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**THE EFFECTS OF ACUTE ALCOHOL CONSUMPTION
ON MUSCULAR PERFORMANCE AND RECOVERY
AFTER EXERCISE**

A thesis submitted in partial fulfilment
of the requirements for the degree of
Doctor of Philosophy
in
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New Zealand

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ABSTRACT

The acute consumption of alcohol after sport, particularly team sport, is common place. Indeed, sportspeople regularly consume hazardous levels of alcohol at rates significantly higher than non-sportspeople during this period. Much focus is given to behaviours that may enhance the rate of recovery after sport/exercise however little attention has been given to behaviours that may have the opposite, negative effect such as alcohol consumption. Further, while it is widely recommended that alcohol consumption be avoided if damage/injury to skeletal muscle is present little direct evidence exists to support this recommendation. As acute post-eccentric exercise alcohol consumption has previously been shown to impact the magnitude of force loss associated with such exercise, the overall purpose of this thesis was to further investigate the interaction between acute alcohol consumption and damage to skeletal muscle. Within this thesis the consumption of 1 g, but not 0.5 g, of alcohol per kg bodyweight was found to magnify the force loss typically observed in the days after laboratory based, eccentrically biased exercise. This affect was shown to be due to a combination of decreased neural drive and alterations at the muscle level in the days following the damaging event. Investigation into the effect of alcohol on recovery from an ecologically valid game simulation found that acute alcohol consumption and the stresses induced by a rugby match may interact to reduce lower body power output in the days after the match. Other sports specific performance measures, testosterone and cortisol, and markers of immunoendocrine function were unaffected by this combination. In conclusion, the findings presented in this thesis provide evidence that the consumption of alcohol, even at volumes considerably less than those regularly consumed by sportspeople, has deleterious effects on muscle function when consumed soon after strenuous eccentric exercise. This affect is not seen with a lower dose of alcohol or with modest levels of muscle damage. Important to the wider sporting community, these data support the recommendation of limiting alcohol consumption when damage/injury to skeletal muscle has occurred.

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TABLE OF CONTENTS

Abstract	ii
Acknowledgements	iii
Table of Contents	ix
List of Abbreciations.....	x
List of Figures	xiv
List of Tables	xvii
Chapter 1	1
Overview	1
Chapter 2	3
Literature Review	3
2.1 Alcohol.....	3
2.1.1 Production	3
2.1.2 Absorption and metabolism	4
2.1.3 Consumption levels	6
2.1.4 Guidelines for alcohol use	7
2.1.5 Drinking behaviour	8
2.1.5.1 General population	8
2.1.5.2 Sportspeople	8
2.1.6 General physiological effects of alcohol	10
2.1.6.1 Central nervous system.....	10
2.1.6.2 Skeletal muscle	12
2.1.6.3 Immune function	13
2.1.6.4 Hormonal function.....	15
2.1.6.5 Circulation	17
2.1.7 Effects of alcohol on exercise performance	18
2.1.8 Effects of alcohol on recovery	20
2.1.8.1 Metabolic recovery	21
2.1.8.2 Recovery from soft tissue injury	23
2.1.8.3 Alcohol and EIMD	24
2.2 Eccentric EIMD	26
2.2.1 Voluntary force production	26
2.2.1.1 Neural control of force	27
2.2.1.3 Cross-bridge cycle	28
2.2.2 Eccentric muscular contraction	29
2.2.2.1 Force – velocity relationship	30

2.2.2.2 Neural strategies during eccentric contraction	31
2.2.2.3 Mechanisms of force production	32
2.2.2.3.1 Cross-bridge contributions.....	32
2.2.2.3.2 Passive tension.....	34
2.2.3 EIMD related force loss	36
2.2.3.1 Mechanisms of force loss	37
2.2.3.1.1 Structural changes.....	37
2.2.3.1.2 The “popping sarcomere theory”	39
2.2.3.1.3 Direct damage to the sarcolemma.....	40
2.2.3.1.4 Ca ²⁺ mediated muscle damage.....	41
2.2.3.1.5 EC uncoupling	43
2.2.3.1.6 Low frequency fatigue.....	44
2.2.3.1.7 Altered CNS function	46
2.2.3.1.7 Inflammation, repair and regeneration	48
2.2.3.1.8 The sequence of events	49
2.2.3.2 Implications of EIMD on force production	50
2.2.3.2.1 Shift in the length – tension relationship	51
2.2.3.2.2 Force – velocity relationship	51
2.2.3.2.3 Factors influencing the magnitude of force loss.....	52
2.2.3.2.4 Implications of EIMD on functional performance	53
2.2.3.2.4.1 Power output	53
2.2.3.2.4.2 Running economy	55
2.2.3.2.4.3 Cycling performance.....	57
2.2.4 Rugby Union	57
2.2.4.1 Rugby – the sport.....	58
2.2.4.2 Physical demands of rugby.....	59
2.2.4.3 Physical cost of a rugby match.....	62
2.2.4.3.1 Match induced muscle damage.....	63
2.2.4.3.2 Post-match recovery from muscle damage.....	65
2.2.4.4 Rugby match simulations	66
2.3 Summary	67

