EDITH COWAN UNIVERSITY

School of Exercise, Biomedical and Health Sciences

Does training with PowerCranks™ affect economy of motion, cycling efficiency, oxygen uptake and muscle activation patterns in trained cyclists?

Masters Thesis

Jack Burns

(BSc. Sports Science)

This thesis is presented in fulfilment of the requirements for the degree of

Master of Science (Sports Science)

Supervisor: Dr Paul Laursen

Associate Supervisor: Dr Greig Watson

Date of Submission: 5th June, 2008

EDITH COWAN UNIVERSITY

DECLARATION

I certify that this thesis does not, to the best of my knowledge and belief:

(i) incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education.

(ii) contain any material previously published or written by another person except where due reference is made in the text; or

(iii) contain any defamatory material.

I also grant permission for the Library at Edith Cowan University to make duplicate copies of my thesis as required.

Signature: …………………………………….

Date: ……………………………..

ACKNOWLEDGEMENTS

I would like to dedicate this thesis to the memory of David Deverell, my Pop, who still remains a strong driving force in my life and someone I miss very much.

Firstly, I would like to thank my supervisors, Paul Laursen and Greig Watson, who have provided much support and advice throughout the development and writing of this thesis. Their friendship has been something that I am very grateful for.

I would also like to strongly acknowledge the support of Jeremiah Peiffer and Chris Abbiss whose assistance in everything from project development to data collection and thesis write up has been invaluable. I am truly in debt to both for their kindness and friendship.

Thankyou also to all the Staff and Postgraduate Students at the University for generously offering your support, advice and above all, friendship.

Thankyou to the subjects for without their time and efforts this project would not of have happened.

To my Family, Dad, Mum and Ray, Gran, Luke and Fern. Their support of me in my educational pursuits has been generous and selfless. I simply can not thank you enough.

To Meredith, thankyou for your support and friendship.

Abstract

PowerCranks™ are claimed to increase economy of motion and cycling efficiency by reducing the muscular recruitment patterns that contribute to the resistive forces occurring during the recovery phase of the pedal stroke. However, scientific research examining the efficacy of training with PowerCranks™ is lacking. Therefore, the purpose of this study was to determine if five weeks of training with PowerCranks™ improves economy of motion (EOM), gross efficiency (GE), oxygen uptake (**Error! Bookmark not defined.**$\dot{V}O_2$) and muscle activation patterns in trained cyclists. Sixteen trained cyclists were matched and paired into either a PowerCranks™ (PC) or Normal Cranks (NC) training group. Prior to training, all subjects completed a graded exercise test (GXT) using normal bicycle cranks. Additionally, on a separate day the PC group performed a modified GXT using PowerCranks™ and cycled only until the end of the 200W stage (PCT). During the GXT and PCT, FeO_2, $FeCO_2$ and $\dot{V}_E$ were measured to determine EOM, GE and $\dot{V}O_2$max. Integrated electromyography (iEMG) was also used to examine selected muscular activation patterns. Subjects then repeated the tests following the completion of training on their assigned cranks. No significant improvements were observed for EOM, GE, $\dot{V}O_2$max or iEMG in either the PC or NC group when subjects were cycling with normal cranks during the GXT. Likewise, no significant training effects were observed when PC subjects cycled with PowerCranks™ during the PCT. PC group subjects were significantly less efficient and economical, before and after training when cycling with PowerCranks™ compared to cycling with normal cranks. The results from this study do not support benefits claimed by PowerCranks™, however further research is needed to examine the influence of training with PowerCranks™ on various physiological variables over a more prolonged training duration.

TABLE OF CONTENTS

List of Tables

List of Figures