat on athlete perception, processing and performance including potential mechanisms for athlete strategies.

- Performance in tropical environments (Chapters 7, 8, 11, 12). These chapters examine the performances of humans during sport, exercise and occupational tasks within tropical environments.
- Development of a personal aid for tropical environments (Chapter 12). This chapter describes the development of a novel aid to assist performance in tropical climates.
- Physical activity in the tropics (Chapter 14). This chapter examines the impact of tropical environments on physical activity performance and behaviour.
- Clinical exercise physiology and development of future professionals (Chapters 15-17). These chapters examine the education of new graduates and professionals including work-integrated learning opportunities and developing areas for target.

This text does not represent the final discussion on tropical research; however, it takes the first step in identifying some pertinent considerations for these conditions. It is anticipated that this book will stimulate further research on the interaction of tropical conditions with sport, exercise and physical activity. The style of the book is therefore particularly focused on providing key commentary articles on thematic areas considered of importance across sport, clinical aspects of exercise, and physical activity, in addition to empirical work.