Chapter 3	70
Aims and Hypotheses.....	70
3.1 Hypotheses	70
3.2 Aims	71
Chapter 4.....	72
General Methodology.....	72
4.1 General Methodology.....	72
4.2 Pre-Experimental Control	72
4.3 Experimental Measures.....	73
4.4 Exercise Protocols.....	74
4.4.1 Eccentric exercise.....	74
4.4.2 Rugby simulation	74
4.5 Treatment	75
Chapter 5	76
Post Exercise Alcohol Ingestion Exacerbates Eccentric-Exercise Induced Losses in Muscular Performance	76
5.1 Abstract	76
5.2 Introduction	77
5.3 Methods.....	78
5.3.1 Subjects	78
5.3.2 Overview	79
5.3.3 Muscular performance.....	79
5.3.4 Exercise protocol.....	79
5.3.5 Treatment	80
5.3.6 Statistical analysis	80
5.4 Results	81
5.5 Discussion	83
5.5.1 Conclusion.....	84
Chapter 6.....	86
A Low Dose of Alcohol Does Not Impact Skeletal Muscle Performance After Exercise Induced Muscle Damage	86
6.1 Abstract	86
6.2 Introduction	87
6.3 Methods.....	88
6.3.1 Subjects	88
6.3.2 Overview	89
6.3.3 Muscular performance.....	89

6.3.4 Exercise protocol.....	90
6.3.5 Treatment	90
6.3.6 Statistical analyses.....	90
6.4 Results	91
6.5 Discussion	93
6.5.1 Conclusion.....	95
Chapter 7	96
The Effects of Acute Alcohol Consumption and Eccentric Muscle Damage on Neuromuscular Function.....	96
7.1 Abstract	96
7.2 Introduction	97
7.3 Methods.....	99
7.3.1 Subjects	99
7.3.2 Overview	99
7.3.3 Neuromuscular performance	100
7.3.3.1 Voluntary and electrically stimulated muscle tension	100
7.3.3.2 Percutaneous electrical stimulation	101
7.3.3.3 MVIC.....	103
7.3.3.4 EMG	103
7.3.3.5 Voluntary activation	103
7.3.3.6 Low frequency fatigue.....	103
7.3.4 Creatine kinase	104
7.3.5 Eccentric exercise.....	104
7.3.6 Treatment	104
7.3.7 Statistical analyses.....	105
7.4 Results	106
7.4.1 MVIC	106
7.4.2 iEMG.....	108
7.4.4 VA	108
7.4.5 LFF	108
7.4.6 CK	108
7.5 Discussion	109
7.5.1 Conclusion.....	113
Chapter 8	115
The Effects of Acute Alcohol Consumption on Recovery from a Simulated Rugby Match.....	115
8.1 Abstract	115

8.2 Introduction	116
8.3 Methods.....	117
8.3.1 Subjects	117
8.3.2 Overview	118
8.3.3 Game simulation	118
8.3.4 Performance measures.....	120
8.3.4.1 Counter movement jump	121
8.3.4.2 Scrummaging power.....	121
8.3.4.3 High intensity drill.....	121
8.3.5 Treatment	122
8.3.6 Blood measures	123
8.3.6.1 Sample collection	123
8.3.6.2 Creatine kinase	123
8.3.6.3 Immune cell concentrations.....	123
8.3.6.4 Hormonal variables	123
8.3.7 Statistical analysis	124
8.4 Results	124
8.4.1 Simulation	124
8.4.2 Performance measures.....	126
8.4.3 Blood measures	128
8.4.4 Blood alcohol concentration.....	131
8.5 Discussion	131
8.5.1 Conclusion.....	135
Chapter 9	136
General Discussion and Conclusion.....	136
9.1 General discussion	136
9.2 Limitations	139
9.3 Conclusions	141
9.4 Future Directions.....	142
References.....	144
Appendix A.....	178
Ethics Application Documentation	178
Chapters 5 and 7.....	178
Chapter 6	179
Chapter 8	180

