AN EXAMINATION OF THE ROLE OF TRAINING DEMANDS AND SIGNFICANT OTHERS IN ATHLETE BURNOUT

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Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the Faculty Ethics Committee / University Ethics Committee.

I declare that the Word Count of this Thesis is 53540 words

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Date: 03/06/2019

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List of Abbreviations

AGT	Achievement Goal Theory
ACTH	Adrenocorticotrophic Hormone
AIC	Akaike's Information Criterion
α	Alpha
EABI	Athletic Burnout Inventory
ABQ	Athlete Burnout Questions
ANOVA	Analysis of Variance
BM	Burnout Measure
cm	Centimetre
$\Delta\chi^2$	Change in Chi-squared
ΔR^2	Change in Coefficient of determination
χ^2	Chi-squared
CFS	Chronic Fatigue Syndrome
CART-Q	Coach–Athlete Relationship Questionnaire
r	Coefficient of Correlation
R^2	Coefficient of Determination
d	Cohen's Effect Size
CFI	Comparative Fit Index
3 + 1Cs	Conceptualisation of the Coach-Athlete Relationship
CI	Confidence Interval
CFA	Confirmatory Factor Analysis
CTCM	Correlated Traits-Correlated Method Model
CTUM	Correlated Traits/ Uncorrelated Methods Model

CTPCM	Correlated Traits/ Perfectly Correlated Methods Model
CJM	Countermovement Jumps
C	Degrees Celsius
df	Degrees of Freedom
$\geq$	Equal to or greater than
F	F-test
GPS	Global Positioning System
g/mL	Gram per millilitre
$>$	Greater than
HPA	Hypothalamic-pituitary-adrenal
km	Kilometre/s
$<$	Less than
–2LL	Log-likelihood
MBI	Maslach Burnout Inventory
MBI-GS	Maslach Burnout Inventory General Service Scale
m	Metre/s
M	Mean
mol/L	Moles per litre
min	Minute
MLM	Multilevel Modelling
MTMM	Multi-Trait/Multi-Method
NA	Negative Affect
NTCM	No Traits/Correlated Methods Model
N	Number
OLBI	Oldenburg Burnout Inventory

η^2	Partial Eta Squared
%	Percent
PCTCM	Perfectly Correlated Traits/Correlated Methods Model
PA	Positive Affect
PANAS	Positive and Negative Affect Scale
rpm	Revolutions per minute
RMSEA	Root Mean Square Error of Approximation
BIC	Schwarz Bayesian Information Criterion
s	Second/s
SDT	Self-Determination Theory
SMBM	Shirom-Melamed Burnout Measure
p	Significance
SD	Standard Deviation of the Mean
β	Standardised Regression Coefficients
SRMR	Standardised Root Mean Square Residual
SEM	Structural Equation Modelling
SDT	Self-determination Theory
t	T-test
TBQ	Team Burnout Questionnaire
TLI	Tucker Lewis Index
UTCM	Uncorrelated Traits/Correlated Models

Publications

Peer Reviewed Papers

This thesis is comprised of the following three papers which have either been peer reviewed and published within a scientific journal or have been submitted for peer review for publication and currently awaiting a response.

1. **Appleby, R**., Davis, P., Davis, L., & Gustafsson, H. (2018). Examining Perceptions of Teammates' Burnout and Training Hours in Athlete Burnout. *Journal of Clinical Sport Psychology*, in press. DOI: https://doi.org/10.1123/jcsp.2017-0037.
2. Davis, L., **Appleby, R**., Davis, P., Wetherell, M., & Gustafsson, H. (2018). The role of coach-athlete relationship quality in team sport athletes' psychophysiological exhaustion: implications for physical and cognitive performance. *Journal of Sports Sciences*, 1-8
3. **Appleby, R**., Davis, P., Davis, L., & Stenling, P., (Under review). Examining perceptions of teammates' burnout and training hours in athlete burnout. *Measurement in Physical Education and Exercise Science.*

Conference Proceedings

During the period of postgraduate study at Northumbria University, the following conference abstracts were accepted for presentation:

1. **Appleby, R.,** Davis, P., Davis, L., & Gustafsson, H. (2015). An Examination of the Influence of Training Hours on Athlete Burnout. *The British Psychology Society Division of Sport and Exercise Psychology*, Leeds, United Kingdom, 14th-15th December 2015.

2. **Appleby, R.,** Davis, L., Davis, P., Gustafsson, H., & Lundkvist, E. (2016). The influence of perceptions of teammates' burnout on individual athletes' emotional well-being. *The British Psychology Society Division of Sport and Exercise Psychology*, Cardiff, United Kingdom, 12th-13th December 2016.
3. **Appleby, R.,** Davis, L., Davis, P., Gustafsson, H., & Wetherell, M. (2017). The psychosocial impact of coach-athlete relationship quality on athletes' psychophysiological exhaustion: implications for physical and cognitive performance. *The International Society of Sport Psychology,* Sevilla, Spain, 10^{th}-14^{th} July 2017.

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Thesis Abstract

The current thesis is written as a collection of four experimental studies, which aimed to examine possible antecedents of athlete burnout, as well as potential performance consequences of the social environment (i.e. coach-athlete relationship) and athlete burnout. The thesis adopts the integrated model of athlete burnout (Gustafsson et al,. 2011) as a theoretical framework to explore the athlete burnout construct. Chapter 1 provides an introduction to the thesis whilst Chapter 2 reviews specific research literature to establish the research area interest for the four experimental studies.

Chapter 3: Validating a Measurement of Perceived Teammate Burnout

The aim of the first experimental study was to validate a sport specific method of measuring perceptions teammate burnout. The athlete burnout questionnaire (ABQ) was adapted to create the team burnout questionnaire (TBQ) with items relating to the three dimensions of burnout (i.e. exhaustion, reduced accomplishment, and sport devaluation) modified through referent-shift to represent the perceptions of teammates (i.e. team exhaustion, team reduced accomplishment, and team sport devaluation). A sample of 290 team sports athletes completed the athlete burnout questionnaire (ABQ) and the TBQ at a single time point. To validate the proposed TBQ as a measure of athletes' perceptions of teammates' burnout two statistical steps were carried out. In the first step, the ABQ and the TBQ were analysed using confirmatory factor analysis (CFA). The next step was to combine both models into one multi-trait/multi-method (MTMM) analysis to test for discriminant validity and convergent validity. Comparing the CFA and MTMM models identifies that the discriminate validity of the TBQ was statistically supported. The TBQ could be utilised by researchers to examine an athlete's perception of their social

environment as previously the integrated model of athlete burnout (Gustafsson et al., 2011) indicated that stressful social relationship may be a possible antecedent of athlete burnout.

Chapter 4: Examining Perceptions of Teammates' Burnout and Training Hours in Athlete Burnout

Following on from the validation of the TBQ in Chapter 3, Chapter 4 aimed to explore whether athlete perceptions of their teammates burnout influence their experience of burnout symptoms. The second aim of the study was to investigate the influence of training hours on the development of athlete burnout. 140 team sport athletes on two occasions separated by 3 months completed a series of questionnaires including the ABQ, the TBQ, and a number of demographic questions (e.g., On average, how many hours do you train per week?). Global burnout scores (i.e. mean of the 15 items of the ABQ) for athlete burnout and actual team burnout level were used to carry out the statistical analysis for the main analysis. The actual team burnout level was calculated by taking the mean of athletes' burnout scores within each team. To assess whether athlete burnout and athletes' perceptions of team burnout changed across time points, paired samples t-tests were conducted. To determine whether training hours impact upon athlete burnout and athletes' perception of team burnout, hierarchical regressions and linear regressions were conducted. The dynamic nature of athlete burnout was highlighted following data collection as the athlete's score on global burnout significantly increased across the 3 month period. At the initial time point, the training hours were not significantly associated to athlete burnout or the perception of their teammate's burnout. However, the cumulative training demands over the course of the 3 months appeared to impact upon athlete burnout. The study also identified that an athlete's perception of their teammates burnout may be a possible athlete burnout antecedent as results indicated that athlete's perceptions of their social environment predicted athlete burnout.

Chapter 5: The Role of Coach-Athlete Relationship Quality in Team Sport Athletes' Psychophysiological Exhaustion: Implications for Physical and Cognitive Performance

Further to stressful social relationships, the integrated model of athlete burnout (Gustafsson et al., 2011) identified the coach-athlete relationship is related to the development of athlete burnout. Chapter 5 aimed to examine whether the quality of the coach-athlete relationship (i.e. closeness, commitment and complementarity) was related to the development of athlete exhaustion and the performance of athletes. Chapter 5 adopted a two phase design. Phase One, 82 athletes participants completed a quasi-experimental trial measuring physical performance during a 5-m multiple shuttle-run test, followed by a Stroop test to assess cognitive performance, provided three samples of saliva to measure cortisol, and a series of questionnaire (i.e., ABQ, coach-athlete relationship questionnaire (CART-Q), demographic and background questionnaire). Structural equation modelling revealed a positive relationship between the quality of the coach-athlete relationship and Stroop performance. Negative relationships existed between the quality of the coach-athlete relationship and cortisol responses to high-intensity exercise, cognitive testing, and exhaustion and athlete exhaustion. In Phase Two, twenty-five athletes completed the experimental procedure on a further two occasions each time separated by 3 months. Structural equation modelling analysis revealed that the coach-athlete relationship at the beginning of the season predicted athlete exhaustion in the middle of the season. The analysis also revealed that the coach-athlete relationship and athlete exhaustion were unrelated to the physical and cognitive performance of athletes at the end of the season. The results indicated that athletes who perceived their relationship with their coach as being close, committed and complementary were less likely to perceive themselves as exhausted. Additionally, indicating that low quality coach athlete relationship increase the likelihood of athletes experiencing symptoms of emotional and physical exhaustion.

Chapter 6: The Physical Implications of Athlete Exhaustion and the Quality of Coach-Athlete Relationship: A Case Study

Chapter 6 aimed to investigate whether athlete burnout and the quality of the coach-athlete relationship accounted for differences in sporting performance. Fourteen male footballers complete a series of questionnaires including the CART-Q and the ABQ on two occasions separated by 10 weeks. Across the 10 weeks the total distance athletes covered during games and training was monitored using global positioning systems (GPS) technology. Further to monitoring running performance athletes counter movement jump (CMJs) were recorded each week. A series of three mixed factor models were utilised to investigate the potential influence of athlete burnout and the quality of the coach-athlete relationship on the variability of athletic performance. Findings from the first mixed factor model indicated that both athlete exhaustion at Time One and coach-athlete relationship quality at Time Two predicted the running distance covered by athletes during training session. The second mixed factor model revealed that performance on CMJs was predicted by athlete exhaustion at Time One, coach-athlete relationship quality at Time One, and the interaction effect between athlete exhaustion at Time One and coach-athlete relationship quality at Time One. The final mixed factor model indicated athlete exhaustion and the quality of the coach-athlete relationship did not predict the running distance covered by athletes during games. The results revealed that athlete who feel they are experiencing symptoms of emotional and physical exhaustion were likely to run further in training but not jump as high on CMJs. Furthermore, it could be suggested that athletes who perceive a high quality coach athlete relationship in terms of being close, committed and complementary were likely to have a lower CMJ score. Finally, the results may suggest that the coach athlete relationship acts as a protective mechanism when exhaustion is high to maintain CMJs performance.

Chapter 7 discusses the general findings arising from the experimental Chapters, presents the central theoretical and applied implications, identifies the limitations of the research programme, and provides suggestions for future research.

Chapter 1: Introduction

1.1. Burnout

Originally developed in caregiving environments, Maslach and Leiter (1997) suggested that burnout represents an erosion in values, dignity, spirit, and will, [it is] an erosion of the human soul' (p. 17). Burnout has arisen as an important health threat that reduces the quality of life of an individual, but also, for their immediate family, friends and other surrounding people (Maslach, Schaufeli, & Leiter, 2001). Maslach et al., (2001) described burnout as a prolonged response to chronic emotional and interpersonal stressors on the job and defined it by three dimensions which are exhaustion (e.g. emotional exhaustion, physically overstretched), depersonalisation (e.g. indifferent attitude towards work), and reduced personal accomplishment (e.g. feelings of inadequacy and incompetence). However, it is important to consider the theoretical issues surrounding this concept of burnout as the relationship between the sub-dimensions of burnout remains unclear (Shirom & Melamed, 2006). It has been suggested that depersonalisation and personal accomplishment do not appropriately characterise burnout and as exhaustion is the central dimension of burnout, research should focus on this (Gustafsson et al., 2016; Shirom, 1989). However, by focussing on the exhaustion element of burnout research may lose sight of the complexity of the concept (Cresswell & Eklund, 2006c). Despite a number of proposed methods of assessing burnout, created due to issues with the conceptualisation of burnout (Lee & Ashforth, 1996; Shirom & Melamed, 2006), the most commonly used method is Maslach Burnout Inventory (Maslach et al., 1996) which assess all three dimensions. This has been subsequently adapted to the elite sport environment.

1.2. Athlete Burnout

Athlete's take part in sport as it is inherently enjoyable, however, training for sport can be physically and emotionally challenging as well as requiring a substantial amount of time and energy (Schellenberg, Gaudreau, & Crocker, 2013). Within sports media, the term burnout is used frequently, this may potentially be because the term burnout is a very powerful phrase that conjures emotive images (Raedeke & Smith, 2001). A reporter for the Guardian claimed that "Raheem Sterling, England's tired striker, might be suffering from burnout" after asking not to be included in the starting team against Estonia, (https://www.theguardian.com/football/2014/oct/13/raheem-sterling-england-tired-striker-burnout). Ben Youngs, an England scrum-half, suggested that due to the demands of the Rugby World Cup, six nations and domestic competitions it is likely that rugby players returning from internationals will suffer from burnout (https://www.mirror.co.uk/sport/rugby-union/rugby-world-cup-2015-englands-6095403). Additionally, Jonathan Trott, a former English cricket player, used the term to describe his departure from a tour of Australia by saying "I wasn't suffering from depression, I was just burnt out" (https://www.telegraph.co.uk/sport/cricket/international/england/10697493/Jonathan-Trott-I-wasnt-suffering-from-depression-I-was-just-burnt-out.html). More recently (2016), Nick Compton decided to have an indefinite break from cricket after a "challenging start to the season, both physically and mentally" (https://www.bbc.co.uk/sport/cricket/36611707).

In order to describe and explain the athlete burnout construct a number of models have been proposed. Athlete burnout research has been guided by Smith's (1986) cognitive affective model which suggests that burnout develops as a consequence of chronic stress and the inability to meet the demands of sport. Coakley (1992) proposed an alternative perspective indicating that athlete burnout is a consequence of the social constraints placed on an athlete by the organisation of sport that hinders the development of a young athlete's identity. Similarly, Raedeke (1997) indicated the commitment model which proposed that athletes engage in sports as a consequence of their feeling of entrapment, with those athletes who engage in sport due to feelings of entrapment more likely to burnout.

Recently an integrated model of athlete burnout has been developed by Gustafsson, Kenttä, and Hassmén (2011) taking a more holistic approach to the development of the construct. The model includes a variety of different aspects including burnout antecedents (e.g. excessive training, stressful social relationships), early signs (e.g. mood disturbance, lack of control), entrapment (e.g. unidimensional athletic identity, high investment), vulnerability factors (e.g. personality, coping, and environment), key burnout dimensions (e.g. physical and emotional exhaustion, reduced accomplishment, and sport devaluation), and maladaptive consequences (e.g., withdrawal, long term performance impairment). Athlete burnout is a multidimensional phenomenon, which has resulted in multiple attempts to characterise and develop models that explain both the processes of burnout as well as possible antecedents. Athlete burnout is characterised by physical and emotional exhaustion (i.e. is related to intensity of training and competition), a reduced sense of accomplishment (i.e. is associated with a loss of interest in the sport) and sport devaluation (i.e. a "don't care" attitude, or resentment towards performance) (Raedeke, 1997; Raedeke, Lunney, & Venables, 2002). In a similar manner to the conceptualisation of burnout in non-sport settings, research has suggested that exhaustion is the central dimension of athlete burnout and feelings of emotional exhaustion have been shown to create a higher risk of burnout manifesting (Lundkvist, Gustafsson, Hjälm, & Hassmén, 2012).

1.3. Differentiating between occupational burnout and athlete burnout

The main conceptualisations of occupational burnout share three common dimensions which develop over an extended period of time: exhaustion, depolarisation (or cynicism), and reduced personal accomplishment (also termed lack of professional efficacy) (Maslach, Jackson, & Leiter, 1996; Maslach et al., 2001; Schaufeli & Enzmann, 1998). Although similar to the characterisations of the dimensions of athlete burnout, they do differ to those of occupational burnout due to the sporting context (Raedeke, & Smith, 2001). Athlete burnout is generally defined as a cognitive-affective syndrome characterised by emotional and physical exhaustion, reduced sporting accomplishment, and devaluation of sport participation (Raedeke, 1997; Raedeke, & Smith, 2001).

In the context of occupational burnout, exhaustion is characterised by a feeling of emotional exhaustion and being physically overstretched, a lack of energy, and a low mood (Bianchi, Schonfeld, & Laurent, 2015). However, in sporting contexts, when an athlete is experiencing symptoms of emotional and physical exhaustion it refers to the depletion of emotional and physical resources as a consequence of training and/or competition. Reduced personal accomplishment in occupational burnout is characterised by feelings of inadequacy and incompetence, which is related to the loss of self-confidence. Reduced sporting accomplishment encompasses an individual’s negative evaluation of sporting abilities and achievements. Finally, depolarisation is defined as a distance or indifferent attitude towards the person’s career where the individual lacks motivation and withdraws from this career, whereas, devaluation of sport participation is characterised by the diminishment of perceived benefits of being involved in sport (Gustafsson, DeFreese, & Madigan, 2017).

1.4. Excessive training

A key aspect of an athlete being successful in sport is the requirement to invest hours into training and gaining experience of performing well in high pressured environments (Balk, Adriaanse, De Ridder, & Evers, 2013; Isoard-Gautheur et al., 2016). Athletes use training (which at times can demand high intensity and may be physically strenuous) to automate motor skill and improve their physical condition (Gustafsson, Kenttä, & Hassmén, 2011; Scott, Lockie, Knight, Clark, & Janse de Jonge, 2013). However, high levels of training can place stress on the athlete resulting in a poorer health rating, greater prevalence of injury and a lower rating of fun during sessions (Law, Côté, & Ericsson, 2008). If athletes are unable to cope with the demand of training, it is possible for them to have a maladaptive response (i.e. negative response to stress) resulting in the development of athlete burnout (Gould & Dieffenbach, 2002; Isoard-Gautheur et al., 2013; Law, Côté, & Ericsson, 2008). Excessive training has been highlighted within the integrated model of athlete burnout as a possible antecedent to athlete burnout (Gustafsson et al., 2011). However, to date research has yielded mixed results in regards to the potential impact of excessive training on athlete burnout development (Cresswell & Eklund, 2006c, 2007b; Smith, Gustafsson, & Hassmén, 2010). Although training load has a been linked to the development of athlete burnout, additional stressors such as personal relationships (e.g. between the coach and athletes, between teammates) must also be considered when considering the possible antecedent of athlete burnout (Gustafsson, Davis, Skoog, Kenttä, & Haberl, 2015).

1.5. Perception of Teammates – Stressful Social Relationships

As proposed by the integrated model of athlete burnout, the social environments (e.g. teammates, coach) an athletes' engage in with their coach may have implications for the development of burnout (Gustafsson et al., 2011). In team sports, athletes work together with teammates towards a common goal or collective objective (Bandura, 1997). As a consequence of time spent interacting and sharing experiences with teammates, collective mood may develop between the team influencing athlete perceptions (Totterdell, 2000). Although researchers are yet to investigate athletes perception of their teammates' burnout, researchers have investigated the influence of collective cohesion and collective efficacy (Carron, Bray, & Eys, 2002; Leo, González-Ponce, Sánchez-Miguel, Ivarsson, & García-Calvo, 2015; Shearer et al., 2009). Athlete burnout may develop in a similar manner, whereby a collective burnout develops between teammates with individuals reflecting commonly held team-based beliefs (Shearer, Holmes, & Mellalieu, 2009). Within environments away from sport such as teaching and nursing burnout has been found to be contagious whereby individuals are influenced by their perceptions of colleagues' burnout level (Bakker, Demerouti, & Schaufeli, 2003; Bakker, Le Blanc, & Schaufeli, 2005; Bakker & Schaufeli, 2000).

1.6. Coach-Athlete Relationship

Athletes often give credit for their accomplishments to the support of their coach. This can be seen through post-competition interviews of athletes and in the acknowledgements and dedications of autobiographies. At the Olympic trials, Michael Phelps described his relationship with Bob Bowman as "It works, and it's worked in the past. I have full trust in him, and he has been the one person that's got me where I am today. He's the best coach for me" (Phelps & Bowman, 2012). Following Andy Murray's Wimbledon title in 2013, he described how his relationship with Ivan Lendl had influenced his performance in training and competitions (www.telegraph.co.uk, 2013). Andy Murray claimed that "he's made me learn more from the losses that I've had than maybe I did in the past…he's been extremely honest with me. If I work hard, he's happy. If I don't, he's disappointed, and he'll tell me". Additionally, Andy Murray highlighted that "When I've lost matches, last year after the final, he told me he was proud of the way I played because I went for it when I had chances. It was the first time I played a match in a grand slam final like that. He's got my mentality slightly different going into those sorts of matches". These two examples highlight that the coach-athlete relationships help to energise, motivate, and support the athletes (Jowett & Shanmugam, 2016). From a coach's perspective, Sir Clive Woodward described how the relationship or the partnership between the athlete or team and their coach is one of the most important elements for performance. Explaining that in order to achieve high level of success, winning a gold medal, an athlete needs a gold medal-winning coach and it has to be a true partnership (www.thetimes.co.uk, 2012). Sir Clive Woodward astutely identifies the importance of the relationship and the influence a coach can have on an athlete's performance.

In contrast, it is uncommon to hear athletes that win medals and break records attack and criticise their coaches. That said, the coach-athlete relationship is at the centre of coaching practice (Jowett & Carpenter, 2015; Lyle, 2002) and has also been found to influence negative outcomes including the perception of stress and development of burnout (Arnold, Fletcher, & Daniels, 2013; DeFreese & Smith, 2014; Fletcher, Hanton, & Mellalieu, 2006; Isoard-Gautheur, Trouilloud, Gustafsson, & Guillet-Descas, 2016). Previously the 3 + 1Cs framework which characterises the quality of the coach-athlete relationship received considerable attention and could utilised to assess the potential stressful coach-athlete relationship (Gustafsson, et al., 2011). The model proposed that the coach-athlete relationship is characterised by closeness (i.e. the affective tone of the relationship), commitment (i.e. cognitive attachment), and complementary (i.e. behavioural transaction of cooperation).

1.7. Performance Impairment

To create a successful training programme coaches are required to balance physical overload and recovery to improve the performance of the athletes (Hough, Corney, Kouris, & Gleeson, 2013). It has been previously proposed that physiological stress or training stress are major contributors to reduction in physical performance and the development of overtraining syndrome (Meeusen et al., 2013; Meeusen et al., 2006, Rollo, Impellizzeri, Zago, & Iaia, 2014). Within burnout research it has been suggested that burnout often leads to a decrement in performance (Cureton, 2009). Furthermore, antecedence related to athlete burnout (e.g. coach-athlete relationship) have linked to the performances of athletes. Considering the integrated model of athlete burnout (Gustafsson, et al., 2011) it can be proposed that stressful antecedents increase the athletes experiencing symptoms of burnout which may result in underperformance indicating possible causal relationships.

1.8. The Present Study

The purpose of this thesis is to build on previous research by investigating the associations between athlete burnout and key relationships in the athletes' sport environment (e.g. coach and teammate). The thesis aims to address the gap in sport psychology literature assessing the potential antecedence of athlete burnout, as well as the potential performance consequences of athlete exhaustion and the athlete's social environment. Research suggests that the crossover/contagion of burnout occurs between individuals in other non-sporting settings; however, there is currently no appropriate tool to measure an athlete's perceptions of their teammates' level of burnout within the domain of sport. As such, the aim of Study 1 (Chapter 3) is to validate an assessment tool to allow researchers to measure athlete's perception of their teammates' burnout (team burnout questionnaire (TBQ)). Although the number of longitudinal research studies investigating athlete burnout has increased, research examining the possible aetiology of athlete burnout is still required. Building on the validation of the TBQ, an investigation into the impact of training hours and social perceptions of teammates' burnout on athlete burnout over a three-month period will also be completed within Study 2 (Chapter 4).

The presented review of research highlights that it is important that research investigates social relationships and their potential impact upon the athlete (i.e. athlete exhaustion, cognitive and physical performance, acute cortisol response). In light of the conceptualisation and development issues surrounding athlete burnout, the final sections of this thesis, focus on the core dimension of exhaustion (Kristensen, Borritz, Villadsen, & Christensen, 2005; Lundkvist, Gustafsson, & Davis, 2016).

Study 4 (Chapter 5) will examine the role of the coach-athlete relationship quality in team on sport athletes' psychophysiological exhaustion; specifically, focussing on the implications for athletes' physical and cognitive performance. In order to further investigate the potential influence of athletic environments on athlete exhaustion and subsequently the impact of athlete exhaustion on athlete's physical and cognitive performance, this study incorporated two phases. Phase one encompassed a quasi-experimental cross-sectional design, whilst Phase two adopted a three-wave longitudinal approach utilising a mediation design. The final study (Chapter 6) investigated athlete exhaustion and the quality of the coach-athlete relationship over a 10-week period with a focus upon athletes' physical performance within an applied environment.

Through each of the experimental studies (Chapters 3-6), the thesis aimed to evaluate aspects of the integrated model of athlete burnout (Gustafsson et al., 2011):

- Validate a method of assess athletes perceptions of their teammates burnout.
- Explore the impact of training hours on athlete burnout.
- Investigate the link between athlete's perceptions of their teammate's burnout, athlete burnout and the quality of the coach-athlete relationship.
- Examine the physical and cognitive performance implications of the coach-athlete relationship quality and athlete exhaustion.

Chapter 2: Literature Review

2.1 Burnout

Despite substantial burnout research being undertaken across a variety of contexts which include occupational health, (Bakker, van Emmerik, & Euwema, 2006), nursing (Kalliath, O'Driscoll, Gillespie, & Bluedorn, 2000), and sport (Gustafsson, Hancock, & Côté, 2014; Hill, & Appleton, 2011), concerns remain regarding the definition of the construct (Kristensen, Borritz, Villadsen, & Christensen, 2005; Lundkvist, Gustafsson, & Davis, 2016; Shirom, 2005). According to one of the initial characterisations of burnout by Maslach and Jackson (1981), burnout is the result of chronic stress within the work place that is not resolved.

In consideration that burnout is a response to prolonged periods of stress, it is therefore the product of maladaptation to demands and should not be confused with acute syndromes (Schaufeli & Buunk, 2003; Schaufeli & Enzmann, 1998). A number of conceptualisations have been proposed in attempts to define burnout; however, each of these main conceptualisations share three common dimensions which develop over an extended period of time: exhaustion, depolarisation (or cynicism), and reduced personal accomplishment (also termed lack of professional efficacy; Maslach, Jackson, & Leiter, 1996; Maslach et al., 2001; Schaufeli & Enzmann, 1998). In the context of burnout, exhaustion refers to feelings of emotional exhaustion and being physically overstretched, a lack of energy, and a low mood (Bianchi, Schonfeld, & Laurent, 2015). Depolarisation is characterised by a distance or indifferent attitude towards the person’s career where the individual lacks motivation and withdraws from this career. Finally, reduced personal accomplishment encompasses feelings of inadequacy and incompetence, related to the loss of self-confidence. From a theoretical perspective it is important to note that the nature of the relationships across the three dimensions have not been clarified (Shirom & Melamed, 2006).

Previous research has suggested that exhaustion is the central characteristic and the most obvious manifestation of burnout (Maslach et al., 2001); further, feelings of emotional exhaustion create a higher risk of burnout manifesting (Lundkvist, Gustafsson, Hjälm, & Hassmén, 2012). The central role of exhaustion within burnout has led some researchers to argue that the other two aspects of the complex syndrome (i.e. depolarisation (or cynicism) and reduced personal accomplishment) are unnecessary due to the relationships found between the three dimensions (Gustafsson et al., 2016; Shirom, 1989). Alternatively, Maslach et al. (2001) and Cresswell and Eklund (2006c) argue that although exhaustion is a crucial criterion for explaining burnout it does not provide a complete explanation. Solely focusing on this one concept may lead to a lack of insight into the complexity of the entire phenomenon and resulting consequences.

An individual who suffers from severe burnout typically reports feeling constantly overwhelmed, stressed, exhausted, helpless, hapless, and powerless (Bianchi, Schonfeld, & Laurent 2015). Whilst exhaustion is representative of the stress element of burnout, it does not embody other aspects of the multi-dimensional syndrome individuals develop as a consequence of excessive demands and load (Maslach et al., 2001). The strong relationship between exhaustion and depersonalisation may suggest that when individuals are exhausted and feel discouraged, they may also cognitively distance themselves from their work by developing indifferent or cynical attitudes (Maslach et al., 2001). It appears that reduced personal accomplishment has a more complex relationship with the other sub-dimensions of burnout (i.e. exhaustion and depersonalisation) than the relationship between exhaustion and depersonalisation. Previously, reduced personal accomplishment has appeared simply to be a function, to some degree, of either exhaustion or depersonalisation, or a combination of the two (Byrne, 1994; Lee & Ashforth, 1996). Specifically, work environments with overwhelming demands which contribute to exhaustion and depersonalisation are also likely to erode an individual's sense of effectiveness. Furthermore, exhaustion and depersonalisation interfere with effectiveness as it is difficult to gain a sense of accomplishment when an individual is feeling exhausted or has a sense of indifference to others in their care (Maslach et al., 2001). However, this relationship is not definite, alternative research has suggested there is a weak relationship between personal accomplishment and exhaustion, as well as other known correlates of burnout such as commitment and job satisfaction (Gustafsson et al., 2016; Halbesleben & Demerouti, 2005; Kalliath, O'Driscoll, Gillespie, & Bluedorn, 2000; Lee & Ashforth, 1996; Schaufeli & Enzmann, 1998).

It is crucial that research determines the correlates of burnout and assesses burnout in a number of different contexts. Therefore, it is important that researchers utilise valid burnout measurements. Within past research, it is common practice that the three dimensional model of the syndrome is assessed using the Maslach Burnout Inventory (MBI), a self-report questionnaire (Maslach et al., 1996). The MBI was the first standardised tool to assess burnout and has played a key role in the development of research in occupational settings (Schaufeli, Leiter, & Maslach, 2009). Maslach et al. (1996) define burnout as, “a state of exhaustion in which one is cynical about the value of one’s occupation and doubtful of one’s capacity to perform” (p.20). Maslach’s burnout definition is not based on clinical observations or theory; instead it has been inductively developed using exploratory factor analysis (Lee & Ashforth, 1996; Shirom & Melamed, 2006). Despite this position, Maslach et al.'s (2001) model dominates the literature, although alternate conceptualisations have led to the development of different proposed assessment tools. In particular, the Maslach Burnout Inventory General Service Scale (MBI-GS; Leiter & Schaufeli, 1996; Maslach et al., 1996), Oldenburg Burnout Inventory (OLBI; Halbesleben & Demeroutil, 2005), Burnout Measure (BM; Malach-Pines, 2005), and the Shirom-Melamed Burnout Measure (SMBM; Melamed, Kushnir & Shirom, 1992; Shirom, 1989, 2003) have been advanced in attempts to address issues surrounding the development and theoretical underpinning of the MBI. Leiter and colleagues (Leiter & Schaufeli, 1996; Maslach et al., 1996) refined the MBI to represent environments outside of human care due to issues surrounding the relationship between the exhaustion and depersonalisation dimensions of the MBI in human care settings. The OLBI is based on a similar model to the MBI, however, it only features two scales - exhaustion and disengagement - using both positive and negative wording (Bakker, Verbeke, & Demerouti, 2004). The OLBI encompasses questions designed to assess cognitive and physical components of exhaustion which are consistent with previous burnout research literature (Pines et al., 1981; Shinn, 1982). The BM offers a method of assessing the level of an individual's physical, emotional and medical exhaustion (Malach-Pines, 2005). The focus of the measure is on different levels of exhaustion rather than the other dimensions of burnout. Finally, Shirom, (1989, 2003) views burnout as relating to individuals' feelings of physical, emotional and cognitive exhaustion, specifically focussing on the depletion of resources to energetic coping as a consequence of exposure to occupational stress. This conceptualisation of burnout led to the creation of the SMBM (Melamed, Kushnir, & Shirom, 1992; Shirom, 1989, 2003). Due to the fact that no definition of burnout this makes it difficult to measure it using one specific tool, however, there is an underlying consensus within the literature about the three core dimensions of burnout (Maslach et al., 1996). Maslach's theoretical framework continues to be the predominant one applied in research of burnout across multiple domains.

In summary, burnout is viewed as a response to prolonged periods of emotional and intrapersonal stress (Bianchi et al., 2015; Maslach, Schaufeli, & Leiter, 2001). Although criticised, the MBI is the most utilised self-report measure of burnout (Halbesleben & Demerouti, 2005) characterising burnout as exhaustion, depersonalisation, and personal accomplishment. Researchers have argued that depersonalisation and personal accomplishment do not appropriately characterise burnout and researchers should focus on the exhaustion dimension (Gustafsson et al., 2016; Shirom, 1989).

2.2. The Context of Sport

High levels of stress have been shown to increase the likelihood of burnout developing in sport and occupational environments (Bakker, Demerouti, & Schaufeli 2003; Demerouti, Bakker, Nachreiner, & Schaufeli, 2001; Gustafsson, Kenttä, & Hassmén, 2011). Whilst research aims to incorporate and examine theorisation of burnout based in non-sporting settings, it is important to discuss possible differences across sport settings. Athletes are susceptible to three basic sources of stress: physiological (e.g. training stress and injury), psychological, and social (Kenttä & Hassmén, 2002). The following section will look to clarify the difference between the physiological antecedents of athlete burnout and occupational burnout.

In syndromes related to athlete burnout such as overtraining syndrome, researchers have suggested that the physiological stress (or training stress) is the main cause of training maladaptation and underperformance (Kuipers & Keizer, 1988; Morgan, Brown, Raglin, O'Connor, & Ellickson, 1987). However more recently, psychosocial antecedents (i.e. non-training stressors) have received increased attention within overtraining research (Meehan, Bull, Wood, & James, 2004). The focus has predominantly been on the possible psychosocial antecedents (Cresswell & Eklund, 2005c; Gustafsson, Hassmén, & Hassmén, 2011; Hill & Curran, 2015; Isoard-Gautheur, Trouilloud, Gustafsson, & Guillet-Descas, 2016). Several psychosocial antecedents have been previously identified, including: school or work, financial strain, dysfunctional relationships, and social conflict; these antecedents may influence an athlete's training tolerance and risk of underperformance (Miller, Vaughn, & Miller, 1990).

It is suggested that stress may be accumulative and can therefore become chronic (McEwen, 1998; Semmer, McGrath, & Beehr, 2005). Potentially, this may explain why a variety of small, daily stressors can contribute to the maladaptive training response, as well as the development of overtraining and athlete burnout (Cresswell, 2009; Gustafsson et al., 2008; Rowbottom, 2000). Athletes can at times be subject to high exhaustive levels of daily physiological stress due to training and competition demands which is not common in occupational settings (Balk, Adriaanse, De Ridder, & Evers, 2013; Isoard-Gautheur, Guillet-Descas, & Gustafsson, 2016; Smith, 2003). Athletes are required to be dedicated to physically demanding training, continually pushing themselves to improve their performance (Hill & Appleton, 2011; Koutedakis, Metsios, & Stavropoulos-Kalinoglou, 2006). However, performance enhancement in sport requires athletes and coaches to find a balance between training and recovery in order to avoid underperformance or the onset of athlete burnout (Gustafsson, Holmberg, & Hassmén, 2008). Raglin and Wilson (2000) highlight that the training volume (Drew, & Finch, 2016; Gabbett, Whyte, Hartwig, Wescombe, & Naughton, 2014; Huxley, O'Connor, & Healey, 2014) of elite athletes has dramatically increased in recent years and in addition to experiencing a greater number of maladaptations (e.g., injury, burnout) resulting from training when compared to positive training responses (e.g, improved performance). In non-sporting settings, the daily physical requirement of workers is not as prevalent and as a result of this underperformance at work can go undetected for long periods of time.

Athletes with less severe symptoms of burnout can typically continue in sport for a long period of time when compared to workers, athletes can become labelled as 'active burnouts' (Gould, Udry, Tuffey, Loehr, 1996; Gustafsson, Kenttä, Hassmén, Lundqvist, & Durand-Bush, 2007). In this case, a combination of low burnout levels and restraining factors such as athletic identity, play an influential role in the athlete continuing in sport whilst suffering from less severe symptoms of burnout. A strong and unidimensional identity (i.e. where an individual defines themselves as an athlete) plays an important role in the development of burnout, but when an athlete becomes severely burnt out they lose their motivation and withdraw from their sport potentially impacting upon their athletic identity (Gustafsson et al., 2008; Raedeke, 1997). It could be suggested that the balance between training and recovery is not synchronised which is important to protect against the development of burnout or an athlete becoming an active burnout, which has led to an increase in recovery research (Gould & Dieffenbach, 2002).

Significant increases in the personal rewards available to athletes and coaches, as well as national and international recognition, may incentivise athletes to train harder and longer (Engebretsen et al., 2010; Huxley, O'Connor, & Healey, 2014). For young athletes this can result in early specialisation in sport and high training volumes, possibly leading to an increased risk of injury (Brenner, 2007; DiFiori, 2010). This early specialisation and continuation in sport through adolescence may influence their self-identity to become strongly and exclusively based on athletic performance (Coakley, 1993). Early specification may not play as much of a role in the development of occupational burnout compared to the sporting environment, as sporting careers tend to start from a younger age. Despite perceiving themselves as athletes, the length of their careers can be considerably shorter than careers in other occupational settings since the professional career of athletes typically lasts between 10-15 years (King, Rosenberg, Braham, Ferguson, & Dawson, 2013). It has been proposed that this decreased duration of career length may be caused by the high risk of career terminating injury (Hanton, Fletcher, & Coughlan, 2005).

Numerous studies encompassing various sports have indicated that training volume (Caine, DiFiori, & Maffulli, 2006), as well as coach experience and education (Schulz et al., 2004), may influence the risk of injury to athletes. Athletes who are unable to take part in planned training due to illness or injury, are likely to feel unable to meet the situational demands of being an athlete and as a consequence, their self-identity might be experienced as harmed (Moen, Myhre, Klöckner, Gausen, & Sandbakk, 2017). Previous findings suggest that an athlete's experience of being ill or injured is related to their cognitive response to the situation they are currently within (Granito, 2001), therefore, it may influence the development of athlete burnout (Moen et al., 2017) and may not be as prevalent in the development of occupational burnout.

Athletes, as opposed to employees in occupational settings, are often required to manage potential sources of stress such as direct competition, selection/threat of being deselected, and pressure from the enviroment. Jones et al. (2009) suggest that athletes may respond to competition as a threat or a challenge which may then have cognitive, emotional, and physiological consequences. During competitions and training an athlete's performance is continually being scrutinised by parents (Gaudreau, Morinville, Gareau, Verner-Filion, Green-Demers, & Franche, 2016), coaches (Appleton, & Duda, 2016), teammates (Hall, Newland, Newton, Podlog, & Baucom, 2017), and media (Kristiansen, Halvari, & Roberts, 2012); this can be extremely stressful, especially if the individual or team performs below expectations (Pensgaard & Ursin, 1998). This has been shown to result in poor athlete health and an increased likelihood of burnout development (Appleton & Duda, 2016). The fact athletes are under the scrutiny of others (e.g. coaches, parents, media, teammates) can result in the fear of being dropped from the team, loss of employment and/or a loss of funding (Dubuc-Charbonneau & Durand-Bush, 2014; Hackfort & Huang, 2005). Further, this perception of external evaluation may also contribute to a loss of motivation (Raglin, 2001).

Successful athletes are those typically characterised as being able to cope with pressure (Calmeiro, Tenenbaum, Eccles, 2014), positively deal with the media (Mains, 2015), possess a positive coach-athlete relationship (Vella, Oades, & Crowe, 2013), and experience positive parental support (Dorsch, Smith, & Dotterer, 2016). Athletes' interactions with their social environment can have psychophysiological implications

(Barcza-Renner, Eklund, Morin, & Habeeb, 2016); specifically, athletes' perceptions of their teammates and coaches may be linked with the development of burnout (Arnold, Fletcher, & Daniels, 2013; DeFreese & Smith, 2014; Fletcher, Hanton, & Mellalieu, 2006; Isoard-Gautheur, Trouilloud, Gustafsson, & Guillet-Descas, 2016) and have performance implications for the athlete (Gillet, et al., 2010).

