Holistic Exploration of Training Design and Periodisation in Professional Rugby League – A Case Study

by Joanne Michelle Hausler

Thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

under the supervision of
Distinguished Professor Aaron Coutts
Dr. Katie Slattery

University of Technology Sydney
Faculty of Health

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CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Joanne Hausler declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy in the Faculty of Health, at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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Joanne Hausler

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PREFACE

This thesis for the degree of Doctor of Philosophy is in the format of Thesis by Compilation following the 'Graduate Research Candidature Management, Thesis Preparation and Submission Procedures'.

This thesis begins with an introduction (Chapter One), which provides background information, highlights the research problem as well as the purpose and significance of the proposed studies. A literature search was segregated into two parts (Chapter Two); a scoping review and narrative review to provide the current knowledge and research gaps in the physical, technical and tactical demands of rugby league training and current periodisation frameworks applied in team sport. The main body of this thesis presents a sequential series of seven studies (Chapters Two – Chapter Eight) following the development of research ideas to address the research problem. Each study follows a similar outline of Introduction, Methods, results, Discussion and Conclusion. All findings are combined into a discussion chapter (Chapter Nine) to integrate the main findings, limitations and practical applications of the thesis. The final chapter (Chapter Ten) provides an overall conclusion of how the thesis contributes to the initial research problem, provides information on the impact of the thesis and recommendations for future research.

Data obtained for this thesis was collected over the entirety of the 2018 National Rugby League (NRL) competition year from a highly successful club (i.e., NRL champions). Furthermore, this club had prior success in the previous year (e.g., preliminary final participants) and in the subsequent year (i.e., NRL and World Club champions). The continued success of the club in combination with the nature of data collected (i.e., tactical demands of rugby league drills and tactical prescription), the publication of data during this time was embargoed by the NRL club. Accordingly, there are currently no publications. However, it is intended to submit the following studies for peer review publication prior to the submission of this thesis:

- Hausler, J. M., Slattery, K. M., & Coutts, A. J., (2022). The physical, technical and tactical demands of on-field training drills in professional rugby league: A scoping review *(Sports Medicine)*

- Hausler, J. M., Slattery, K. M., & Coutts, A. J., (2022). The development and evaluation of the Training Drill Questionnaire for rugby league *(Science and Medicine in Football)*

- Hausler, J. M., Stolp, S. M., Slattery, K. M., & Coutts, A. J., (2022). The physical, technical and tactical demands of on-field training drills in professional rugby league *(Science and Medicine in Football)*

- Hausler, J. M., Stolp, S. M., Slattery, K. M., & Coutts, A. J., (2022). Variation in physical, technical and tactical aspects in professional rugby league training *(Science and Medicine in Football)*

- Hausler, J. M., Stolp, S. M., Slattery, K. M., & Coutts, A. J., (2022). How do coaches prescribe the tactical elements of training in professional rugby league? A case study *(Science and Medicine in Football)*

- Hausler, J. M., Stolp, S. M., Slattery, K. M., & Coutts, A. J., (2022). Developing a Match Difficulty Index for professional rugby league *(Journal of Sports Sciences)*

- Hausler, J. M., Stolp, S. M., Slattery, K. M., & Coutts, A. J., (2022). How do coaches design training to prepare for upcoming oppositions? *(Journal of Sports Sciences)*

ABSTRACT

Coaches and support staff in professional rugby league clubs collaborate to prepare players for the specific physical, technical and tactical elements required for performance. This is achieved through careful prescription and manipulation of training. Due to the perceived importance to successful match performance, coaches emphasise tactics in training where much of practice is focussed on the execution of strategies. Recently, there has been increased interest in periodisation strategies that seek to concurrently develop the multifaceted physical, psychological and technical requirements of competition, while centrally focussing on the tactical elements of performance (i.e., tactical periodisation). When implemented effectively, this approach ensures that training is designed to prepare for moments within the game (i.e., attack, defence and transitions) while adhering to the philosophies, strategy and game style desired by coaches. Anecdotally, this approach is popular within team sports, but to date, due to the dynamic and changing professional rugby league environment, there is little empirical evidence describing or assessing the efficacy of this approach.