Appendix B	181
Statements of Contribution	181
Chapter 5	181
Chapter 6	182
Chapter 7	183
Chapter 8	184
Appendix C	185
Publications	185
Chapter 5	185
Chapter 6	186
Chapter 7	187
Chapter 8	188
Appendix D	189
Copyright Licence Agreements.....	189
Chapter 5	189
Chapter 6	190
Chapter 7	191
Chapter 8	192
Appendix E	193
24 Hour Diet Recall	193

LIST OF ABBREVIATIONS

A

ACh	Acetylcholine
ACSM	American College of Sports Medicine
ADP	Adenosine diphosphate
Ag/AgCl	Silver chloride
ATP	Adenosine triphosphate
ALAC	Alcohol Advisory Council of New Zealand
ALC	Alcohol
ANOVA	Analysis of variance

B

BAC	Blood alcohol concentration
BrAc	Breath alcohol concentration
BURST	Bath University Rugby Sprint Test
BW	Body weight

C

C°	Degrees centigrade
CAM	Cell adhesion molecule
CBF	Cerebral blood flow
CK	Creatine kinase
CL	Confidence limit
cm	Centimetre
CMJ	Counter movement jump
CNS	Central nervous system
CON	Concentric torque
CV	Coefficient of variation

D

DOMS	Delayed on set of muscle soreness
------	-----------------------------------

E

EC	Excitation-contraction
ECC	Eccentric torque
EIMD	Exercise induced muscle damage
EMG	Electromyography
ES	Electrical stimulation
EX	Exercising

G

g	Grams
<i>g</i>	Gravity
GABA	Gamma-Aminobutyric acid

H

h	Hour/s
HID	High intensity drill
HR	Heart rate
HR max	Heart rate maximum
Hz	Hertz

I

ICC	Intra-class coefficient
iEMG	Integrated electromyography
IGF-1	Insulin-like growth factor 1
IL.	Illinois
Inc.	Incorporated
ISO	Isometric tension

K

K_m	Michaelis constant
kg	Kilograms

L

L	Litre
---	-------

La ⁻	Lactate
LFF	Low frequency fatigue
M	
μm	Micrometer
μs	Micro second/s
mA	Milliamp
MEOS	Microsomal ethanol oxidising system
mmol	Millimole
MU	Motor unit
mV	Millivolt
MVIC	Maximum voluntary isometric contraction
MVC	Maximum voluntary contraction
N	
n	Number of subjects
N	Newton
NAD ⁺	Nicotinamide adenine dinucleotide
NADH	Reduced form of nicotinamide adenine dinucleotide
NADPH	Reduced for of nicotinamide adenine dinucleotide phosphate
Nm	Newton meter
NX	Non-exercising
O	
OJ	Orange juice
P	
PES	Percutaneous electrical stimulation
P _i	Inorganic phosphate
PPO	Peak power output
PRE	Pre-exercise value
R	
rad	Radians

RE	Running economy
RPE	Rating of perceived exertion
S	
s	Second/s
SD	Standard deviation
SE	Standard error
SPSS	Statistical Package for the Social Sciences
SR	Sarcomplasmic reticulum
StD	Standard drink
T	
TCA	Tricarboxylic acid
TMS	Transcranial magnetic stimulation
U	
USA	United States of America
V	
V	Volt
VA	Voluntary activation
VO ₂	Rate of oxygen consumption
VO ₂ max	Maximal rate of oxygen consumption
v/v	Volume/volume
W	
W	Watts

LIST OF FIGURES

Figure 1 Peak concentric torque (mean \pm SE) measurements made before and 36 and 60 h after 300 eccentric contractions of the quadriceps under control (OJ) and alcohol (ALC) conditions. Significant differences in values occur over time ($p < 0.001$) and between trials ($p < 0.05$) exist. A significant interaction effect exists ($p < 0.05$). Significantly different from preceding values – a $p < 0.001$, b $p < 0.05$ (Barnes et al. 2010).	26
Figure 2 Velocity – power curve for isolated human type I (slow), IIA and IIB fibres at 12° C (Bottinelli et al. 1996).	29
Figure 3 Force velocity curve in a single muscle fibre from a frog (Adapted from Edman 1988).	30
Figure 4 Length – tension relationships of isolated frog skeletal muscle fibres (a), whole muscle (b) length tension curves and single joint torque – angle curves (Brughelli and Cronin 2007).	35
Figure 5 Electron micrograph of rabbit tibialis anterior muscle subjected to isometric (A) or eccentric (B) contractions. No change to normal morphology is evident after isometric contraction however Z – disk streaming and smearing (arrows) and extension of Z – disks into adjacent A – bands (circled areas) is clearly evident in muscle exercised eccentrically (Adapted from Lieber et al. 1991).	38
Figure 6 Schematic representation of the time line used in all studies (not to scale). Performance measures were made immediately before exercise (Pre). Follow up measures (Post 1 and Post 2) were made at either 24 h and 48 h (Chapter 8) or 36 h and 60 h (Chapters 5, 6 and 7), respectively.	74