Within team sports, athletes are surrounded by their teammates working together for collective goals (Bandura, 1997). Athletes' social interactions can influence how they cope with the physical and mental demands of participating in sport (Gustafsson et al., 2011; Smith, 1986; Udry, Gould, Bridges, & Tuffey, 1997), which may influence the incidence of burnout. Furthermore, the coach-athlete relationship is suggested to be a crucial feature of an athlete's sporting experience (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009; Jowett, 2017). Jowett (2009) previously defined the coach-athlete relationship as a distinctive interpersonal relationship in which coaches' and athletes' thoughts, feelings, and behaviours are causally and mutually engaged in. Positive relationships with the social environment characterised by supportive social interactions can enhance athletes' performance and development (Bianco & Eklund, 2001). On the other hand, negative perceptions and relationships between the coach and teammates encompassing unwanted, rejecting, or neglecting behaviours, can have a negative impact on athlete progression and result in a deleterious athlete experience (Newsom, Rook, Nishishiba, Sorkin, & Mahan, 2005) as well as the development of athlete burnout (Isoard-Gautheur, Trouilloud, Gustafsson, & Guillet-Descas, 2016).

Within the sport environment burnout is typically seen as a cognitive-affective syndrome comprised of emotional and physical exhaustion, reduced sporting accomplishment and devaluation of sport participation (Raedeke, 1997; Raedeke, & Smith 2001). Burnout in sport is very emotive and conjures powerful images; although previously, the definition and measurement within sporting contexts were disputed

(Raedeke & Smith, 2001). For research of burnout in sport to progress it is important that future studies take into consideration the unique aspects of the sporting environment and the stressors athletes are exposed to. In particular, physiological, psychological, and social stressors can all lead to the development of burnout (Maslach et al., 2001). To undertake a more comprehensive study of burnout, research may also assess the possible performance implications of social aspects comprising the sporting environment (i.e. social relationships).

2.3. Models of Athlete Burnout

Several models have been developed to describe and explain athlete burnout and this section will provide a brief outline of the most influential models discussing the overview of the theory, review the research, and critique the model. The majority of athlete burnout research has been guided by Smith's (1986) cognitive affective model which indicates that burnout develops as a consequence of chronic stress, resulting from a long-term perceived inability to respond to excessive sporting demands. An alternative perspective is that of Coakley's (1992) suggestion that the social organisation of sport hinders the development of a young athlete's identity, putting constraints on their lives. Similarly, Raedeke (1997) proposed the commitment model which indicates that athletes engage in sport for a variety of reasons relating to their attraction to the sport, or their feelings of entrapment.

More recently an integrated model of athlete burnout has been proposed by Gustafsson, Kenttä, and Hassmén, (2011) which is more comprehensive than the previous models highlighted. The integrated model of athlete burnout includes antecedents (e.g. training hours, stressful social relationships), early signs (e.g. mood disturbance, lack of control), entrapment (e.g. unidimensional athletic identity, high investment), vulnerability factors (e.g. personality, coping, and environment), key burnout dimensions (i.e. physical and emotional exhaustion, reduced accomplishment, and sport devaluation), and maladaptive consequences (e.g. withdrawal, long term performance impairment).

2.3.1. Smith's (1986) Cognitive-Affective Stress Model

Stress in sport has been defined as an "ongoing process that involves individuals interacting with the environments, making appraisal of the situations they find themselves in and endeavouring to cope with any issue that may arise" (Fletcher, Hanton, & Mellalieu, 2006, p. 329). If the stress experienced by the athlete becomes chronic they may develop burnout (Gustafsson et al., 2011). Smith (1986) proposed a stress-induced model of burnout, based on social exchange theory, derived from Thibaut and Kelley (1959). The theory suggests that behaviour is directed by an individual's desire to secure positive experiences and minimise negative ones. This indicates that athletes are rational individuals who drop out from sport following a cost benefit analysis. Athletes withdraw from sport when their perceived demands outweigh what they perceive as the benefits and turn to other activities they deem to be of greater benefit. Smith's model has theoretical basis, with burnout defined as a psychological, emotional at times, physical withdrawal from a previously enjoyed activity (Smith, 1986).

Within Smith's model, burnout is theorised as developing via a four-stage process during which stress and burnout develop in tandem. The stages are: situational demands, cognitive appraisals, physiological response, and behavioural response (Gustafsson, et al., 2011). The first stage "situational demands" is characterised by high demands placed on the athlete (i.e. high training volume and/or external pressure; Gould & Whitley, 2009). The second stage involves the athlete's "cognitive appraisals" of the situation. All athletes will not interpret the demands on their resources in the same way. Certain athletes may be able to cope with the demands, while others may interpret situations as excessively demanding and deem the situation to be overwhelming which results in feelings of helplessness. This may account for individual difference in the development of burnout. If the demand is perceived as overwhelming or threatening, the arising "physiological response" (e.g. increased anxiety and cortisol release), is the key aspect of the third stage. Within the "physiological response" stage athletes may experience feelings of tension and fatigue. Finally, the fourth stage addresses the "psychological response" leading to behaviour changes such a reduced performance, avoidant behaviour, or even withdrawal from activity. A key aspect of Smith's model is its circular nature, as prior coping and behavioural responses will have a knock on effect to subsequent stages. Gustafsson, Skoog, Podlog, Lundqvist, and Wagnsson (2013) highlighted that all four stages of this model are influenced by an individual's personality.

Overall, Smith's model has been the most influential in athlete burnout research (Gustafsson, Hancock, & Côté, 2014). This is supported by research showing the close association between athlete burnout and stress (Gustafsson & Skoog, 2012; Raedeke & Smith, 2004; Tabei, Fletcher, & Goodger, 2012). Historically, in the investigation of the physical demands of sport, athletes have listed severed practice conditions, fatigue, and being stressed, as being associated with burnout (Cohn, 1990; Silva, 1990). Furthermore, Gould et al. (1996) highlight that physical and social psychological stressors were associated with the development of burnout. Psychological demands athletes encounter vary and incorporate a number of factors such as perceptions of increased pressure or stress, reduced social support, criticism from parents, and high parental expectations, which are thought to be associated with high levels of burnout (Cohn, 1990; Gould et al., 1996; Raedeke & Smith, 2001). Though influential, Smith's (1986) definition of athlete burnout has made it difficult to study as it results in an individual's withdrawal from the activity and therefore, making it difficult to include within research (Gould et al., 1996; Gustafsson et al., 2008). Furthermore, the stress perspective as noted by Smith (1986) has been criticised as there is evidence to suggest that not all athletes who experience stress will experience burnout (Raedeke, 1997) and this has resulted in the development of alternative theorisations of athlete burnout.

2.3.2. Silva's (1990) Training Stress Syndrome

Silva (1990) introduced and developed, the training stress syndrome which focusses on physical and training factors, and proposed that burnout is a consequence of excessive training demands. However, this model also recognised the importance of psychological factors. The model identifies that stress arising from physical training can have both positive and negative effects (Gould & Whitley, 2009). If the increased training stressor has a positive effect and the athlete experiences a positive adaptation it will result in enhanced sporting performance (Scott, Lockie, Knight, Clark, & Janse de Jonge, 2013). Positive adaptations such as improving an athlete's physiological and physical ability, as well as changes to their technical proficiency are desirable, and align with the general aims of training (Borresen & Lambert, 2009). On the other hand, if the increased training stressors have a negative effect on the athlete and cause a negative adaptation, this may lead to the athlete having a maladaptive response (e.g. athlete exhaustion, devaluation of sporting involvement, reduced sense of sporting competency) (Gould & Dieffenbach, 2002; Gustafsson et al., 2015). This may lead to burnout and potentially a physical withdrawal from sport (Cresswell & Eklund, 2006a; Gustafsson et al., 2007; Madigan et al., 2016).

Furthermore, Silva's model suggests that negative adaptations can be illustrated on a continuum, starting with staleness (i.e. the athlete's initial failure to cope with psychophysiological stress), to overtraining (i.e. demonstrated by visible psychophysiological malfunctions, categorised by changes to both the athlete's mental attitude and physical performance (Silva, 1990). The final category on the continuum is burnout, described in Silva's model as an exhaustive psychophysiological response resulting from frequent but often ineffective efforts to meet excessive sporting demands. A key aspect of Silva's model is the impact of training demands on the development of burnout, with previous research has supporting this suggestion, specifically the link between physical training and the development of athlete burnout (Kenttä & Hassmén, 1998; Kenttä, Hassmén, & Raglin, 2001).

When considering the training stress syndrome model, it is important to consider the confusion between overtraining syndrome and athlete burnout in the wider field (see section 2.5.4). The continuum aspect of Silva's model indicates that there is a link between overtraining and burnout, which has been supported recent times (Gustafsson, Kenttä, Hassmén, Lundqvist, & Durand-Bush, 2007; Lemyre, Roberts, & Stray-Gundersen, 2007). However, a criticism of Silva's (1990) training stress model is the focus on the physiological antecedents of burnout, which would suggest that research should take a holistic approach to the development of athlete burnout. A multivariate perspective examining not only the impact of training but also psychological and social stressors needs to be considered when examining athlete burnout development (Gould & Whitley, 2009; Gustafsson et al, 2011).

2.3.3. The Unidimensional Identity Development and External Control Model (Coakley, 1992)

In response to early stress based models, Coakley (1992) proposed the unidimensional identity development and external control model through informal interviews with adolescent athletes playing at an elite level. Whereas previous models highlight stress as a precursor to burnout, Coakley's model suggests stress is only a symptom of burnout. Coakley proposes that the cause of burnout is the social organisation of the sport. Coakley's (1992) perspective highlights a fundamental issue with the structure of competitive sport is that it does not allow the athlete to have control and constricts the athlete's identity. This identity constriction may restrict the athlete to focus solely on identifying with athletic success, which can become unhealthy, especially if the athlete is injured or not meeting expectations (Black & Smith, 2007). A negative bi-product of the structure of competitive sport is the way in which the social worlds of the athlete are organised as it inhibits their control and decision making as well putting constraints on the time they need to spend with their teammates and coach. Coakley's research suggests that at some point in young athletes' lives they desire an alternative identity and personal control over their life which may result in the individual wanting to withdraw from sport (Gould & Whitley, 2009). Coakley indicates that withdrawing from sport is painful for the individual and is a symptom that is associated with burnout.

There is limited empirical support for this model, although Hodge, Lonsdale, and Ng (2008) did report that autonomy (i.e. allowing the athlete choice and providing the opportunity to make decisions) within elite rugby players was negatively related to burnout. Other researchers have suggested that the environmental demands athletes are exposed to are stimulated within the organisation (Arnold, Fletcher, & Daniels, 2016; Fletcher et al., 2006), and have been linked with overtraining dissatisfaction, negative emotions, undesirable behaviours, low well-being, underperformance, and burnout (Fletcher, Hanton, & Wagstaff, 2012; Meehan et al., 2004; Noblet, Rodwell, & McWilliams, 2003; Tabei et al., 2012). When considering Coakley's unidimensional identity development and external control model it is important to acknowledge that is based upon interviews taken from a sample of convenience and the notion of burnout used remains unclear, making it difficult to interpret whether the athletes were experiencing burnout or not (Gustafsson, et al., 2011).

2.3.4. Commitment Model (Schmidt & Stein, 1991; Raedeke, 1997)

Raedeke (1997) and Schmidt and Stein (1991) moved away from the stress perspective, instead focusing on commitment. Although Raedeke (1997) recognises that stress is related to the development of burnout, the commitment model recognises that not all athletes who experience stress develop burnout and that an athlete's type of commitment plays a part in the development of burnout. Raedeke (1997) and Schmidt and Stein (1991) propose athletes partake in sport either because they are entrapped (i.e. because they have to) or because they are attracted (i.e. they want to) to the sport. From this position, they identified three athlete profiles which were expected to vary in character and commitment: attraction-based commitment, entrapment-based commitment, and low commitment. If athletes were committed to a sport because they themselves wanted to be, they were labelled to have attraction-based commitment; these individuals would experience high commitment and low burnout. Individuals described as having entrapment-based commitment, play sport because they feel they must play. Research suggests that these athletes are more likely to experience low commitment and theoretically have a greater chance of experiencing burnout than individuals who have low commitment and experience a low desire to continue with sport (Readeke, 1997). Finally, individuals with a low commitment profile should not experience burnout as they do not feel they have to prolong their sports participation (Readeke, 1997). The commitment model as has received empirical support via entrapment-based profiles predicting burnout symptoms in athlete populations (Readeke, 1997), however support for this model is limited. Gustafsson et al. (2011) suggests that although the link between entrapment and commitment provides important insight into burnout, further studies investigating this concept are required to provide insight as to how entrapment develops into burnout over time.

2.3.5. Self-determination theory

The self-determination theory examines the personal and contextual factors that determine optimal personal growth and development; a component that has been recognised as an important concept to explain healthy sporting engagement and is the satisfaction of three fundamental basic psychological needs (Deci, & Ryan., 2000). Basic needs theory is a mini-theory within the self-determination theory framework which proposes that the fundamental basis for positive well-being is when the social environment facilitates satisfaction of the basis psychological needs (Quested & Duda, 2011). These principles are autonomy (i.e. to experience behavioural volition), competence (i.e. to perceive oneself as behavioural effective), and relatedness (i.e. to feel socially interconnected with valued others). All three are essential and universal amongst humans (Barcza-Renner et al., 2016; Ryan & Deci, 2000a). Thwarting of the core human needs can result in negative health outcomes and ill-being (i.e., burnout, Li, Wang, & Kee, 2013). Moreover, Ryan and Deci (2002) proposed that humans desire personal growth and assimilation through internalisation of behaviour in to the self. This internalisation process can result in autonomous regulation of behaviour, where behaviour is fully integrated in to the self, or can be a more controlled form of motivational regulation, where the behaviour is only partially integrated into the self (Hodgins & Knee, 2002). Self-determination theory suggests that more autonomous motivation likely leads to improved well-being, whereas more controlled regulation is related to poor psychological adjustment (see Ryan & Deci, 2007 for a review of supporting empirical studies).

Self-determination theory has been used to explain the development of athlete burnout (e.g., Cresswell & Eklund, 2005; Hodge, Lonsdale, & Ng, 2008; Lemyre, Treasure & Roberts, 2006). Theorising that athlete burnout is a state of ill-being that is characterised by unique motivational regulation patterns (Cresswell & Eklund, 2005). Self-determination theory differentiates multiple forms of motivation ranging from intrinsic to extrinsic motivation. Intrinsic motivation regulation is the most autonomous form of motivation and represents engaging in an activity for the inherent knowledge, enjoyment, and stimulation (Pelletier, Fortier, Vallerand, Tuson, Briere, & Blais, 1995). On the other end of the self-determination scale, extrinsic motivation encompasses four forms of regulations that differ according to extent to which behaviour is internalised. External regulation can vary depend on the level of control (i.e., extrinsic regulation and introjected regulation) and level of autonomy (i.e., identified regulation and integrated regulation). Self-determination theory also acknowledges amotivation which is characterised by a lack of motivation and helplessness. Self-determination suggests that motivational states exist along a self-determination continuum with representing the least self-determined form of motivation and intrinsic motivation representing the highest level of self-determination. SDT incorporates two coach motivational styles which are necessary for the engagement and disaffection of athletes. The first is autonomy-support, encompassing the degree to which coaches encourage an athlete to develop, provide rationale, be an active problem solver and take an athlete's perspective rather than a coach's (Mageau & Vallerand, 2003). Research suggests that autonomy-support is related to attentive, effortful, persistent participation in sport (Curran, Appleton, Hill, & Hall, 2013; Curran, Hill, Hall, & Jowett, 2014). The second is controlling behaviours, implicating external and less self-determined reasons for sport participation. This includes being driven by feelings of guilt, shame, and behaviours fully contingent upon external punishment or reward (Bartholomew, Ntoumanis, Ryan, Bosch, & Thøgersen-Ntoumani, 2011). Li et al.'s (2013) review identifies that positive relationships have been found between amotivation (i.e. when an athlete lacks motivation) and athlete burnout, whereas, athletes who are autonomously motivated were found to experience less burnout.

Gustafsson et al., (2011) incorporated aspects of the self-determination theory into the integrated model of athlete burnout which aimed to provide a holistic conceptual framework for understanding athlete burnout. It is important to consider that a common assumption of athlete burnout is that it is an evolving process where factors influencing psychological needs satisfaction may affect motivational dynamics over time (Cresswell & Eklund, 2006; Deci & Ryan, 2000). For example, within sporting environments, it is common for athletes to experience mixed patterns of positive and negative events (e.g., poor performance, within career transition). This experience may result in an athlete's feelings of satisfaction fluctuating over the course of the competitive season (Smoll & Smith, 2002), which should be considered when interpreting the relationship between self-determination theory and athlete burnout research.

2.3.6. An Integrated Model of Athlete Burnout (Gustafsson, Kentta, & Hassmén, 2011)

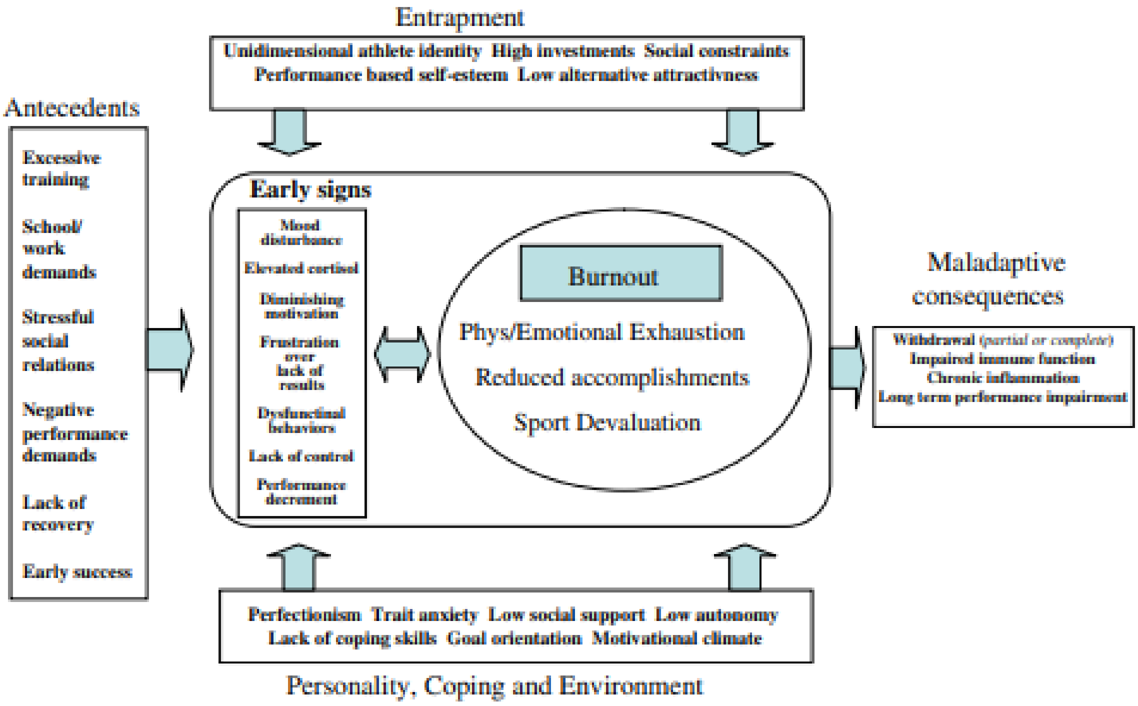

Figure 2.1. An integrated model of athlete burnout including major antecedents, early signs, entrapment, vulnerability, key dimensions, and maladaptive consequences taken from Gustafsson et al. (2011).

Recently, Gustafsson et al. (2011) proposed an integrated model of athlete burnout consisting of major antecedents, early signs, entrapment, personality, coping and environment, as well as key dimensions and consequences of burnout (see Figure 2.1 above). The model is based on the conceptualisation of burnout identified by Raedeke (1997), however, takes a more holistic view of the athlete burnout concept. The integrated model of athlete burnout proposes that burnout is characterised by emotional, mental and physical exhaustion, a reduced sense of accomplishment, and sport devaluation (Gustafsson et al., 2008; Raedeke, 1997). Additionally, this model incorporates aspects of previous models (e.g. cognitive-affective stress model, training stress model, and unidimensional identity development and external control model), providing a more encompassing overview of burnout, and the severity of outcomes. The model highlights that it is important to consider early detections and possible antecedents. Burnout is a highly personal experience (Goodger et al., 2007) therefore, the model incorporates a wide range of potential aetiological factors considered in previous burnout models (e.g. training demands, unidimensional athletic identity, personality traits, coping, and the environment). In consideration the development of burnout, it is important to consider possible antecedents that may impact its development.

Gustafsson et al. (2011) highlight a number of possible antecedents that have been linked to burnout in previous models and research, ranging from chronic stress (Raedeke & Smith, 2001) to competition volume (Gould et al., 1996). Additionally Gustafsson et al. (2011) highlight the potential influence of the coach-athlete dyad (Jowett, 2009; Jowett & Carolis, 2003), identifying that coaches suffering from burnout were perceived as providing less empathy and instructions, resulting in their athletes experiencing higher levels of burnout (Price & Weiss, 2000; Vealey et al., 1998). Early symptoms of burnout have been incorporated into the model, however, this is an area of confusion due to issue with investigating the detection of burnout, such as the negative attitudes toward athlete burnout within sports which possibly prevents athletes from revealing their symptoms (Cresswell & Eklund, 2006c).

Researchers have suggested a range of early symptoms that are thought to increase the likelihood of athletes developing burnout including: overtraining (Lemyre et al., 2007), motivation (Cresswell & Eklund, 2005b), withdrawal from coaches and teammates (Gustafsson, Hassmén, & Kenttä, 2008), frustration, mood swing, decreased performance, and lower self-confidence (Cresswell, 2009). Gustafsson et al. (2011) highlight the importance of aspects of personality, coping, and environment in their model which have been supported in research (e.g., Appleton, Hall, & Hill (2009) results suggest that perfectionism traits differ between burned-out athletes and healthy athletes). Despite difficulties in the assessment of the early symptoms of burnout it is important this is considered in research to identify possible markers of burnout.

The model proposed by Gustafsson and colleagues (2011) includes aspects of entrapment which helps explain why athletes push themselves to burnout, instead of dropping out of sport. This aspect of the model is similar to Raedeke (1997) and Schmidt and Stein's (1991) commitment-related explanation for the occurrence of burnout. Entrapment includes high investment, lack of attractive alternatives, performance-based self-esteem, social constraints, and strong athletic identity which commits individual athletes in sport, despite negative outcomes such as exhaustion and negative emotions (Coakley, 1992; Gustafsson, Hassmén, & Kenttä, 2008). The integrated model of athlete burnout adopts a holistic view of the development of athlete burnout by incorporating different aspects of previous models which have been supported in research. One of the aims of the current thesis was to examine the potential impact of the possible antecedents of athlete burnout and the performance consequences of athlete's burnout, utilising the theoretical framework out lined in the integrated model of athlete burnout.

2.4. Measurement of Burnout

Understanding the nature of burnout, including antecedents and consequences, is predicated on the use of psychometrically sound assessment tools (Raedeke, Arce, Seoane, & De Francisco, 2013). The constructs within Raedeke et al.'s (2002) definition have been utilised to develop the ABQ, which is one of the most prominently used tools to measure athlete burnout (Gustafsson et al., 2014; Raedeke & Smith, 2009). Additional support for the multidimensional approach of the ABQ stems from qualitative research investigating burnout across a wide variety of sports, cultures and contexts (Gustafsson et al., 2008; Raedeke et al., 2002); supporting the notion that emotional/physical exhaustion, reduced sense of accomplishment, and sports devaluation characterise athletes' burnout experiences. Recently, the ABQ has been developed to fit a coaching context and renamed the Coach Burnout Questionnaire (Lundkvist, Stenling, Gustafsson, & Hassmén, 2014; Malinauskas, Malinauskiene, & Dumciene, 2010).

The ABQ is based on the original version of the MBI (Maslach & Jackson, 1986). Psychometric comparisons between the ABQ and MBI in athletic populations have been undertaken previously (Cresswell & Eklund, 2006b; Raedeke et al., 2013). Unfortunately, due to statistical shortcomings in both Cresswell and Eklund (2006b) and Raedeke et al. (2013), psychometric comparisons are difficult to evaluate. Neither of the two studies provide loadings on general factors in their model, making the claims of validity difficult to interpret. According to Eid, Lischetzke, Nussbeck, and Trierweiler (2003) in order to assess the validity (i.e. discriminate and convergent) of the model, the model should be created so that it encompasses how much the individual items load onto a general factors. In the case of both Cresswell and Eklund (2006b) and Raedeke et al. (2013), they base their convergent validity on the correlation between dimensions of burnout (i.e. general factors) rather than the loading of items onto the general factors as suggested by Eid et al. (2003). Researchers need to consider the psychometric issues surrounding the ABQ

(Gustafsson et al., 2011; Maslach et al., 2001; Shirom, 2005), as well as the overlap between burnout and related concepts (Gustafsson et al., 2016).

2.5. Differentiating Burnout from Related Concepts

As a consequence of the popularity of the term burnout it is often used with a number of different meanings inferred. Raedeke (1997) suggests that the term is popular because it enables the majority of individuals to conjure an image of the meaning of the word. Despite Raedeke's (1997) conceptualisation of athlete burnout and the term being intuitively appealing, an accurate definition of the term remains difficult to identify. Burnout dimensions have substantial conceptual overlap with other psychological concepts used in psychological research and this has resulted in some confusion over the conceptualisation of athlete burnout (Gustafsson et al., 2016). The current section highlights related concepts, areas of conceptual overlap, and identifies the uniqueness of the burnout construct. Resent research, has explored the relationship between stress, depression, and burnout within sport (De Francisco, Arce, del Pilar Vílchez, & Vales, 2016).

2.5.1. Burnout and Stress

Most models of athlete burnout propose that burnout is a response to chronic stress; although the commitment perspective (Raedeke, 1997) suggests that burnout is more than just a reaction to chronic stress. Cordes and Dougherty (1993) argue that burnout is a type of stress and the distinction between the two concepts has not been defined. An issue with conceptualising burnout within stress, is that it is plagued by the same definitional ambiguity as burnout (Pines & Keinan, 2005; Schaufeli & Enzmann, 1998). Most researchers though, including those investigating burnout in non-sporting environments, acknowledge that burnout is related to stress in some way (Pines & Keinan, 2005). De Francisco et al. (2016) suggest that athletes' perceived stress is a predictor of burnout; although not everyone who experiences stress experiences burnout. For example if we consider burnout from a commitment perspective (Raedeke, 1997; Schmidt & Stein, 1991), athletes engage in sport as a consequence of their feelings of attraction and entrapment to their sport; athletes who feel entrapped in their sport are more like to develop burnout (Eklund & DeFreese, 2015). However, Brill (1984) previously distinguished between stress and burnout describing stress as an acute response accompanied by mental and physical symptoms and burnout as a process of maladaptation, where individuals are unable to adapt without situational change or outside help. It could be suggested that although burnout and stress share similar characteristics; stress is an acute response whereas burnout develops gradually over time. Furthermore, it could be proposed that burnout is a possible consequence of prolonged stress and the severity of symptoms may depend on the physical and psychological load the athlete is exposed to (Moen et al., 2015). Similarly, recovery strategies targeting stress reduction could prevent the development of athlete burnout (Gustafsson, Skoog, Davis, Kenttä, & Haberl, 2015).

2.5.2. Burnout and Depression

From the initial conceptualisation by Freudenberger (1974), burnout was thought to share similarities to depression, "the person looks, acts, and seems depressed" (p.161). Burnout and depression share a number of characteristics (Ahola, Hakanen, Perhoniemi, & Mutanen, 2014; Iacovides, Fountoulakis, Kaprinis, & Kaprinis, 2003) and some authors have gone as far to suggest that burnout is a form of depression (Bianchi et al., 2015; Schonfeld, & Bianchi, 2016). Maslach and Leiter (1997) highlight that burnout is not only the "presence of negative emotions" but also the "absence of positive ones, which connects burnout with the key dimensions of depression (i.e. dysphoria and anhedonia; Schonfeld,

& Bianchi, 2016). Previous research indicates that burnout may lead to the development of depression, although there is no evidence that depression leads to the development of burnout (Glass, McKnight, & Valdimarsdottir, 1993).

Previous literature reviews, focusing on the distinction between burnout and depression have yielded mixed results. However, research does tend to favour the hypothesis that burnout differs from depression (Schaufeli, 2003). Although burnout and depression are related concepts there are distinctions, especially as far as exhaustion is concerned (Iacovides et al., 2003; Schaufeli & Enzmann, 1998). Glass and McKnight's (1996) review of eighteen burnout-depression studies argue that burnout and depression do not share complete symptomatology and are therefore not similar concepts. The relationship between burnout and depression remains unclear (De Francisco, et al., 2016), however the sub-dimensions of athlete burnout (i.e. physical and emotional exhaustion, reduced sporting accomplishment, and sport devaluation) focus on the athlete involvement with sport.

2.5.3. Burnout and Chronic Fatigue Syndrome

Burnout and CFS both share fatigue as a prominent characteristic however, despite this similarity and the initial appearance of being related, they are distinct conditions. CFS is a long-term, disabling fatigue with other symptoms such as musculoskeletal pain, sleep disturbances, and impaired concentration, which have no known medical cause (Jameson, 2016);. The symptoms of burnout though are psychological (e.g. social environment, feelings of entrapment; Schaufeli & Buunk, 2003) and physical (e.g. performance decrements; Gustafsson et al., 2011). Furthermore, while CFS has no known medical cause, an integrated model of athlete burnout proposes that burnout develops as a consequences of being unable to adapt to associated stressors or recover from demands placed on resources (Schaufeli & Enzmann, 1998). Burnout is also characterised by negative feelings and dysfunctional attitudes and behaviours, these are not a characteristic of CFS (Schaufeli & Buunk, 2003).

2.5.4. Burnout and Overtraining/Staleness

The overall aim of training is to improve an athlete's performance by using an optimal training load to achieve positive training outcomes (Main & Landers, 2012). When considering negative influences it is important to consider a combination of training loads and the potential impact of non-training stressors (Gustafsson et al., 2011). Current conceptualisations suggest athlete burnout is grounded in a psychosocial framework where burnout is a process responding to stress overload, where excessive physical stress is a possible but not a requisite antecedent (Main & Landers, 2012).

Halson and Jeukendrup (2004) define overtraining as an accumulation of training and non-training stressors resulting in long term decrement in performance with prolonged maladaptation of several biological, neurochemical, hormonal and metabolic regulatory mechanisms. Within overtraining research, the psychological demands and training stressors are historically considered to be the main antecedent to underperformance (Meeusen et al., 2006). Researchers have suggested that burnout and overtraining may differ through motivational aspects related to the self-determination theory (Barcza-Renner, Eklund, Morin, & Habeeb, 2016), although some scholars suggest that a lack of motivation may also be present in overtraining syndrome (Fry, Morton, & Keast, 1991). Previous research suggests that athletes suffering from overtraining syndrome can be either highly motivated or not motivated at all (Resolution Kenttä et al., 2001). In comparison, burnout research has had a greater focus on the associated psychosocial influences rather than overtraining research (Cresswell & Eklund, 2005b; Lemyre, Hall, & Roberts, 2008). When considering the factors affecting athlete burnout it is important to take a holistic perspective as there are a wide variety of potential influencers.

2.6. Physiological and Psycho-Social Antecedents

When participating in sport, athletes are exposed to both physiological and psycho-social stressors (Gould & Dieffenbach, 2002; Isoard-Gautheur, Guillet-Descas, & Duda, 2013) and this has implications for the development of athlete burnout (Gustafsson et al., 2011). The following section focuses upon the potential impact of physical and psycho-social stressors on athlete burnout in consideration of the integrated model of athlete burnout.

2.6.1. Excessive Training

Competing in sport requires time, commitment, and intense effort in training (Gustafsson, et al., 2015). It is generally believed that increasing training will result in improvements in sport performance and physical well-being (Borresen & Lambert, 2009). Although natural ability (i.e. sport skill/ability without training) plays a role in the sporting prowess of an individual, performance excellence is also a result of training (Elliott & Mester, 1998). The theory of deliberate practice is popular in both academic and non-academic settings as it suggests that it is the number of hours spent practicing a skill that will be the foundation of performance outcomes (i.e. the number of hours invested by an athlete will reflect their level of sporting expertise; Ericsson, 2013). As athletes invest time to become experts (Viru & Viru, 2001), they must be able to cope with the demands of training to develop positive adaptations (Gustafsson et al., 2011; Scott et al., 2013). To become a successful elite athlete one must have the ability to successfully perform over an extended period of time, during both training and in match-play.(Kellmann, Kolling, & Pelka, 2017; Lemyre, Roberts, & Stray-Gundersen, 2007; Meeusen et al., 2013). Many young athletes are willing to experience this (Lemtre, et al., 2007), however, prolonged exposure to high training loads and other psychosocial forms of stress may have negative consequences on the athlete (Meeusen, et al., 2013).

An athlete may incur a maladaptive response if unable to cope with demands of training (Gould & Dieffenbach, 2002; Isoard-Gautheur et al., 2013; Law, Côté, & Ericsson, 2008). Previous research has attempted to suggest that athlete burnout is on the rise as a direct result of increasing training demands and pressure in elite sport (Gould & Dieffenbach, 2002; Gustafsson et al., 2015). Furthermore, excessive training has been highlighted as a possible antecedent of athlete burnout within the integrated model of athlete burnout (Gustafsson et al., 2011). It has been suggested that training intensity is more specifically related to the emotional and physical exhaustion than reduced accomplishment and sports devaluation (Lemyre et al. 2008). Although training demands or stress feature in many of the athlete burnout models, (Gustafsson et al., 2011; Silva, 1990; Smith, 1986), to date research has yielded mixed results.

Previous research has used Silva's (1990) model of negative training response to examine the impact of training on athlete burnout, identifying that when training becomes too demanding athletes may develop symptoms of burnout (Gould & Dieffenbach, 2002; Kenttä et al., 2001; Raglin & Wilson, 2000). Qualitative research has suggested that training load influences athletes burnout (Cresswell & Eklund, 2006c, 2007; Gustafsson, et al., 2008; Tabei et al., 2012). To date, the majority of quantitative research investigating the influence of training load has been cross-sectional and yielded mixed results (Cresswell & Eklund, 2006c, 2007b; Smith, Gustafsson, & Hassmén, 2010). A review by Goodger et al. (2007) suggests there is a positive relationship between training load, perceived stress, and athlete burnout. However, further cross-sectional research suggests that training load is unrelated to burnout (Black & Smith, 2007; Gustafsson et al., 2007; Smith et al., 2010); although, cross-sectional studies only take into account a snapshot of the season. In consideration that burnout is a process that develops gradually over time (Gustafsson et al., 2014), the point in time within the season that the data is collected will impact upon the observed prevalence of burnout as well as the relationship between training and burnout.

It is also important to consider how training may impact upon concepts related to athlete burnout, for example, athlete mood has previously been associated with athlete burnout (Gustafsson et al., 2015) and furthermore changes in training volume have also been shown to impact athlete mood (Kellmann, Altenburg, Lormes, & Steinacker, 2001; Kenttä, Hassmén, & Raglin, 2006). Over the course of a three-week training camp Kenttä et al. (2006) assessed the impact of training and recovery on the mood states of elite kayakers. Here it was identified that aspects of the athletes' mood states (e.g. vigour and fatigue) were influenced by their training-recovery cycle.

Research suggests that a positive mental-health profile is associated with successful athletic performance, whereas mood disturbances are suggested to be signs of overtraining (Kellmann et al., 2001; Steinacker, Lormes, Kellmann, & Liu, 2000) and are identified in the integrated model of athlete burnout as an early indicator (Gustafsson et al., 2011). Furthermore, Gastin, Meyer, and Robinson (2013) suggest that athletes' subjective rating of physical and psychological wellness are sensitive to weekly training manipulations. Two studies have examined the relationships between perceptions of training load experienced, recovery strategies, and stress (Grobbelaar, Malan, Steyn, & Ellis, 2010; Hartwig, Naughton, & Searl, 2009). Hartwig et al. (2009) investigated the relationships between perceived load, stress, and recovery in 106 rugby union adolescents across a competitive season. Their results suggest that increases in participation demands, feelings of stress and under recovery, during intensive periods of competition are related. Grobbelaar et al. (2010) report similar findings over a 5-month period with 41 rugby union players, identifying that playing position, year experience, and starting status, need to be considered when monitoring players' likelihood of developing overtraining and burnout. Further longitudinal research investigating the impact of training hours is required to better understand its influence on athlete burnout and its influence on related concepts such as social perceptions.

2.6.2. Psychosocial Aspects of Elite Sport

Research within social psychology suggests that individuals' social perceptions influence the way in which they see themselves (self-concept), and are linked with close relationships and an individuals' self-concept (Sedikides & Gregg, 2003; Swann Jr, Chang-Schneider, & Larsen McClarty, 2007). In sport, athletes seek relationships typified by mutual caring and connection with teammates and/or coaches and these are central to their well-being (Deci & Ryan, 2002; Hodge et al., 2008). This need for connection can be satiated through acceptance into a peer group (e.g. competitive team) or by a coach fulfilling an athlete's desire to be connected to others (Baumeister & Leary, 1995). Social support from those close to athletes has been found to help protect against the development of burnout (Lu et al., 2016). Further, the quality of athletes' social interactions can influence how they cope with the physical and mental demands of participating in sport (Gustafsson et al., 2011; Smith, 1986; Udry, Gould, Bridges, & Beck, 1997).

Humans do not live in social isolation and often work towards a collective objective (Bandura, 1997), especially within sports teams. When interdependence between teammates is crucial, the individual self-efficacy and confidence of each player comprising the team will influence performance (Beauchamp, Jackson, & Lavallee, 2007; Fransen et al., 2012). Research highlights the importance of athletes' perceptions by demonstrating that athletes who are more confident in their team's abilities: exert more effort (Greenlees, Graydon, & Maynard, 1999), set more challenging goals (Silver & Bufanio, 1996), are more resilient when facing adversities (Morgan, Fletcher, & Sarkar, 2013), and perform better (Stajkovic, Lee, & Nyberg, 2009).

Previously, Zaccaro, Blair, Peterson, and Zazanis (1995), defined collective efficacy as “a sense of collective competence shared among individuals when allocating, coordinating, and integrating their resources in a successful concerted response to specific situational demands” (p 309). Collective efficacy develops through sources of efficacy information (Bandura, 1997). Sources of collective efficacy information in sport are similar to those used to determine self-efficacy but relate to perceptions of the team: past performance, vicarious experience, verbal persuasion, and physiological states (Bandura, 1997; Feltz, Short, & Sullivan, 2008). In a similar manner, it could be suggested that burnout develops in a collective fashion whereby athletes who perceive their teammates as exhausted, exert less effort, are less likely to set goals, less resilient, and poor performances.

2.6.2.1. Work Engagement

Within other domains work engagement has been an important construct for well-being and performance (Halbesleben, 2010). Engaged workers have a tendency to work more hours (Schaufeli, Taris, & Van Rhenen, 2008), help colleagues (Halbesleben & Wheeler, 2008), and manage to stay healthy in stressful environments (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). Work engagement is a positive, fulfilling state of work-related well-being, which has been explored at a team level (Costa, Passos, & Bakker, 2014). The job demands-resources model framework has been utilised to show that job demands, and resources are related to engagement and burnout (Bakker, Albrecht, & Leiter, 2011). Job resources such as performance feedback, job autonomy and supervisory support are considered to be significant antecedents of work engagement (Hakanen, Bakker, & Schaufeli, 2006; Richardsen, Burke, & Martinussen, 2006). It is suggested that work engagement is influenced by the work environment (Costa et al., 2014). At the team level, team work engagement is considered to be a shared, positive, and fulfilling, motivational emergent state of work-related well-being (Costa et al., 2014). Engaged teams are energised when they are working and display active, productive behaviours, such as refocussing from unexpected negative events (Costa, Passos, & Bakker, 2015). These teams are enthusiastic about what they do and working together; they consider what they do as being meaningful and relevant (Costa et al., 2015). Previous research highlights the mediating role of team work engagement in relationships between social resources (e.g. coordination, team work, and supportive team climate) and performance (Torrente, Salanova, Llorens, & Schaufeli, 2012). It could be suggested that athlete burnout operates in a similar manner and is influenced by the social environment surrounding the athlete. When an athlete perceives their teammates as not being able to cope with the demands of sport, collective burnout may develop within the team and result in performance decrements.

2.6.2.2. Influence of Teammates

Teams are a distinguishable pair or group of people who interact dynamically, interdependently, and adaptively towards a common goal and values; they have been set specific role to perform and have a limited lifespan of membership (Salas, Dickinson, Converse, & Tannenbaum, 1992). Smith (1986) and Coakley (1992) argue that athletes from individual sports are more likely to suffer from burnout than athletes from team sport backgrounds however, there is limited empirical research to support this notion. Working in a team differs to individual work as team members need to coordinate and synchronise their actions (Costa et al., 2014). Consequentially, the success of teams is dependent on the interactions between teammates to complete work (Marks, Mathieu, & Zaccaro, 2001). Coakley (1992) suggests athletes expect social support to be greater in team sports than in individual sports. Social support can act as a buffer, thereby reducing team-based athletes' susceptibility to burnout (Coakley, 1992). More recently Gustafsson et al. (2007) suggested that male athletes playing team sports were more likely to score higher on each of the subscales of the Eades Burnout Inventory (EABI), compared to individual sport athletes. However, the opposite was found for female athletes as individual sport athletes were more likely to score higher on the EABI than team sport athletes.