While there are many studies describing the physical demands of rugby league performance and others that have highlighted the importance of specific technical and tactical features for successful performance, a scoping review (Chapter Two) identified gaps in understanding the physical, technical and tactical demands of rugby league training. A narrative review also highlighted the lack of empirical evidence investigating tactical periodisation frameworks. Accordingly, it was apparent there had been no investigations on how coaches plan and prescribe the tactical elements of training for preparation according to their desired game style and philosophical approach.

To address these shortcomings, study two (Chapter Three) developed a questionnaire tool to quantify and monitor how coaches prescribe the tactical elements of training. Measures of tactical descriptors, variables and post-training assessment were identified to form a questionnaire and were subsequently applied in study three (Chapter Four) and study five (Chapter Six) of this thesis.

Studies three (Chapter Four) and four (Chapter Five) investigated the multifaceted demands within rugby league training by describing and examining the variability of

physical, technical and tactical components within team-based training drills. These studies were the first to provide descriptions on the various demands of training, discerning eight overarching components and six central types of drills conducted throughout the season.

Study five (Chapter Six) applied the tool developed in study two (Chapter Three) to describe the tactical arrangement of coaches' on-field training prescription during weekly and seasonal cycles. Results revealed two overarching trends of tactical prescription in the weekly lead up to match performance, with only one variable increasing throughout the competition season. Studies six and seven extended on study five by examining the tactical prescription by coaches in relation to difficulty of upcoming opponent, with main findings revealing the majority of tactical variables differed by training day, with only two variables varying for difficulty of upcoming opponent.

Taken collectively, the findings from this thesis contribute new information to facilitate a holistic approach to the preparation for performance in professional rugby league. These studies extend on the previous knowledge base of physical and technical demands of rugby league training and provide novel insights into how coaches tactically plan, prescribe and arrange rugby league training. Accordingly, studies in this thesis deliver an example of how this information can be routinely collected, monitored and measured to assist coaches and support staff in strategically manipulating physical – technical loads and tactical approaches to training. Future investigations are encouraged to examine whether there are physical, technical and tactical factors that underpin the coaches' prescription and assess these relationships within training and performance.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

%	Percentage
2D	2-Dimensional
ANOVA	Analysis of Variance
AU	Arbitrary units
AUC	Area under curve
CI	Confidence interval
COD	Change of direction
COREQ	Consolidated Criteria for Reporting Qualitative research
COSMIN	COnsensus-based Standards for the selection of health Measurement INstruments
CV	Coefficient of variation
df	Degrees of freedom
ES	Effect size
ESL	European Super League
Exp(B)	Odds ratio
GAS	General Adaptation Syndrome
GLD	Goal line defence
GPS	Global Positioning Satellite
HMP	High-metabolic power
HSD	High speed distance
HSR	High-speed running
HUF	Hit-up forwards
Hz	Hertz
ICC	Intraclass coefficient correlation
IFT	Intermittent fitness test
IMA	Inertial Movement Analysis
IMU	Inertial Movement Units
kg	Kilogram
km	Kilometre
KPC	Kingston Press Championship
M	Mean
m	Metre
mm	Millimetre
MDI	Match Difficulty Index
min	Minute
n	Sample size
NASA-TLX	NASA task load index
NR	Not reported

NRL	National Rugby League
NYC	National Youth Competition
OB	Outside back
PCA	Principal component analysis
Pred	Predicted
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews
Prob	Probability
PTB	Play-the-ball
QC	Queensland Cup
RHIE	Repeated high-intensity effort bouts
RPE	Rating of perceived exertion
s	Second
SAP	Skill Acquisition Periodisation
SD	Standard deviation
SE	Standard error
SPSS	Statistical Package for the Social Sciences
sRPE	Session RPE
SSG	Small-sided games
SWC	Smallest worthwhile change
TAD	Transition from attack to defence
TDA	Transition from defence to attack
TMT	Tactical metabolic training
USB	Universal Serial Bus
VAS	Visual Analogue Scale
VHSR	Very high-speed running
W	Watts
WRF	Wide-running forwards
comp	Competition
F	Forwards
g	G-force
NR	Not reported
Semi-pro	Semi-professional
VHSD	Very high speed distance