- Figure 7** Schematic view of the neuromuscular performance protocol. Rest periods are included. See Methods for details. MVIC (hatched bars), maximal voluntary isometric contraction; iEMG, integrated electromyography; ES, electrical stimulation (solid bars); MVIC_t, MVIC with 100 Hz interpolated tetanus.101
- Figure 8** Positioning of percutaneous electrical stimulation and EMG electrodes (A) and customised electrical stimulation rig with accompanying Powerlab (ADInstruments, Australia) data acquisition unit, electrical stimulator (Digitimer DS7, Digitimer Ltd, England) and customised amplifier (B).102
- Figure 9** CK activity prior to (PRE) and 12, 36 and 60h post eccentric exercise under OJ (control) and ALC (alcohol) treatments. * Significantly different to pre-exercise values ($p < 0.05$). Values are mean \pm SE.109
- Figure 10** Schematic view of the simulation. Subjects completed 16 blocks of exercise (four blocks per quarter). Each block involved subjects performing five circuits in which they were required to walk 20 m, run 20 m, perform a contact drill and then jog 20 m. Each circuit took 51 s. At the end of the fifth circuit subjects performed a high intensity drill (Figure 10) which included an agility task and 15 m sprint. After blocks 4 and 12 subjects rested for 4 minutes (quarter time) while between blocks 10 and 9 subjects rested for 10 minutes (half time). Each simulation took 122 ± 1 minutes to complete.120
- Figure 11** Schematic view of the High Intensity Drill. Subjects picked up the first tackle bag and carried it 9 m. They then collected the second tackle bag, carried it 9 m and then weaved through 3 cones set 3 m apart at an angle 45° . Agility task time was recorded with timing gates (1) and (2). Subjects then rested for 25 s before sprinting 15 m through timing gates (3) and (4). Not to scale.122

Figure 12 Between trial (control (OJ) vs. alcohol (ALC)) comparisons of lactate (A), RPE (B) and heart rate (C) responses over four quarters (Q1-Q4) of a rugby game simulation (pre-game simulation, immediately post and 12, 24, 36 and 48 h post game simulation (mean \pm SD). * Significantly different to Q1 value ($p < 0.05$). † Significantly different to Q2 value ($P < 0.05$). # Significantly different to Q3 ($p < 0.05$).127

LIST OF TABLES

Table 1 Alcohol's effects on cognitive function at different blood alcohol concentrations.	11
Table 2 Summary of the effect acute alcohol has on a select number of hormones in males.	16
Table 3 Summary of the research carried out since the ACSM Position Stand (1982) into the effects of alcohol on physical performance.	19
Table 4 Summary of the total distance covered, percentage of time spent in different phases of locomotion and the total number of contacts, including rucks, mauls, tackles and scrums, for forwards and (backs) during matches at various levels of competition. Classification of walking, jogging, striding and sprinting differs between studies however these components usually relate to speeds of approximately 0-6, 6-12, 12-18 and > 18 km/h, respectively. * Venter et al. (2011) included contacts with the ground in addition to those reported by others.	61
Table 5 Absolute changes in torque (Nm) following strenuous eccentric exercise (mean \pm SD).	82
Table 6 Changes in torque (Nm) over time following strenuous eccentric exercise (mean \pm SD).	92
Table 7 Raw values (mean \pm SD) for maximum voluntary isometric contraction (MVIC), integrated EMG (iEMG), voluntary activation (VA) and low frequency fatigue (LFF) for the exercise (EX) and non-exercise (NX) groups under the control (OJ) and alcoholic treatments (ALC).	107
Table 8 Summary of distances covered and number of contacts made during each simulation.	125

Table 9 Scrummaging power, counter movement jump height (CMJ), 15m sprint time and time to complete an agility drill before and 12 and 24 hours after a rugby game simulation (mean \pm SD).128

Table 10 Immune cell concentrations pre-game simulation, immediately post and 12, 24, 36 and 48 h post-game simulation (mean \pm SD).129

Table 11 CK, testosterone and cortisol pre-game simulation, immediately post and 12, 24, 36 and 48 h post-game simulation (mean \pm SD).130