Previous qualitative research has highlighted the implications of social interactions in athlete burnout (Cresswell & Eklund, 2006c; Gustafsson, et al., 2008). Furthermore, Gustafsson and colleagues (2008) indicated, based on interviews with ten athletes, that social relationships and a lack of social support were associated with athlete burnout development. Taking an integrated model of athlete burnout perspective, it could be theorised that stressful social relationships may increase the likelihood of burnout development (Gustafsson et al., 2011). However, the impact of the social environment in sport requires further investigation.

An important aspect of the social environment is the collective mood developed by athletes. Totterdell (2000) indicates that little is known about a team mood although it is often referred to in the media. Limited research validating the construct of collective mood, or how it relates to the mood of each individual is available. An athlete's mood has been shown to impact their sporting performance (Totterdell, 1999). Specifically, Totterdell (1999) highlights that athletes' subjective and objective performance is associated with their feelings of happiness, energy, enthusiasm, focus, and confidence during games. Moreover, Totterdell (2000) provides some evidence for the team mood construct and its potential implications, as well as suggesting two possible mechanisms by which a collective mood may develop. Firstly, team members may respond in similar ways to a shared experience or event, therefore having similar feelings. Secondly, team members may influence each other (i.e. emotional contagion) through direct and indirect communication during training and games.

Moritz and Watson (1998) indicate that when investigating groups, it is important to consider the influence of the individual and the group. Failing to consider both may potentially result in: (a) over generalisation, that the assumption made at one level is the same at the other; (b) underestimating the influence of the group at an individual level and individual at a group level; (c) single-level analysis at a group level may lead researchers to treat the group construct as real and tangible, rather than an abstract construct.

Interpersonal moods and feelings may be caused by the same response to sport stressors or possibly through emotional contagion (Totterdell, 2000). Barsade (2002) describes emotional contagion as a type of social influence. Within teams, individuals are exposed to the positive and negative emotions of teammates. An athlete's perception of stressors, such as training demand, can be influenced by their social relationships with their teammates (Kerdijk, Kamp, & Polman, 2016). The process of emotional contagion can occur subconsciously (i.e. athletes automatically mimic other team members' expressive display and hence have similar emotional experiences) or consciously (i.e. athletes compare their feelings with how others feel) (Totterdell, 2000). When these interpersonal processes function over time, individual team member's moods appear to become synchronised and mutually entrained. Totterdell (2000) suggests that connections between team members' moods maybe linked with the athlete's emotional expressiveness and affective communication via deliberate and non-deliberate facial, verbal, and behavioural expressions.

The process of emotional contagion is similar to crossover theory, where the interpersonal process that occurs when one individual's stress experience impacts another individual's perceptions of stress within the same environment (Bolger, DeLongis, Kessler, & Wethington, 1989). Crossover is thought to occur both directly and indirectly (Westman, 2001). Furthermore, Barsade (2002) highlights that direct personal contact is important for the transmission of emotions between individuals within a group. These finding support the concept that body language and non-verbal communication are important between athletes, their teammates, and coaches (LeCouteur & Feo, 2011). This raises an interesting question as to whether a burnt-out individual who may be expressing negative emotions can have a negative influence on the rest of the athletes in the sports team. Furthermore, a negative environment (e.g. teammates expressing symptoms, low quality coach-athlete relationships) may increase the likelihood of an individual athlete within the team to experience burnout.

Previously, Schaufeli and Enzmann (1998) suggested that burnout may manifest itself behaviourally or socially therefore it may be noticed by other individuals. Within burnout research there is a growing body suggesting that burnout may be contagious; transferred from one person to another (Bakker, Le Blanc, & Schaufeli, 2005; Bakker, van Emmerik, & Euwema, 2006; González-Morales, Peiró, Rodríguez, & Bliese, 2012). Potentially, burnout contagion utilises a similar mechanism to the crossover of stress pathways, when individuals have an impact on each other, within their social environment (Bakker, Westman, & Hetty van Emmerik, 2009). Indirect crossover takes place through changes in communication or behaviours resulting in the development of burnout (Hakanen, Perhoniemi, & Bakker, 2014). Whereas direct crossover is thought to occur as a consequence of the receiver either consciously imagining feelings that the other teammate is expressing or automatically catching the emotions of their teammates (Bakker et al., 2009; Barsade, 2002).

Within non-sporting settings it has been suggested that burnout is contagious, Bakker and Schaufeli (2000) identified that teachers who frequently discussed problematic students with a burnt out colleague had the highest probability of reflecting the negative attitudes expressed by their burnt out colleague. Bakker, Demerouti, and Schaufeli (2003), highlight that burnout contagion occurs in work teams as observed among a sample of 490 employees from a large bank and an insurance company. Their results indicate that burnout at a team level was associated with individual team member burnout scores, which was directly and indirectly transmitted through relationships with individual members relating to job demands, job control, and perceived social support. These findings link with Barsade's (2002) suggestion that personal contact is important for the transmission of emotions. However, at the current point in time the concept of burnout contagion has not been investigated within sports teams.

2.6.2.3. Coach-Athlete Relationship

Within competitive sport environments a high-quality interdependent coach-athlete relationship is central to effective, successful coaching and is a crucial precursor for athletes' optimal functioning (Gould, Collins, Lauer, & Chung, 2007; Lyle, 2002). The mutual dependence is created due to the athlete's need to acquire the knowledge, competence, and experience from the coach, and in the coaches' desire to transfer their competence and skill, to produce success and good performance in the athlete (Philippe & Seiler, 2006). In Philippe and Seiler's (2006) longitudinal study of swimmers and their coaches, coaches who were trained to create a supportive and encouraging environment had a positive influence on their athletes. These results support the notion that the interpersonal dynamics between coaches and athletes have implications for athlete development and performance.

The coach-athlete relationship has been recognised as a mechanism for success and satisfaction within sport (Jowett, 2005). Recently, increased interest in the coach-athlete relationship has resulted in a network of theoretical frameworks and measurement tools derived from other psycho-social disciplines which have been transferred into the sport context (Poczwardowski, Barott, & Jowett, 2006). Over the last decade a range of models have been put forward, such as the motivational model of the coach-athlete relationship, the qualitative-interpretative framework of coach-athlete dyads (Poczwardowski, Barott, &

Henschen, 2002), the application of reversal theory to the relational processes (Shepherd, Lee, & Kerr, 2006), and the 3+1C model of the coach-athlete relationship (Jowett, 2008).

2.6.2.4. 3 + 1Cs Conceptualisation of the Coach-Athlete Relationship

The 3+1C's model has attracted considerable attention and Jowett's conceptualisation of the coach-athlete relationship has been linked to the development of athlete burnout (Gustafsson et al., 2011). The coach-athlete relationship has been defined by Jowett (2005) as the situation in which coaches' and athletes' feelings (closeness), thoughts (commitment), and behaviours (complementary) are interdependent (co-orientation). This definition has led to the development of the model (Jowett, 2009) and has provided a platform from which an integrated conceptual model has been developed to represent the multifaceted nature of the dyadic coach-athlete relationship. Closeness refers to the affective tone of the relationship and the degree to which the relationship members are affectively attached, such as respecting, liking, trusting and appreciating each other. Commitment refers to the cognitive attachment and long-term orientation towards one another. Complementary describes coaches' and athletes' behavioural transaction of cooperation, responsiveness, and affiliation. Olympiou, Jowett, and Duda (2008) highlight a major advantage of the 3 + 1Cs model of the coach-athlete relationship is its emphasis on the bidirectional nature of the relationship. Co-orientation represents coaches' and athletes' intersubjective experiences and inter-perceptions. This construct contains two sets of interpersonal perceptions, direct and meta-perceptions (Jowett, 2005).

This concept may provide crucial insight into how burnout is affected by the coach-athlete dyad. Previously, the 3 + 1Cs model has been employed to investigate correlates of the coach-athlete relationship, including investigations of the effect these relationship constructs have on the motivational climate (Olympiou et al., 2008), athletes' perception of satisfaction (Jowett & Nezlek, 2012), athletes' perception of self-concept (Jowett, 2008), athletes' perception of team cohesion (Jowett & Chaundy, 2004) and passion (Lafrenière, Jowett, Vallerand, Donahue, & Lorimer, 2008). Research has also suggested that the perceived quality of the coach-athlete relationship is related to enhanced athlete performance (Rhind & Jowett, 2010). Furthermore, cross-sectional research has identified that the quality of the coach-athlete relationship is negatively related to athlete burnout (Isoard-Gautheur, et al., 2016).

2.6.2.5. Implications of the Coach-Athlete Relationship

Coaches play an important role in the lives of athletes, often having control over many facets of their lives, both inside and outside of the sporting environment (Barcza-Renner, Eklund, Morin, & Habeeb, 2016). It could be suggested that the coach-athlete relationship is at the heart of the competitive endeavour (Isoard-Gautheur et al., 2016) and athletes' perception of their social environment may have implications for their psychophysiological health (Barcza-Renner, et al., 2016). Athletes' perceptions of their coach's attitudes and behaviour have been shown to influence athlete motivation (Barcza-Renner et al., 2014), well-being (Davis & Jowett, 2014), performance and burnout (Isoard-Gautheur, et al., 2016), autonomy support (Mageau & Vallerand, 2003), perceived quality of relationship endeavour (Isoard-Gautheur et al., 2016), motivational climate (Ntoumanis, Taylor, & Thøgersen-Ntoumani, 2012), and social support (Reinboth, Duda, & Ntoumanis, 2004).

The 3 + 1Cs model has been used to investigate typical and atypical coach-athlete relationships within mainly individual sports (Jowett, 2003). Jowett and colleagues studies' findings identify that feelings such as trust, respect, and commitment - in addition to cooriented views regarding values, practice and performance goals, and finally complementary behaviours - are crucial aspects that have a positive effect on the quality of the athletic coach-athlete relationship (Jowett & Cockerill, 2003; Jowett & Meek, 2000).

On the other hand feelings of being unattached or distant, having competing interests, conflicting goals and poor understanding, as well as non-complementary behaviours can negatively affect the coach-athlete relationship (Jowett & Cockerill, 2003).

Research suggests that the 3 + 1Cs are an effective way of describing the coach-athlete relationship by identifying both positive and negative relational issues (Jowett, 2003). It is possible many coaches are unaware of the signals they transmit to athletes, leading to potential communication and interaction issues within the coach-athlete relationship (Thelwell et al., 2016). Irrespective of whether coaches are aware of the stress signal they communicate to their athletes, it is likely they have a contagion effect (Davis & Davis, 2016). Scanlan, Stein, and Ravizza's (1991) suggest that elite figure skaters' disharmony with coaches are underlined by a disliking of the coaches' dominant personality or their style of coaching. Furthermore, Greenleaf, Gould, and Dieffenbach (2001) note that elite coach and athlete experiences of conflict arise due to issues around training, perceived power, technical information, and team conflict.

When athletes perceive their coach-athlete relationship as close, committed, and complementary it may lead to positive adaptations for the athlete, but if the athlete perceives the relationship as stressful maladaptation may result and lead to ill-being and burnout (Arnold et al., 2013; DeFreese et al., 2014; Fletcher et al., 2006; Isoard-Gautheur et al., 2016). Individuals are thought to consider a situation as a threat when the perceived demand outweighs their resources to cope with the situation (Renfrew, Howle, & Eklund, 2017). Whereas, a challenge-based appraisal is established if the individual perceives their available coping resources outweigh the situational demands (Tomaka, Blascovich, Kelsey, & Leitten, 1993). Research has assessed whether challenge and threat appraisal influence sport performance (Jones et al., 2009), suggesting that challenge and treat states may be associated with distinct physiological (e.g. neuroendocrine and cardiovascular) and emotional response that are more (e.g. challenge appraisal) or less (e.g. treat appraisal) adaptive in nature. Nicholls et al. (2016) previously suggested coach-athlete relations may impact the way in which athletes appraise the demands on their resources.

Understanding the consequences of the coach-athlete relationship is essential to inform practice. The importance of the coach-athlete relationship should not be undervalued; a high quality coach-athlete relationship results in superior coaching (Lyle, 2002), coach and athlete well-being (Appleton & Duda, 2016), and better self-concept (Jowett & Cramer, 2010). Previously, Vealey et al. (1998) reported that athletes experiencing burnout perceived their coaches as being less empathetic, communicating dispraise, more autocratic, and placing an emphasis on winning. Further research indicates that athletes are more at risk of experiencing burnout when they perceive low social support from their coaches (Raedeke & Smith, 2001), when coaches act in a ridged or controlling way (Raedeke, 1997), and when coaches do not provide autonomy support (Quested & Duda, 2011). Examining the perceived quality of the coach-athlete relationship may help identify possible social stressors causing the development of athlete burnout as well as the potential performance implications of the quality of the relationship.

Research investigating the influence of the coach-athlete relationship on athlete functioning and health has increased (Appleton & Duda, 2016). Jowett and Cockerill (2002) suggest that the coach-athlete relationship refers to all situations in which athletes' and coaches' thoughts, feelings, and behaviours are inter-related. Rhind and Jowett (2010) previously investigated whether the quality of the coach-athlete relationship is related to subjective performance of athletes and their satisfaction using the long version of the Coach-Athlete relationship questionnaire (CART-Q; Rhind & Jowett, 2010) and short version of the CART-Q (Jowett, 2009); both measures indicate significant relationships with subjective performance. To further investigate the impact of the coach-athlete relationship and performance it is important to look beyond subjective measures. Research should consider alternative means of assessing athletes' performance for greater applicability to the applied field. Initial research by Gillet, Vallerand, Amoura, and Baldes (2010) suggests that objective performance can be associated with coaches' support of autonomy in their athletes. However, their results are difficult to generalise because tournament placing was used as the objective performance measure. As sporting competitions differ from sport to sport in terms of composition and format is difficult to generalise tournament placing across sporting context. Further research is required to assess how the coach-athlete relationship may affect the development of athlete burnout and the performance of athletes.

2.7. Consequences of Athlete Burnout

Testing and monitoring athletes' physiological responses to training and competition occurs regularly in elite sport and when conducted frequently, monitoring can help to track athletes' improvements over time, allowing for the modification of training (Lambert, 2006). A successful training programme involves balancing physical overload and recovery in order to improve physical performance of the athlete and at times coaches will increase the physical intensity placed on an athlete with this goal in mind (Hough, Corney, Kouris, & Gleeson, 2013). If this state of intensified training continues excessively athletes can develop overreaching, resulting in a reduction in physical performance and the development of overtraining syndrome (Meeusen et al., 2013; Meeusen et al., 2006). Overtraining and burnout often leads to a decrement in performance, accompanied by physiological and psychological changes reflecting maladaptation (Cureton, 2009).

Historically, physiological stress or training stress is considered to be a major contributor to maladaptation and a cause of underperformance (Kuipers & Keizer, 1988; Morgan et al., 1987) whilst high training and competition load can lead to technical, physical and tactical underperformance (Ekstrand, Waldén, & Hägglund, 2004, Rollo, Impellizzeri, Zago, & Iaia, 2014). Although less researched, non-training and social stressors have been suggested to contribute to the underperformance of athletes (Meehan et al., 2004). In consideration of the theoretical framework of the integrated model of athlete burnout (Gustafsson et al., 2011), it could be suggested that the physiological and psycho-social antecedents increase the likelihood of athletes experiencing symptoms of burnout which has implications for the athlete's performance.

In order for an athlete to attain an expert level of competence, they must focus on important environmental information, for example, recognising and recalling patterns of play and making correct decisions during match play, as well as contributing to the physical performance of the team (Buszard, Farrow, & Kemp, 2013; MacDonald & Minahan, 2016; Roca, Ford, McRobert, & Williams, 2013). Therefore, cognitive performance in the areas of attention, working memory, and executive function are crucial to athletic proficiency (MacDonald & Minahan, 2016). Individuals with burnout often report experiencing cognitive problems such as poor concentration and memory impairment (Weber & Jaekel-Reinhard, 2000). To date, several studies have explored the relationship between objective measures of cognition and burnout (Jonsdottir et al., 2013; Oosterholt, Maes, Van der Linden, Verbraak, & Kompier, 2015; Oosterholt, Van der Linden, Maes, Verbraak, & Kompier, 2012; Österberg et al., 2009; van Dam, Keijsers, Eling, & Becker, 2011; Van der Linden, Keijsers, Eling, & Schaijk, 2005). These studies suggest that cognitive problems experienced in burnout are accompanied by actual cognitive impairments, assessed by a variety of neurological tests.

However, research examining relationships between burnout and cognition have not always produced consistent results. Österberg et al. (2009) report that there was no difference between high and low burnout groups on a sustained attention task that required scanning a set of letters and responding to critical stimuli. Furthermore, Diestel and Schmidt (2011) suggest burnout may only affect performance when demands on executive control are high. Therefore, burnout might only be associated with deficits in higher-order executive functioning. This suggestion relies on the theoretical notion of a limited resource that is temporarily depleted by executive processes; the outcome is dependent on the extent to which the task requires executive control (Hofmann, Schmeichel, & Baddeley, 2012). Oosterholt et al. (2012) indicate that burnout involves chronic impairment limiting capacity. This may suggest that in the presence of high demand, individuals with high level of burnout will not perform as well as those with low level of burnout whereas, when demand is low there would be no difference between the two groups.

Kane, Conway, Miura, and Colflesh (2007) and Miyake et al. (2000) revealed that the N-back task (i.e. continuous performance task that is commonly used as an assessment working memory and working memory capacity) and the Stroop interference task are most valid to reflect updating and monitoring working memory and response inhibition. Ryu et al.'s (2015) analysis of the Stroop interference task indicates that non-burnout athletes react slower to the stimulus than burnt out athletes, although burnt out athletes respond faster they were not as accurate. When considering the theory of attention, it could be suggested that when an individual pays focal attention to a task, accuracy may be heightened at the expense of processing time (Beatty, Fawver, Hancock, & Janelle, 2014).

Previously, it has been suggested that overtraining syndrome and burnout are characterised by a neuroendocrine imbalance, while the underlying mechanism involves disturbances at a hypothalamic-pituitary level (Danhof-Pont, van Veen, & Zitman, 2011; Meeusen et al., 2004). As the major output of the HPA axis is cortisol, levels of cortisol are believed to differ between healthy individuals and those suffering from burnout (Oosterholt et al., 2015). It is generally accepted that acute stress leads to increases in cortisol concentration, a general notion is that chronic stress (burnout) can cause HPA axis disruption resulting in decreased cortisol levels (Fries, Dettenborn, & Kirschbaum, 2009; McEwen, 1998). The results of previous studies investigating the relationship between burnout and cortisol are not consistent (Danhof-Pont et al., 2011; De Vente, Olff, Van

Amsterdam, Kamphuis, & Emmelkamp, 2003; Marchand, Juster, Durand, & Lupien, 2014; Melamed et al., 1999; Sonnenschein et al., 2007). Several factors may explain the variability in the research findings, such as heterogeneity in the assessment of cortisol; uncontrolled confounding variables, the samples sizes but perhaps most crucially the differing operational definitions of burnout used in research (Oosterholt et al., 2015). Finding a population of athletes who are clinically diagnosed with burnout is difficult, to address this issue research may be required to consider a different approach to current procedures used.

Instead of examining the resting levels of cortisol, assessment of cortisol change to exercise may give a clearer picture of the endocrine alterations that may occur in the case of burnout. Hough, Papacosta, Wraith, and Gleeson (2011) identified that well physically trained athletes evoke robust increases in exercised-induced salivary cortisol. Previously, researchers have used a combination of hormones, cortisol, growth hormone, prolactin, and adrenocorticotrophic hormone (ACTH), to discriminate between normally training athletes (i.e. athlete not experiencing burnout symptoms), overreached athletes, and those suffering from overtraining syndrome (Meeusen et al., 2010; Meeusen et al., 2004). A testing protocol consisting of two maximal cycling exercise bouts separated by a four hour resting recovery was used to examine the hormone response to a short-term high-intensity cycle as well as to examine the impact of short term recovery. Meeusen et al. (2004) report that the exercise induced cortisol concentration to the second bout of exercise dropped by ~118%; this followed a 10-day period consistent with an increased training load, compared to the training load prior to testing. Athletes were categorised as overreached if their performance on the cycle to fatigue bout decreased following the 10 day training period. Blunting of the cortisol response following exercise may be a physiological consequence of burnout that requires further exploration. Research may wish to examine the relationship between athlete burnout and acute cortisol change to physical testing rather than baseline levels.

2.8. Psychological Concepts Related to Burnout

2.8.1. Perfectionism

Perfectionism is a personal disposition characterised by striving for flawlessness and setting high standards for performance, accompanied with tendencies to be over critical about ones' own behaviour (Flett & Hewitt, 2002). As perfectionism is multi-faceted, it is best conceptualised as a multidimensional characteristic (Frost, Marten, Lahart, & Rosenblate, 1990; Madigan et al., 2016). It is suggested that perfectionism encompasses two higher-order dimensions: perfectionistic strivings, representing high expectation and striving for perfection; and perfectionistic concerns reflecting concerns over mistakes as well as negative evaluation (Stoeber & Otto, 2006). In sport research, differentiating between perfectionistic strivings and perfectionistic concerns is important, due to the opposing relationship they have with various outcomes (Madigan et al., 2016). A previous review by Gotwals, Stoeber, Dunn, and Stoll (2012) suggests perfectionistic concerns are associated with negative processes and outcomes (e.g. maladaptive coping, negative affects) whereas, perfectionistic strivings associated with positive process and outcomes (e.g. adaptive coping positive affects).

Research examining the relationship between perfectionistic strivings, perfectionistic concerns, and burnout have found different relationships (Hill & Curran, 2015). Research indicates that perfectionistic strivings are negatively related to athlete burnout whereas perfectionistic concerns are positively related to athlete burnout (Hill & Curran, 2015). Unlike other psychological concepts related to burnout, this relationship has also been studied longitudinally. Research indicates that perfectionistic concerns predicts longitudinal increases in athlete burnout whereas perfectionistic strivings predicts decreases in athlete burnout, over a three month period (Madigan et al., 2015).

2.8.2. Motivation

Roberts (2001) defines motivation as a psychological construct that directs, energises and focuses on achievement behaviour. Although the exact reason why some athletes develop burnout and others do not is not fully understood, researchers have suggested that motivation of athletes may play a role (Gould et al., 1996). Two major motivational theories from a social-cognitive framework are achievement goal theory (Nicholls, 1984) and self-determination theory (Deci & Ryan, 2000, 2002) (for self-determination please refer to section 2.3.5). Both theories have been related to athlete burnout.

Achievement goal theory (AGT; Dweck, 1986; Nicholls, 1984) interprets human behaviour and experiences in relation to the demonstration of competence. Fundamentally, AGT assumes that the overall goal of action, which becomes the driving force in achievement settings, is the desire to avoid demonstrating incompetence and to demonstrate competence (Isoard-Gautheur et al., 2013). The theory suggests that there are two approaches athletes may adopt when judging their abilities while playing sport. A task-orientated individual is focused on improving relative to their own past performances; their perceived ability is not based on a comparison with others (Ames, 1992; Dweck, 1999; Nicholls, 1984). An ego-orientated individual is focused on comparing themselves with, and defeating others; here the ego-orientated individual feels good about themselves when they win (high perceived ability), but not so good when they lose (low perceived ability; Ames, 1992; Dweck, 1999; Nicholls, 1984). Duda and Pensgaard (2002) suggest that an athlete's focus on individual improvement, rather than comparisons with others, are likely to be more resilient motivational process and more persistent.

Situational and environmental factors are thought to contribute to the development and maintenance of the athlete's goal orientation. Based on the work of Ames (1992) in educational contexts, significant others emphasise either a task-involving or ego-involving environment and help create the motivational climate around the individual athlete. Within sporting contexts the coach is central to the creation of the motivational climate (Duda & Balaguer, 2007). The coach can either emphasize a task-involving environment making it more likely that athletes will focus on task goals; or an ego-involving environment that increases the probability that athletes will emphasise ego goals (Duda & Pensgaard, 2002). A mastery climate is correlated with lower levels of anxiety, higher intrinsic motivation, and enjoyment; where as an ego-oriented climate is negatively correlated with enjoyment and satisfaction (Harwood & Biddle, 2002). Isoard-Gautheur et al. (2013) describe how ego-involving coaches create climates which positively predict all three sub-dimensions of athlete burnout, whilst task-involving climates negatively predicted sport devaluation, through mastery-approach goals.

2.8.3. Athletic Identity

Researchers have found that athletic identity is strongly related to a number of potential issues, such as burnout (Coakley, 1992). Coakley (1992) suggests that young athletes in sport organisations experience identity foreclosure, which results in a unidimensional identity and a feeling of loss of autonomy. Athletic identity is defined as the extent to which individuals define themselves as athletes (Brewer, Van Raalte, & Linder, 1993). Athletic identity is a social role, influenced by the social environment of the athlete, including their coach and teammates (Brewer et al., 1993). Often athletes' participation in sport is a fundamental cornerstone to their self-worth, self-esteem, and how athletes define themselves (Brewer et al., 1993). These individuals may view athletic competition as an arena where they have to perform well as a low threat. However, other individuals may be overwhelmed and experience high level of stress leading to maladaptations (Petrie, Deiters, & Harmison, 2014). Brewer et al. (1993) suggest that individuals who strongly identify as being athletes will be influenced by their own success and failures.

Although a strong athletic identity may be beneficial to athletes' performance and commitment (Horton & Mack, 2000), research has suggested it may also lead to the development of overtraining syndrome and burnout (Brustad & RitterTaylor, 1997; Coakley, 1992). Burnt out athletes may initially have possessed a strong athletic identity which was subsequently undermined by the development of symptoms related to sport devaluation (Raedeke, 1997).

2.9. Summary of Main Points

Athlete burnout is a cognitive-affective syndrome comprised of emotional and physical exhaustion, reduced sporting accomplishment and devaluation of sport participation (Raedeke, 1997; Raedeke, & Smith 2001). Gustafsson et al. (2011) integrated model of athlete burnout indicated a number of possible antecedents that have been linked to the development of burnout including chronic stress (Raedeke & Smith, 2001) and competition volume (Gould et al., 1996). Goodger et al. (2007) indicated there is a positive relationship between training load and athlete burnout; however, further longitudinal research is required to assess this causal relationship. Furthermore Gustafsson et al., (2011) highlighted the potential influence of the social environment (Jowett, 2009; Jowett & Carolis, 2003). Athletes interact and engage with coaches and teammates seeking relationships typified by mutual caring and connection (Deci & Ryan, 2002; Hodge et al., 2008). Within sport teams, an athlete's social environment is comprised of teammates sharing similar experiences to their own. Within non-sporting settings, research suggests that the contagion of burnout occurs between individuals (Bakker, van Emmerik, & Euwema, 2006; González-Morales, Peiró, Rodríguez, & Bliese, 2012). Burnout contagion may utilise a similar mechanism to the crossover of stress (both indirect and direct)

(Bakker et al., 2009; Hakanen, Perhoniemi, & Bakker, 2014). The integrated model of athlete burnout suggests that the coach-athlete relationship may influence the development of burnout (Gustafsson et al., 2011). Previously it has been suggested that athletes who perceive low quality coach-athletes relationship are more likely to have a maladaptive response to stressful demands of sport which may result in ill-being and burnout (DeFreese et al., 2014; Isoard-Gautheur et al., 2016) as well as having performance implications (Gillet et al., 2010). The model proposed by Gustafsson et al., (2011) highlights the potential for athlete burnout to have a negative impact on the performance of athletes. This may have implications for the both the physical (Cureton, 2009) and cognitive (Jonsdottir et al., 2013; Oosterholt, Maes, Van der Linden, Verbraak, & Kompier, 2015) performance of athletes.

2.10. Unanswered Questions in Previous Research

Whilst research investigating athlete burnout and the social environment of athletes is on the rise, valuable information regarding possible causes of burnout and the potential physiological consequences of burnout require further exploration. It has previously been proposed that chronic stress is the main cause of burnout (Black & Smith, 2007; Raedeke & Smith, 2001). Adopting the theoretical framework of the integrated model of athlete burnout (Gustafsson, et al., 2011) may provide insight into how athlete burnout may develop as well as the possible implications of the social environment and athlete burnout.

Gustafsson et al.,'s (2011) integrated model of athlete burnout, suggests that burnout may manifest as a consequence of physical stressors. However, the role of excessive training still requires further investigation due to the conflicting findings within research (Black & Smith, 2007; Cresswell & Eklund 2006b; Gustafsson et al., 2007). Although longitudinal research designs are now more commonly undertaken within the study of athlete burnout (Cresswell & Eklund, 2006b; Madigan et al., 2016), it is still necessary as it allows research to examine potential relationships between training load and burnout.

The social environment surrounding an athlete appears to be a central component of the burnout process (Smith et al., 2010; Gustafsson et al., 2011). Research has begun to examine the impact of the athlete's social environment by examining the influence of the quality of the coach-athlete relationship on burnout (Isoard-Gautheur, et al., 2016). Initial findings suggest the coach-athlete relationship influences burnout, however longitudinal data is required to investigate the process and the development of the interaction (Cresswell & Eklund 2006b; Madigan et al., 2016). Furthermore, within sports teams, teammates are an integral part of the social environment (DeFreese, & Smith, 2014). It is therefore important that research attempts to investigate the potential impact that athletes' perceptions of teammates may have on the development of burnout.

However, due to the consequences of burnout and because exhaustion is a core component of burnout, research has suggested that athletes having raised exhaustion levels may influence performance even in healthy populations. In addition, it is suggested that the coach-athlete relationship is fundamental in the development and well-being of athletes (Davis & Jowett, 2014). Therefore, it is important that research looks to investigate the practical implications this relationship. As such, there is a need for research to investigate the performance consequence of athlete burnout and the coach-athlete relationship.

2.11. Specific Aims of Experimental Chapters

The subsequent experimental chapters will look to address the unanswered questions from previous research, as well as assess the cause and consequences of athlete burnout, exhaustion, and the coach-athlete relationship, highlighted in the integrated model of athlete burnout (Gustaffson et al., 2011). The specific aims of each of the Experimental Chapters are presented below.

Study 1 (Chapter 3) aims to create a validated a three-factor team burnout measurement tool to assess the impact of athlete's perception of their teammate's burnout comprised of subscales reflecting team sport devaluation, team emotional and physical exhaustion, and team reduced accomplishment allowing research to assess a possible antecedent of burnout.

Following on from Study 1 (Chapter 3), Study 2 (Chapter 4) aimed to utilise the newly created team burnout questionnaire to investigate the potential impact of social factors on the development of burnout in team, specifically looking at athlete perceptions of their teammates burnout and the actual level of team burnout. The second aim of Study 2 (Chapter 4) is to assess the dynamic nature of burnout by investigating whether it changes across a 3-month period. Third, considering the proposed link between the cumulative demand of training hours and burnout (e.g. Creswell & Eklund, 2006b), Study 2 (Chapter 4) aimed to investigate whether training hours were related to athlete and perception of their teammates' burnout.

Study 3 (Chapter 5) examines aimed to explore the potential influence of coach-athlete relationship quality in team sport on athletes' psychophysiological exhaustion with a particular focus upon the implications for physical and cognitive performance. Study 3 (Chapter 5) utilised a two phased approach. The first phases aimed to investigate the association between the quality of the coach-athlete relationship, athlete exhaustion, cortisol response, physical performance, and cognitive performance. The second phase aimed to investigate whether these associations were present over time (i.e., to examine whether the quality of the coach athlete relationship was able to predict athlete exhaustion, cortisol response, physical performance, and cognitive performance. Finally, Study 3 (Chapter 5) aimed to determine whether the relationship between the quality of the coach-athlete relationship and athletic performance (i.e., cognitive and physical performance0 was mediated by athlete exhaustion.

Finally, Study 4 (Chapter 6) aimed to investigate the potential influence athlete exhaustion and the quality of the coach-athlete may have on the performance of athletes in an applied environment.

Chapter 3: Validating a Measurement of Perceived Teammate Burnout

Study 1

3.1. Abstract

Previous research has highlighted that the social environment athlete are immersed in may influence their own well-being and mood. It is important for research to be able to investigate the possible contagion effect of perception of teammate burnout on team-sport athletes by utilising the Team Burnout Questionnaire (TBQ). The aim of this study was to provide support for the validation of the TBQ. Athletes from a variety of sports (*N* = 290) completed the TBQ, and the Athlete Burnout Questionnaire (ABQ). Confirmatory factor analysis revealed acceptable fit indexes for the three-dimensional models (i.e. exhaustion, sport devaluation, reduced accomplishment) of the TBQ and the ABQ. Multi-trait multi-method analysis revealed that the TBQ and ABQ showed acceptable convergent and discriminant validity. The creation of the TBQ offers greater insight into factors influencing athlete burnout as well as offering a new tool for measuring burnout with teams.

Keywords: burnout; team burnout; social perceptions; validation; measurement

3.2. Introduction

Burnout in athletes is associated with a variety of negative outcomes such as decreased well-being, reduced performance, and dropout from sport (Cresswell & Eklund, 2006a; Gustafsson, Kenttä, & Hassmén, 2011; Madigan, Stoeber, & Passfield, 2016). Athlete burnout is generally defined as a cognitive-affective syndrome comprised of emotional and physical exhaustion, reduced sporting accomplishment, and devaluation of sport participation (Raedeke, 1997; Raedeke, & Smith, 2001). Emotional and physical exhaustion is characterised by the perceived depletion of emotional and physical resources as a consequence of training and/or competition, reduced sporting accomplishment reflects an individual's negative evaluation of sporting abilities and achievements, and devaluation of sport participation is defined as the diminishment of perceived benefits of being involved in sport (Gustafsson, DeFreese, & Madigan, 2017). Despite a widespread acceptance of the conceptualisation of athlete burnout and multiple decades of research pursuing the established line of enquiry, limitations have been noted within recent studies regarding the development of athlete burnout and the role of social factors (e.g., teammates; DeFreese, & Smith, 2013; Lundkvist, Gustafsson, Davis, et al., 2017). Furthermore, the integrated model of athlete burnout identifies the potential impact of psycho-social stressors on athlete burnout (Gustafsson et al., 2011).

Athlete burnout may manifest itself behaviourally as well as socially and as a result, it is likely that symptoms of burnout are observed by other individuals including teammates (DeFreese & Smith, 2013; Schaufeli & Enzmann, 1998). In other performance domains beyond sport (e.g., work organisations), it has been noted that the environmental context can impact upon individuals' levels of burnout (González-Morales, Peiró, Rodríguez, & Bliese, 2012). Within sport, research suggests that collective moods may develop between team members as a result of sharing similar experiences; subsequently, teammates may develop similar feelings and influence each other's perceptions (Totterdell, 2000). Although good quality relationships may protect athletes from negative moods and burnout (DeFreese & Smith, 2013), interpersonal connections can also facilitate interactions that transfer burnout between individuals (Hakanen, Perhoniemi, & Bakker, 2014).

In an education setting, teachers' perceived that collective burnout (i.e., the mean score of group members' perceptions of their colleagues' burnout) can impact upon individual levels of burnout; indicating that collective burnout can be an influential aspect of the work environment and a significant factor in the development of individuals' burnout (González-Morales et al., 2012). In sport, athlete burnout research has historically failed to acknowledge the impact of perceptions of teammates, instead burnout is only investigated at the individual level and social factors are negated. In a recent study measuring team sport athletes' levels of burnout at two time points across as season, Appleby et al. (2018) observed that individual athletes' burnout can be influenced by perceptions of their teammates' burnout. A potential explanation for this finding may relate to athletes' extending their perceptions of their own burnout to their teammates' as a consequence of shared experiences (i.e., number of training hours).

Previously, research within work contexts (e.g., nursing) investigated the crossover of burnout (i.e., the transfer of burnout between individuals) using the contagion theory of emotions (Bakker & Schaufeli, 2000; Bakker, Schaufeli, Sixma, & Bosveld, 2001). Crossover is the interpersonal process that occurs when stress experienced by one individual influences the stress experienced by another individual within the same environment (Bolger, DeLongis, Kessler, & Wethington, 1989). It is suggested that crossover (i.e., burnout contagion) occurs directly and indirectly (Westman, 2001). Indirect crossover transpires through changes in communication or behaviours resulting in the development of burnout (Hakanen et al., 2014). In comparison to this, direct crossover is proposed to occur as a consequence of the receiver either consciously imagining feelings that other colleagues are expressing or automatically catching the emotions of their co-workers (Bakker, Westman, & van Emmerik, 2009; Barsade, 2002). In consideration of the interpersonal nature of sport, a measure of athletes' perceptions of their teammates' burnout appears to be warranted in order to advance knowledge of athlete burnout.

In order to develop an appropriate tool for measuring athletes' perceptions of their teammates' burnout, it is important to consider measures of athlete burnout currently being used within sport research. Although a substantial volume of burnout research has been conducted across various contexts (e.g., occupational settings, nursing, and sport), there remains a lack of consensus regarding the construct itself as well as continuing debate surrounding instruments used to measure athlete burnout (Gustafsson, Lundkvist, Podlog, & Lundqvist, 2016; Lundkvist, Gustafsson, & Davis, 2016). A number of alternative measures have been employed to assess athlete burnout with varying degrees of success; initial attempts to measure burnout utilised well-established instruments such as the Maslach Burnout Inventory (MBI; Maslach and Jackson, 1986). The MBI includes the subscales of reduced accomplishment, physical and emotional exhaustion, and depersonalisation. Preliminary use of the MBI in sport adapted the measure to investigate burnout in coaches (Kelley, Eklund & Ritter-Taylor, 1999) and athletic directors (Martin, Kelley, & Eklund, 1999). Leiter and Schaufeli (1996) as well as Maslach et al., (1996) further refined the MBI to represent environments outside of nursing, social work, and other human care environments due to the issues surrounding the overlap of depersonalisation and exhaustion subscales in human care settings. This resulted in the development of Maslach Burnout Inventory-General Survey (MBI-GS) for individuals outside of the human care setting. The MBI-GS differs from the MBI with the reworking of the depersonalization subscale into a related measure labelled "cynicism" and defined as a negative attitude to one's work place role. Previously, Cresswell and Eklund (2006b) provided support for the validity of the MBI-GS within sporting environments; however, sport psychology research has progressed in developing sport specific burnout measures.

Eades' (1990) pioneering development of the Athletic Burnout Inventory (EABI), offered researchers (e.g., Gould, Tuffet, Udry, & Leohr, 1996) a sport specific tool to investigate athlete burnout. However, the measure has received criticism for the poor theoretical underpinning of the instrument (Cresswell & Eklund, 2006b) as well as low internal consistency within its two factors (i.e., congruent athlete-coach expectations, and personal and athletic accomplishment; Gustafsson, Kenttä, Hassmén, & Lundqvist, 2007). In response to the shortcomings of the EABI, Raedeke and Smith (2001) developed the Athlete Burnout Questionnaire (ABQ). The ABQ represents Raedeke's (1997) modification of Maslach and Jackson's (1986) definition of burnout and the MBI scale; specifically, emotional exhaustion, reduced accomplishment, and sport devaluation comprise the measure's sub-dimensions. Sport devaluation (adapted from the depersonalszation subscale of the MBI) is typified by the development of a cynical attitude towards sports participation. The ABQ is the most widely used burnout questionnaire used with athletes (Gustafsson, Hancock, & Côté, 2014) and has been validated to show good psychometric properties (Sharp, Woodcock, Holland, Duda, & Cumming, 2010). The validity of a measurement is considered to be one of the most fundamental issues surrounding scale development, evaluation, and usage (Marsh, 1998; Raedeke, Arce, De Francisco, Seoane, & Ferraces, 2013; Rowe & Mahar, 2006;). Although researchers have noted a number of measurement issues surrounding the use of the ABQ (i.e., lack of clinical cut offs), it is still the most commonly used method of assessing athlete burnout (Gustafsson, Hancock, & Coté, 2014; Gustafsson, Lundkvist, Podlog, & Lundqvist 2016; Lundqvist, Gustafsson, & Davis, 2016; Smith, Hill, & Hall, 2018). Previously the ABQ has been determined to be a reliable measure of athlete burnout (Cresswell, & Eklund 2006b) and as a result the ABQ has been identified as an appropriate basis for an adapted questionnaire measuring an athlete's perception of their teammates' burnout.

In consideration of previous research in occupational and educational domains where a variety of methods to calculate perceptions of others' collective burnout or perceived collective burnout have been used, the development of a reliable measure of athletes' perception of their teammates burnout appears to be warranted. In particular, to examine perceived burnout of co-workers, studies by Bakker and colleagues (2000, 2005) used a three item scale created by Groenestijn, Buunk, and Schaufeli (1992). Whilst Hakanen et al. (2014) devised an adapted version of the MBI-GS (Maslach, Schaufeli, & Leiter, 2001) following the referent-shift consensus model (Chan, 1998). This resulted in a transformed version of the MBI-GS, which shifted the MBI-GS from an individual referent accessing an individual's own burnout, to reflect the perception of the individual about his or her colleagues' burnout symptoms. This approach could be similarly performed on the ABQ to shift the focus from an individual referent to reflect an athlete's perception of their teammates.

Altering the referent of the ABQ enables researchers to assess athlete's perception of their teammates (i.e., Team Burnout Questionnaire, TBQ) and consider athletes' perceptions of their teammates' burnout as the sporting environment that has been suggested to influence the development of burnout (Cresswell & Eklund, 2006b; Appleby et al. 2018).

3.2.1. Aim

Previously the integrated model of athlete burnout highlights stressful social relationships as a possible cause of burnout (Gustafsson, et al., 2011). The current study aims to create a validated measurement tool to assess the impact of athlete's perception of their teammate's burnout allowing research to assess a possible antecedent of burnout. In summary, there is limited understanding of an athlete's perceptions of their teammate's burnout and the potential impact this may have on the athlete. Research has previously indicated the crossover of burnout albeit in a non-sporting context, however there is no appropriate tool to measure an athlete's perceptions of their teammates within sport. Therefore, the aim of the present study was to validate a three-factor team burnout questionnaire (TBQ) comprised of subscales reflecting team sport devaluation, team emotional and physical exhaustion, and team reduced accomplishment.

3.2.2. Hypothesis

We hypothesise that the TBQ and ABQ will show discriminant validity and convergent validity in athletic populations

3.3. Method

3.3.1. Participants

A total of 290 athletes including 170 males (58.6%) and 120 females (41.4%), participated in the study. The participants ranged in age from 16 to 35, with a mean age of 20.97 years (*SD* = 3.08). All of the athletes played team sports in the UK, representing 8 different sports. Athletes competed in Netball (*N* = 21, 7.2%), Football (*N* = 44, 15.2%), Rugby (*N* = 33, 23.6%), Gaelic football (*N* = 15, 5.2%), Cheerleading (*N* = 28, 9.7%), Volleyball (*N* = 34, 11.7%), Rugby league (*N* = 19, 6.6%) and Hockey (*N* = 23, 7.9%). All participants trained with their teammates on a regular basis between 1-3 times a week for an average of 8.65 hours (*SD* = 4.45) and reported to have played together for between 2 months and 14 years (*M* = 2.46, *SD* = 2.57). Data collection occurred within the competitive season.

3.3.2. Measures

Demographic and Background Inventory. Participants reported a variety of demographic information including: age, gender, how often they train as a team together and years played with current team.

Athlete Burnout. Each athlete's level of burnout was assessed using the Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001). The 15-item self-report measure is comprised of questions which assess the subscales of physical and emotion exhaustion (e.g., "I feel overly tired from my sport participation"), reduced accomplishment (e.g., "I am not performing up to my ability in sport"), and sport devaluation (e.g., "I don't care as much about my sport performance as I used to"). The stem for each was "How often do you feel this way?" to which participants respond on a five-point Likert Scale anchored by (1) "*Almost Never*" and (5) "*Almost Always*". Previous research has supported the validity and reliability of the ABQ. This included factor structure, internal consistency ($\alpha \geq .85$), and reliability ($r \geq .75$) (Raedeke & Smith, 2001). Within this study the ABQ showed good psychometric properties with internal consistencies ($\alpha > .75$) for all of the three subscales.

Team Burnout. The Team Burnout Questionnaire was developed in line with the referent-shift consensus model (Chan, 1998). The items of this measure were adapted from the Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001) to reflect the perception of the individual about his or her teammates' burnout symptoms. The Team Burnout Questionnaire (TBQ) is a 15-item self-report measure that is comprised of questions that assess the sub-scales of physical and emotion exhaustion (e.g., "My teammates feel overly tired from their sport participation"), reduced accomplishment (e.g., "My teammates are not performing up to their ability in sport") and sport devaluation (e.g., "My teammates don't care as much about their sport performance as they used to"). The stem for each was “How often do your teammates feel this way?” to which participants responded, on a five-point Likert Scale anchored by (1) “Almost Never” and (5) “Almost Always”. Assessed from the data in this study the TBQ showed good psychometric properties with internal consistencies ($\alpha > 0.75$) for all of the three subscales. Previous research has supported the internal consistency ($\alpha \geq 0.80$) for each of the three subscales of the TBQ (Appleby, et al., 2018).

3.3.3. Procedure

Ethical approval was granted from the research ethical committee of the first author’s university prior to conducting the study. Initially, the directors of sports clubs and head coaches of sports teams were contacted via an e-mail and follow up phone calls where necessary, in order to obtain permission to conduct the study at their respective institutions. Following on from directors and coach consent the first author attended a training session to outline the aims and objectives of the study to a sample of athletes and to gain athlete consent. Information sheets outlining the aims of the study were then provided to the athletes prior to participating and written consent was sought. Data was collected prior to the commencement of training. On gaining consent, participants were provided with a multi-section questionnaire that consisted of questions pertaining to demographic information (e.g., age, gender, number of months/years playing with teammates), the ABQ, and the TBQ. Participants were reassured of the anonymity and confidentiality of their responses. This process took no longer than 15 minutes to complete and the first author was on hand to supervise any enquiries.

3.3.4. Data Analysis

Descriptive statistics and bivariate correlations were performed using SPSS version 22. To validate the proposed TBQ as a measure of athletes’ perceptions of teammates’ burnout statistical analyses were conducted using Amos 22 software. In the first step, the

ABQ and the TBQ were analysed using confirmatory factor analysis (CFA). The next step was to combine both models into one multi-trait/multi-method (MTMM) analysis to test for discriminant validity and convergent validity (Figure 3.1.).

The chi-square (χ^2), comparative fit index (CFI), root mean square error of approximation (RMSEA) and its associated 90% confidence interval (RMSEA-CI), and Tucker-Lewis Index (TLI) were used to assess model fit. Values around 0.90 indicate acceptable fit for CFI and TLI, whereas values round 0.08 indicate acceptable fit for RMSEA (Marsh, 2007). Chi-square difference tests and Akaike's information criterion (AIC, where the lower AIC score represent better fit) (Buckland, Burnham, & Augustin, 1997) were employed to statistically compare MTMM models to assess convergent and discriminant validity (Byrne, 1994a).

3.3.4.1. Multi-Trait Multi-Method Analysis

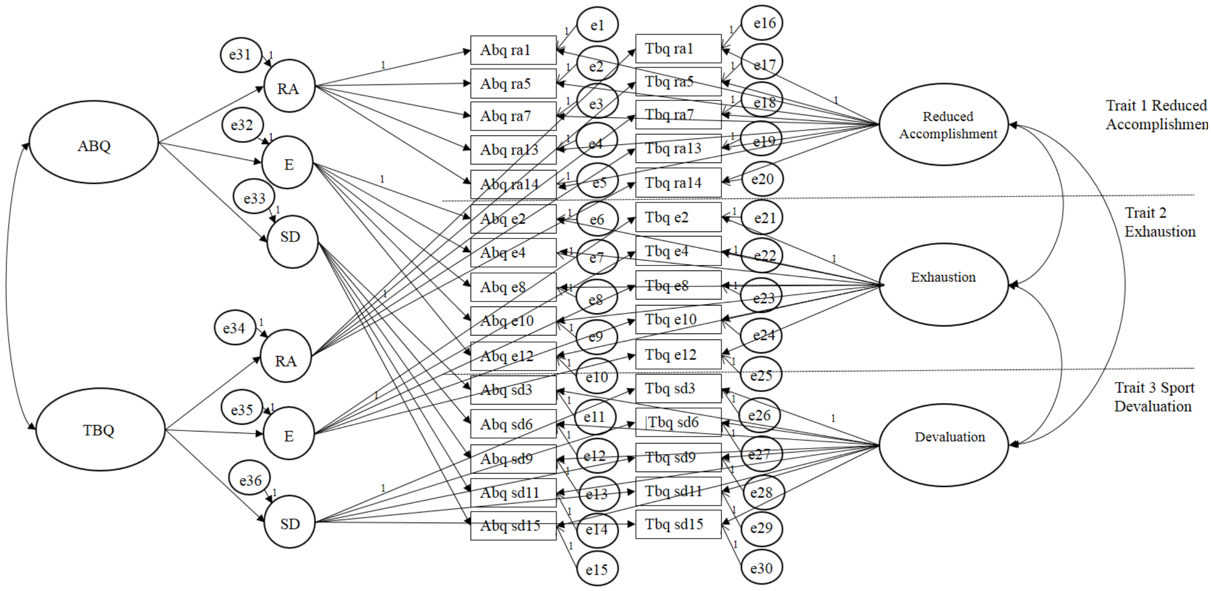

Figure 3.1. Hypothesised MMTM model (correlated traits – correlated methods).

MTMM matrix level evaluation of construct validity involves the comparison of various nested models to come to a conclusion about convergent and discriminant validity (Byrne, 1994a). Figure 3.1. illustrates the relationships between traits, methods, and the indicators underlying all the MTMM models analysed in this study. The correlated traits-correlated method (CTCM) with second-order methods was chosen as the baseline model as athlete burnout comprises of the three sub-dimensions, reduced accomplishment, physical and emotional exhaustion, and sport devaluation (Gustafsson et al., 2011; Raedeke, 1997). Although exhaustion is considered to be the core dimension of burnout, many researchers argue that the other dimensions are required to capture the syndrome (Maslach, Schaufeli, & Leiter, 2001; Gustafsson et al., 2011). This has theoretical implications for the MTMM modelling process as it lends itself to second-order method factors. In this proposed model, second-order factors (i.e., ABQ and TBQ) represent the relations between first-order factors (i.e., exhaustion and team exhaustion); the first-order factor represent the relations between the corresponding items of each of the questionnaires.

The correlated traits-correlated method (CTCM) with second-order methods allows for a direct comparison between the ABQ and TBQ. Although, fully crossed MTMM models (all traits x all methods) evaluated using CFA often present inadmissible solutions and convergence problems (Mash, 1989). As a result alternative models such as CU model (Kenny, 1976), the composite direct model (Browne, 1984), and the CTC(M-1) model (Eid, 2000) have also been suggested to offer solutions to the short comings of using the CTCM as a base model. Despite criticisms of the full CTCM model it was chosen due to the strong theoretical foundations and completeness of the model (Natesan & Aerts, 2016).

In the CTCM model all indicators were loaded uniquely upon trait (i.e., reduced accomplishment, exhaustion and sport devaluation) and method (i.e., ABQ or TBQ). All the traits are free to correlate with one another; the methods factors are free to correlate with one another. Trait and method factors are not allowed to correlate with one another. In the subsequent models the loading of the indicators remains the same, it is, the relationship between the traits and second order methods that are adjusted to allow for the comparison of the ABQ and TBQ. The other nested comparison models include: the correlated traits/

uncorrelated methods model (CTUM) (i.e., all traits are correlated freely and second ordered methods are uncorrelated), the correlate traits/ perfectly correlated methods model (CTPCM) (i.e., the model is specified by allowing the correlations between traits to vary and fixing the correlation between the second-order methods to 1), the perfectly correlated traits/correlated methods model (PCTCM) (i.e., the correlation between traits are set to 1 and the correlation between methods is free to vary), the uncorrelated traits/correlated models (UTCM) (i.e., no correlations between traits and methods are able to freely correlate), and the no traits/correlated methods model (NTCM) (i.e., a model where traits are not included and methods are free to vary.

Looking at the extent to which the independent measures of the same trait are correlated provides an indication of convergent validity. A significant difference between a model where the traits are specified and one where the traits are not specified provides evidence of convergent validity. Evidence of convergent validity is calculated by assessing the $\Delta\chi^2$ between the CTCM model and the NTCM model (Cresswell & Eklund, 2006a). Discriminant validity is assessed in relation to traits and methods with low correlations between independent measures of different traits providing evidence. Discriminant validity of traits is manifested by significant $\Delta\chi^2$ between the CTCM model and the PCTCM. Discriminant validity of methods is assessed by the significant $\Delta\chi^2$ between the CTCM model and the CTPCM model. In the current study discriminant validity of method and traits are provided by a significant difference in χ^2 between (1) the CTCM and PCTCM models, and (2) the PCTCM and CTPCM models as well as non-significant difference between (1) CTCM and UTCM models and (2) the CTCM and CTUM models (Byrne, 1994b). The comparison of the CTCM and CTUM models tests whether the methods are correlated. The comparison of the CTCM and UTCM models determine whether the traits are related. A non-significant difference give an indication of discriminant validity.

Campbell and Fiske (1959) suggested that the evaluation of patterns of the correlations within the MTMM matrix could provide evidence of convergent and discriminant validity. Marsh, Asci, and Tomas (2002) highlight that MTMM evaluation of construct validity through SEM are useful because data factor structures can be evaluated while also appropriately correcting constructs for measurement error. Correlations between matching traits should not be too high (r > 0.70) (Eid et al., 2008), as these provide evidence of discriminant validity. Within the context of the current study construct validity refers to the extent to which burnout constructs assessed by the instruments subscales are appropriately measured in regard to the other instrument.

3.4. Results

3.4.1. Descriptive Statistics

Table 3.1. presents means, standard deviations, alpha coefficients, and bivariate correlations of all variables under investigation. Athletes' scores on the dimensions of the ABQ and the TBQ are relatively low. Pearson's correlation co-efficient indicated that the three subcategories of the TBQ were positively and significantly correlated (r = 0.358-0.703). The analysis showed positive and significant correlations between the three subcategories of the ABQ (r = 0.242-0.530). The correlations between the ABQ and the TBQ subcategories were positive and were statistically significant (r = 0.198- 0.648) please see Table 3.1. for correlation values.

Table 3. 1. Descriptive statistics, alpha coefficients, and bivariate correlations for all main variables under investigation.

Variables	M	SD	alpha	1	2	3	4	5	6	7	8
Athlete Variables											
1. TBQ RA	2.12	0.63									
2. TBQ E	2.54	0.71	0.358**								
3. TBQ SD	2.03	0.63	0.703**	0.506**							
4. TBQ	2.24	0.54	0.809**	0.771**	0.869**						
5. ABQ RA	2.33	0.61	0.317**	0.244**	0.397**	0.382**					
6. ABQ E	2.53	0.74	0.198**	0.648**	0.306**	0.491**	0.242**				
7. ABQ SD	1.95	0.72	0.340**	0.265**	0.483**	0.430**	0.530**	0.349**			
8. ABQ	2.27	0.53	0.370**	0.518**	0.517**	0.573**	0.744**	0.719**	0.824**		

Note: The unbroken lines represent significant paths; ****p* significant at 0.001; ***p* significant at 0.01; **p* significant at 0.05.

3.4.2. Confirmatory Factor Analysis

Three proposed Confirmatory Factor Analysis (CFA) models were created using AMOS. Model A represents the ABQ encompassing all 15-items mapped on to the appropriate sub-dimension (i.e., reduced accomplishment, exhaustion, and sport devaluation). Mode B represents the TBQ including all 15-items corresponding to the sub-dimensions (i.e., team reduced accomplishment, team exhaustion, and team sport devaluation). Finally, Model C included both the ABQ and the TBQ (i.e., all 30 items mapped on to one of the six sub-dimensions). Within Model C second order latent variable (i.e., ABQ and TBQ) were allowed to correlate. There was a positive and statistically significant correlation between the two methods (i.e., ABQ and TBQ) (r = 0.642, p < 0.001), below the threshold (r > 0.70) suggested by Eid et al., (2008). The model fit criteria (i.e., χ^2, CFI, TLI, and RMSEA) are outlined for each model in Table 3.2.

Table 3. 2. Fit Indices on ABQ and TBQ

						90% Cl	
Model	χ^2	df	CFI	TLI	RMSEA	Lower	Upper
A	248.432	87	0.899	0.878	0.080	0.069	0.092
B	194.632	87	0.940	0.940	0.065	0.053	0.078
C	980.522	398	0.849	0.831	0.071	0.066	0.077

Note: $\chi 2$ = Chi Square; df = degrees of freedom, CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; TB = team burnout; TRA = team reduced accomplishment; TE = team exhaustion; TSD = team sport devaluation: Model A = CFA ABQ; Model B = CFA TBQ Model C = CFA ABQ & TBQ.

3.4.3. MMTM Analyses

The hypothesized model shown in Figure 3.1. has the same structure as the tested model in CTCM model presented in Table 3.4. All of the MMTM models converges appropriately. A summary of the models is presented in Table 3.3. The CTCM and UTCM models showed acceptable fit. The fit of the other models (i.e., CTUM, CTPCM, PCTCM, UTCM, NTCM) was below the acceptable threshold.

Table 3. 3. Fit indices for the multi-trait/multi-method models

								90% Cl	
Model	df	χ^2	$\Delta\chi^2$	AIC	CFI	TLI	RMSEA	Lower	Upper
CTCM	358	703.682**		917.682	0.908	0.889	0.058	0.051	0.064
CTUM	359	696.907**	-6.775**	908.907	0.911	0.862	0.057	0.051	0.063
CTPCM	359	706.281**	2.599	918.281	0.908	0.889	0.058	0.052	0.064
PCTCM	370	754.871**	51.189**	962.871	0.896	0.874	0.061	0.055	0.068
UTCM	370	628.323**	-75.359**	836.323	0.929	0.915	0.051	0.044	0.057
NTCM	391	889.231**	185.549**	1037.213	0.868	0.853	0.066	0.061	0.072

Note. CTCM = correlated trait/ correlated methods; CTUM = correlated traits/ uncorrelated methods; CTPCM = correlated traits/perfectly correlated methods; PCTCM = perfectly correlated traits/correlated methods; Uncorrelated traits/correlated methods; NTCM no traits/correlated methods ***p* significant at 0.01

3.4.4. Discriminant validity and convergent validity

The comparison of the MTMM models with the baseline CTCM model for the purpose of evaluating convergent and discriminant validity were conducted using the $\Delta\chi^2$ tests. The $\Delta\chi^2$ and AIC values for each of the model are reported in Table 3.3. Evidence of trait and method discriminant validity is supported by a statistically significant $\Delta\chi^2$ ($\Delta\chi^2$ = 51.189, $p < 0.001$) between CTCM (χ^2 = 703.682) and PCTCM (χ^2 = 754.871) as well as a statistically significant $\Delta\chi^2$ ($\Delta\chi^2$ = 48.590, $p < 0.001$) between CTPCM (χ^2 = 706.281) and PCTCM. This is reinforced by the large increase in AIC between CTCM (AIC = 917.682) and PCTCM (AIC = 962.871) as well as CTPCM (AIC = 918.281) and PCTCM. The significant $\Delta\chi^2$ between CTCM and CTPCM models supports discriminant validity between methods. The difference between CTCM and PCTCM provides support for discriminant validity between traits. Furthermore, the pattern between CTCM and CTUM ($\Delta\chi^2$ = -6.775, $p < 0.001$) and CTCM and UTCM ($\Delta\chi^2$ = -75.359, $p < 0.001$) supports convergent and discriminant validity. Finally, the significant $\Delta\chi^2$ between CTCM and NTCM provides evidence of convergent validity.

The correlations between the trait variables (i.e. reduced accomplishment, exhaustion, sport devaluation) represent the discriminant validity between the different traits. These correlations should not be too high (*r* > 0.70) (Eid et al., 2008). Correlations between reduced accomplishment and sport devaluation were high but below the *r* > 0.70 threshold indicating discriminant validity. Reduced accomplishment and sport devaluation correlation was statistically significant (factor $r = 0.634$, $p < 0.001$). Exhaustion shows low correlations to sport devaluation (factor $r = 0.153$, $p = 0.100$) and reduced accomplishment (factor $r = 0.139$, $p = 0.116$). This indicates that the three traits (i.e., reduced accomplishment, exhaustion and sport devaluation) have high discriminant validity and are justified as different constructs in the scale.

Table 3. 4. Method factor correlations

Variables	1	2	3	4	5	6
1. TBQ RA	1					
2. TBQ E	0.442**	1				
3. TBQ SD	0.879**	0.583**	1			
4. ABQ RA	0.369**	0.302**	0.491**	1		
5. ABQ E	0.275**	0.750**	0.373**	0.349**	1	
6. ABQ SD	0.430**	0.286**	0.592**	0.667**	0.409**	1

Note. TBQ = team burnout; TBQ RA = team reduced accomplishment; TBQ E = team exhaustion; TBQ SD = team sport devaluation; ABQ = Athlete burnout; ABQ RA = reduced accomplishment; ABQ E = exhaustion; ABQ SD = sport devaluation **p significant at 0.01

The correlations between trait-specific method factors determine the generalisability of method effects across traits (i.e. team reduced accomplishment (TBQ RA), team exhaustion (TBQ E), and team sport devaluation (TBQ SD)). The correlation between TBQ RA and TBQ SD was above the $r > 0.70$ threshold ($r = 0.879$, $p < 0.001$). TBQ E shows good discriminant validity with TBQ RA ($r = 0.442$, $p < 0.001$) and TBQ SD ($r = 0.583$, $p < 0.001$). These correlations specify how strongly an over or underestimation on one of the trait-specific method factors is related to the over-or underestimation on the other trait-specific method factor of the same method. Correlations between TBQ methods and ABQ methods were also conducted ranging from *r*s 0.275-0.750 (Table 3.4.). Although, the athlete exhaustion and team exhaustion was above the $r >$ 0.70 threshold, Raedeke, Arce, De Francisco, Seoane, and Ferraces (2013) found similar findings acceptable. Furthermore, Marsh et al. (2002) would consider the size of these correlations relative to the convergent correlations well within the tolerable range. The factor loadings are shown in Tables 3.5. offering further support for the validation of the TBQ. Items 1, 5 and 14 (team reduced accomplishment) loaded well on to trait (factor loading ranged from 0.187- 0.233) and method (factor loading ranged from 0.450- 0.644). Items 7 and 13 (team reduced accomplishment) results indicated low loading onto trait (factor loading ranged from 0.027-0.072) and high loading on to method (factor loading ranged from 0.699- 0.791). The results emphasise the high loading of the team exhaustion items on to the trait (factor loading ranged from 0.511- 0.773) and the method (factor loading ranged from 0.354- 0.430). The results also highlight the high loading of 4 of the item sport devaluation items (i.e. 3, 6, 9, 11) on the trait (factor loading ranged from 0.246-0.316) and the method (factor loading ranged from 0.477- 0.661). Item 15 (team reduced accomplishment) results highlighted low loading on trait (0.097) and high on to method (0.673). Therefore, the MTMM provides support for the convergent and discriminant validity of the subscales within the TBQ and ABQ.

Table 3. 5. Standardised trait and method-specific factor loading in CTCM Model (part 1)

	Reduced accomplishment				
	T1-RA	T2-E	T3-SD	ABQ	TBQ
ABQ					
1	0.534**			0.027	
5	0.648**			0.103	
7	0.699**			0.372**	
13	0.498**			0.397**	
14	0.661**			0.156*	
TBQ					
1	0.233**				0.450**
5	0.187*				0.642**
7	0.027				0.699**
13	0.072				0.791**
14	0.225**				0.460**

Note. TBQ = team burnout; ABQ = Athlete burnout; TI-RA = Trait one reduced accomplishment; T2-E = Trait two exhaustion; T3-SD = trait three sport devaluation; ***p* significant at 0.01; **p* significant at 0.05.

Table 3.5. Standardised trait and method-specific factor loading in CTCM Model (part 2)

	Exhaustion				
	T1-RA	T2-E	T3-SD	ABQ	TBQ
ABQ					
2		0.410**		0.398**	
4		0.472**		0.433**	
8		0.559**		0.578**	
10		0.525**		0.579**	
12		0.453**		0.648**	
TBQ					
2		0.511**			0.399**
4		0.537**			0.430**
8		0.660**			0.395**
10		0.773**			0.354**
12		0.658**			0.405**

Note. TBQ = team burnout; ABQ = Athlete burnout; TI-RA = Trait one reduced accomplishment; T2-E = Trait two exhaustion; T3-SD = trait three sport devaluation; ***p* significant at 0.01; **p* significant at 0.05.

Table 3.5. Standardised trait and method-specific factor loading in CTCM Model (part 3)

	T1-RA	T2-E	T3-SD	ABQ	TBQ
Sport devaluation					
ABQ					
3			0.325**	0.276**	
6			0.772**	0.284**	
9			0.673**	0.433**	
11			0.668**	0.235**	
15			0.313**	0.359**	
TBQ					
3			0.273**		0.477**
6			0.246**		0.613**
9			0.300**		0.661**
11			0.316**		0.535**
15			0.097		0.673**

Note. TBQ = team burnout; ABQ = Athlete burnout; TI-RA = Trait one reduced accomplishment; T2-E = Trait two exhaustion; T3-SD = trait three sport devaluation; ***p* significant at 0.01; **p* significant at 0.05.

3.5. Discussion

The purpose of the current study was to extend previous research by validating a measure of athletes' perceptions of their teammates' burnout. Central to this aim was an assessment of the convergent and discriminant validity of the factors comprising the ABQ and TBQ (i.e., exhaustion, reduced accomplishment and, sport devaluation). Although there were limitations observed in both measures, the findings of the MTMM analysis support the discriminant and convergent validity of the ABQ and TBQ in athletic populations. Specifically, the correlations of the equivalent sub-dimensions across the two burnout measures (i.e., reduced accomplishment and team reduced accomplishment) are high, indicating that both scales had good convergent validity. The correlations between equivalent sub-dimensions were higher than for non-matching sub-dimensions although, there was a stronger correlation between team reduced accomplishment (i.e., perception of teammates) and sport devaluation (i.e., self) compared to team reduced accomplishment and reduced accomplishment. Furthermore, the within method correlation for both ABQ and the TBQ sub-dimensions were strongly correlated. High internal discriminant validity was also observed between the methods. As the loading of the TBQ items onto the sub-dimensions of the TBQ suggest sufficient discriminant validity of the TBQ as a measure for assessing an individual athlete's perceptions of teammates' burnout (Eid, Liachetzke, Nussbeck, & Trierweiler, 2003).

Whilst these findings support the convergent and divergent validity of the TBQ and ABQ, it is important that future research replicates the present study using diverse samples (Raedeke et al., 2013) in order to validate the TBQ with athletes from differing environments as the TBQ has the potential for use in team sport environments as a method of assessing an athlete's perception of their teammates' burnout across age groups. Furthermore, research may also wish to consider the size of teams being represented. Across sport, the number of the athletes on a team varies from two in doubles tennis to squads of forty-five players in American football. It is possible that the number of individuals on a team may influence the athlete's perception of their teammates' burnout and the accuracy of this perception, although future research is warranted in this area.

Previously it has been proposed that an individual's contextual environment can also influence their wellbeing (González-Morales, Peiró, Rodríguez, & Bliese, 2012); the TBQ may be used as a tool to assess the potential influence an athletes perceptions of their teammates burnout may have on the individual athlete (Totterdell, 2000; Appleby et al., 2018). The creation of the TBQ will allow researchers to examine the possible cause of athlete burnout (Gutafsson, et al., 2011). The contagion process may take place directly through changes in communication and behaviour of teammates interacting with each other (Hakanen et al., 2014), or it may occur indirectly through athletes imagining the feelings of their teammates or sub-consciously "catching" the emotions of their teammates (Bakker, Westman, & van Emmerik, 2009; Barsade, 2002).

From an applied perspective, developing a validated burnout measure which assesses an athlete's perception of their teammates' burnout has the potential to increase our understanding of the social environment and the potential influence this may have on athletes. Sport psychologists working with teams could use the TBQ to gauge perceptions of burnout within a team and facilitate the development of targeted interventions to improve athlete well-being. Within research, the TBQ can be incorporated into studies aiming to elucidate the factors influencing athlete's contextual environment and interpersonal relationships. For example, previous research has suggested that basic psychological needs mediate the relationship between perfectionism and athlete burnout (Jowett, Hill, Hall, & Curran, 2016). Future studies may examine whether an athletes' perception of their teammates burnout mediates the relationship between needs thwarting or needs satisfaction behaviours and their own burnout.

The present study advances our understanding of burnout within sports teams however it is not without limitations. First, the TBQ was validated with a sample of adult athletes, limiting its utility with younger age groups. As burnout is on the rise in adolescent and elite athletes (Gustafsson, Hassmén, Kenttä, & Johansson, 2008; Gustafsson, Kentta, Hassmén, & Lundqvist, 2007), it is recommended that the TBQ should be validated with these populations. Second, it is important to note that most athletes in the current study perceived their teammates as healthy and expressing low levels of burnout. Burnout research has predominantly investigated athletes reporting relatively low levels of burnout (Gould & Whitley, 2009; Gustafsson et al., 2011) to alleviate potentially confounding measurement issues, previous research suggests considering the "healthy worker" effect (Gustafsson et al., 2011). In order to advance the field, future research should consider samples of athletes who have perceived their teammates as expressing higher level of burnout.

Despite the acknowledged limitations, the present study displayed satisfactory discriminant and convergent validity of the ABQ and the TBQ. The results of the study indicate that researchers should be confident in utilising the ABQ and the TBQ in sporting contexts. The present study offers guidance for further research for the theoretical and practical uses of the TBQ. This has important implications for the applied and research fields as the contextual environment athletes are exposed to can influence the individual athlete.

Chapter 4: Examining Perceptions of Teammates' Burnout and Training Hours in Athlete Burnout

Study 2

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4.1. Abstract

Perceptions of athlete's social environment and training load are two factors which have been shown to influence an athletes' physical and psychological health, however, limited research has investigated these factors in relation to burnout. Athletes (N = 140) from a variety of competitive team sports, ranging in ability level, completed questionnaires which measured individual burnout, perceptions of teammates' burnout, and training hours per week on two separate occasions within a season. After controlling for burnout at Time One (middle of the season), the number of training hours were associated with athletes' burnout and perceptions of teammates' burnout at Time Two (end of season). Multilevel modelling indicated actual team burnout (the average burnout score of the individual athletes in a team) and perceived team burnout were associated with individual's own burnout. The findings highlight that burnout is dynamic and relates to physiological stressors associated with training and psychological perceptions of teammates' burnout. Future research directions exploring potential social influences on athlete burnout are presented.

Key words: global burnout, exhaustion, training load, team sports, teammates

4.2. Introduction

To be successful in competitive sport, athletes are required to invest hours of intense training and perform effectively under pressure (Balk, Adriaanse, De Ridder, & Evers, 2013; Isoard-Gautheur, Guillet-Descas, & Gustafsson, 2016). In addition to this, athletes are also required to manage stressors associated with competition, organisational demands, and interpersonal relationships (Chan, Londsdale, & Fung, 2012; Lu, et al., 2016). Although stress is widely acknowledged to be an inherent aspect of competitive sport, research indicates that chronic stress can lead to the development of burnout (Gould, Tuffey, Udry, & Loehr, 1997; Gustafsson, De Freese, & Madigan, 2017).

Athlete burnout is a psychological syndrome that is characterised by symptoms of emotional and physical exhaustion, reduced sporting accomplishment, and the devaluation of sports participation (Raedeke, 1997; Raedeke, & Smith 2001). Burnout has been associated with negative cognitive, motivational, and behavioural consequences (Goodger, Gorely, Lavallee, & Harwood, 2007). High levels of burnout are related to feelings of depression, frustration, and irritation, contributing to diminished overall health and wellness (Gustafsson, Hassmén, Kenttä, & Johansson, 2008). Smith’s (1986) Cognitive-Affective Stress Model, and Gustafsson, Kenttä, and Hassmén’s (2011) Integrated Model of Athlete Burnout, suggest that burnout may manifest as a consequence of both physical and psychological stressors (for a review see Gustafsson, Hancock, & Côté, 2014). Physical strains, a concept related to athlete burnout and perceived exhaustion, can develop as a result of the physical demands of training (Gould & Dieffenbach, 2002; Isoard-Gautheur, Guillet-Descas, & Duda, 2013).

Poor adaptation to the demands of physical training is proposed as a key contributor to the development of burnout amongst athletes (Gould & Dieffenbach, 2002; Kenttä, Hassmén, & Raglin, 2001; Raglin & Wilson, 2000), with qualitative research outlining the link between high training load and the development of burnout (Cresswell &

Eklund, 2006a, 2007a; Gustafsson, et al., 2008; Tabei, Fletcher, & Goodger, 2012). A review by Goodger and colleagues (2007) identifies positive relationships between training load, perceived stress, and athlete burnout. As previous cross-sectional quantitative research investigating the influence of training hours on burnout, using a single time point for data collection, has yielded mixed results (Cresswell & Eklund, 2006b, 2007a; Smith, Gustafsson, & Hassmén, 2010) there is a need for research to adopt a longitudinal approach.

In addition to training load and the intensity of training sessions (Cresswell & Eklund, 2006a, 2007a; Klenttä et al., 2001), the time spent in non-strenuous sport involvement (e.g. video analysis) may also contribute to athlete burnout. Cresswell and Eklund's (2007b) qualitative analysis of rugby union athletes highlighted that time commitments to a sport and the social pressure of others influence the development of athlete burnout. The continuous physical and mental workload is therefore likely to have a cumulative effect resulting in higher levels of burnout, despite training hours per week remaining somewhat consistent across the season (Cresswell & Eklund, 2006b). Although the number of training hours may place considerable demands upon athletes, there are multiple stressors associated with sport participation such as social relationships which should also be considered (Cresswell & Eklund, 2006b, Gustafsson et al., 2015; Gustafsson, et al., 2011; Sarkar & Fletcher, 2014).

Despite suggestions within previous research that the athletes' social environment can influence the development of athlete burnout (Gould, et al., 1996; DeFreese, & Smith, 2013), current research is yet to assess the impact of athletes' perception of their teammates' burnout. In the previous chapter, we sought to create a validated method for measuring an athlete's perception of their teammate's burnout in an attempt to advance the field by allowing the assessment of a possible antecedent identified in the integrated model of athlete's burnout (Gustafsson, et al., 2011). Previously it has been suggested that as a consequence of shared experiences, collective moods may develop between teammates, whereby teammates may develop similar feeling states and influence others' perceptions of success (Totterdell, 2000). In team sports, where athletes often compete and train with others, individuals will naturally empathise with their teammates and reflect commonly held team-based beliefs (Shearer, Holmes, & Mellalieu, 2009). Athletes' social interactions can influence how they cope with the physical and mental demands of participating in sport (Gustafsson, et al., 2011; Smith, 1986; Udry, Gould, Bridges, & Tuffey, 1997), which may influence the incidence of burnout.

Athlete burnout may manifest itself behaviourally and socially, therefore it may be observed by other individuals including teammates (DeFreese, & Smith, 2013; Schaufeli & Enzmann 1998). Beyond the domain of sport, within nursing, teaching, and organisational settings, burnout has been found to be contagious (i.e. individuals are influenced by their perceptions of their colleagues' level of burnout; Bakker, Demerouti, & Schaufeli, 2003; Bakker, Le Blanc, & Schaufeli, 2005; Bakker & Schaufeli, 2000). Within sport, research has yet to investigate the influence of the team on the individual athlete.

It is suggested (Moritz and Watson, 1998) that research failing to consider both the individual (i.e. athlete) as well as the group (i.e. sports team), in the study of groups/teams may suffer a number of potential issues: (a) over generalisation, where the assumptions at one level (i.e. athlete and team) are the same as another; (b) underestimation of the influence of the group at an individual level, and the individual at the group level (i.e. how does the individual influence the group and how does the group influence the individual); (c) single-level analysis at a group level may lead research to treat a group construct as real and tangible rather than abstract construct.

Research examining team sports has adopted a similar group level approach in the investigation of collective cohesion and collective efficacy (Carron, Bray, & Eys, 2002; Leo, González-Ponce, Sánchez-Miguel, Ivarsson, & García-Calvo, 2015; Shearer, Holmes,

& Mellalieu, 2009). That said, it is important to note that an athlete's perception of their teammates may not reflect the true level of burnout within the sports team. Therefore, research examining burnout in team sports may be well served by investigating the influence of the collective scores of individual athletes' burnout within a team (i.e. actual team burnout level). In order to assess the impact of the environment on the individual athlete it is important that we examine the athletes' perceptions of their teammates' burnout (i.e. perceived environment) and the actual team burnout level created by their teammates.

4.3.1. Aims

The present study investigated the potential impact of social factors (i.e. actual and perceived burnout) on the development of burnout in team sports. Research suggests burnout is dynamic and develops gradually over time (Gustafsson, et al., 2007; Gustafsson, et al., 2011); therefore, a longitudinal research design was used, and data were collected at two time points (i.e. the middle and end of the season). In line with previous research, the current study aimed to assess whether athlete's individual level of burnout would increase from the middle of the season to the end of the season. Additionally, in consideration of the proposed link between training hours and burnout (e.g. Creswell & Eklund, 2006b), the study investigated whether training hours were related to athlete burnout and an athletes' perception of their teammates' burnout. Based on previous research related to the link between perceptions of self and others (e.g. Carron et al., 2002; Leo et al., 2015; Totterdell, 2000), the current study aimed to assess whether actual team burnout level and perceived teammates' burnout were related to an individual athlete's burnout.

4.3.2. Hypothesis

In line with previous research, three hypotheses were proposed for this study. The first hypothesises that an athlete's individual level of burnout would increase from the middle of the season to the end of the season. The second outlined that the number of training hours (at the beginning of data collection) would not be associated with athletes' burnout or perception of their teammates' burnout. However, as the season progressed, the average training hours across the final 3-month period of the season was expected to be associated with individual athletes' burnout and their perception of team burnout. The third hypothesis was that actual team burnout level and perceived teammates' burnout would be associated with an individual athlete's burnout.

4.3. Method

4.3.1. Participants

A total of 140 athletes including 64 males (46.00% of total athletes) and 76 females (54.00%), participated in the study. The participants ranged in age from 18 to 34 years, with a mean age of 21.67 years (*SD* = 3.19). The sample included athletes from seven different sports and was comprised of 10 teams: two rugby teams (*N* = 33, 23.57% of total athletes); one cheerleading squad (*N* = 27, 19.29%); two volleyball teams (*N* = 23, 16.40%); two soccer teams (*N* = 20, 14.29%); one netball team (*N* = 14, 10.00%); one field hockey team (*N* = 13, 9.29%); and one Gaelic football team (*N* = 10, 7.14%). An ANOVA revealed that there was no significant difference between the 10 teams on athlete burnout scores at the time of recruitment (i.e. first data collection time point, $F(1,9) = 1.588$, $p = 0.125$). All participants were members of teams currently undertaking inter-team competitions, ranging in level from regional to professional. The participants trained for an average of 8.78 hours per week (*SD* = 5.18, *range* = 1.25 to 24.00) and attended training sessions with their teammates on a regular basis between 1-5 times a week. Participants had on average played their sport for 10.82 years (*SD* = 5.84, *range* = 0.60 to 29.00) and been a member of their current team for 2.50 years (*SD* = 2.63, *range* = 0.10 to 14.00).

4.3.2. Measures

Demographic and background inventory. Participants reported a variety of demographic information including: age, gender, years of competitive experience, years played with current team, and level of sport competition. The demographic questionnaire also examined the number of hours an athlete trained per week (i.e. "On average, how many hours do you train per week?") in a manner similar to previous sport research (Cresswell, & Eklund, 2006b; Smith, Gustafsson, & Hassmén, 2010).

Athlete burnout. Each athlete's level of burnout was assessed using the Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001). The 15-item self-report measure is comprised of questions that assess the subscales of physical and emotional exhaustion (e.g. "I feel overly tired from my sport participation"), reduced accomplishment (e.g. "I am not performing up to my ability in sport"), and sport devaluation (e.g. "I don't care as much about my sport performance as I used to"). The stem for each was "How often do you feel this way?" to which participants respond on a five-point Likert Scale anchored by (1) "*Almost Never*" and (5) "*Almost Always*". The ABQ showed good psychometric properties with internal consistencies ($\alpha > 0.75$) for all of the three subscales.

Team burnout. An adapted version of the ABQ (Raedeke & Smith, 2001) (referred to as the Team Burnout Questionnaire (TBQ) in the current study) was used to assess participants' perception of their teammates' burnout. The TBQ is a 15-item self-report measure comprised of questions which assess the subscales of physical and emotion exhaustion (e.g. "My teammates feel overly tired from their sport participation"), reduced accomplishment (e.g. "My teammates are not performing up to their ability in sport"), and sport devaluation (e.g. "My teammates don't care as much about their sport performance as they used to"). The stem for each was "How often do your teammates feel this way?" to which participants responded, on a five-point Likert Scale anchored by (1) "*Almost Never*" and (5) "*Almost Always*". The TBQ showed good psychometric properties with internal consistencies (α > 0.80) for all of the three subscales; confirmatory factor analysis is reported below.

4.3.3. Procedure

Ethical approval was gained from the research ethics committee of the first author's university prior to conducting the study. The current study used opportunistic sampling. Initially, the Directors of sports clubs and Head Coaches of the sports teams were contacted in order to obtain permission to conduct the study at their respective institutions. Information sheets outlining the aims of the study were provided to coaches and athletes prior to participants granting written consent. Arrangements were made for the athletes to complete of the aforemtioned questionnaires, on two occasions separated (i.e. data was collected pre or post session at the middle and end of season) by at least a three-month period (M_{months}= 3.025; *SD* = 0.381), as used by Madigan, Stoeber, and Passfield (2015, 2016). The initial data was collected between January and February (the mid-point of the competitive season, referred to as Time One); the second data collection was in the following months of May and June (in the last two weeks of the competitive season, referred to as Time Two). Data were collected at the athletes' home ground or training centre under the supervision of the first author.

4.3.4. Data Analysis

Initially, preliminary data screening was performed in accordance with procedures outlined by Tabachnick and Fidell (2007); data were assessed for missing values, outliers and violations of the assumptions of multivariate analysis. Firstly, descriptive statistics and bivariate correlations were conducted on all of the variables. Secondly, to assess whether the proposed TBQ (adapted from Raedeke & Smith, 2001) is a reliable measure of an athlete's perception of teammates' burnout. Confirmatory Factor Analysis (CFA) was conducted using Amos 22 software. Following suggestions by Hu and Bentler (1999) and Marsh (2007), the following indices of fit were employed: Standardised Root Mean square Residual (SRMR), Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Tucker Lewis Index (TLI). Values between 0.90 and 0.94 for the CFI and TLI indicate an acceptable fit, whereas values of 0.95 and higher indicate a relatively good fit. RMSEA values of less than 0.08 represent a good fit. All 15 items of the questionnaire were included as the observed variables; the dimensions of burnout were the first order latent indicators; and perceived team burnout the second order latent indicator (see Figure 4.1).

Thirdly, global burnout scores (i.e. mean of the 15 items of the ABQ) for athlete burnout and actual team burnout level were used to carry out the statistical analysis using SPSS 22. The actual team burnout level was calculated by taking the mean of athletes' burnout scores within each team. To determine whether athlete burnout and athletes' perceptions of team burnout changed across time points, paired samples t-tests were conducted. Fourthly, to investigate whether training hours impact upon athlete burnout and athletes' perception of team burnout, hierarchical regressions and linear regressions were conducted.

Finally, to test the hypothesis concerning the association between athlete burnout and athletes' perception of team burnout, a linear regression analysis was conducted.

Multilevel modelling (MLM; Heck, Thomas, & Tabata, 2013) was used to analyse the intercept, the impact of actual team burnout level and perceived teammate burnout influence on athlete burnout; potential changes over time were also examined. Multilevel modelling aims to analyse whether data at one level could be nested within a second level (Chou, Bentler, & Pentz, 1998). In the present study, the first level includes individual athlete burnout scores at two stages of measurement (within subject level), and the second level includes the collective burnout scores as well as the perceived burnout of teammates (between subjects). To evaluate the model fit using MLM, three different models of fit information criteria were used: Log-likelihood (–2LL) value, Akaike's Information Criterion (ACI), and the Schwarz Bayesian Information Criterion (BIC). In the model selection, lower values on all criteria are equivalent to a better model fit (Heck et al., 2013).

4.4. Results

4.4.1. Preliminary Analysis

Prior to data analysis 48 participants' scores were removed because they only completed the questionnaires at the first time point. The remaining 140 participants had their scores examined for missing values; no participants had missing values above 5%, for any of the missing score below 5% series means were included. Therefore, there was no need to withdraw any records from the sample before running the descriptive statistics. Following the guidelines of Tabachnick and Fidell (2007), Mahalanobis distance values were examined and revealed no potential univariate or multivariate outliers.

4.4.2. Descriptive Statistics

Means and standard deviations for the study variables are presented in Table 4.1. The ABQ, actual team burnout level, and TBQ scores in the study were low to moderate, indicating that many of the participants were experiencing a low or moderate level of athlete burnout and athletes' perception of team burnout was low to moderate. This is consistent with findings commonly reported in related literature (Gustafsson, et al., 2015; Raedeke & Smith, 2009). There was no significant difference between training hours at Time One (M = 8.67, SD = 5.16) and Time Two (M = 8.89, SD = 5.40, $t(139) = -1.30$, $p > 0.05$, d = 0.155).

Table 4. 1. Correlations and descriptive statistics of the main variables in the current study

	1	2	3	4	5	6	7
1. Global burnout (Time One)	1						
2. Team Global burnout (Time One)	0.649**	1					
3. Global burnout (Time Two)	0.614**	0.392**	1				
4. Team Global burnout (Time Two)	0.345**	0.515**	0.575**	1			
5. Actual team burnout level (Time One)	0.315**	0.210*	0.157	0.145	1		
6. Actual team burnout level (Time One)	0.220**	0.172**	0.224**	0.228**	0.700**	1	
7. Average training hours (Time One & Two)	0.000	0.049	0.146	0.202*	-0.052	0.146	1
Cronbach α	0.863	0.909	0.879	0.918			
Mean	2.24	2.17	2.35	2.29	2.24	2.29	8.78
SD	0.54	0.53	0.59	0.57	0.17	0.23	5.18

Note: *N* = 140; ** Correlation is significant at the 0.01 level (2-tailed); *Correlation is significant at the 0.05 level (2-tailed).

Team burnout questionnaire. This study was used to further test the appropriateness of the TBQ to assess athletes' perception of team burnout. Consequently, using the sample of this study, a second order CFA model was tested (see Figure 4.1.). The model is composed of all three dimension**s** of burnout adapted from the ABQ: team emotional and physical exhaustion, team reduced accomplishment, and team sport devaluation. The model yielded acceptable fit indices, *df* = 83, χ^2 = 163.021, *RMSEA* = 0.072, *TLI* = 0.907, *CFI* = 0.927.

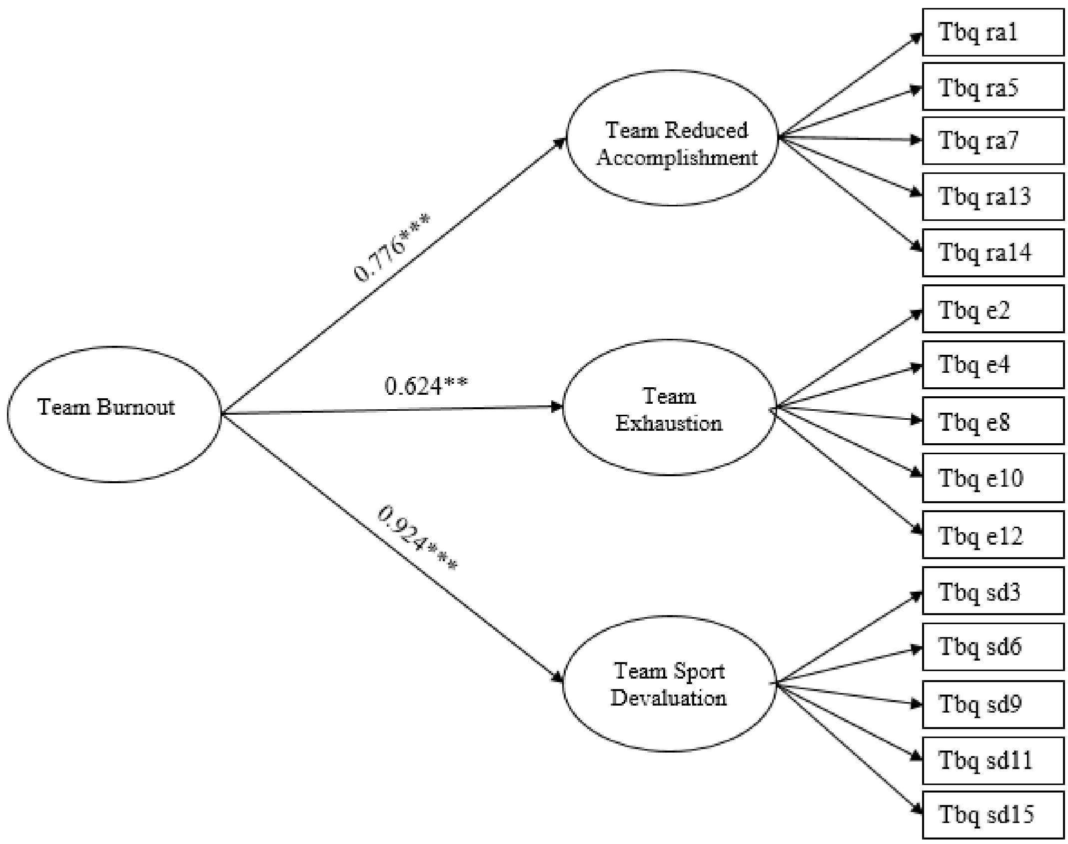

Figure 4.1. The second order structural equation model of Team Burnout Questionnaire.

Note: The unbroken lines represent significant paths; ****p* significant at 0.001; ***p* significant at 0.01; **p* significant at 0.05.

The dynamic nature of burnout. Results from paired samples t-tests were used to determine whether athlete and team burnout changed across the two time points; athlete burnout at Time Two (*M* = 2.35, *SD* = 0.57) was significantly higher than at Time One (*M*

= 2.24, *SD* = 0.54, $t(139) = 2.65$, $p < 0.01$, $d = 0.317$). Team burnout at Time Two (*M* = 2.29, *SD* = 0.57) was significantly higher than at Time One (*M* = 2.17, *SD* = 0.53, $t(139) = 2.67$, $p < 0.01$, $d = 0.319$).

Influence of training hours. To investigate whether training hours reported at Time One predicted athlete burnout and athletes' perception of team burnout at Time One, linear regression analyses were conducted. Results indicated that the number of training hours did not significantly predict athlete burnout, ($R^2 < 0.001$, $F(1,138) < 0.001$, $p > 0.05$), or team burnout, ($R^2 = 0.003$, $F(1,138) = 0.452$, $p > 0.05$) at Time One.

Two hierarchical multiple regressions were conducted to examine whether training hours predicted athlete burnout and athletes' perception of team burnout at the second time point, while controlling for athlete burnout and athletes' perception of team burnout at the first time point. The first two stage hierarchical multiple regression analysis was conducted with athlete burnout at Time Two as the dependent variable. Athlete burnout at Time One was entered at stage one of the regression to control for athletes' initial burnout levels; the average of the training hours, based on training hours from Time One and Time Two, was entered at stage two. The second two stage hierarchical multiple regression analysis was conducted with athletes' perception of team burnout at Time Two as the dependent variable. Athletes' perception of team burnout at Time One was entered at stage one of the regression to control for athletes' perception of team burnout at the initial level; the average of the training hours, from Time One and Time Two, was entered at stage two. The independent variables were entered in this manner as it allowed for the impact of training hours to be investigated. Regression statistics for athlete burnout and athletes' perception of team burnout are displayed in Tables 4.3 and 4.4.

The hierarchical multiple regression revealed that at step one, athlete burnout at Time One significantly contributed to the regression model, $F(1,138) = 83.61$, $p < 0.001$, accounting for 37.7% of the variance in athlete burnout at Time Two. Introducing average training hours explained an additional 2.1% of the variation in athlete burnout at Time Two and this change in R^2 was significant, $F(2,137) = 45.41$, $p < 0.001$.

Table 4. 2.The changes of study variables across the 3 months from the middle of the season to the end of the season for team sport athletes.

	Middle of season		End of season		Paired Differences		t	Sig. (2-tailed)
	Mean	SD	Mean	SD	Mean	SD		
Training Hours	8.67	5.16	8.89	5.4	-0.22	2.01	-1.30	> 0.1
Global Burnout	2.24	0.54	2.35	0.59	-0.11	0.50	-2.65	< 0.01
Perceived Team Burnout	2.17	0.53	2.28	0.57	-0.12	0.54	-2.67	< 0.01
Actual Team Burnout Level	2.24	0.17	2.35	0.13	-0.11	0.12	-10.81	< 0.001

The first step of the hierarchical multiple regression indicated that athletes' perception of team burnout at Time One significantly predicted 26.6% of the variance of team burnout at Time Two, $F(1,138) = 49.94$, $p < .001$. Factoring in average training hours, in the second stage, accounted for an additional 3.1% and this change in R^2 was significant, $F(2,137) = 28.97$, $p < .001$.

Table 4. 3. Regression analysis for athlete global burnout and average training hours

	b	SE b	B
Step 1			
Constant	0.85	0.17	
Burnout (Time One)	0.67	0.07	0.61***
Step 2			
Constant	0.69	0.18	
Burnout (Time One)	0.67	0.07	0.61***
Average Hours Training	0.02	0.01	0.15*

Note. $R^2 = .38$ for Step 1: $\Delta R^2 = .02$ for Step 2 (ps <.05). *p<.05, ***p<.001.

Table 4. 4. Regression analysis for team global burnout and average training hours.

	b	SE b	B
Step 1			
Constant	1.09	0.17	
Team Burnout (Time One)	0.55	0.08	0.52***
Step 2			
Constant	0.95	0.18	
Team Burnout (Time One)	0.54	0.08	0.51***
Av Hours training	0.02	0.01	0.18*

Note. $R^2 = .38$ for Step 1: $\Delta R^2 = .03$ for Step 2 (ps<.05). *p<.05, ***p<.001.

Individual, actual team, and perceived team burnout. Two MLMs were used to analyse individual athletes' initial level and change of burnout over the two stages of measurement. Moreover, the MLM was used to investigate the predictive association of actual team burnout level and perceived team burnout on athlete burnout twice across the three-month period (i.e. middle of season and end of season). Considering recommendations by Field (2013), an empty model without predictors was initially tested (Null Model). Model A included the actual team burnout level of the athlete's team. Model B included the athlete's perception of their teammates as well as the interaction between actual team burnout level and perception of teammates. Results show that including actual team burnout level as a fixed factor improved the fit of the model, *BIC* = 492.37 (Null Model) to *BIC* = 409.28 (Model A). In this model, results show that actual team burnout level significantly predicted athlete burnout, $F(1, 248.05) = 29.12$, $p < 0.001$. Additionally, accounting for perceived team burnout and the interaction improved the model fit, *BIC* =

300.50 (Model B). In Model B both actual team burnout level, $F(1, 255.65) = 5.50$, $p = 0.02$, and perceived burnout, $F(1, 229.80) = 5.54$, $p = 0.02$ significantly predicted athlete burnout. The interaction did not significantly predict athlete burnout.

Table 4. 5. Parameters Estimates (SE) for the performed multilevel linear models.

	Null Model	Model A	Model B
Fixed Effects			
Intercepts (*p*-value)	2.29**(.33)	0.01 (.42)	-2.16 (1. 73)
Actual Team Burnout Level		1.00** (.18)	1.40** (.60)
Team Global Burnout			1.46** (.62)
Team Global Burnout* Actual Team Burnout Level			-0.39 (.27)
Overall Model Test			
-2LL	481.11	392.40	283.63
AIC	485.11	398.40	289.63
BIC	492.37	409.28	300.50

Note. ** $p < 0.00$.

4.5. Discussion

The purpose of the present study was to examine the dynamic nature of burnout over time; in particular, the influence of perceptions of teammates' burnout and cumulative training hours (Gould & Dieffenbach, 2002; Gustafsson, et al., 2007) on athlete burnout was investigated. The present study supports previous longitudinal investigations of athlete burnout (e.g. Madigan, et al., 2015, 2016) as the change in burnout from Time One (i.e. mid-season) to Time Two (i.e. end of season) highlights the dynamic nature of burnout over the course of the season (Cresswell & Eklund, 2006b). The findings of the present study suggest that the development of burnout may be related to athletes' perceptions of teammates burnout and the actual level of burnout of their teammates (Bakker, et al., 2005; Hakanen, Perhoniemi, & Bakker, 2014) as well as cumulative training hours (Gould & Dieffenbach, 2002; Gustafsson, et al., 2007).

The training demands, operationally defined as training hours in the present study, were initially not observed to influence burnout at Time One; however, towards the end of the season the cumulative training demands appeared to impact upon athlete burnout. One potential explanation of this finding is that athletes might expect substantial involvement in training earlier in the season and perceive the training demands as an accepted/anticipated stressor (Smith, et al., 2010). Over the course of the season, in addition to competition stress, training hours may accumulate to the point that previously manageable training loads exacerbate athletes' feelings of exhaustion, reduce their sense of accomplishment, and devalue perceptions of sport involvement. Although many athletes are able to handle demanding situations for short periods (i.e. high training hours at the start of season), if they chronically experience insufficient recovery the risk of developing maladaptations to training and stress-related health issues increases (i.e. continued high training hours; Gustafsson et al., 2011).

Findings from the current study suggest there is an association between athlete burnout and perceptions of teammates' burnout. Previous research has suggested an athlete's perception of stress can be influenced by their social relationships with teammates (Kerdijk, Kamp, & Polman, 2016; Smith et al., 2010); therefore, the current research investigated individual athletes' perception of their teammates' and team's collective burnout (i.e. through the measurement of each team members' level of burnout). Findings suggest that both athletes' perceptions of teammates' burnout and the team's collective burnout are associated with athlete burnout. One possible explanation for this finding is that as a consequence of teammates sharing similar experiences (e.g. during the hours spent training together), athletes may project their individual self-assessment onto teammates. Specifically, athletes may perceive their teammates share a similar mood and associated level of burnout as themselves (Tamminen & Crocker, 2013; Totterdell, 2000). Alternatively, social interactions between teammates offers the opportunity for athletes to gain information regarding peers' emotions and perceived demands of training (Campo, Sanchez, Ferrand, et al., 2016; Tamminen, Palmateer, Denton, et al., 2016); this information may guide athletes' appraisals of the level of burnout within the team environment (DeFreese & Smith, 2013).

The present study highlights the association of training hours and social factors on the development of athlete burnout; consequently, it raises a number of applied implications warranting consideration. In particular, athletes appear to be susceptible to developing burnout due to the accumulated demands of training and the social perception of their teammates; as the season progresses athletes and coaches should aim to optimise the balance between training load and recovery (i.e. physical, emotional) (Kellmann, 2010). Coaches may also benefit from working with a sport scientist that possesses expertise in monitoring training demands and athletes' recovery (e.g. exercise physiologists; Starling & Lambert, 2017) to prevent overloading athletes and intervene with opportunities for recovery. To minimise the possible detrimental effect of the cumulative demand of training on athletes, coaches should program in advance time for recovery (Lundqvist & Kenttä, 2010). Furthermore, coaches and team leaders (e.g. captains) may endeavour to optimise the social environment that surround athletes by provide an opportunity for the expression of social support (Defreese & Smith, 2014). Coaches are also advised to be mindful of interpersonal interactions during training and competition (Davis & Davis, 2016). The motivational climate created by the coach and peers can influence athletes' perceptions of burnout (Smith et al., 2010); therefore, positive communication and establishing shared goals will enhance the training environment and wellbeing of athletes (Wachsmuth, Jowett, & Harwoord, 2017).

The present study is subject to several limitations that require discussion. First, the findings of the present study suggest there is a complex relationship between social perceptions and burnout; the factors influencing this relationship require further empirical research. In particular, the current study highlights athletes' perceptions of the burnout level in the team may lead to the development of similar perceptions between an athlete's own burnout and that of their teammates; however, the quality of the relationship between teammates may moderate an athlete's perceptions of the team level burnout. Previous research suggests that social support is negatively associated to burnout (Cresswell, 2009), and that maladaptive social interactions are linked to burnout-related perceptions (DeFreese & Smith, 2014; Smith et al., 2010). However, as a result of the measures used in the present study it is difficult to substantiate the direction of the relationship between an athlete's burnout and their perception of teammates' burnout as they may be linked to either positive (e.g. social support) or negative group dynamics (e.g. peer conflict).

A second limitation relates to potential measurement issues that exist within burnout research in sport; the global burnout scores were used in analyses (in line with extensive research examining burnout in sport; Gustafsson, et al., 2014), however the individual dimensions of burnout (i.e. exhaustion, sport devaluation, and reduced accomplishment) may be considered independently as exhaustion has been proposed to be the central dimension of athlete burnout (Gustafsson, et al., 2011; Maslach, et al., 2001; Shirom, 2005).

A third limitation to the study is the range of sport teams comprising the sample; specifically, they vary in terms of playing level, age of athletes, gender, and requirements of training. In particular, across the teams the social interactions between teammates may differ depending on the level, age, and context of the team. Although there was not a significant difference in the level of burnout across the teams, the study did not examine the variability of social interactions between teammates across the teams. Future research may wish to focus upon specific populations of athlete (i.e. student athletes or academy athletes) rather than a broad spectrum of athletes used in the current study.

Additionally, the TBQ was adapted from the ABQ and requires more rigorous validation. The sample comprising the present study resulted in the reporting of acceptable findings arising from CFA as a preliminary validation of the TBQ; however, future research would be well served by further psychometric support. Finally, the lack of objective measures of physiological stress and training data limits the interpretation of findings in relation to underpinning physiological factors and associated consequences.

Future research would be strengthened by the inclusion of biomarkers of stress (e.g. cortisol) and/or measurement of factors related to recovery (e.g. sleep; Söderström, Jeding, Ekstedt, Perski, & Åkerstedt, 2012). Assessing biomarkers of stress would permit future research to assess the relationship between athlete burnout and physiological systems underlying training and competition. The allostatic load model suggests the physiological system fluctuates according to how the individual recovers from stress (McEwen & Seeman, 1999). Activation of the allostatic process causes the release of catecholamines and cortisol, as this process continues an individual's ability to cope with stress and effectively recover decreases (McEwen, 2006). The continuing accumulation of training hours over the course of a season can become a stressor for athletes; this may activate physiological systems associated with the stress response that lead to the chronic overexposure of stress identified within burnout (Cresswell & Eklund, 2006b). As suggested by Melamed and colleagues (2006), a potential physiological explanation may be the impairment of the regulatory ability of hypothalamic-pituitary-adrenal axis to respond to stress and to allow sufficient recovery; this offers a physiological link between chronic stress and burnout.

Future research may also wish to investigate whether perceptions of group cohesion influence the relationship between individual and group levels of burnout that have been observed in other settings (e.g. nursing; Li, Early, Mahrer, Klaristenfeld, & Gold, 2014). Group cohesion related to task and social aspects may influence athletes' perceptions of teammates' shared vision and social support which may in turn augment the relationship between individual and team burnout. In further consideration of the role of significant others in sport, research suggests that the environment created by parents and coaches has an impact on the well-being of athletes (Gagne, 2003; Hodge & Lonsdale, 2011; Vealey, Armstrong, & Comar, 1998). Future research may also look to address the influence of other key relationships that may influence the social perceptions of both athletes' and coaches' burnout (Lundkvist, Gustafsson, & Davis, 2016).

In summary, the findings of the present study extend previous research investigating the impact of both physiological and social antecedents on the development of burnout. The findings of the present study suggest that over the course of a competitive season, cumulative training hours may act a stressor for athletes and increase the risk of burnout. The dynamic nature of burnout and the association between perceptions of teammates and athlete burnout highlight the complexity of factors underlying the incidence of burnout. The relationship between athletes' own levels of burnout and their perceptions of teammates' burnout requires further study to elucidate the underpinning mechanisms that influence athletes' social perceptions as well as their performance and wellbeing.

Chapter 5: The Role of Coach-Athlete Relationship Quality in Team Sport Athletes' Psychophysiological Exhaustion: Implications for Physical and Cognitive Performance

Study 3

Adapted from the peer-reviewed paper **Accepted and Published** in Journal of Sports Sciences:

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5.1. Abstract

The present study examined relationship between the quality of the coach-athlete relationship and athlete exhaustion as well as assessing physiological and cognitive consequences. In Phase One of this study, athletes representing seven teams across four different sports participated in a quasi-experimental study measuring physical performance during a 5-m multiple shuttle-run test, followed by a Stroop test to assess cognitive performance. Participants provided saliva samples measuring cortisol as a biomarker of acute stress response and completed questionnaires measuring exhaustion, and coach-athlete relationship quality. In Phase Two, twenty-five athletes completed the experimental procedure on a further two occasions this time separated by 3 months. Structural equation modelling conducted as part of Phase One revealed a positive relationship between the quality of the coach-athlete relationship and Stroop performance (β = -0.228, p = 0.033). Negative relationships existed between the quality of the coach-athlete relationship and cortisol responses to high-intensity exercise, cognitive testing, and exhaustion (β = -0.240, p = 0.024) and athlete exhaustion (β = -0.344, p = 0.004). The Phase Two structural equation modelling analysis revealed that the coach-athlete relationship at the beginning of the season predicted athlete exhaustion in the middle of the season (β = -0.489, p = 0.026). The analysis also revealed that the coach-athlete relationship and athlete exhaustion were unrelated to the physical and cognitive performance of athletes. The results indicated that athletes who perceived their relationship with their coach as being close, committed and complementary were less likely to perceive themselves as exhausted. Low quality coach athlete relationship increase the likelihood of athletes experiencing symptoms of emotional and physical exhaustion.

Key words: coach-athlete relationship, exhaustion, team sports, teammate, performance

5.2. Introduction

Participation in sports encompasses a number of cognitive-affective experiences with implications for athletes' well-being and psychological health (Gustafsson, DeFreese, & Madigan, 2017). Athletes' perceptions of their social environment can manifest psychophysiological implications (Barcza-Renner, Eklund, Morin, & Habeeb, 2016); specifically, coaches are key components of the social environment that may potentially influence stress and the development of exhaustion (Arnold, Fletcher, & Daniels, 2013; DeFreese & Smith, 2014; Fletcher, Hanton, & Mellalieu, 2006; Isoard-Gautheur, Trouilloud, Gustafsson, & Guillet-Descas, 2016). In terms of a positive influence, supportive social interactions within the athletes' environment has the potential to enhance their performance and development (Bianco & Eklund, 2001). On the contrary, unwanted, rejecting or neglecting behaviours that typify negative social interactions (with coaches) can hinder progress and result in a deleterious athlete experience (Newsom, Rook, Nishishiba, Sorkin, & Mahan, 2005).

Recent research has attempted to examine the athletes' social environment from the perspective of the quality of the coach-athlete relationship (Jowett, 2007; Davis, Jowett, & Lafrenière 2013). The coach-athlete relationship has been identified as being a central feature of an athlete's sport experience (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009). Jowett (2007) defines the coach-athlete relationship as a unique interpersonal relationship in which athletes' and coaches' feelings, thoughts, and behaviours are mutually and causally interconnected. These feelings, thoughts, and behaviours have been reflected in Jowett's (2007) 3 + 1Cs framework. Specifically, according to this framework *Closeness* reflects the affective bond that develops between the coach and athlete, manifesting in "feelings" of liking one another, mutual trust, respect, and appreciation. *Commitment* is characterised by the athlete's and/or coach's "thoughts" of maintaining a close-tied athletic relationship over a long period of time.

Complementarity reflects athletes' and coaches' "behaviours" that are both complementary and cooperative and determine the efficient conduct of interactions. Finally, the +1C *co-orientation* represents the inter-connected aspect of the coach-athlete relationship, referring to coaches' and athletes' interpersonal perceptions regarding the quality of the coach-athlete relationship. Within the construct of co-orientation, Jowett (2007) has explained the importance of considering two distinct perceptual platforms from which coaches and athletes are likely to view, consider, and assess the quality of the relationship. These perceptual platforms include: the direct perspective (e.g. I like my coach) and the meta-perspective (e.g. my coach likes me). Both the direct and meta-perspectives of the 3Cs are essential indicators that shape the quality of the coach-athlete relationship.

Previous research has investigated the influence of the quality of the coach-athlete relationship on both interpersonal and intrapersonal outcomes including the athlete's physical and psychosocial development (Davis & Jowett, 2014), satisfaction (Jowett & Ntoumanis, 2004), motivation (Isoard-Gautheur et al., 2016), collective efficacy (Hampson & Jowett, 2014), and one's subjective evaluation of performance (Rhind & Jowett, 2010). However, seldom does sport research link the quality of the coach-athlete relationship to an athlete's actual physical and cognitive performance. This shortcoming may be due to the consideration that subjective evaluations of performance are less intrusive to the athlete and potentially offer greater generalisability across sports (Biddle, Hanrahan, & Sellars, 2001) in comparison to objective physical performance measures where it is crucial to consider the ecological validity of research. Therefore, it is warranted that research incorporates alternative objective measures to more accurately assess athletes' performance with greater applicability to their applied environment. Gillet, Vallerand, Amoura, and Baldes (2010) propose "tournament placing" as an objective measure of performance; however, it is difficult to generalise "tournament placing" to other performance contexts due to many unique variables across specific performance settings (e.g. level of competition; Gillet et al, 2010).

Although there is limited longitudinal research investigating the coach-athlete relationship across a season, research has begun to examine the impact the tone of coach-athlete interactions (i.e. how coaches convey information to athletes) on the athletes' psychological development (Erickson & Côté, 2016). In team sport settings the coach is a shared element for each athlete, whereby, different athletes on the same team may have varied interactive experiences with the same coach (Erickson & Côté, 2016). The findings of Erickson and Côté, (2016) highlight that differences in coach-athlete interactive experiences are associated with different developmental trajectories of athletes (i.e. high and increasing, low and decreasing, moderate and maintaining) across the season. Within any team, it is likely that each individual athlete will have their own perception of the quality of the coach-athlete relationship, in part, due to the individual interactive experiences they share with their coach. As a consequence of these individual's perceptions within each unique coach-athlete dyad, the same coach may also influence individual athlete's cognitive and physical performance differently.

In proposing an alternative method of objectively measuring sport performance, assessing outcomes on a running task may offer increased generalisability across a greater number of sports. This would permit more extensive comparisons when examining the impact of the coach-athlete relationship across a wider range of performance contexts. Further, research examining the potential impact of the quality of the coach-athlete relationship on performance would also be well served by differentiating aspects of performance into subcomponents of performance including physical and cognitive functioning. Cognitive performance in the areas of attention, working memory, and executive function are crucial to athletic proficiency (MacDonald & Minahan, 2016). Despite the importance of decision making in competitive sport (Light, Harvey, &

Mouchet, 2014), limited research has investigated the impact of the quality of the coach-athlete relationship on cognitive functioning.

Cognitive and physical subcomponents of sport performance are both notably influenced by athletes’ emotions (Vallarand & Bouchard, 2000; Woodman, Davis, Hardy et al., 2009). In particular, the impact of anxiety and stress upon performance has been the focus of extensive research (Hanton, Neil, & Mellalieu, 2008), with athletes reporting a variety of stressors associated with competitive sport (e.g. performance errors, interpersonal relationships; Nicholls, Jones, Polman, & Borkoles, 2009; Sarkar & Fletcher, 2014). The traditional reliance upon self-report measures in the study of stress in sport has been a shortcoming in research design; however, advances in research methods now offer the supplemental use of psychophysiological measures as biomarkers of stress (Hellhammer, Wüst, & Kudielka, 2009). In particular, salivary cortisol, the main end product of hypothalamic-pituitary-adrenal (HPA) axis has emerged as an important biomarker of the psychophysiological stress responses (Hough, Corney, Kouris, & Gleeson, 2013) and provides an indication of the physiological stress response of athletes to a bout of high-intensity exercise (Kerdijk, Kamp, & Polman, 2016; Leite et al., 2011).

Research examining psychosocial stressors (e.g. coaches; Hogue, Fry, Fry, & Pressman, 2013) highlights the significance of examining the cortisol response of individuals (Wegner, Schüler, Schulz Scheuermann, Machado, & Budde, 2015). In particular, the coach-athlete relationship can influence athletes’ appraisals of demands on their resources and influence perceptions of stress (Nicholls et al., 2016). However, limited research has examined psychophysiological indices of the outcomes associated with the relationship quality between the coach and athlete. When the relationship quality between the coach and athlete is deemed to be poor, it can potentially contribute to athletes’ perceived stress through a coach’s use of controlling behaviours that have been associated with maligned motivational regulation and the development of athlete burnout (Barcza-

Renner et al., 2016; Cresswell & Eklund, 2007; Gustafsson, Hassmén, Kenttä, & Johansson, 2008; Isoard-Gautheur, Trouilloud, Gustafsson, & Guillet-Descas, 2016). Specifically, poor quality coach athlete relationships (i.e. characterised by a lack of closeness, commitment, and complementarity) have been linked with athlete burnout (i.e. exhaustion, sport devaluation, reduced accomplishment), whilst athletes reporting a high quality relationship with their coach indicate lower levels of burnout (Isoard-Gautheur et al., 2016).

Burnout has been extensively studied in the domain of sport over the past three decades and has been linked with athletes' negative health outcomes (Gustafsson, DeFreese, & Madigan, 2017). In particular, athletes suffering from burnout report greater depression, mood disturbance, and general feelings of frustration (Eklund & Cresswell, 2007; Eklund & DeFreese, 2015). Despite it being the focus of comprehensive study, the understanding of burnout is limited by a lack of agreement regarding the definition of the construct and has been the subject of ongoing debate in the research literature (Kristensen, Borritz, Villadsen, & Christensen, 2005; Lundkvist, Gustafsson, & Davis, 2016). Further, the relationships between the proposed sub-dimensions (i.e. exhaustion, reduced accomplishment, and sport devaluation) are unclear (Lundkvist, Gustafsson, Davis, et al., 2017). That said, there is consensus among researchers that exhaustion is the core dimension of burnout (Gustafsson, Kenttä, & Hassmén, 2011; Maslach, Schaufeli, & Leiter, 2001) and may be used as an indicator of the psychological health of athletes (Gustafsson et al., 2016).

5.2.1. Aims

In consideration of the conceptualisation and developmental issues surrounding burnout research, the current study focuses on the core dimension of exhaustion. Furthermore, in light of possible antecedences and observed associations between exhaustion, stress, and cognitive and physical performance, the present study aims to extend previous research by examining the influence of the quality of the coach-athlete relationship, an aspect of the integrated model of athlete burnout (Gustafsson et al., 2011). Therefore, this study examines the role of coach-athlete relationship quality in team sport athletes' psychophysiological exhaustion with a particular focus upon the implications for physical and cognitive performance. In review of previous research, a two phased study was proposed.

5.2.2. Phase One

Phase One adopted a cross-sectional design utilising data collected from the beginning of the season (referred to as Time One) and aimed to assess three aspects of the integrated model of athlete burnout (Gustafsson et al., 2011). First, in light of the proposed effects of the coach-athlete relationships on sport performance (Gillet et al, 2010), Phase One aimed to assess the impact of the quality of the coach-athlete relationship has on an athlete's performance. With regards to the second aspect, considering high quality coach-athlete relationships are associated with lower levels of perceived stress (Nicholls et al., 2016), the study aimed to explore whether the coach-athlete relationship was associated with acute changes in cortisol resulting from the objective measurement of physical and cognitive performance. Finally, in review of research examining coach-athlete relationship quality and burnout (Isoard-Gautheur et al., 2016), the final aim of this study was to assess whether the coach-athlete relationship was a possible antecedent of athlete exhaustion.

5.2.2. Phase Two

The integrated model of athlete burnout (Gustafsson et al., 2011) suggested possible predictive relationships between such as antecedents of burnout, symptoms of burnout, and performance deficiencies. As such, it is important to examine the proposed relationships over time, which meant that Phase Two of the current study adopted a three-wave longitudinal approach utilising a mediation design to assess the impact of the quality of the coach-athlete relationship on athletes' psychophysiological exhaustion, and physical and cognitive performance over time. As the proposed mediation of the present study incorporates two causal relations (i.e. coach-athlete relationship quality → athlete exhaustion, and athlete exhaustion → athlete's performance outcomes), a three-wave design is required to examine the mediation appropriately (Cole & Maxwell, 2003). It is important, however, that further longitudinal research is conducted as a means of avoiding biased estimates of longitudinal relationships (Maxwell & Cole, 2007). Finally, despite prior longitudinal research investigating changes in athlete exhaustion (Cresswell & Eklund, 2006a) and physiological performance markers (Kavaliauskas, 2010), research has yet to establish whether athlete exhaustion mediates the relationship between the quality of the coach-athlete relationship and the physical and cognitive performance of athletes.

5.2.3. Hypothesis

In consideration of previous research, a further four hypotheses were proposed. First, it was hypothesised that a high-quality coach-athlete relationship would predict lower levels of athlete exhaustion. Secondly, high quality coach-athlete relationships were expected to be positively related to cognitive and physical performance. the third hypothesis was that a high-quality coach-athlete relationship would be negatively related to acute changes in cortisol, resulting from the objective measurement of physical and cognitive performance. Therefore, the final hypothesis proposed that the relationship between the quality of the coach-athlete relationship at Time One and the performance of athletes (i.e. physical and cognitive) at Time Three (i.e., end if the season) would be mediated by athlete exhaustion at Time Two (i.e., middle if the season) (Phase Two).

5.3. Method

5.3.1. Participants

A total of 82 athletes, including 55 males (67.07%) and 27 females (32.93%), participated in the study. The participants' age ranged from 18 to 31, with a mean age of 19.87 years (SD = 2.94). All of the athletes were actively competing in team sports at a university level; the sample was comprised of four different sports: rugby union (*N* = 50, 60.98%), rugby league (*N* = 19, 23.17%), volleyball (*N* = 6, 7.32%), and netball (*N* = 7, 8.54%). The participants trained on average for 9.14 hours per week (SD = 3.55), and attended training sessions with their teammates and coach on a regular basis (range: 3-5 times per week). Participants had on average played their sport for 9.27 years (SD = 5.14) and had been competing with their current team and coach for 1.20 years (SD = 1.80) at the beginning of the season.

5.3.2. Measures

Demographic and Background Inventory. Participants provided a variety of demographic information including: age, gender, years of competitive experience, years played with current team, and level of sport competition. Additionally, the demographic questionnaire examined the number of hours an athlete trained per week (e.g. "On average, how many hours do you train per week?") in a manner similar to previous sport research (Cresswell & Eklund, 2006; Smith et al., 2010).

Coach-Athlete Relationship. The 11-item Coach-Athlete Relationship Questionnaire (CART-Q; Jowett, & Ntoumanis, 2004) was used to measure athletes' direct perception of the quality of the coach-athlete relationship (Jowett, 2008). The 11-item direct perspective has four items assessing closeness (e.g. "I like my coach"), three items assessing commitment (e.g. "I am committed to my coach") and four items assessing complementarity (e.g. "When I am coached by my coach, I am ready to do my best"). All

CART-Q items were measured on a scale ranging from 1 (*"Strongly Disagree*") to 7 (*"Strongly Agree")*. Previous research (Jowett & Ntoumanis; Davis & Jowett, 2013) have presented sound psychometric properties of validity and reliability.

Athlete Exhaustion. Each athlete's level of exhaustion was assessed using items from the Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001). Only the five items referring to the athlete's physical and emotional exhaustion were used for the present study (e.g. "I feel overly tired from my sport participation"). The stem for each item was "How often do you feel this way?" to which participants responded on a five-point scale, ranging from 1 (*"Almost Never")* to 5 (*"Almost Always")*. Previous research has provided sound psychometric properties across all three dimensions of the ABQ (Raedeke & Smith, 2001; Smith, Gustafson, Hassmén, 2010).

Physical Performance. A high-intensity bout of exercise comprised of a 5-m multiple shuttle test (Boddington et al., 2001) was used to measure participants' physical performance. Participants were instructed to stand in line with the first of six cones that were placed five m apart in a straight line on a running track (the total distance from the first to sixth cone was twenty-five m). An auditory signal indicated the beginning of the test; upon this signal participants sprinted five m to the second cone and touched the ground in line with the cone using their hands before sprinting back to the first cone; without hesitation participants then sprinted ten m to the third cone and then back to the starting cone. Participants continued to run in this pattern to the subsequent fourth and fifth cone (each time returning to the starting cone) until 30 s elapsed and a signal to stop was provided. The distance covered by the participants was recorded to the nearest two and a half m during each 30 s shuttle. Participants completed six 30 s shuttle tests with 35 s of recovery time provided between each shuttle. Participants were instructed to run maximally (i.e. maximal effort) throughout the test and the total cumulative distance covered across the six trials was recorded as the physical performance marker (i.e. total running distance).

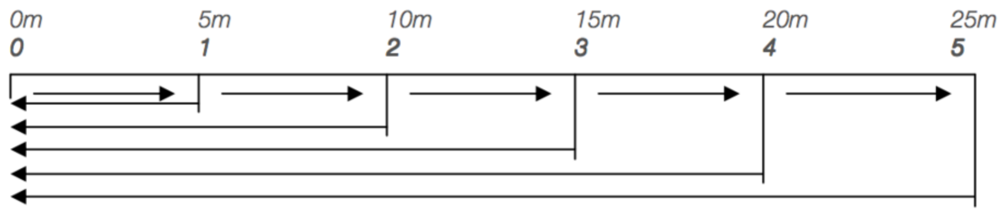

Figure 5.1. Layout of the 5-m multiple shuttle test (Boddington et al., 2001) was used to measure participants' physical performance. Note: unbroken lines represent the running directions of the participants.

Cognitive Performance. Participants' scores on a Stroop task were used as a measure of cognitive performance. The application was downloaded from the Apple app store (EncephalApp Stroop; Bajaj et al., 2015; Bajaj et al., 2013) and was used in testing on Apple iPads (Apple, China). The app allows two components to be set (i.e. the "off" and "on" state), depending on the discordance or concordance of the stimuli. The participants were only exposed to the "on" state, which is the more cognitively challenging of the two states as incongruent stimuli are presented in nine of the ten stimuli. Participants were instructed to indicate the correct response by touching a section at the bottom of the screen which corresponded with the color being displayed; for example, in the discordant coloring trials that participants completed, if the word "GREEN" was displayed in the color red, the correct response is red and incorrect response would be green). If the participant was to make a mistake (i.e. select the incorrect color), the trial would stop and the program would restart at the beginning. Participants were required to correctly answer ten stimuli in a row to complete a trial. Participants were allowed one practice attempt at completing a trial prior to undertaking the two test trials. The mean time (Stroop score) for completion of two successful trials was calculated and used in the further analysis.

Biomarker of Stress. Salivary cortisol was measured as a biomarker of athletes' stress response. Saliva samples were collected in Salimetric collection tubes (Greinerbio-one, Frickenhausen, Germany) using a passive drool technique to gain 1.0 g/mL of saliva. The collection tubes containing the samples were retained by the researcher immediately after collection and frozen at -20C within an hour from the time of collection. Samples were defrosted and centrifuged at 3,000 rpm for 15 mins prior to analysis. Salivary cortisol was quantified for each sample by enzyme immunoassay (Salimetrics Europe, Newmarket, United Kingdom) in accordance with the manufacturer's instructions. Intra-assay coefficients of variation were less than 10%.

5.3.3. Procedure

Ethical approval was granted by the university prior to collecting the data. Initially, the head of the university strength and conditioning department and head coaches of the university sports teams were approached to obtain permission to conduct the study with their respective athletes. On approval, and before a prearranged training session, potential athletes were informed of the nature of the research and invited to take part in the study. Those who provided informed consent were scheduled to attend a testing session. Data collection for Phase One took place between September and October (Time One). Subjects were asked to abstain from consuming alcohol for 24 hours before testing and to be well hydrated at the time of testing. Athletes who agreed to take part in the study did so as part of their normal strength and conditioning program. Therefore, the time of day the testing was conducted was dependent on the sports team (i.e. early morning 7-9 am, mid-morning 10-11 am, afternoon 1-3 pm, and evening 6-8 pm) but was in keeping with usual training patterns. Under normal conditions, the highest level of cortisol production occurs in the second half of the night peaking in the early hours of the morning (Fries, Dettenborn, & Kirschbaum, 2009). Thereafter, the level of cortisol steadily declines during the day with the lowest level of cortisol in the first half of the night (Tsigos & Chrousos, 2002). However, in Phase One there was no significant difference when comparing the time of day testing took place (i.e. early morning, mid-morning, afternoon, and evening) and changes in cortisol levels (i.e. baseline to post-task) across the testing sessions, $F(3,81) = 1.401$, $p = 0.249$.

To conduct the three-wave longitudinal analysis for Phase Two, additional periods of data collection were arranged with participants where they completed the same experimental protocol at two additional time points in order to look at causal relationships. The second wave of data collection occurred between January and February (Time Two). The third data collection occurred during May and June (Time Three). The study utilised these time points to allow changes over the season to occur (Isoard-Gautheur et al., 2016). The three-month intervals between the time points were considered to be sufficient as previous research has indicated that a three month time interval allows researchers to capture change in athlete burnout during the season (Isoard-Gautheur et al., 2016). The time of day the testing was conducted varied across the different teams that were involved in the study, however, this remained consistent for each team throughout the data collection period (i.e. early morning 7-9 am, mid-morning 10-11 am, afternoon 1-3 pm, and evening 6-8 pm). Each athlete conducted the procedure at the same time across the studies. Furthermore, across the three waves there was no significant difference between time of day testing took place and the change in cortisol of athletes (i.e. baseline salivary cortisol to post-task salivary cortisol at time point 1), $F(3,21) = 1.813$, $p = 0.176$.

5.3.4. Experimental Protocol

Following the provision of informed consent, participants produced their first 1.0 g/mL saliva sample. On completion of saliva collection, participants were asked to warm up and then undertake a submaximal attempt of the shuttle test to familiarise themselves with the test protocol. The submaximal attempt of the shuttle test was comprised of a single 30 s trial at a lower intensity following the procedure previously outlined. The athletes then performed the 5-m multiple shuttle test comprised of six trials and had their maximal distance recorded. Immediately upon completion of the physical task they undertook the two Stroop trials and had their cognitive performance recorded. Following the completion of the physical and cognitive testing, participants provided a second 1.0 g/mL saliva sample. Participants then remained trackside and were monitored as they completed the multi-section questionnaire. Participants provided a third and final saliva sample 20 mins following the completion of the physical and cognitive testing.

5.4. Phase One Data Analysis

The statistical analyses were performed with the IBM SPSS and AMOS programs (IBM SPSS Inc., 2011). Firstly, descriptive statistics and bivariate correlations were performed. For the purpose of Phase One, the quality of the coach-athlete relationship was represented by a global score in which all three dimensions of the 3+1Cs were subsumed. This was due to the strong correlations (r = 0.627 -0.711) observed across commitment, closeness, and complementarity. This approach has been used and supported in previous research (Adie & Jowett, 2010; Davis, et al., 2013; Isoard-Gautheur et al., 2016). A one-way repeated measures ANOVA (significance was set at $p < .05$) was used to investigate changes in saliva cortisol across the baseline, post-test, and 20 mins post-testing.

Structural Equation Modelling (SEM) was then used to test the three hypotheses. The hypothesised model included direct paths between the quality of the coach-athlete relationship and maximum distance covered on the shuttle task (physical performance), Stroop scores (cognitive performance), transient change in cortisol, and athlete exhaustion. All of the factors were allowed to correlate. In Figure 5.2., the hypothesised associations are illustrated. A collection of goodness of fit indices was employed to assess whether the hypothesised model fit the data were chosen to assess the model. Following the suggestion made by several researchers (Hu & Bentler, 1999; MacCallum & Austin, 2000), the following indices were employed the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Tucker Lewis Index (TLI). According to Hu and Bentler (1999) and MacCallum and Austin, (2000) values that are equal to or above 0.90 for the CFI and TLI indicate a satisfactory fit to the data, whereas values of 0.95 and higher indicate an excellent fit to the data. Similarly, RMSEA values of less than 0.08 represent a satisfactory fit, whilst values of less than 0.05 provide an excellent fit to the data.

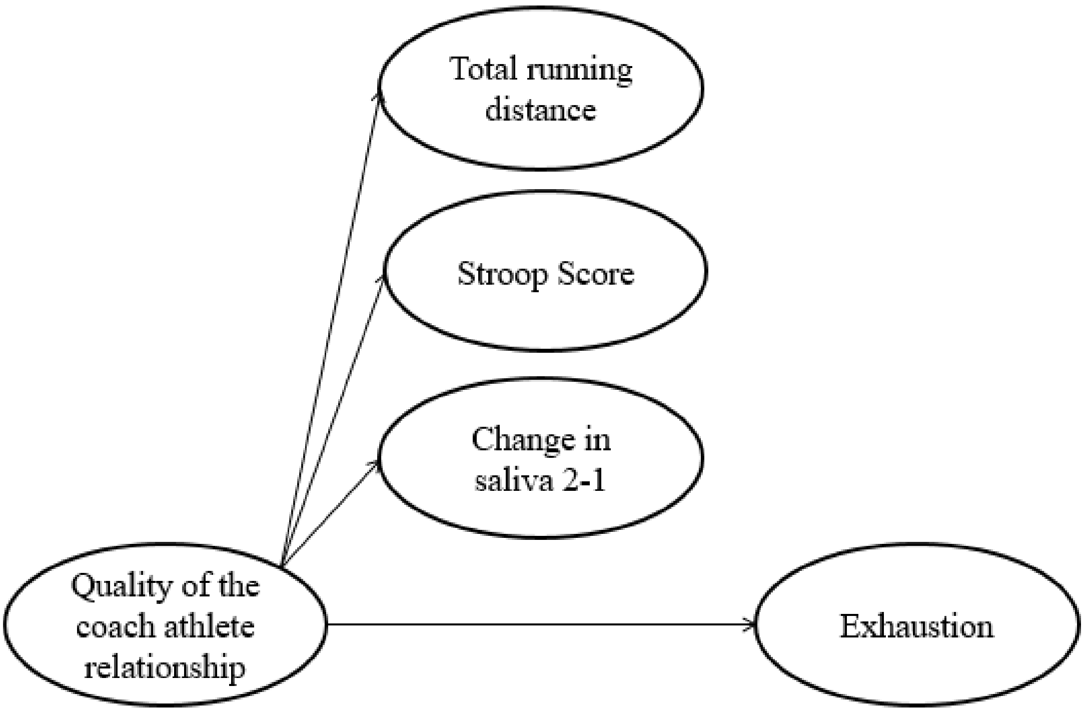

Figure 5.2. Theoretical model to assess the cognitive and psychophysiological consequences of the quality of the coach-athlete relationship in sports teams athletes.

5.5. Phase One Results

5.5.1. Descriptive Statistics

Preliminary analyses showed that none of the participants were considered to be outliers across the variables used in the study (Tabachnick & Fidell, 2007). Descriptive statistics and bivariate correlations amongst variables are presented in Table 5.1. The ABQ exhaustion scores in the study were low to moderate, indicating that many of the participants were experiencing a low or moderate level of athlete exhaustion; this is consistent with finding commonly reported in related studies (Gustafsson, Davis, Skoog, Kenttä, & Haberl, 2015; Raedeke & Smith, 2009). Athletes reported to experience relatively moderate to high levels of perceived coach-athlete relationship quality.

Table 5. 1. Descriptive statistics, standard deviations, alpha reliability and correlations for all main variables in the study.

	M	SD	α	1	2	3	4	5	6	7	8
Quality relationship	5.04	0.97	0.91	1							
Commitment	4.39	1.14	0.77	0.861**	1						
Closeness	5.44	1.12	0.88	0.889**	0.627**	1					
Complementary	5.29	1.01	0.86	0.883**	0.629**	0.711**	1				
Stroop score	11.97	2.1		-0.221*	-0.249*	-0.153	-0.178	1			
Exhaustion	2.61	0.67	0.86	-0.325**	-0.264**	-0.367**	-0.220*	0.202	1		
Total Distance	697.63	47.22		0.054	0.250*	-0.115	0.002	0.097	0.213	1	
Change Saliva	1.9	7.01		-0.254*	-0.213	-0.159	-0.300**	0.104	0.096	-0.112	1

Note: **. Correlation is significant at the 0.01 level (2-tailed), *. Correlation is significant at the 0.05 level (2-tailed).

5.5.2. Cortisol

A single-factor repeated-measures ANOVA was conducted to investigate changes in participants' cortisol concentration across the three measurement time points. The results suggest that there was a significant difference across the cortisol measurements $F(2,162) = 5.395$, $p = 0.009$, $\eta^2 = 0.062$. Bonferroni post hoc comparisons identified that post-test cortisol concentration ($M = 9.83$) was significantly higher than baseline cortisol concentration $p = 0.049$. Cortisol concentration measured 20 mins following completion of the 5-m multiple shuttle test and Stroop test ($M = 10.32$) was significantly higher than baseline cortisol concentration $p = 0.029$. No other significant differences were found, as shown in Table 5.2.

Table 5. 2. Representing descriptive and multiple comparisons to summarise Bonferroni test for saliva at baseline, post testing and 20 mins post testing.

Time		BL	Post Test - 0 min	Post Test - 20 min
	Means (SD)	7.93 (8.00)	9.83 (10.51)	10.32 (10.11)
BL	7.93 (8.00)	1		
Post Test - 0 min	9.83 (10.51)	-1.91, $p = 0.049$	1	
Post Test - 20 min	10.32 (10.11)	-2.43, $p = 0.029$	-0.52^{NS}	1

Note: BL = baseline saliva concentration; Post Test - 0 min = immediately post testing saliva concentration; Post Test - 20 mins = 20 mins post testing saliva concentration

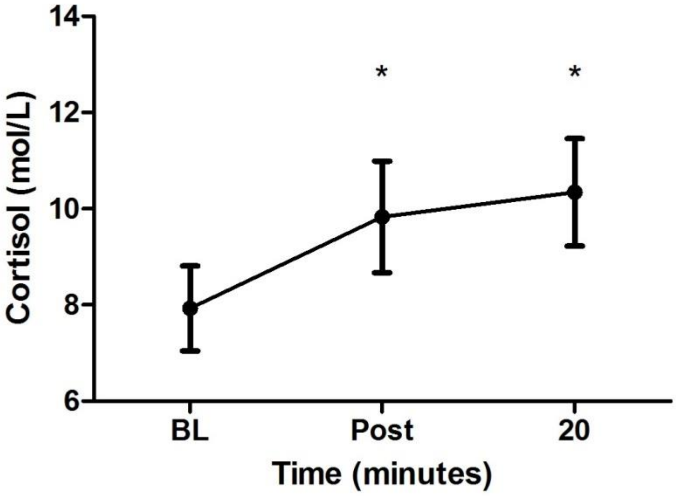

Figure 5.3. Salivary cortisol (mol/L) response to 5-m shuttle test and Stroop test represented by means (+/- SEM). Note: BL representing baseline. Post immediately following shuttle and Stroop test. * Significantly different to baseline.

5.5.3. Structural Equation Modelling

Structural equation modelling presented in Figure 5.4., revealed relatively good fit to the data (df = 6, χ^2 = 8.394, RMSEA = 0.070, TLI = 0.924, CFI = 0.943). Coach-athlete relationship quality was negatively related to Stroop scores (β = -0.228, p = 0.033), indicating that high quality coach-athlete relationships predicted better cognitive performance (i.e. a lower mean time taken by the athlete to complete the two Stroop trials represents better performance). Coach-athlete relationship quality did not predict participants' performance on the physical task (i.e. total distance accrued on the shuttle test, β = 0.019, p = 0.861). The coach-athlete relationship was negatively related to changes in salivary cortisol from pre to immediate post testing (β = -0.240, p = 0.024), suggesting higher quality of coach-athlete relationship was related to less acute stress (i.e. less change in cortisol levels from pre to post-test). Finally, the quality of coach-athlete relationship was negatively associated with athlete exhaustion (β = -0.344, p = 0.004), suggesting a high quality coach-athlete relationship is associated with low levels of exhaustion.

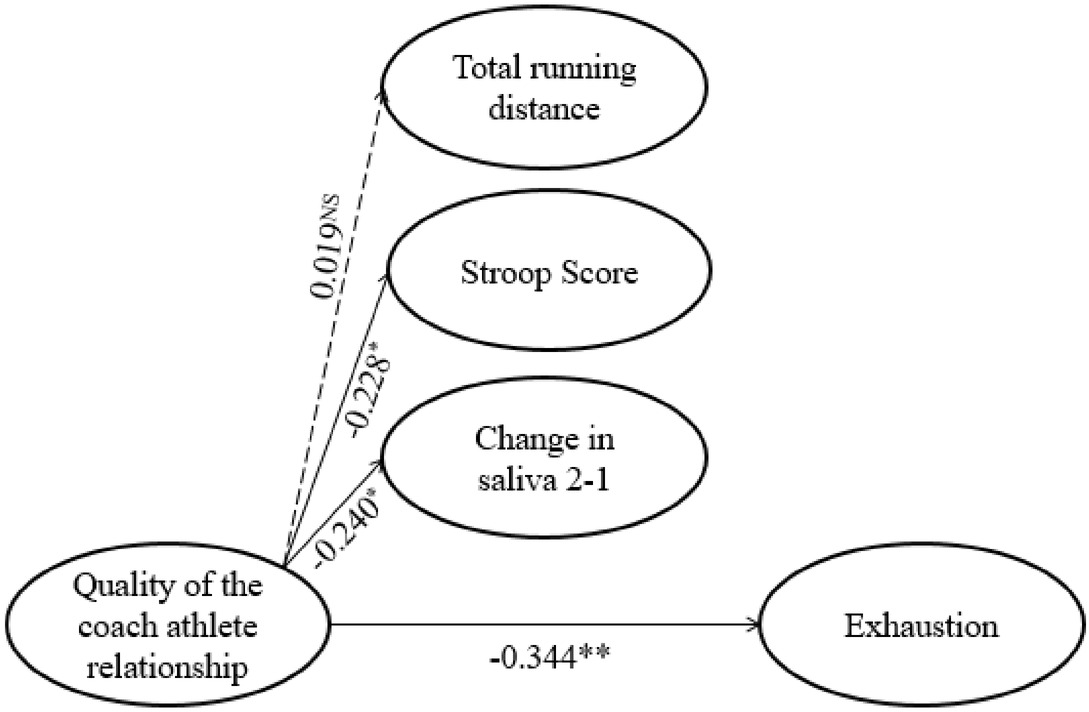

Figure 5. 4. Structural equation modelling of the relationships between the quality of the coach-athlete relationship and exhaustion (5 items of the ABQ), and various psycho-physiology outcomes relating to sports performance. Note: Dotted lines represent non-significant paths; ****p* significant at 0.001; ***p* significant at 0.01; **p* significant at 0.05.

5.6. Phase Two Data Analysis

Statistical analyses were performed with the IBM SPSS and AMOS programs (IBM SPSS Inc., 2011). A total of 25 athletes including 17 males and 8 females completed the provided all data at each of the time points due to a number of participants not providing data at Time Two (*N* = 29) and Time Three (*N* = 43). Only those athletes who completed the full trial at each of the time points were included in the subsequent analysis. The 25 participants included in the subsequent analysis ranged in age from 18-27 years, with a mean age of 20.04 (SD = 2.11) years. All of the athletes were actively competing in team sports at university level, comprising of four different sports: rugby union (*N* = 14, 56% of total athletes); rugby league (*N* = 5, 20%); volleyball (*N* = 3, 12%); and netball (*N* = 3, 12%). Participants had on average played their sport for 9.42 (SD = 5.21) years and had been a member of their current team for 0.93 (SD = 1.05) years at the start of the season.

Descriptive statistics and bivariate correlations were used to analyse the data. Following this, structural equation modelling was used to test the hypotheses. The hypothesised model included direct paths between the quality of the coach-athlete relationship and the variables to examine two of the hypotheses. In order to investigate whether the coach-athlete relationship quality at Time One predicted athlete exhaustion at Time Two a direct path was included. A direct path was incorporated between the athlete's perception of the coach-athlete relationship at Time One and transient change in cortisol from pre to post at Time Three. A direct path was included between Stroop score at Time Three (i.e. the mean Stroop scores over the two attempts) and coach-athlete relationship quality. A direct path was incorporated between running performance at Time Three (i.e. total distance ran by each athlete across all six trials) and coach-athlete relationship quality at Time One. Finally, to assess the third hypothesis, the possible mediating role of athlete exhaustion, indirect paths were included between athlete exhaustion at Time Two to the performance variable at Time Three (i.e. Stroop score, saliva change and running performance). All of the factors were allowed to correlate. See Figure 5.5. for the theoretical model.

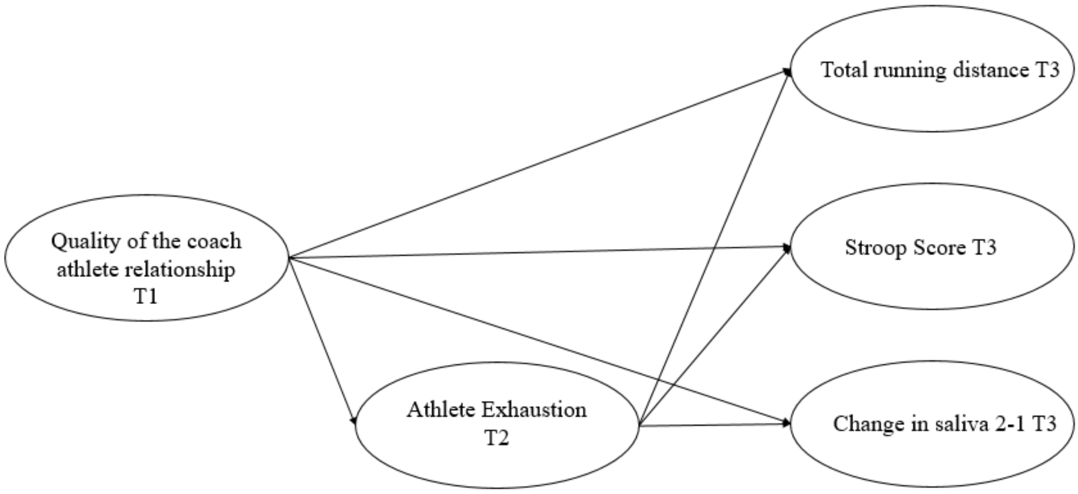

Figure 5. 5. Theoretical model to assess the cognitive and psychophysiological consequences of the quality of the coach-athlete relationship in athletes.
Note: T1 = Time One; T2 = Time Two; T3 = Time Three.

As used in other studies (Hu & Bentler, 1999; MacCallum & Austin, 2000), multiple indices of fit were chosen to assess the model: the CFI, RMSEA, and the TLI. Values between 0.90 and 0.94 for the CFI and TLI indicate an acceptable fit, whereas values of 0.95 and higher indicate a relatively good fit. RMSEA values of less than 0.05 represent a close fit. In order to examine the mediation in the structural equation model non-parametric bootstrapping was employed (Preacher & Hayes, 2008). Bootstrapping allows the direct and indirect effects to be estimated in the model (Preacher & Hayes, 2008).

5.7. Phase Two Results

5.7.1. Descriptive Statistics

Preliminary analyses showed that none of the participants were considered to be outliers across the variables used in the study data was assessed utilising the procedure outlined by Tabachnick and Fidell (2007**)**. Descriptive statistics and bivariate correlations among variables are presented in Table 5.3. and 5.4. All three dimensions of the CART-Q were combined to create the composite variable of relationship quality, due to the high correlations observed across all of the three dimensions (ranging from $r = 0.517$ to $r = 0.644$).

Table 5. 3. Demographic variables, exhaustion, quality of coach-athlete relationship and performance aspects of athletes across the season.

		Hours Trained (h)		Exhaustion		CAR		Stroop (s)		Running (m)		Saliva Change (mmol/L)	
	N	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Time One	88	9.35	3.33	2.6	0.69	4.97	1.05	11.93	2.09	694.34	44.92	1.71	6.80
Time Two	59	10.02	4.31	2.69	0.71	4.96	1.14	11.34	1.77	709.6	46.68	1.06	11.55
Time Three	45	11.52	4.55	2.78	0.59	4.48	1.26	10.9	1.46	693.4	44.85	0.32	6.20
Time One	25	9.12	3.04	2.46	0.64	5.20	0.71	11.9	1.96	694.34	44.92	1.90	5.88
Time Two	25	9.55	3.01	2.47	0.62	5.06	1.13	11.46	2.14	709.6	46.68	1.70	6.80
Time Three	25	11.00	4.61	2.71	0.59	4.45	1.3	10.9	1.59	693.4	44.85	2.25	9.74

Table 5. 4. Correlations Matrix of the psych-physiology measures (*N* = 25). See page 152

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Hours training T1	1																	
Hours training T2	0.634**	1																
	0.001																	
Hours training T3	.614**	0.696**	1															
	0.001	0.000																
E T1	-0.293	-0.169	-0.150	1														
	0.155	0.420	0.476															
E T2	-0.152	-0.025	-0.119	.692**	1													
	0.467	0.905	0.571	0.000														
E T3	-0.353	-0.140	0.079	0.660**	0.433*	1												
	0.083	0.506	0.708	0.000	0.031													
CAR T1	0.066	-0.095	-0.232	-0.486*	-0.457*	-0.377	1											
	0.756	0.650	0.264	0.014	0.022	0.063												
CAR T2	-0.279	-0.178	-0.442*	-0.165	0.111	-0.018	0.329	1										
	0.178	0.394	0.027	0.430	0.599	0.932	0.109											
CAR T3	-0.012	0.063	0.055	-0.353	-0.162	-0.128	0.538**	0.411*	1									
	0.953	0.765	0.796	0.084	0.440	0.542	0.006	0.041										
Saliva change	0.004	-0.127	-0.070	0.179	0.173	0.147	-0.363	-0.154	-0.113	1								
	0.985	0.546	0.740	0.393	0.409	0.483	0.075	0.463	0.589									

T1																	
Saliva change T2	-0.361	-0.169	-0.341	0.228	0.149	0.349	-0.295	-0.138	-0.368	0.090	1						
	0.076	0.419	0.096	0.274	0.476	0.087	0.153	0.511	0.070	0.669							
Saliva change T3	0.110	0.099	-0.011	-0.121	0.002	-0.106	-0.029	-0.130	-0.319	-0.306	0.266	1					
	0.601	0.639	0.958	0.565	0.993	0.614	0.890	0.534	0.120	0.137	0.199						
Total Distance T1	0.141	-0.128	-0.146	0.201	0.070	-0.048	0.103	-0.066	0.099	0.014	-0.072	-0.313	1				
	0.502	0.543	0.487	0.334	0.738	0.819	0.624	0.753	0.637	0.946	0.732	0.127					
Total Distance T2	0.133	0.013	-0.037	0.038	0.056	0.032	0.085	0.065	0.081	-0.123	0.097	-0.356	0.736**	1			
	0.526	0.951	0.860	0.857	0.789	0.878	0.686	0.757	0.699	0.559	0.643	0.081	0.000				
Total Distance T3	0.304	0.071	0.071	0.007	-0.051	-0.113	0.133	-0.073	0.083	-0.005	-0.184	-0.286	0.840**	0.843**	1		
	0.139	0.737	0.734	0.972	0.809	0.592	0.525	0.727	0.693	0.983	0.379	0.166	0.000	0.000			
Stroop score T1	-0.262	-0.081	0.079	0.355	0.004	0.233	-0.264	-0.352	-0.317	0.060	0.227	-0.177	-0.112	0.138	0.041	1	
	0.206	0.700	0.709	0.082	0.985	0.262	0.202	0.084	0.123	0.777	0.275	0.396	0.593	0.510	0.847		
Stroop score T2	-0.323	-0.076	-0.042	0.322	0.084	0.231	-0.106	-0.175	-0.156	0.114	0.282	-0.184	-0.068	0.189	0.126	0.860**	1
	0.115	0.719	0.841	0.116	0.691	0.267	0.615	0.403	0.456	0.589	0.172	0.380	0.746	0.365	0.550	0.000	
Stroop score T3	-0.246	0.038	0.110	0.239	0.039	0.125	-0.083	-0.266	-0.231	-0.004	0.150	-0.015	-0.098	0.064	0.036	0.817**	0.890**
	0.237	0.856	0.602	0.251	0.853	0.552	0.693	0.198	0.267	0.985	0.475	0.943	0.642	0.762	0.863	0.000	0.000

Note: ** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed); T1 = Time One; T2 = Time Two; T3 = Time Three.

5.7.2. Structural Equation Modelling

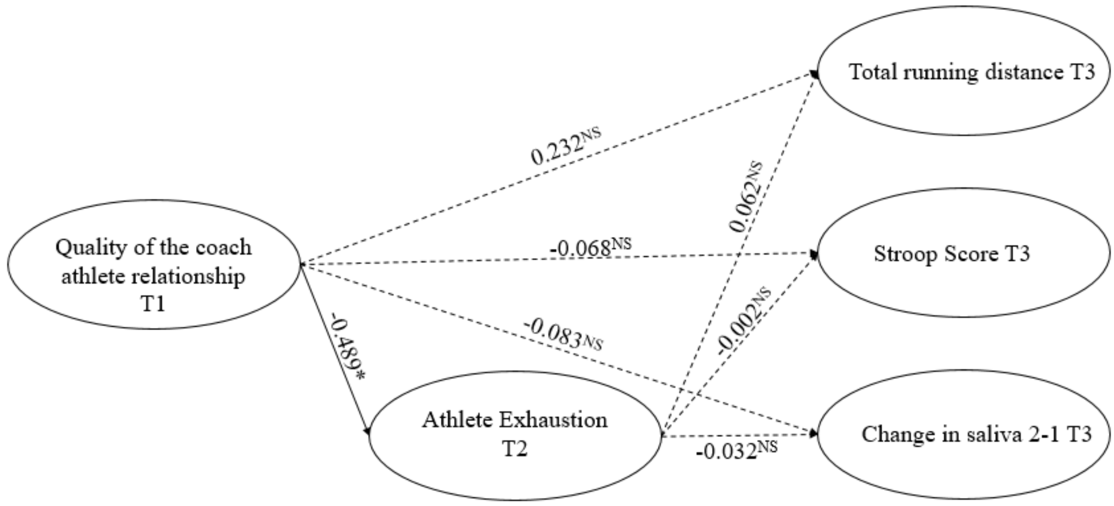

Figure 5. 6. Structural equation modelling of the relationships between the quality of the coach-athlete relationship and exhaustion, and various psych-physiology outcomes.

The structural equation model, presented in Figure 5.6., revealed a relatively good fit to the data (*df* = 11, χ^2 = 12.080, RMSEA = 0.064, TLI = 0.900, CFI = 0.948). The quality of the coach-athlete relationship was negatively related to athlete exhaustion (β = -0.489, *p* = 0.026). Coach-athlete relationship quality did not predict participants' performance on the physical task (total distance completed during the shuttle-run test, β = 0.232, *p* = 0.626), salivary cortisol from pre to post testing (β = -0.068, *p* = 0.754), or on Stroop performance (β = -0.083, *p* = 0.797). Athlete exhaustion did not predict participants' performance on the physical task (β = 0.062, *p* = 0.793), salivary cortisol from pre- to post-testing (β = -0.032, *p* = 0.896), or Stroop performance (β = -0.002, *p* = 0.995). Based on these findings and considering the recommendations of Preacher and Hayes (2008), these results would indicate that athlete exhaustion would not mediate a link between coach-athlete relationship and the performance variables. To further explore this, a mediation test was conducted

5.7.3. Mediation Test

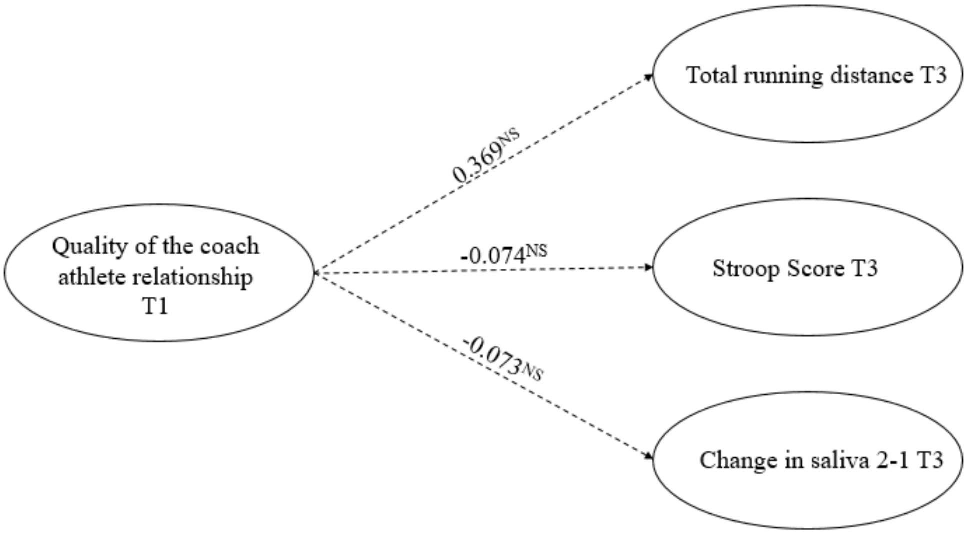

Figure 5. 7. Structural equation modelling of the relationships between the quality of the coach-athlete relationship and the performance outcomes.

The structural equation model presented in Figure 5.7., revealed that the model had relatively good fit (*df* = 9, χ^2 = 9.504, RMSEA = 0.048, TLI = 0.958, CFI = 0.975). The results of the mediation test are presented in Table 5.5. According to the bootstrapping procedure, the total effect of the quality of the coach-athlete relationship on physiological performance was not significant (total distance β = 0.369, p = 0.097; Stroop Score β = -0.074, p = 0.679; changes in salivary cortisol from pre- to post-testing β = -0.073, p = 0.685). Furthermore, when exhaustion was entered into the model as a mediator variable, the direct effect between the quality of the coach-athlete relationship and physiological performance variables were not significant (total distance β = 0.232, p = 0.626; Stroop Score β = -0.083, p = 0.797; changes in salivary cortisol from pre to post testing β = -0.068, p = 0.754). The proposed mediator of exhaustion did not have a significant indirect effect with the measures of physiological performance (total distance β = -0.031, p = 0.978; Stroop Score β = 0.001, p = 0.981; changes in salivary cortisol from pre to post testing β = 0.015, p = 0.980). Although there was a statistically significant relationship between athlete exhaustion and the quality of the coach-athlete relationship (β = -0.489, p = 0.026), there was no statistically significant relationship between the quality of the coach-athlete relationship and physiological performance outcomes measured. Consequentially, the relationship between the quality of the coach-athlete relationship and physiological performance was not mediated by athlete exhaustion.

Table 5. 5. Indirect effect of the coach-athlete relationship on physiological performance through exhaustion.

	Direct without Mediator	Direct with Mediator	Indirect (two tailed bootstrap)	95 % Bias corrected and accelerated C.I.	
				Lower	Upper
Cart --E--Distance	0.369 (p = 0.097)	0.232 (p = 0.626)	-0.031 (p = 0.978)	-0.315	0.171
Cart --E--Stroop	-0.074 (p= 0.679)	-0.083 (p = 0.797)	0.001 (p = 0.981)	-0.323	0.367
Cart --E--Saliva	-0.073 (p= 0.685)	-0.068 (p = 0.754)	0.015 (p = 0.980)	-0.188	0.138

5.8. Discussion

The aim of the present study was to examine relationship between the quality of the coach-athlete relationship, cognitive and physical performance, as well as athlete exhaustion utilising two phases. In relation to Phase One, the findings arising from the SEM analysis suggest that the quality of the coach-athlete relationship was associated with better cognitive performance on the Stroop test however, relationship quality was unrelated to physical performance on the running task. The partial support of the hypothesis suggests further investigation of the associations between the quality of the coach-athlete relationship and athletes' performance outcomes is warranted. In particular, cognitive performance may be closer linked with the attributions underpinning subjective self-ratings of performance (Biddle et al., 2001), and could relate with previous research observing associations between coach-athlete relationship quality and subjective performance (Rhind & Jowett, 2010).

The findings of the Phase One highlight that coach-athlete relationship quality may have a greater impact on cognitive sub-components of sport performance, and the appraisal of potentially stressful demands, rather than impact directly upon physical aspects of sport. Previous research examining the anxiety-performance relationship highlights that anxiety can be associated with diminished concentration and impaired decision making (Allen, Jones, McCarthy, Sheehan-Mansfield, & Sheffield, 2013). Further, in testing the second hypothesis the findings of the present study suggest that an athlete's anxiety response to performance demands may be influenced by relationship quality with his/her coach. More specifically, the pattern of responses observed in the measurement of biomarkers of stress (i.e. changes in salivary cortisol concentration) may suggest that athletes reporting a positive perception of their coach-athlete relationship perceived the physical and cognitive tests as being less stressful. Research examining coach-athlete emotion congruence suggests that athletes' perceptions of optimal performance are associated with emotional states that align with desired emotional states often derived from interactions with coaches (Friesen, Lane, Galloway, et al., 2017); coach-athlete relationship quality can be enhanced by a coach's use of effective interpersonal emotion regulation strategies (Davis & Davis, 2016).

However, further research was required to assess the potential causality of the observed link between the quality of the coach-athlete relationship and performance markers as indicated by Phase One. Phase Two sought to investigate these associations over a longer period of time; hypothesising that high-quality coach-athlete relationships would predict improved scores on physical and cognitive performance (Total running distance and Stroop scores) and physiological responses (acute changes in salivary cortisol). The results of Phase Two indicate that the quality of the coach-athlete relationship at the beginning of the season was unable to predict the physical and cognitive variables at the end of the season. This finding does not support the original hypothesis and contradicts previous research which has investigated the associations between the quality of the coach-athlete relationship and subjective performance levels (Gillet et al., 2010; Rhind & Jowett, 2010). Specifically, Phase Two revealed that those athletes who reported high feelings of trust, commitment, and complementarity with their coach, were likely to perform equally as well on running and cognitive tasks as those athletes who had reported poor relationships with their coach. Furthermore, the degree to which an athlete perceived their coach-athlete relationship at Time One as being close and mutual in appreciation had no influence on their cortisol response to physical and cognitive testing at Time Three. These findings suggest that the quality of the coach-athlete relationship (e.g. an appraisal made by the athlete) may be more closely linked to the athlete's perceptions (e.g. perceptions of their own exhaustion) or subjective self-ratings of performance (Rhind & Jowett, 2010), rather than objective measures of performance over time.

Both Phase One and Phase Two examined the relationship between the CAR and athlete exhaustion, the findings indicate that the quality of the coach-athlete relationship was negatively related to athlete exhaustion. This supports previous research suggesting that coach-athlete relationship quality can be associated with athlete exhaustion (Isoard-Gautheur et al., 2016) and highlights the importance of the social environment in athletes' sport experiences (Arnold, Fletcher, & Daniels, 2016; DeFreese & Smith, 2014; Fletcher et al., 2006). Phase Two utilised a three-wave longitudinal design to assess whether the quality of the coach-athlete relationship would predict athlete exhaustion. The findings of the current study indicate that the quality of the coach-athlete relationship at the beginning of the season was able to predict athletes' exhaustion at the middle of the season. This suggests that coach-athlete relationships characterised as being close, committed, and complementary at the start of the season can lead to lower levels of athlete exhaustion in the middle of the season. This follows a similar pattern to Phase One and previous findings (Cresswell & Eklund, 2007; Gustafsson, Holmberg, & Hassmén, 2008; Isoard-Gautheur et al., 2016), where athletes who reported higher levels of cooperation with their coach and intended to maintain long-term partnerships, were more likely to perceive lower levels of their own exhaustion. The present study builds on previous findings by exploring associations between the coach-athlete relationship quality and athlete exhaustion over time.

In relation to the final hypothesis, it was proposed that athlete exhaustion would mediate the link between the quality of the coach-athlete relationship and physical performance. The findings from Phase Two suggest that the quality of the coach-athlete relationship at the beginning of the season was able to predict athlete exhaustion at the second time point. However, the perceived quality of the coach-athlete relationship at beginning of the season was unrelated to physical and cognitive performance measured at the end of the season. Furthermore, athlete exhaustion did not mediate the relationship between the quality of the coach-athlete relationship and the physiological variables. Research has previously highlighted a relationship between athlete exhaustion and performance during training and match-play (Goodger, Gorely, Lavallee, & Harwood, 2007; Moen, Myhre, Klöckner, Gausen, & Sandbakk, 2017). Thus, we proposed that athletes experiencing exhaustion would perceive themselves as unable to deal with situational demands (e.g. high training load, coach-athlete relationship) and consequently impact negatively on their ability to maintain performances (Cresswell & Eklund, 2006b).

The current study showed though, that athlete exhaustion did not mediate the relationship between the quality of the coach-athlete relationship and the physical and cognitive variables. To be specific, our findings indicated that the athlete's feeling of emotional and physical exhaustion were unrelated to distance covered on a shuttle-run test, their performance on a Stroop test, and the acute cortisol response of the athlete to physical and cognitive testing. Future research may wish to consider alternative approaches to the assessment of athletes' physical performance, for example distance covered in games or seasonal volume of training may offer a more accurate representation of athletes' on-field performance (Anderson et al., 2016).

The present study utilised a longitudinal research and quasi-experimental design in order to further investigate the causal relationship between the quality of the coach-athlete relationship, athlete exhaustion, as well as cognitive and physical performance. The necessity of this line of enquiry has been previously highlighted within the burnout research field (Lundkvist et al., 2017). However, the current study presents a number of limitations, which should be acknowledged. Firstly, the design of the study involved a 5 m multiple shuttle-run test and a Stroop test, which may have limited ecological validity in relation to athletes' actual in-competition performance demands. The limitations associated with the ecological validity of the tests may have influenced the findings of the study, as the quality of the coach-athlete relationship at the beginning of the season was unrelated to the performance of the athletes at end of the season perhaps, in part due to the novelty of the tasks.

Second, an important consideration is the role of the coach during the testing of the athletes. During the present study, performance outcomes may not have been influenced by coach-athlete relationship quality due to athletes perceiving the role of the coach-athlete relationship to be insignificant, or inconsequential to the completion of the tests, especially considering that coaches were not present at testing. As the physical testing was conducted as part of the strength and conditioning program, rather than at the usual location for matches and training, the link between athletes' exhaustion and performance may not have been salient to the athletes. Further to this point, the exhaustion aspects of the athlete burnout questionnaire are related to sports participation and involvement (i.e. "I feel physically worn out from [sport], I am exhausted by the mental and physical demands from [sport]") and not directly linked with strength and conditioning training demands. Future research may wish to consider whether the physical presence of the coach during testing influences the potential link between sport performance and coach-athlete relationship quality. This could be further enhanced by measuring athletes' actual on-field performance during training sessions and/or competition, rather than in a laboratory based setting.

It was proposed that athletes' perceptions of their relationship with their coach would influence their performance and perceptions of exhaustion. This was only partially supported by the current study, as the quality of the coach-athlete relationship predicted athlete exhaustion. Phase One indicated that coach-athlete relationship quality may enhance cognitive functioning as well as reduce levels of acute stress responses. However, this was not supported in Phase Two. Further, athlete exhaustion did not mediate the relationship between the quality of the coach-athlete relationship and athletes' physical and cognitive performance. Despite the limitations of the current study, the findings present a number of applied implications for coaches. The findings of the current study suggest that the relationships that athletes' form with their coaches are crucial in protecting athletes from developing exhaustion. In particular, it is crucial that coaches seek to build strong relationships with their athletes that are based on commitment, closeness, and complementarity to optimise athletes' health and performance.

Chapter 6: The Physical Implications of Athlete Exhaustion and the Quality of Coach-Athlete Relationship: A Case Study

Study 4

6.1. Abstract

The present study aimed to investigate whether athletes' scores regarding athlete exhaustion and coach-athlete relationship quality would account for differences in sporting performance. Fourteen male footballers completed questionnaires measuring exhaustion, and coach-athlete relationship quality on two separate occasions separated by 10 weeks. The total distance covered during each training session and game was recorded as well as weekly counter movement jump (CMJs) scores. Mixed factor modelling was conducted to assess whether differences in the quality of the coach athlete relationship and athlete exhaustion accounted for differences in performance. Findings indicated that athlete exhaustion at Time One ($F(1, 162.32) = 4.59$, $p = 0.034$) and the quality of the coach-athlete relationship at Time Two ($F(1, 164.60) = 33.53$, $p < 0.001$) were able to predict the running distance covered by athletes during training session. Performance on CMJs was predicted by athlete exhaustion at Time One ($F(1, 6.96) = 6.35$, $p = 0.041$), coach-athlete relationship quality at Time One ($F(1, 6.90) = 5.62$, $p = 0.049$), and the interaction effect between athlete exhaustion at Time One and coach-athlete relationship quality at Time One ($F(1, 6.96) = 6.35$, $p = 0.049$). Athlete exhaustion and the quality of the coach-athlete relationship did not predict the running distance covered by athletes during games. The analysis revealed that athletes who measured high on emotional and physical exhaustion were likely to run further in training but not jump as high on CMJs. Results indicate athletes who perceived their relationship with their coach as being close, committed and complementary were likely to have a lower CMJ score. The interaction effect between athlete exhaustion at Time One and coach-athlete relationship quality at Time One suggests that the coach athlete relationship acts as a protective mechanism when exhaustion is high to maintain CMJs performance. Athlete exhaustion and coach-athlete relationship has implication on the performance of athletes in the applied environment.

Key words: coach-athlete relationship, exhaustion, team sports, performance

6.2. Introduction

The cognitive-affective experiences of participating in sport have implications for athletes' well-being and psychological health (Gustafsson, DeFreese, & Madigan, 2017). Athletes' perceptions of their social environment can influence the individual athlete, for example, the quality the coach-athlete relationship (refer to Chapter 5) and athletes' perception of their teammates' burnout (refer to Chapter 4). Although research has begun to examine the cognitive and psychological impact of coach-athlete relationship (refer to Chapter 5), longitudinal research investigating the physical implications of athlete exhaustion and the quality of the coach-athlete relationship within applied sporting environments remains under represented in the field. Previously, the integrated model of athlete burnout has suggested performance implications as a consequence of athlete burnout (Gustafsson et al., 2011).

The previous experimental study (Chapter 5) sought to investigate whether the coach-athlete relationship and the athlete's perception of exhaustion were related to the physiological performance of athletes. Phase one (Chapter 5) a cross-sectional analysis of data from time 1 indicated that athletes' perception of the coach was related to their own performance on a Stroop task and the cortisol response to a stressor as well as athletes exhaustion scores. To examine the possible causality of the finding of phase one and the suggestions of the integrated model of athlete burnout (Gustafsson et al., 2011) the relationship was examined over time (Phase two, Chapter 5). The results of phase two did not indicate that a significant relationship between the coach-athlete relationship at Time One and the physical and cognitive performance of athletes at Time Three. Additionally, there was no significant relationship between exhaustion at Time Two and the athlete's physical and cognitive performance at Time Three. However, the quality of the coach athlete relationship at Time One was associated with athlete exhaustion at Time Two. In part the previous chapter supported the integrated model of athlete burnout (Gustafsson et al., 2011), however further research is required. A possible explanation for the findings may be the physical test chosen does not reflect the sporting performance and is associated rather with the strength and conditioning programme. Many team sports (i.e. football, rugby) require each athlete to maintain high-intensity exercise (Mohr, Krustrup, & Bangsbo, 2005) rather than to perform well on a physical and cognitive tests.

Previous research has suggested that athlete exhaustion and the athlete's perception of the coach-athlete relationship influences the individuals' sporting performance (i.e. athlete burnout and performance (Goodger, Gorely, Lavallee, & Harwood, 2007; Moen, Myhre, Klöckner, Gausen, & Sandbakk, 2017), coach-athlete relationship and subjective performance levels (Gillet, Vallerand, Amoura, & Baldes, 2010; Rhind & Jowett, 2010). Rather than focussing on physical and cognitive testing it is crucial that researchers look to incorporate applied research designs into research. One of the most common methods to quantify intensity activities during training and games is to determine the total distance the athletes cover (Bradley et al., 2009; Mohr, Krustrup, & Bangsbo, 2003). Global positioning system (GPS) technology is commonly used within professional sport as a method of assessing the physical demand of training and games within team sports (Aughey, 2011; Vickery, Dascombe, & Duffield, 2017) and is utilised to assess the physiological performance of athletes. Countermovement jumps (CMJs) have also been shown to be a reliable and a useful way of detecting low frequency fatigue in team sport athletes (Cormack, Newton, McGuigan, & Doyle, 2008; McLean, Coutts, Kelly, McGuigan, & Cormack, 2010). As such the total distance athletes cover during games and training as well as athletes CMJs may be reliable methods of athlete's physical performance in order to assess the potential influence of athlete exhaustion and the quality of the coach-athlete relationship.

6.2.1. Aim

To further test the appropriateness of aspects of the integrated model of athlete burnout (Gustafsson et al., 2011). The current study aimed to assess the potential impact exhaustion and coach-athlete relationship quality have on physical performance of athletes within an applied environment (i.e. GPS) and on CMJ. First, considering that athlete exhaustion has been linked to the performance of athletes (Goodger et al., 2007; Moen et al., 2017), we aimed to explore the relationship between athlete exhaustion and performance. Second, as a consequence of previous findings suggesting that the coach-athlete relationship may impact the athletes' performance (Gillet et al., 2010; refer to Chapter 5), the current study looks to further explore this possible relationship in an applied environment. Finally, we aimed to assess whether a possible interaction effect between quality of the coach athlete relationship and athlete exhaustion which may influence the performance of athlete (i.e., running distance in games and training, CMJ height).

6.2.2. Hypothesis

In light of previous research, three hypotheses were proposed. First, we expected that high exhaustion at Time One will predict poor performance across the 10 weeks (i.e., lower distance during games and training, as well as lower jump as high on a CMJ). Second, we propose that high quality coach-athlete relationships at Time One would predicted better performances on the physical measures recorded over the 10 weeks. Third, we expect that there may be an interaction effect between which may predict the performance of athletes.

6.3. Method

6.3.1. Participants

A total of 14 male football athletes aged 17.36 years old (SD = 0.63) participated in the current study. All of the athletes were actively competing for a Premiership football academy under-18's team based in the United Kingdom and had been playing football for 12.33 (SD = 1.21) years and had been competing in their current team for 5.87 (SD = 4.47) years. The head coach was new in position at the beginning of the year, each athlete has established a relationship with the head coach for 6 months before Time One. Each participant completed 11.64 hours of training (SD = 0.50) each week at the football academy's training bases.

6.3.2. Procedure

Ethical approval was gained from the research ethics committee of the author's university prior to conducting the study. Initially, the Director of Football at the club was contacted in order to obtain permission to conduct the study at the Premiership football academy. Alongside the strength and conditioning coach for the under-18 team the researcher distributed the information sheets to coaches, athletes and parents prior to participants granting written consent. On approval, and before a prearranged training session, potential athletes were informed of the nature of the study and invited to partake in the study. Athletes who agreed to take part in the study did so as part of their normal strength and conditioning program as well as academy training programme. At the beginning, (week 1, March [the mid-point of the competitive season]) and the end of the 10 weeks (week 10, May [in the last month of the competitive season]) study period, participants were required to complete a demographic questionnaire, the Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001), and the Coach–Athlete Relationship

Questionnaire (CART-Q; Jowett, 2009). Over the course of the 10 weeks, participants completed CMJs every Tuesday between 8:00 am and 10:00 am. While taking part in the study, the total distance athletes covered in all match and training days for each of the participants was recorded by the football academy and made available to the researcher. Data was collected at the academy training facility, except for the GPS data collected at an external facility (i.e. during away fixtures).

6.3.3. Questionnaire Measurements

Demographic and Background Inventory. Participants provided a variety of demographic information at the beginning of the study alongside the collection of the other measures including: age, years of competitive experience, years played with current team, and level of sport played.

Athlete Exhaustion. Each athlete's level of exhaustion was assessed using items from the Athlete Burnout Questionnaire (ABQ; Raedeke & Smith, 2001). Only the five items referring to physical and emotional exhaustion of athletes were used for the present study as previously adopted in Chapter 5 (e.g. "I feel overly tired from my sport participation"). The stem for each item was "How often do you feel this way?" to which participants responded on a five-point Likert Scale, anchored by (1) *"Almost Never"* to (5) *"Almost Always"*. In the present study the athlete exhaustion dimension of the ABQ showed good psychometric properties with internal consistencies (α = 0.87). Previous research has suggested that the ABQ has strong psychometric validity (α = 0.80) for all of all three subscales (Raedeke & Smith, 2001; Smith, Gustafsson, Hassmén, 2010).

Coach-Athlete Relationship. The 11-item Coach-Athlete Relationship Questionnaire (CART-Q; Jowett, & Ntoumanis, 2004) was used to measure athletes' direct perception of the quality of the coach-athlete relationship (Jowett, 2008). The 11-item direct perspective has four items assessing closeness (e.g. "I like my coach"), three items assessing commitment (e.g. “I am committed to my coach”) and four items assessing complementarity (e.g. “When I am coached by my coach, I am ready to do my best”). All CART-Q items were measured on a Likert-type seven-point scale ranging from 1 *“Strongly Disagree*” to 7 *“Strongly Agree”*. In the present study the CART-Q shows strong psychometric properties with internal consistencies (α > 0.75) for all three subscales.

6.3.4. Physical Performance

Distance Covered. The physical performance of athletes was assessed by the distance each athlete covered across the 10-week period during each individual training session or match. The distance each athlete covered during games and training was assessed by GPS microtechnology devices. Each GPS devices sampled at 10 Hz (Team S4, Firmware 6.88, Catapult Sports, VIC, Australia). The participants were required to wear GPS devices during all of their outdoor training sessions and games. The majority of games and training took place outside however, on the occasion the participants trained or played indoor they did not wear the GPS devices as they were unable to accurately record the distance covered by athletes during indoor sessions. The process of wearing GPS devices and having the GPS data recorded is familiar to the participants as GPS data is recorded by the academy’s strength and conditioning coach throughout the season. After each of the match and training session the academy’s strength and conditioning coach recorded the total distance covered by each of the participants on a laptop (MacBook Air, Apple, China).

Countermovement Jumps. CMJs were used as a method of measuring the physical performance of the participants. All of the CMJs were completed at a similar time (between 8:00 am - 10:00 am) the same day each week prior to completing the scheduled strength and conditioning session. Before commencing the CMJs, participants were instructed to perform a standardised group warm-up led by the team strength and conditioning coach. The warm-up included a number of different movement patterns at various increasing levels of intensity culminating in three submaximal practice jumps. Athletes then performed two CMJs with their hands held on the hips and were instructed to jump as high as possible for each attempt. (McLean et al., 2010). The participants had approximately 60 s between each jump. The maximal countermovement height was recorded (OptoJump Next; Microgate SRL, Italy) and the mean height of two jumps was calculated and utilised in the data analysis as a representative for each week. All of the jumps were performed by the athletes at a self-selected depth and no instruction was given as to what countermovement depth to use.

6.3.5. Data Analysis

Statistical analyses were conducted using SPSS Statistics software (IBM Inc., USA) with significance set at $p \leq 0.05$. Descriptive statistics and bivariate correlations were conducted on all of the variables. Paired samples t-tests and mixed factor modelling were conducted to assess the three hypotheses.

6.4. Results

6.4.1. Psychological Measures

Initially, preliminary data screening was performed in accordance with procedures outlined by Tabachnick and Fidell (2007) where data were assessed for missing values, outliers and violations of the assumptions of multivariate analysis. Descriptive statistics and bivariate correlations amongst variables are presented in Table 6.1. The athletes scores for ABQ exhaustion were low to moderate, indicating that participants are experiencing low or moderate levels of exhaustion, this is commonly reported amongst athletes (Gustafsson, Davis, Skoog, Kenttä, & Haberl, 2015; Raedeke & Smith, 2009). Athletes also scored moderate to high on the CART-Q, which is representative of athletes who perceive their coach-athlete relationships as moderate to high (Jowett, & Ntoumanis, 2004).

Table 6. 1. Demographic variables and correlations matrix of the psychological measures: exhaustion and quality of coach-athlete relationship

	1	2	3	4
1. Exhaustion (Time One)	1			
2. Exhaustion (Time Two)	0.777^{**}	1		
3. Coach-athlete relationship (Time One)	-0.287	-0.361	1	
4. Coach-athlete relationship (Time Two)	-0.042	-0.176	0.468	1
	-0.071	-0.246	-0.341	-0.070
Cronbach α	0.827	0.673	0.913	0.933
M	2.97	2.75	4.28	4.65
SD	0.80	0.48	1.13	0.98

6.4.2. Changes in Psychological Variables over the 10 weeks

Paired samples t-tests were conducted to assess the changes in the psychological variables across the 10 weeks, specifically investigating athlete’s experience of exhaustion and their perception of the quality of the coach-athlete relationship changes. There was no significant change in athlete exhaustion between Time One (M = 2.97, SD = 0.80) and Time Two (M = 2.75, SD = 0.48), $t(13) = -1.27$, $p = 0.226$, $d = 0.585$. There was no significant difference between the quality of the coach-athlete relation at Time One (M = 4.28, SD = 1.13) and Time Two (M = 4.65, SD = 0.95), $t(13) = 1.55$, $p = 0.146$, $d = 0.481$.

6.4.3. Mixed Factor Modelling

To examine the effect of athlete exhaustion and the quality of the coach-athlete relationship on the performance of athletes (i.e., CMJ, running distance in training and games), generalised linear mixed-models for longitudinal data were used (Hedeker, 2005).

This method of analysis allows the inclusion of fixed linear predictor models as well as random variances to account for cluster-related correlations in data (i.e., multiple data collection points). Generalised linear mixed-models consider all available data points and accounts for missing data, which conforms to the aim of the study to look at all athletes individually. Models were entered in increased complexity by. firstly, including sessions into the model to assess whether there was a significant difference across the 10 weeks. Following this, the athletes scores on athlete exhaustion and coach-athlete relationship quality at both Time One and Time Two were added to the model. Finally, the model included two interaction effects between the athletes score of exhaustion and the quality of the coach-athlete relationship at both time points (i.e., Exhaustion Time One*Coach-athlete relationship Time One, Exhaustion Time Two*Coach-athlete relationship Time Two). At each stage the Akaike information Criterion (AIC) was calculated and determined the fit of the model (Yu, 2015).

6.4.4. Total Distance Covered During Training

The first generalized linear mixed-models were used to analyse changes in athletes' running distance during training, whether running performance of athletes during training was related to their score on exhaustion, and the quality of the coach-athlete relationship at both time points. The models were also used to assess the interaction effect of exhaustion and the quality of the coach-athlete relationship on performance during training. Considering recommendations by Field (2013), an empty model without predictors was initially tested in order to assess any differences between the sames on the depedant variable (Null Model). The Null model included the total distance covered by athletes in each of the 29 training session across the 10 weeks. Model A included athlete exhaustion and the coach-athlete relationship at both time points. Model B included the interaction between athlete exhaustion and the coach-athlete relationship at both time points. The results show that there was a significant difference in the total distance covered by athletes in each of the training sessions, $F(28, 15.07) = 52.57$, $p < 0.001$. Including athlete exhaustion and the coach-athlete relationship at both time points as a fixed factors improved the fit of the model, *BIC* = 4444.88 (Null Model) to *BIC* = 4353.60 (Model A). In this model, results show that athlete exhaustion at Time One, $F(1, 162.32) = 4.59$, $p = 0.034$, and coach-athlete relationship quality at Time Two, $F(1, 164.60) = 33.53$, $p < 0.001$, significantly predicted the distance covered by athletes during training. Including the interaction improved the model fit, *BIC* = 4327.53 (Model B). The interactions did not significantly predict athlete exhaustion and there were no other significant relationships.

Table 6.2. Parameter Estimates (SE) for the generalized linear mixed-models performed on distance covered in training sessions.

	Null Model	Model A	Model B
Fixed effects			
Intercepts (t-value)	5166.94**(36.98)	3191.74**(9.84)	6476.91**(3.35)
Exhaustion at Time One		125.99*(2.12)	-272.80 (-0.79)
CAR at Time One		21.55 (0.74)	-615.70 (-0.83)
Exhaustion at Time Two		143.00 (1.37)	-178.74 (-0.30)
CAR at Time Two		218.46**(5.79)	-.39 (0.27)
Exhaustion at Time One* CAR at Time One			71.33 (0.81)
Exhaustion at Time Two* CAR at Time Two			162.59 (0.82)
Overall model test			
-2LL	4282.74	4191.90	4166.05
AIC	4340.73	4249.90	4224.05
BIC	4444.88	4353.60	4327.53

Note. * $p < 0.05$, ** $p < 0.00$.

6.4.5. Countermovement Jumps

The second generalized linear mixed-models was used to analyse changes in athlete CMJs performance and if this was related to athletes score on exhaustion and the quality of the coach-athlete relationship at both time points. The models were also used to assess the interaction effect of exhaustion and the quality of the coach-athlete relationship on CMJs scores. The Null model included the CMJs scores for athletes from 8 testing sessions across 10 weeks. Model A included athlete exhaustion and the coach-athlete relationship at both time points. Model B included the interaction between athlete exhaustion and the coach-athlete relationship at both time points. Results show that there was a significant difference in the CMJs scores of athletes across the 10 weeks, $F(7, 66.00) = 2.86$, $p = 0.012$. Including athlete exhaustion and the coach-athlete relationship at both time points as a fixed-factors improved the fit of the model, $BIC = 374.46$ (Null Model) to $BIC = 360.92$ (Model A). There were no significant relationships between exhaustion, coach-athlete relationship quality, and CMJs performance. Accounting for the interaction improved the model fit, $BIC = 345.44$ (Model B). In Model B, results show that athlete exhaustion at Time One, $F(1, 6.96) = 6.35$, $p = 0.041$, and coach-athlete relationship quality at Time One, $F(1, 6.90) = 5.62$, $p = 0.049$, significantly predicted athletes counter movement scores. The interaction effect between athlete exhaustion at Time One and coach-athlete relationship quality at Time One significantly predicted athletes CMJs scores, $F(1, 6.96) = 6.35$, $p = 0.049$. No other significant relationships were present.

Table 6.3. Parameter Estimates (SE) for the generalized linear mixed-models athlete counter movement performance.

	Null Model	Model A	Model B
Fixed effects			
Intercepts (t-value)	37.82**(31.40)	45.28*(3.93)	24.56 (0.34)
Exhaustion at T1		-1.67 (-0.68)	-21.08*(-2.50)
CAR at T1		0.05 (0.04)	-27.57*(-2.37)
Exhaustion at T2		1.09 (0.26)	33.12 (1.18)
CAR at T2		-1.22 (-0.86)	32.25 (1.47)
Exhaustion at T1* CAR at T1			7.22*(2.38)
Exhaustion at T2* CAR at T2			-10.79 (-1.42)
Overall model test			
-2LL	365.72	352.30	337.86
AIC	369.71	356.30	341.86
BIC	374.46	360.92	345.44

Note. * $p < 0.05$, ** $p < 0.00$.

6.4.5. Total Distance Covered During Game-Play

The third generalized linear mixed-models was used to analyse changes in athlete running distance during games, and if this was related to athletes score on exhaustion and the quality of the coach-athlete relationship at both time points. The models were also used to assess the interaction effect of exhaustion and the quality of the coach-athlete relationship on distance covered by athletes during games. The Null model included the distance covered by athletes in the 5 games data was available across the 10 weeks. Model A included athlete exhaustion and the coach-athlete relationship at both time points. Model B included the interaction between athlete exhaustion and the coach-athlete relationship at both time points. Results show that there was no significant difference in the distance covered by athletes in games across the 10 weeks, $F(4, 35.61) = 1.83$, $p = 0.145$. Including athlete exhaustion and the coach-athlete relationship at both time points as a fixed-factors improved the fit of the model, *BIC* = 917.85 (Null Model) to *BIC* = 859.73 (Model A). There were no significant relationships between exhaustion, coach-athlete relationship quality, and athletes running performance during games. Accounting for the interaction improved the model fit, *BIC* = 821.43 (Model B). The interactions did not significantly predict athlete exhaustion and there were no other significant relationships.

Table 6. 2. An overview of games played in the testing period

Game	Date	Week	Home/Away	Result
1	12.03.16	2	Home	3-0 Win
2	19.03.16	3	Away	1-0 Win
3	10.04.16	6	Home	1-1 Draw
No data available	16.04.16	7	Away	4-1 Win
4	23.04.16	8	Home	1-4 Loss
5	30.04.16	9	Home	4-1 Win

Table 6.5. Parameter Estimates (SE) for the generalized linear mixed-models athlete counter movement performance.

	Null Model	Model A	Model B
Fixed effects			
Intercepts (t-value)	8950.22 (40.15)	2371.56 (0.26)	-50143.49 (-0.81)
Exhaustion at T1		-171.81 (-0.10)	7723.92 (1.07)
CAR at T1		-185.61 (-0.21)	7944.04 (0.80)
Exhaustion at T2		495.34 (0.16)	9932.08 (0.41)
CAR at T2		1328.25 (1.13)	4016.80 (0.21)
Exhaustion at T1* CAR at T1			-2076.38 (-0.81)
Exhaustion at T2* CAR at T2			-1428.10 (-0.22)
Overall model test			
-2LL	917.85	852.16	813.96
AIC	922.12	856.16	817.96
BIC	917.85	859.72	821.43

Note. * $p < 0.05$, ** $p < 0.00$.

6.5. Discussion

The aim of the present study was to further investigate the potential influence of athlete exhaustion and coach-athlete relationship quality on an athlete’s performance as suggested in the integrated model of athlete burnout (Gustafsson et al., 2011). As part of the preliminary investigations, changes in physiological variables were calculated. Findings from Study 2 (Chapter 4) suggested that athlete exhaustion can increase over the course of a three month period, however, findings of the current study revealed no significant change in athlete exhaustion over a similar time frame. The findings of the current study parallel the results of Lonsdale and Hodge (2011) and Madigan et al. (2015), which indicate that athlete's perception of their own burnout level did not significantly change over a competitive season. It could be possible that burnout is relatively stable over short periods of time (i.e. less than three months as in the current study), but more likely to fluctuate during longer periods of time (i.e. three years (Ingrell et al., 2018). The quality of the coach-athlete relationship is partially the athlete’s perception of maintaining a long-term relationship with their coach (Davis & Jowett, 2014; Jowett & Cramer, 2010). Consequentially, the findings of the current study indicate that the athlete’s perception of the quality of the coach-athlete relationship did not significantly across the 10 weeks. Previous research has indicated that throughout a season athlete's perceptions of their relationship with their coach may fluctuate both in intensity and direction (Felton & Jowett, 2017). It could be proposed that across short periods of time (i.e. 10 weeks) the coach athlete relationship is relatively stable, however, across a season the quality of the coach-athlete relationship is likely to fluctuate as a consequence of the interactions shared (i.e. the number of opportunities athletes and coaches share, the content of which may influence the closeness, commitment and complementarity of the relationship) (Erickson & Côté, 2016; Felton & Jowett, 2017). However, this was not the primary aim of the current study. Due to limited the number of athletes monitored in the current study and that data was only collected from one team it difficult to generalise the findings beyond this context. Further research may wish to monitor athlete exhaustion and the quality of the coach-athlete relationship more regularly over longer periods of time in order to assess the development and temporal changes.

In relation to the first hypothesis, it was proposed that high exhaustion at Time One would predict lower levels of athletic performance across the 10 weeks. It has been suggested that exhausted athletes are unable to meet the situational demands (e.g., training load) (Goodger et al., 2007), which has a negative impact on the athlete training and game performances. As a result, we expected that an athlete who perceives their own exhaustion level as high would not perform as well on the physical measurements within this study (i.e., distance covered in games and training, CMJ). The results of the current study indicate that high athlete exhaustion at Time One predicted greater distances covered by athletes in training across the 10 weeks. However, there was no relationship between exhaustion at Time One and distance covered by athletes in games. It has previously been suggested that high training demands can only be sustained for short periods (e.g. pushing for play-off positions), if athletes experience this situation chronically they increase the risk of developing maladaption to training stress which may result in stress-related health issues (Gustafsson, Kenttä, & Hassmén, 2011). It could be proposed that athletes who are able to moderate their effort during training (i.e., not travelling further than required during a training session), may protect themselves from developing the symptoms of exhaustion due to the demands of a busy training schedule. Future research may wish to monitor the perceived effort of athletes during training sessions to order to evaluate this proposal further.

The findings of the current study indicate that exhaustion and coach-athlete relationship quality were able to predict athlete's CMJ performance. The results suggest that higher levels of exhaustion at Time One and lower levels of perceived coach-athlete relationship quality at Time One predicted lower jump height score on the CMJs across the 10 weeks. The interaction effect between exhaustion at Time One and coach-athlete relationship quality at Time One also predicted the athlete's CMJs performance. The interaction effect suggested that when an athlete is experiencing low levels of exhaustion, a perception of a high-quality coach athlete relationship had a negative impact on athletes CMJs performance. However, when an athlete is experiencing high levels of exhaustion symptoms, a high-quality coach-athlete relationship predicted a higher level of CMJ performance. This may indicate that when an athlete is experiencing a high level of exhaustion, the coach-athlete relationship may act as a protective mechanism for athletic performance during a maximum effort test. Previous research utilising subjective methods of performance has demonstrated a link between the quality of the coach-athlete relationship and athlete burnout (Gillet et al., 2010; Rhind & Jowett, 2010).

It was further expected that the coach-athlete relationship would predict an athlete’s performance during games and training, however, the results of the current study did not confirm this. A potential explanation as to the findings of the current study may be that the athlete's perception of the coach-athlete relationship quality has a greater impact on the perceived performance of athletes (Gillet et al., 2010; Rhind & Jowett, 2010), the cognitive sub-components of sport performance, and the appraisal of potentially stressful demands (refer to Chapter 5). It has previously been suggested that interactions between the athlete and coach through direct and indirect interpersonal emotion regulation have been suggested to influence athlete’s appraisals (Friesen et al., 2013) and can enhance the perceived quality of the coach-athlete relationship (Davis & Davis, 2016).

Despite these novel findings, the present study is subject to a number of limitations. First, the present study’s findings suggest that there is a complicated relationship between athlete exhaustion and the athlete’s ability to run during training and games, with the factors influencing this requiring further empirical research. In particular, the current study highlights that higher levels of athlete exhaustion predicted greater distances travelled by athletes during training. However, as a result of the design of the study, it is difficult to determine whether the findings are a result of previous situational demands during training and games, or rather the recovery strategies that were employed by the team in the current study.

A second potential limitation relates to issues surrounding athlete burnout research within sport. Gustafsson et al. (2016) raised a number of concerns with Raedeke and Smith’s (2001) athlete burnout definition. The 14 athletes monitored in the current study reported experiencing low to moderate levels of burnout (Gustafsson, DeFreese, & Madigan, 2017). Future research may try to establish an athlete burnout measure based on a strong theoretical underpinning which encompasses clinical cut-offs and focuses on athletes who experience high levels of burnout. A third limitation was the small sample of athletes from a single environment which resulted in a limited variety of playing levels, age of athletes, gender, and requirements of training. Although it has been previously suggested that future research needs to focus upon specific populations of athlete (Appleby et al., 2018), burnout literature may benefit from comparing different applied environments in terms of the possible antecedents suggested in the integrated model of athlete burnout (Gustafsson et al., 2011).

Despite the advancement of athlete burnout research (Gustafsson et al., 2017), it is evident that more work is required to assess the practical implications of athlete burnout. The current study attempted to assess a more accurate representation of athletes' on-field performance (Anderson et al., 2016) by measuring athletes' actual on-field performance during training sessions and competition, as well as CMJs performance. The findings suggest that across the 10 weeks the athletes' perceptions of their own exhaustion and their relationship with the coach did not significantly change across the 10 weeks. Athlete exhaustion predicted greater distances during training and poor CMJs but did not significantly predict game performance. Coach-athlete relationship did not predict athlete's performance during games or training but was able to predict CMJ performance. Finally, the interaction between coach-athlete relationship and exhaustion predicted CMJs, suggesting that when athletes are experiencing high symptoms of burnout the coach-athlete relationship acts as a protective mechanism.

Chapter 7: General Discussion

7.1. Introduction

Athlete burnout research has been guided by several models attempting to describe and explain the concept; specifically, Smith's (1986) cognitive-affective stress model, Silva's (1990) training stress syndrome, the unidimensional identity development and external control model (Coakley, 1992), and the commitment model (Schmidt & Stein, 1991; Raedeke, 1997). Gustafsson, Kenttä, and Hassmén (2011) offer a comprehensive explanation of athlete burnout with a model incorporating antecedents (i.e. training hours, stressful social relationships), the three burnout dimensions (i.e. physical and emotional exhaustion, reduced accomplishment, and sport devaluation), and maladaptive consequences (e.g. long term performance impairment). The present thesis aimed to further examine the theoretical framework of Gustafsson et al.'s (2011) integrated model of athlete burnout by examining key elements of the model in relation to athlete burnout (e.g. antecedents, maladaptive consequences). In this section a summary and discussion of the findings that arose from the four experimental Chapters (Study's 1-4) is provided.

7.2. Experimental Chapter summary

Four studies were undertaken which sought to explore possible antecedents of athlete burnout (e.g. training hours, stressful social relationships) and the maladaptive consequences of athlete burnout (cognitive and physical performance). A summary of the four studies is outlined below.

7.2.2. Chapter 3 (Study 1): Validating a Measurement of Perceived Teammate Burnout

The precise aetiology of athlete burnout remains uncertain; however, previous research has suggested that athletes' social interactions can influence how they cope with the physical and mental demands of participating in sport (e.g. teammates; DeFreese, & Smith, 2013; Lundkvist, Gustafsson, Davis, et al., 2017;). To date, research has not yet created a measure of assessing an athlete's perception of the teammates within their sporting environment. The characteristic symptoms of burnout may manifest both behaviourally and socially and as a result, it is likely that they will be observed by other individuals including teammates (DeFreese & Smith, 2013; Schaufeli & Enzmann, 1998). Within educational environments, the collective burnout of teachers was shown to be associated with individual levels of burnout, suggesting that the collective burnout of a working environment may be a significant factor in the development of individuals' burnout (González-Morales et al., 2012). Therefore, Chapter 3 (Study 1) aimed to provide support in validating a method of assessing an athlete's perception of their teammate's burnout. Team sport athletes (*N* = 290) completed the Team Burnout Questionnaire (TBQ), and the Athlete Burnout Questionnaire (ABQ). Confirmatory factor analysis (CFA) revealed acceptable fit indexes for the three dimensional-first order factor models for the TBQ and the ABQ. Multi-trait multi-method analysis revealed that the ABQ and TBQ showed acceptable convergent and discriminant validity. The results of CFA and multi-trait multi-method analysis indicated the validity of the TBQ and the ABQ. Previously the integrated model of athlete burnout (Gustafsson et al., 2011) has highlighted stressful social relationships as an antecedent of athlete burnout. This indicates that the TBQ can be used within sporting contexts, allowing future research to examine the possible effect of the perception of teammates burnout on athlete burnout.

7.2.2. Chapter 4 (Study 2): Examining Perceptions of Teammates' Burnout and Training Hours in Athlete Burnout

It is suggested that within the domain of sport, athletes are exposed to stressors that may manifest in the form of physiological and psychological symptoms indicating distress (Gustafsson et al., 2015). The aim of Chapter 4 (Study 2) was to examine the influence of training hours (physiological stressor) and social perceptions (psychological stressor) on athletes' burnout in team sports. Perceptions of teammates and training load have been shown to influence athletes' physical and psychological health (Cresswell & Eklund, 2006b, Gustafsson et al., 2015; Gustafsson et al., 2011; Sarkar & Fletcher, 2014); however, limited research has investigated these factors in relation to athlete burnout. Athletes (N = 140) from a variety of team sports completed questionnaires measuring individual burnout, perceptions of teammates' burnout, and number of training hours per week on two separate occasions three months apart. After controlling for burnout at the first time point, training hours was associated with athletes' burnout and perceptions of teammates' burnout at the second time point. Linear regression analysis revealed that athlete burnout at Time One predicted athletes' perception of team burnout at Time Two. Multilevel modelling indicated that collective burnout (i.e. the average burnout score of the individual athletes in a team) and perceived team burnout significantly influenced an individual's own burnout. The findings of Chapter 4 (Study 2) supports previous longitudinal research examining athlete burnout (e.g. Madigan et al., 2015, 2016) as athlete burnout increased from Time One (i.e. mid-season) to Time Two (i.e. end of season). This highlights that burnout is dynamic and athletes' experiences of symptoms may change across a season. Furthermore, Chapter 3 (Study 1) highlights that athlete burnout can be influenced by both physiological stressors associated with training load and psychological perceptions of teammates' burnout. The training hours at the beginning of the season did not initially influence the burnout of athletes at Time One, however, towards the end of the season the cumulative training demands appeared to have an impact upon the development of athlete burnout. This may have arisen as athletes might expect substantial involvement in training earlier in the season and perceive the training demands as an accepted/anticipated stressor (Smith, et al., 2010). As the season continues, training hours may accumulate to the point that previously manageable training loads exacerbate athletes' feelings of exhaustion, reduce their sense of accomplishment, and devalue perceptions of sport involvement. Chapter 4 (Study 2) also sought to assess the influence of teammates and it has previously been proposed that an athlete's perception of stress can be influenced by their social relationships with teammates (Kerdijk, Kamp, & Polman, 2016; Smith et al., 2010). The findings indicate that there was an association between athlete burnout and perceptions of teammates' burnout. One potential explanation for these findings is that athletes perceive a shared, similar mood as their teammates along with an associated level of burnout (Tamminen & Crocker, 2013; Totterdell, 2000). As such, it appears as though both physiological and social antecedents influence the development of burnout. The relationship between athletes' own levels of burnout and their perceptions of teammates' burnout requires further study to elucidate the underpinning mechanisms that influence athletes' social perceptions, as well as investigating the potential influence of other significant relationships.

7.2.3. Chapter 5 (Study 3): The Role of Coach-Athlete Relationship Quality in Team Sport Athletes' Psychophysiological Exhaustion: Implications for Physical and Cognitive Performance

To further examine the influence of an athlete's social environment on the potential manifestation of burnout it is crucial to assess the potential influence of the coach-athlete relationship (Gustafsson et al., 2015). Coach-athlete relationships have been highlighted as a potential antecedent to athlete burnout within the integrated athlete burnout model (Gustafsson et al., 2011). It has been suggested that negative social interactions (e.g. unwanted, rejecting, and neglecting behaviours) can hinder an athlete's experiences (Newsom et al., 2005), which may result in the development of burnout. To explore the potential influence of an athlete's social environment it is important to consider the performance implications for the athlete. Furthermore, Gillet et al., (2010) indicate that athletes' subjective performance is associated with the coach-athlete relationship. Chapter 5 (Study 3) aimed to examine associations between the quality of the coach-athlete relationship and athlete exhaustion. Additionally, Chapter 5 (Study 3) also sought to investigate the relationship between the quality of the coach-athlete relationship and athletes' performance (i.e. physical and cognitive). To address the two aims of this study and the lack of longitudinal burnout research with in the field, Chapter 5 (Study 3) adopted a two-phase design. Within Phase One, male and female athletes (*N*= 82) representing seven teams across four different sports completed a quasi-experimental trial measuring physical performance during a 5-m multiple shuttle-run test, followed by a Stroop test to assess cognitive performance. In addition to this, athletes provided three samples of saliva to measure cortisol and completed a series of questionnaires (i.e., ABQ, coach-athlete relationship questionnaire (CART-Q), demographic and background questionnaire). Structural equation modelling revealed a positive relationship between the quality of the coach-athlete relationship and Stroop performance. The quality of the coach-athlete relationship was negatively associated with cortisol responses to high-intensity exercise, cognitive testing, and exhaustion and athlete exhaustion. In Phase Two, twenty-five athletes completed the same experimental procedure on a further two occasions each time separated by 3 months. Structural equation modelling analysis suggests that the quality of the coach-athlete relationship at Time One (i.e. beginning of the season) predicted athlete exhaustion at Time Two (i.e., middle if the season). The results of this study highlighted that athletes who perceived their relationship with the coach as high-quality were less likely to perceive themselves as experiencing exhaustion symptoms.

The results also indicated that athletes who perceived their relationship with their coach as being close, committed, and complementary were less likely to perceive themselves as exhausted. A low quality coach-athlete relationship increased the likelihood of athletes experiencing symptoms of emotional and physical exhaustion. The findings highlight that the quality of the coach-athlete relationship may have a greater impact on cognitive aspects of sport performance, and athletes' appraisal of stress, rather than athletes' physical performance.

7.2.4. Chapter 6 (Study 4): Case Study - The Physical Implications of Athlete Exhaustion and the Quality of Coach-Athlete Relationship.

Chapter 6 (Study 4) aimed to assess whether athlete exhaustion and the quality of the coach-athlete relationship would account for individual differences in sporting performance (i.e. total distance covered during games and training) and performance of countermovement jump (CMJ). Previous research has suggested that the most common method of measuring the intensity of activities during training and games is to monitor the total distance the athlete covers (Bradley et al., 2009; Mohr, Krustrup, & Bangsbo, 2003). Similarly, it has been suggested that the CMJ is a reliable indicator for detecting fatigue in team sport athletes (Cormack, Newton, McGuigan, & Doyle, 2008; McLean, Coutts, Kelly, McGuigan, & Cormack, 2010).

Fourteen male footballers complete a series of questionnaires including the CART-Q and the ABQ on two occasions separated by 10 weeks. During the 10 week monitoring period, the total distance covered by athletes during games and training sessions was monitored using GPS and weekly CMJ performance were recorded. A series of three mixed factor models were utilised to assess the possible impact of athlete burnout and the quality of the coach-athlete relationship on the performance of athletes in an applied environment. The first mixed factor model revealed that athlete exhaustion at Time One and coach-athlete relationship quality at Time Two predicted the running distance covered by athletes during training session. The second mixed factor model indicated that athlete exhaustion at Time One, coach-athlete relationship quality at Time One, and the interaction effect between athlete exhaustion at Time One and coach-athlete relationship quality at Time One predicted CMJ performance. The third mixed factor model highlighted that athlete exhaustion and the quality of the coach-athlete relationship did not predict the distance covered by athletes during games. The findings revealed that athletes that experienced a high level of exhaustion at Time One were likely to run further during training but not jump as high during the CMJ. Additionally, findings indicated that athletes who perceived a high-quality coach-athlete relationship at Time Two in terms of being close, committed, and complementary were likely to have a lower CMJ score. However, exploring the interaction effect between athlete exhaustion at Time One and coach-athlete relationship quality at Time One suggested that the coach-athlete relationship acts as a protective mechanism when exhaustion is high to maintain CMJ performance.

7.3. Theoretical Implications

The purpose of this section is to discuss the main theoretical implications arising from the four experimental studies comprising the present thesis. Specifically, this section discusses implications relating to: the role of training hours in the development of athlete burnout, athlete perceptions of teammates' burnout influencing their own burnout, the development of the TBQ, the coach-athlete relationship as a potential stressful relationship increasing the likelihood of exhaustion and possible performance impairment, the potential consequences of athlete burnout in performance. These implications are discussed in relation to the theoretical frameworks outlined in the literature review with specific attention attributed to Gustafsson et al.'s (2011) integrated model of athlete burnout.

7.3.1. Antecedents – Training Hours

It is widely accepted that in order for athletes to perform during competition and experience positive adaptions to training, they are required to cope with the demands of training and perform under pressure (Balk et al., 2013; Isoard-Gautheur et al., 2016, Gustafsson et al., 2011; Scott et al., 2013). Athletes that are unable to cope with demands may experience maladaptive responses (Gould & Dieffenbach, 2002; Isoard-Gautheur et al., 2013; Law, Côté, & Ericsson, 2008). Previous research suggests that chronic stressors, such as excessive training stress, may be influential antecedents to athlete burnout (Gould & Dieffenbach, 2002; Gustafsson, et al., 2015). Building upon Gustafsson et al.'s (2011) integrated model of athlete burnout, the findings emerging in Chapter 4 (Study 2) support previous suggestions that athlete burnout may develop as a consequences of chronic exposure to excessive training (Gustafsson et al., 2008). Specifically, Chapter 4 (Study 2) indicates that initial training hours did not influence athlete burnout at the first time point (Time One). However, as the season progressed the cumulative demand of training hours influenced athlete burnout at the end of the season (Time Two). A potential explanation for these findings may relate to an athlete's ability to manage demanding training hours at the beginning of the season given that they accepted or even anticipated this level of stressor during this phase of training (Smith, et al., 2010). As the season progresses, the athlete's perception of the demands are subsequently based upon the cumulative experience, rather than the stimulus (e.g. training hours) in isolation. Athletes' initial perceptions of training hours were not considered to be an unmanageable load on their resources. However, upon accruing a substantial number of hours the cumulative demand of sustained training exacerbate athletes' feelings of exhaustion and reduces their sense of accomplishment as well as devalues perceptions of sport involvement. Across short periods of time athletes may be able to cope with a high demand on their resources (i.e. a high number of training hours); however, if they experience chronic exposure and insufficient recovery (i.e.

continued high training hours; Gustafsson et al., 2011) this may result in a maladaptive response to training and the development of burnout.

7.3.2. Antecedents – Stressful Social Relationships

7.3.2.1. Teammates

The current thesis sought to investigate possible antecedents that may influence the development of athlete burnout. Despite the precise aetiology of athlete burnout remaining unclear, previous research has suggested that the athlete's social environment can contribute to the development of burnout (DeFreese, & Smith, 2013; Gould, et al., 1996; refer to Chapter 4 (Study 2)). Specifically, the social interaction athletes share with significant others such as their teammates can influence the incidence of athlete burnout (DeFreese & Smith, 2013; refer to Chapter 4 (Study 2)). Furthermore, it has been suggested that athletes' perceptions of stress may be affected by the social relationships they have with teammates (Kerdijk, Kamp, & Polman, 2016; Smith et al., 2010).

Previous research has identified that athlete burnout may manifest behaviourally and socially consequentially it is likely to be observed by other individual such as teammates (DeFreese & Smith, 2013; Schaufeli & Enzmann, 1998). Within non-sporting settings it has been suggested that burnout can be transferred between colleagues (Bakker et al., 2005; Bakker et al., 2006; González-Morales et al., 2012). Potentially, a contagion mechanism similar to the crossover of stress may be considered whereby the athletes in a team influence each other (Bakker et al., 2009; refer to Chapter 4 (Study 2)). This may occur directly through the information shared between teammates (Hakanen et al., 2014), or this may take place indirectly with athletes sub-consciously perceiving the emotions of their teammates (Bakker et al., 2009; Barsade, 2002). Although, the integrated model of athlete burnout highlights stressful social relationships as a possible cause of burnout (Gustafsson et al., 2011), previous research was yet to validate a measurement tool to assess the impact of athlete's perception of their teammate's burnout. Chapter 3 (Study 1) sought to investigate the convergent and discriminant validity of the TBQ. The TBQ was adapted from the ABQ by altering the referent to enable the questionnaire to assess athletes' perceptions of their teammate's burnout rather than their own burnout. The multi-trait multi-method (MTMM) analysis allows for comparison of the ABQ and the TBQ to determine the convergent and discriminant validity of the questionnaires. The MTMM analysis revealed that both of the questionnaires did have limitations, however, the findings of Chapter 3 (Study 1) support the convergent and discriminant validity of the TBQ in sporting environments.

Building on the validation of the TBQ, Chapter 4 (Study 2) aimed to assess the relationship between teammates' burnout (i.e. athletes' perception of their teammates' and team's collective burnout) and individual athlete burnout. The findings of Chapter 4 (Study 2) indicate that there is an association between athlete burnout and teammates' burnout. Athletes may view their teammates' burnout level as similar to their own as a consequence of the athletes considering that they share similar experiences with their teammates. Therefore, the athletes may project their individual self-assessment onto teammates. Specifically, athletes may perceive their teammates share a similar mood and associated level of burnout as themselves (Tamminen & Crocker, 2013; Totterdell, 2000). Alternatively, the social interactions between teammates may allow athletes to share information related to the experience of burnout (e.g. emotions and perceived demands of training; Campo et al., 2016; Tamminen et al., 2016). The shared information may inform the athlete's perception of their teammates' level of burnout (DeFreese & Smith, 2013). Future research may seek to incorporate the TBQ into the design of studies, to further assess the possible impact of athletes' perceptions of their peers upon the individual athlete. The findings of the current thesis offers support to Gustafsson et al.'s (2011) suggestion that social relationships (e.g. teammates) can influence the development of athlete burnout and advances a method for assessing the potential impact of an athletes perception of their teammates burnout.

7.3.2.2. Coach-Athlete Relationship

Previously the coach-athlete relationship has been described as a central aspect of the sporting experience of athletes (Bartholomew, Ntoumanis, & Thøgersen-Ntoumani, 2009; Gustafsson et al., 2011). Coaches are a fundamental component of an athlete's social environment that may influence the development of athlete exhaustion (Arnold, Fletcher, & Daniels, 2013; DeFreese & Smith, 2014; Fletcher, Hanton, & Mellalieu, 2006; Isoard-Gautheur, Trouilloud, Gustafsson, & Guillet-Descas, 2016) and the performance of athletes (Rhind & Jowett, 2010). Chapter 5 (Study 3) Phase One sought to assess the potential association between the quality of the coach-athlete relationship, cognitive and physical performance, as well as athlete exhaustion at Time One (i.e. beginning of the season). Phase One (Chapter 5, Study 3) reports that the quality of the coach-athlete relationship was positively associated with improved performance on the Stroop test (cognitive performance) and negatively associated with athletes' cortisol response to physical and cognitive stressors. However, the quality of the coach-athlete relationship was unrelated to the distance covered by athletes on a running task (physical performance). Potentially, the quality of the coach-athlete relationship may have a greater impact on the cognitive element of sports performance, and the appraisal of situational demands, rather than the physical performance of athletes. Furthermore, the findings of Phase One (Chapter 5, Study 3) indicate that the quality of the coach-athlete relationship is related to athlete exhaustion. Specifically, findings indicate that coach-athlete relationships characterised as being close, complementary, and committed, were related to athletes perceiving a lower level of exhaustion (refer to Chapter 5 (Study 3)). However, it is important that research begins to address the generalisability of findings across sporting contexts and criticisms of burnout research.

Previous research has highlighted limitations within athlete burnout field focusing on cross-sectional design (Lundkvist, et., 2016). To address this Phase Two (Chapter 5, Study 3) aimed to assess the relationship between coach-athlete relationship, performance, and athlete exhaustion across a competitive season. Incorporating three time points into the design of the study affords the examination of causal relationships. The findings of Phase Two (Chapter 5, Study 3) suggest that the quality of the coach-athlete relationship at Time One predicts athletes' exhaustion at Time Two. Specifically this suggests that athletes who perceive their relationship with their coach as being close, committed, and complementary at the start of the season are less likely to experience symptoms of exhaustion at Time Two. Phase Two (Chapter 5, Study 3) also sought to investigate the impact of the quality of the coach-athlete relationship on physical and cognitive performance. This indicates that the quality of the coach-athlete relationship at Time One does not predict outcomes on specific performance tests and biological indices of physiological stress responses recorded (i.e. Stroop score, acute changes in cortisol, and total running distance) at Time Three. The findings of Phase Two (Chapter 5, Study 3) indicate that athletes who perceive that their coach-athlete relationship is relationships characterised as close, committed, and complementarity are as likely to perform well on the performance tests as those athletes who perceive poor relationships with their coach. However, it is important that research endeavours to investigate the potential influence of the coach-athlete relationship utilising applied designs to advance knowledge of performance outcomes associated with relationship quality.

Alternative approaches to the assessment of athletes' physical performance were incorporated into the research design of Chapter 6 (Study 4) to improve the ecological validity of the study by measuring markers from the applied environment. It was hypothesised that the coach-athlete relationship would predict an improvement in athlete's performance during games and training as well as when performing a CMJ, however, the findings of Chapter 6 (Study 4) were similar to those of Chapter 5 (Study 3). The results indicated that the quality of the coach-athlete relationship was unrelated to the running performance of athletes during games and those athletes who perceived a high quality coach-athlete relationship were more likely to have perform poorly during the CMJ (please see section 7.3.4. *Theoretical implications for the integrated model of athlete burnout (Gustafsson, et al., 2011,* for more information on the relationship between CMJ and coach-athlete relationship quality). Considering the findings from Chapter 5 (Study 3) and Chapter 6 (Study 4) it could be suggested that an athlete's perception of their relationship with their coach may have a greater impact on the perceived performance of athletes (Gillet et al., 2010; Rhind & Jowett, 2010), the cognitive sub-components of sport performance, and the appraisal of potentially stressful demands rather than the physical performance of athlete.

7.3.3. Maladaptive Consequences of Athlete Burnout- Performance.

Sport psychology research suggests that athlete burnout is an indicator of athlete ill-being and has been shown to have a negative impact on athletes' cognitive (Ryu et al., 2015) and physical (Gustafsson, Kenttä, & Hassmén, 2011) performance; these studies highlight the need for further research investigating the potential consequences of athlete burnout. Furthermore, the integrated model of athlete burnout suggests a causal relationship between the possible antecedence of athlete burnout, the dimensions of the burnout (i.e. exhaustion, reduced accomplishment, sport devaluation) and the potential maladaptive consequences of athlete burnout (Gustafsson et al., 2011).

To assess dynamic aspects of burnout in relation to the integrated model proposed by Gustafsson and colleagues (2011), Phase Two (Chapter 5, Study 3) adopted a three-wave longitudinal approach. The mediation model proposed in Phase Two (Chapter 5, Study 3) incorporates two causal relationships to examine the relationship between a possible antigen and athlete burnout as well as determine potential physical performance consequences of athlete burnout (i.e. coach-athlete relationship quality → athlete exhaustion; athlete exhaustion → performance outcomes). It was theorised that athletes experiencing exhaustion would be less able to cope with the demands presented in sport situations (e.g. training loads, stressful social relationships), consequently the athlete would be prone to suffer impaired performance (Cresswell & Eklund, 2006b). The findings from Phase Two (Chapter 5, Study 3) indicate that athlete exhaustion did not mediate the relationship between the quality of the coach-athlete relationship and the performance of athletes (i.e. physical and cognitive). Specifically, the findings highlight that athletes' feelings of emotional and physical exhaustion were unrelated to performance on their performance on the Stroop and 5-m shuttle tests, as well as their acute cortisol response.

The research design of the study may have comprised the findings Chapter 5 (Study 3), as well as the ecological validity of the tests (e.g. 5-m multiple shuttle run, Stroop). In particular, the exhaustion items of the ABQ measure aspects of athletes' participation and involvement within *sport;* participants may not have perceived the items to be related to laboratory based testing (i.e. "I feel physically worn out from [sport], I am exhausted by the mental and physical demands from [sport]"). A potential explanation of the findings observed in Phase Two (Chapter 5, Study 3) may relate to the perception of the demands the physical and cognitive tests had on athletes' executive function. The athletes may not have perceived the cognitive and physical test as being demanding, therefore the tests may not have taxed their executive control (Hofmann et al., 2012). Previously, it has been suggested that when athletes are subjected to high demands, those athletes experiencing symptoms of high burnout will not perform as well as those that are not experiencing symptoms of burnout (Oosterholt et al., 2012). Future research may aim to consider athlete performance in more ecologically valid settings using tests that are more closely related to competitive sport tasks to advance burnout research.

To further examine the consequences of athlete exhaustion in an elite sport environment Chapter 6 (Study 4) assessed performance outcomes by monitoring the total distance that athletes covered during games and training sessions, as well as CMJ performance. It was proposed that athletes who perceived themselves as having symptoms associated with a high level of exhaustion would experience performance impairment. Although further research is required, it has previously been suggested that exhausted athletes are typically unable to meet the situational demands (e.g., training load) (Goodger et al., 2007), which has a negative impact on an athlete's training and game performances (Gustafsson et al., 2011). The findings of Chapter 6 (Study 4) seem to contradict those of previous research, as high athlete exhaustion at Time One predicted greater distances covered by athletes during training across the 10 weeks. However, this was not the case during games as there was no relationship between exhaustion at Time One and distance covered by athletes. Previously, it has been reported that high training demands can only be sustained for short periods (e.g. training volume and intensity), if athletes experience this situation chronically they increase the risk of developing maladaption to training stress which may result in stress-related health issues (Gustafsson, Kenttä, & Hassmén, 2011). Considering the findings of Chapter 6 (Study 4) it could be proposed that future research should explore whether athletes who are able to moderate their effort during training (i.e., not travelling further than required during a training session), which may protect themselves from developing the symptoms of exhaustion which can result from the demands of a busy training schedule.

The findings of Chapter 6 (Study 4) revealed that exhaustion at Time One and coach-athlete relationship quality at Time One predicted an athlete's CMJ performance. Specifically, the findings indicate that higher levels of exhaustion at Time One and lower levels of perceived coach-athlete relationship quality at Time One predicted lower jump height score on the CMJ across the 10 weeks. It is important to highlight that the interaction effect between exhaustion at Time One and coach-athlete relationship quality at Time One also predicted the athlete's CMJ performance. Exploring the interaction further indicated that when an athlete perceives they are experiencing low symptoms of low levels of exhaustion, a perception of a high-quality coach-athlete relationship had a negative impact on athletes CMJ performance resulting in a lower jump height. However, if the athlete perceived that they were experiencing a high level of exhaustion symptoms, a perception of a high-quality coach athlete relationship had a positive impact on athletes CMJ performance. The athlete's perception of the quality of the coach-athlete relationship acted as a protective mechanism for the performance of the athlete during a maximal jump height test when athletes are experiencing high levels of burnout symptoms.

7.3.4. Theoretical implications for the integrated model of athlete burnout (Gustafsson, et al., 2011)

The current thesis adopts the theoretical framework of the integrated model of athlete burnout (Gustafsson et al., 2011) to examine possible antecedents of burnout, as well as examining at the consequences of athlete exhaustion and coach-athlete relationship (for a brief review please refer to section 2.3.6.). The integrated model of athlete burnout (Gustafsson et al., 2011) identifies possible causal relationship between the different elements (e.g., athlete burnout influencing maladaptive consequences), which may account for the dynamic nature of athlete burnout. The longitudinal design of Chapter 4 (Study 2), Phase Two (Chapter 5, Study 3) and Chapter 6 (Study 4) assessed whether causality existed between aspects of the integrated model of athlete burnout (Gustafsson et al., 2011). Although the integrated model of athlete burnout (Gustafsson et al., 2011) offers a clear structure to the development of burnout, in reality and within applied research, the findings of the current research indicate that the causal relationship identified within this model may be even more dynamic with multiple factors influencing one another concurrently. Although, the integrated model of athlete burnout does identify a number of different possible antecedents to athlete burnout development (i.e., excessive training, school/work demands, stressful social relationships, negative performance demands, lack of recover, and early success). The current thesis sought to address two, specifically focusing on the physical (excessive training, maladaptive consequences) and social (stressful social relationships) components of the model.

7.3.4.1. Physical

Chapter 4 (Study 2) identified that the cumulative demand of training hours and athletes perception of their teammates burnout predicted athlete burnout. The findings of the Chapter 4 (Study 2) indicate that irrespective of the intensity of the sessions is the cumulative amount of time engaged in the sport which is related to the development of athlete burnout. It could be suggested that the findings support the proposal of the integrated model of athlete burnout (Gustafsson et al., 2011). However, the measurement of training hours does not allow the research to determine whether the amount of training the athlete is completing is excessive. To examine this further future research may wish to measure a marker for perceived effort exertion. To explore the concurrent development of the factors highlighted in the integrated model of athlete burnout (Gustafsson et al., 2011), it is important to consider how the symptoms of burnout may influence the athlete performance during training. The results of Chapter 6 (Study 4) suggest that athletes who experience high levels of exhaustion were also more likely to cover a greater distance during training, whereas, exhaustion had no influence on athlete's physical performance during games. This may occur for a number of reasons, the decision-making ability of an athlete may be compromised due a depletion of their resources as a consequence of training, or it may be that athletes who are experiencing low levels of burnout are able to regulate the effort the put into training. Alternatively, athletes who are exhausted may be trying to mask symptoms of burnout from their coach and teammates and therefore, continue to push themselves when their resources are stretched (i.e., energy level, mood, recovery capability) (Cresswell & Eklund, 2006c). Although, the integrated model of athlete burnout (Gustafsson et al., 2011) considers the maladaptive consequences of athlete burnout (i.e., withdrawal, impaired function, chronic inflammation, long-term performance impairment) it fails to consider the repercussion of being an "active burnout" athlete (Gould, Udry, Tuffey, Loehr, 1996; Gustafsson, Kenttä, Hassmén, Lundqvist, & Durand-Bush, 2007). It is crucial that we highlight that Chapter 6 (Study 4) focusses on exhaustion rather than burnout, as it has been suggested that most athletes do from time to time experience symptoms of fatigue and exhaustion and may never go on to develop athlete burnout (Gustafsson, Madigan, & Lundkvist, 2017). Being exhuasted after a long training camp or feeling drained after a long season may anticipate for competitive athletes and following a recovery periods, the motivation for more training and new competitions quickly returns (Gustafsson et al., 2017). Future longitudinal research is required to determine whether the high level of distance covered and high level of exhaustion results in a maladaptive response and ultimately leads to performance impairment (Gustafsson et al., 2011). Future research must also address as well the dynamic nature of antecedent, symptoms and consequences of athlete burnout.

7.3.4.2. Social

The integrated model of athlete burnout (Gustafsson et al., 2011) identified that stressful social relationships and how low social support may increase the likelihood of the development of athlete burnout. Chapter 4 (Study 3), Chapter 5 (Study 4), and Chapter 6 (Study 5) sought to investigate the relationship between social elements of the model and athlete burnout, focussing on the quality of the coach-athlete relationship and the perception of teammates burnout.

Chapter 5 (Study 4), showed support for the relationship suggested in the integrated model of athlete burnout (Gustafsson et al., 2011). Both Phase One and Phase Two reported that a positive coach-athlete relationship was related to lower levels of exhaustion. Previously, the quality of the coach-athlete relationship has been identified as a possible protective mechanism against the development of exhaustion (Davis et al., 2018) and burnout (Gustafsson et al. 2011). Building on the theorisation of the integrated model of athlete burnout (Gustafsson et al., 2011), the findings of Chapter 6 (Study 4) suggested that an athlete's perception of the quality of the coach-athlete relationship acted as a protective mechanism for CMJ performance when athletes are experiencing high levels of burnout symptoms. This identifies a potential limitation of the integrated model of athlete burnout (Gustafsson et al., 2011) as it fails to identify intervention strategies the athlete, as well as the organisation they play for, can adopt to support exhausted or burnout athletes (i.e., a coach building a close, committed complementarity relationship). Although good quality relationships may protect athletes from negative moods and burnout (DeFreese & Smith, 2013), interpersonal connections can also facilitate interactions that transfer burnout between individuals (Hakanen, Perhoniemi, & Bakker, 2014). Consequentially, it could be suggested that the notion of stressful social relationships may be misleading as positive relationship can influence the transfer of burnout symptoms (Bakker, Westman, & van Emmerik, 2009; Barsade, 2002). Chapter 4 (Study 3) did not consider the direction of the relationships (i.e., wheather they were positive or negative) although, Chapter 4 (Study 3) did identify that athlete's perception of their teammate's burnout at Time One does predict athlete burnout at Time Two three months later. One potential explanation for these findings is that athletes perceive that their teammates share a similar mood and associated level of burnout as themselves (Tamminen & Crocker, 2013; Totterdell, 2000). Alternatively, the athlete may imagine the feelings that other teammates are expressing or automatically catching the emotions of their teammates (Bakker, Westman, & van Emmerik, 2009; Barsade, 2002). Future research may wish to consider the quality of the relationship between teammates and whether this may mediate the relationship between perception of teammate burnout and athlete burnout.

The integrated model of athlete burnout (Gustafsson et al., 2011) offers a holistic overview of the development of athlete burnout and provides a solid theoretical frame work for future research to consider as it incorporates aspects of alternative athlete burnout models. The current thesis has shown support for aspects of the model and causal relationships within the framework. However, it important that research considers the dynamic nature of athlete burnout as aspects of the model (e.g., performance, coach-athlete relationship, perception of teammates, burnout symptoms) are all evolving concurrently.

7.4. Practical Implications

In order to advance applied sport psychology practice it is crucial that theory generated as a result of research is linked to practice (Pocwardowski, Sherman, &

Henschen, 1998). The current section discusses a number of practical implications arising from the findings of the thesis.

Findings from the current thesis highlight possible antecedents of athlete burnout and the consequences of stressful social relationships on athletic performance; consequently, a number of applied considerations warrant discussion. Findings from Chapter 4 (Study 2) suggest that athletes are susceptible to developing burnout as a consequence of accumulated training hours and the athlete's perception of their teammates; as the season progresses athletes and coaches are advised to establish a balanced training load incorporating both physical and emotional recovery (Kellmann, 2010). As sport becomes increasingly professional, it is important that coaches or directors of sport endeavour to consult with sport scientists possessing expertise in monitoring training demands and athletes' recovery (e.g. exercise physiologists; Starling & Lambert, 2017) as part of the multi-disciplinary team supporting athletes. This would allow for practitioners to monitor athletes' training load with the aim of preventing exhaustion and identifying points to intervene with opportunities for recovery; this approach may minimise the possible maladaptive response of athletes to the cumulative demand of training (Lundqvist & Kenttä, 2010). An important consideration for coaches to be aware of is the possible coping mechanism/s athletes may adopt when training. Athlete's experiencing low level of exhaustion may be able to regulate the effort they put into training while maintaining their performance during games (refer to Chapter 6 (Study 4), whereas, athlete's experiencing high levels of exhaustion can complete a greater distance in training. Although Chapter 6 (Study 4) did not see any performance impairment during games, previous research has indicated that maintaining high training volume for extended periods of time can have a detrimental impact on the athlete (Meeusen, et al., 2013)..

Furthermore, the development of a validated method of assessing an athlete's perception of their teammates' burnout has the potential of increasing understanding of the influence of social environments on individual athletes. The TBQ could be utilised by practitioners to gauge athletes' perception of their teammates' burnout. This would allow the sport organisation or coach to develop targeted interventions to improve the well-being of athletes and perceptions of their surrounding environment. The social environment surrounding athletes has been shown to influence the development of athlete burnout (refer to Chapter 4 (Study 2)) and feelings of exhaustion (refer to Chapter 5 (Study 3)). The leaders (e.g. coach, captain) may endeavour to optimise the social environment surrounding athletes; coaches and captains are advised to attend to the interpersonal interactions between athletes during competition and training (Davis & Davis, 2016). Furthermore, it is important that coaches and peers are aware of the motivational climate they create; previous research has highlighted an association between motivational climates and the development of athlete burnout (Smith et al., 2010). Coaches can promote the use of positive communication and establish shared goals to enhance the training environment and well-being of athletes (Wachsmuth, Jowett, & Harwoord, 2017).

Previous research suggests that coaches who invest time in the development of close, committed, and cooperative relationship are likely to optimize an athlete's sport experience, performance, and well-being (Davis, Jowett, & Lafrenière, 2013; Felton & Jowett, 2014). Specifically, findings from Chapter 5 (Study 3) indicate that high quality coach-athlete relationships were related to athletes' lower cortisol responses to demanding testing conditions (i.e. physical and cognitive performance tests). Athletes who perceive high quality relationships with their coach may be able to deal with increased training demands and protect against the development of athlete exhaustion.

7.5. Limitations

The limitations related to each of the empirical studies have been presented and discussed previously within the thesis in each corresponding Chapter. Throughout the program of research, progressive attempts have been made to minimise the potential limitations; however, general limitations of the burnout concept in particular require consideration.

Throughout the thesis attempts have made to address some of the issues surrounding burnout research, such as the lack of applied and experimental studies (Gustafsson, Hancock, & Côté, 2014). Salivary cortisol is a useful biomarker in stress and burnout-based research (Oosterholt, Maes, Van der Linden, Verbraak, & Kompier, 2015), however, it is important to be aware of possible sources of variance that may affect this measure. Whether these modulating variables are considered as confounders or as an important part of the research depends on the research question. Given Chapter 5 (Study 3) explores the relationship between the perceived quality of coach-athlete relationship and athlete experience of exhaustion symptoms, is not surprising the results were mixed, given the complex interplay between self-report measurements of emotional and physical exhaustion to HPA axis activation. Following HPA activation several additional variables, such as adrenal sensitivity, capacity, and cortisol binding influence the cortisol levels in blood and the resulting level of cortisol in individual saliva (Hellhammer, Wüst, & Kudielka, 2009). These factors however, were not monitored or accounted for in the current study. Furthermore, the current study did not differentiate between gender as estrogen, menstul cycle, oral contraceptives may all influence female athletes' cortisol binding and HPA axis activity. However, data was explored utilising SEM so each participant was considered individually rather than a comparison between groups.

High dropout rates affect the internal and external validity of study results as well as introducing biased outcomes (Beishuizen, Coley, Moll van Charante, van Gool, Richard,

& Andrieu, 2017), especially within athlete burnout where dropout is considered to be the final stage of the continuum (Isoard-Gautheur, Guillet-Descas, & Gustafsson, 2016). This may have been an influence to the overall findings of the thesis and the generalisability of the results. Studies are unable to control for attrition by experimental design and has long been considered to be the "weakest link" in longitudinal research (Hansen, Collins, Malotte, Johnson, & Fielding, 1985). It could be suggested that across the studies within this thesis the high level of dropout was due to participant's withdrawal from sport. Sports dropout is considered a negative motivational consequence which has been consistently shown to be predicted by low levels of self-determinisation (Balish, McLaren, Rainham, & Blanchard, 2014). However, as a result of the longitudinal nature of Chapter 4 (Study 2), Chapter 5 (Study 3), and Chapter 6 (Study 4), attrition from the studies occurred for a number of reasons unrelated to sports dropout (e.g., injury, international call up, unavailable to attend testing session, illness) Although attempts were made to maximise the number of participants available in each study, Chapter 5 (Study 3) and Chapter 6 (Study 4) both attempted to expand the research in athlete burnout literature by taking an experimental and applied approach to explore the consequences of the coach-athlete relationship and exhaustion. The collection of further data was problematic though due to the inaccessibility of some sports teams and the expense of collecting cortisol measurement at 3 times each trail across three time points. Including a larger number of sports teams in Phase Two (Chapter 5, Study 3) and Chapter 6 (Study 4) may have been more beneficial and allowed the research to explore more predictor variables (e.g., social organisation of sport) and allowing for MLM analysis to explore nested data. It is important that future research looks to replicate and expand on the findings of Chapter 5 (Study 3) and Chapter 6 (Study 4), as well as investigate any potential moderating and mediating variables which have previously been highlighted by the integrated model of athlete burnout (Gustafsson et al., 2011).

A potential limitation relates to the measurement issues that exist within burnout research in sport. The ABQ is the most commonly used measure of athlete burnout and has aided in the advancement of literature (Gustafsson, Hancock, & Cote, 2014; Raedeke & Smith, 2009); as such has been used extensively throughout the program of research. Originally, the ABQ was created by adapting the MBI (Maslach & Jackson, 1986). Research has attempted to determine the discriminant validity of the ABQ and the MBI within athlete populations (Cresswell & Eklund, 2006; Raedeke et al., 2013). However, Gustafsson et al., (2016) highlight a number of concerns of the discriminant validity of the ABQ and MBI; in particular, both Cresswell and Eklund (2006) and Raedeke et al. (2013) fail to report factor loadings of their general factor models. As a result, it is difficult to determine the convergent and discriminant validity of the two methods. Furthermore, Cresswell and Eklund (2006) and Raedeke et al.'s (2013) use correlations between subscales to claim convergent validity rather than the loading of the items on the specific method (i.e. ABQ, MBI) or general factor (i.e. exhaustion, cynicism/devaluation, and a reduced sense of accomplishment; Eid et al., 2003). However, the potential limitations of the ABQ go beyond the convergent and discriminant validity issues with the MBI, researchers need to consider the conceptualisation of the construct.

Although the concept of burnout has been extensively studied in the domain of sport, a lack of agreement regarding the definition of the construct has been widely debated in the research literature (Kristensen, Borritz, Villadsen, & Christensen, 2005; Lundkvist, Gustafsson, & Davis, 2016). Gustafsson et al., (2016) identify a number of problematic concerns with Raedeke and Smith's (2001) definition of burnout. In particular, the burnout construct emerged through exploratory factor analysis rather than establishing a theoretical underpinning in the context of sport. As a result of this approach, a poor relationship between exhaustion, reduced sporting accomplishment, and the devaluation of sports participation has been observed (Halbesleben & Demerouti, 2005); overlap of the burnout construct in relation to other somewhat associated constructs used in psychological research has also been highlighted (e.g. depression; Bianchi, Schonfeld, & Laurent, 2015). Furthermore, it is suggested that the three dimensions of burnout (i.e. exhaustion, sport devaluation, and reduced accomplishment) are likely to develop differently and there is a need to study the dimensions independently (Bentzen, Lemyre, & Kenttä, 2016; Lundkvist, Gustafsson, Davis, et al., 2017).

In an attempt to minimise aspects of the acknowledged limitations surrounding the ABQ, there is consensus among researchers to focus on exhaustion which has been described as the core dimension of burnout (Gustafsson, Kenttä, & Hassmén, 2011; Maslach, Schaufeli, & Leiter, 2001; Shirom, 2005) and may be used as an indicator of the psychological health of athletes (Gustafsson et al., 2016). Alternatively, research may benefit from the consideration of clinically validated measures of burnout (e.g. Shirom Melamed Burnout Questionnaire; Lerman et al., 1999) or specifically exhaustion (Karolinska Exhaustion Disorder Scale; Bese`r et al., 2014). This would permit data collected within the domain of sport to be interpreted using clinical cut-off scores (Gustafsson et al., 2016) and for the findings to be extended in relation to other concepts that are established within clinical research. However, it is important that future research validates the use of clinical measures such as the Shirom Melamed Burnout Questionnaire and Karolinska Exhaustion Disorder Scale within sporting environments and with athletes, coaches, etc. A validated method of assessing athlete burnout would advance research within the field of sport psychology; it would provide researchers with less ambiguity and greater confidence when examining specific case studies and concepts in applied sport environments.

7.6. Future Research

Throughout the thesis, findings from each of the empirical chapters have been presented and discussed in relation to future research directions. Considering the findings of the current thesis as a whole, a number of theoretical and methodological implications for future research warrant discussion; the present section outlines avenues for potential future research.

The current thesis advances the field with the creation and preliminary validation of the TBQ; this measure offers researchers the ability to assess athletes' perceptions of their teammates' level of burnout. The TBQ could be used in studies aiming to investigate related factors that may impact upon an athlete's contextual and interpersonal relationships in sport. For example, the influence of key figures within a team (e.g. captains) can be investigated both at the individual as well as group level. Future research may wish to consider whether athletes' perception of their teammates' burnout mediates the relationships between possible antecedents of burnout (e.g. leadership style) and the development of burnout. As the social interactions shared between teammates may provide environment context for information related to the burnout to be interpreted by the individual athlete (i.e. I perceive the demands of training as exhausting to me because my teammates are exhausted as a result of the cumulative training we have taken part in).

As it is thought burnout may manifest itself behaviourally (DeFreese, & Smith, 2013; Schaufeli & Enzmann 1998), it could be proposed that when an athlete perceives their teammates as burnout it may be related to their teammates displaying anti-social behaviours (i.e. criticising a teammate about performance) and lack of prosocial behaviours (i.e. encouraging a teammate after a mistake). Previous research has highlighted that prosocial teammate behaviour positively predicted task cohesion and negatively predicted burnout, and these relationships were mediated by positive affect (Al-Yaaribi & Kavussanu, 2017). Furthermore, antisocial teammate behaviours negatively predicted task cohesion and positively predicted burnout, and these relationships were mediated by negative affect (Al-Yaaribi & Kavussanu, 2017). As such, future research may wish to consider whether the behaviours of teammates (i.e. prosocial or anti-social behaviours) mediated the relationship between an athlete's perceptions of their teammate's burnout and their own.

Al-Yaaribi and Kavussanu, (2017) research highlighted the link between teammate behaviours and task cohesion, where prosocial teammate positively predicted task cohesion and anti-social behaviours negatively predicted task cohesion. Future research may wish to assess whether group cohesion influence the relationship between individual and team levels of burnout that have been seen in other non-sporting settings (e.g. nursing; Li, Early, Mahrer, Klaristenfeld, & Gold, 2014). Whether the environment focusses on task and social aspects of cohesion may influence perception of their teammate's burnout, and consequentially this may affect the athlete's own burnout.

Although extensively utilised in the current thesis to further develop the field and advance research, burnout literature would benefit from the development of a conceptually sound measure of athlete burnout. Despite recent suggestions that research should focus on the exhaustion element of ABQ as a consequence of potential methodological issues with the method (Gustafsson, et al., 2016; refer to Chapter 5 (Study 3)), it is important that future research looks to investigate the global concept of burnout rather focusing on the central dimension. By focussing on the exhaustion element of burnout, research may lose sight on the other negative symptoms experienced by athletes (i.e. sport devaluation, reduced sporting accomplishment) and the possible implications this may have on athlete performance, health, and well-being. The creation of a burnout measure with a theoretical underpinning within sport would aid the advancement of the field and have positive implications for the conceptualisation of the concept.

The current thesis aimed to assess the influence of the athlete's social environment (e.g. quality of the coach-athlete relationship) on athlete exhaustion and performance. Cross-sectional research (refer to Chapter 5 (Study 3)) suggests that the quality of the coach-athlete relationship is positively associated with cognitive performance and negatively associated with the cortisol response of athletes to physiological and cognitive stressors. However, the quality of the coach-athlete relationship was unrelated to the distance covered by athletes on a running task (physical performance). It is proposed that the quality of the coach-athlete relationship may have a greater impact on cognitive elements of sports performance, and the appraisal of situational demands as these processes are more closely linked to athletes' perceptions of situations and relationships. Future research may wish to further examine the relationship between role of the coach and athlete cognitive functioning. To more closely inspect potential associations between exhaustion, coach-athlete relationship quality, and physical performance, the thesis examined athletes' actual on-field performance with the use of GPS devises to measure total distance covered by athletes in games and training (Anderson et al., 2016). One explanation of the findings of Chapter 6 (Study 4) may be that athletes who are experiencing low symptoms of exhaustion manage their effort during training (measured through distance covered) as a means of recovery, which may have protected the athletes from the development of exhaustion. Future research may wish to explore potential behaviour differences during training between athletes who may be suffering from the symptoms of burnout and those athletes who score low on burnout measures. For example, more frequent periods of rest (e.g. rehydration) or alternative recovery strategies beyond the scope of the present study (e.g. identifying when it is appropriate to track players and exert effort). Future, research may also wish to assess the perceived exertion of athletes during training (e.g. Borg Rating of Perceived Exertion Scale) and whether this is related to athlete's experience of burnout symptoms. It has previously been considered that athlete burnout has behavioural consequences (i.e. ability to regulate effort) (DeFreese, & Smith, 2013; Schaufeli & Enzmann 1998), the differences in performance in training may be attributed to the athlete's response to the burnout symptoms.

7.7. Concluding Remarks

Thirty years of athlete burnout research has advanced understanding of the antecedents and outcomes associated with the concept (Gustafsson et al., 2017); however further research may enhanced through the use of an integrated model of athlete burnout for its conceptualisation. Adopting the theoretical framework of Gustafsson et al.'s (2011) integrated model of athlete burnout would permit research to examine potential interactions between various antecedents of burnout, early symptoms, and consequences of burnout. Other models such as Smith's (1986) cognitive-affective stress model, Silva's (1990) training stress syndrome, the unidimensional identity development and external control model (Coakley, 1992), and commitment model (Schmidt, & Stein, 1991; Raedeke, 1997), fail to encompass the whole embodiment of the athlete burnout concept. It could be suggested that the precise aetiology of burnout remains unclear as a consequence of research not adopting a comprehensive model such as the integrated model of athlete burnout (Gustafsson et al., 2011). The integrated model of athlete burnout (Gustafsson et al., 2011) encompasses an all-inclusive approach to the theorisation of the concept and could provide the framework for a validated method of assessing athlete burnout by including aspects of the antecedents, environment, early signs of athlete burnout, and dimensions of athlete burnout which would further aid the development of the field.

To the best of our knowledge, this is the first set of studies to investigate the influence of athlete's perception of their teammate's burnout within the athlete burnout field. It demonstrates that an athlete's perception of their teammates' burnout may influence perceptions of their own burnout. This thesis provides a first step in understanding the role of the teammate's burnout influencing the individual's own burnout as well as developing a validated method of assessing team burnout. Furthermore, the program of research used both experimental and applied research designs to assess the potential performance consequences of the coach-athlete relationship and athlete exhaustion. Although continued research is required as the links between athlete exhaustion, the quality of the coach-athlete relationship, and performance consequences remain unclear. It is crucial that research continues to investigate the potential impact the coach-athlete relationship and athlete exhaustion may have on performance while adopting experimental and applied designs. Whilst this thesis may have potentially benefited the field of athlete burnout research, there is no doubt this line of research inquiry will continue to evolve as burnout construct evolves. The findings of this programme of research may stimulate further academic exploration of the possible antecedents of athlete burnout as well as the consequences of the social environment and athlete burnout.

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Appendix

Appendix I

Study One

A : Participant Information

B : Participant debrief

C : Consent form

D : Contact letter

E : Questionnaires

Appendix I (A): Participant Information

Participant information

What is the purpose of the study?

The aim of the current study is to investigate whether personality and significant others affect burnout. Firstly, whether an athlete's personality type influences susceptibility to burnout. Secondly, to explore how teammates influence each other and develop shared emotions.

Why have I been selected to take part?

You have been selected because you play for a competitive team sport and are over 18 years of age.

Do I have to take part?

You are under no obligation to take part and you will not experience any loss of benefit or penalty if you choose not to participate.

What will I have to do?

A researcher will attend one of your training sessions and this will be organized through your sports team. On attending the session you will be met by the researcher and allowed to ask any questions concerning what will be expected of you. The researcher will provide any pens if required. After signing a consent form, the researcher will ask you to complete a short series of questionnaires independently. While there are no questions on the forms that are felt to be invasive or embarrassing, should you wish to omit some answers (for whatever reason) then that is fine. After completing the series of questionnaires, the researcher will give you a debrief sheet explaining the nature of the research, how you can find out about the results, and how you can withdraw your data if you wish. It is estimated that the total time to complete this study will be less than 15 minutes.

What are the exclusion criteria (i.e. are there any reasons why I should not take part)?

You should not take part in this study if:

You do not play a competitive team sport or you are under 18 years of age

You are currently suffering or recovering from, or are predisposed to any medical condition or illness that prevents you from safely undertaking the activities specified in the section above without exposing yourself to greater risk than you normally experience in usual daily activities.

What are the possible disadvantages and risks of taking part?

You will be asked to sit down for approximately 15 minutes. Participating will involve no physical discomfort

Will my participation involve any psychological discomfort or embarrassment?

The questionnaire will examine current burnout, personality, emotions of yourself and your perception of the squad. Taking part in the study should not involve any psychological discomfort. Though you are free to withdraw at any point up to a month after participation.

Will my taking part be confidential?

Yes. You will be allocated a participant code that will always be used to identify any data that you provide. Your name or other personal details will not be associated with your data, for example the consent form that you sign will be kept separate from your data.

Only the research team will have access to any identifiable information; paper records will be stored in a locked filing cabinet and electronic information will be stored on a password-protected computer. This will be kept separate from any data and will be treated in accordance with the Data Protection Act.

Who will have access to the information that I provide?

Any information and data gathered during this research study will only be available to the research team identified in the information sheet. Should the research be presented or published in any form, then that information will be generalized (i.e. your personal information or data will not be identifiable).

What will happen to the results of the study?

The results will be used in the formation of a thesis that will be examined as part of a research degree programme. Occasionally, some results might be presented at a conference or published in a journal but they will always remain anonymous. All information and data gathered during this research will be stored in line with the Data Protection Act and will be destroyed after a maximum of 3 years following the conclusion of the study. During that time the data may be used by members of the research team only for purposes appropriate to the research question, but at no point will your personal information or data be revealed.

Who has reviewed the study?

The study and its protocol has received full ethical approval from the Department of Sport, Exercise and Rehabilitation postgraduate ethics system. If you require confirmation of this please contact the chair of postgraduate ethics using the details below and stating the full title and principal investigator of the study:

Dr Mick Wilkinson

Department of Sport, Exercise and Rehabilitation

Northumbria University

Northumberland Road

Newcastle-upon-Tyne

NE1 8ST

0191 243 7097

mic.wilkinson@northumbria.ac.uk

Will I receive any financial rewards / travel expenses for taking part?

You will not receive any financial rewards/Travel expenses for taking part in the current study.

How can I withdraw from the project?

The research you will take part in will be most valuable if few people withdraw from it, so please discuss any concerns you might have with the investigators. During the study itself, if you do decide that you do not wish to take any further part then please inform one of the research team as soon as possible, and they will facilitate your withdrawal and discuss with you how you would like your data to be treated in the future. After you have completed the research you can still withdraw your data by contacting one of the research team (their contact details are provided in the last section of this form below), give them your participant number or if you have lost this give, them your name.

If, for any reason, you wish to withdraw your data please contact the investigator within a month of your participation. After this date, it might not be possible to withdraw your individual data as the results might already have been published. As all data are anonymous, your individual data will not be identifiable in any way.

What happens if there is a problem?

If you are unhappy about anything during or after your participation, you should contact the principal investigator in the first instance. If you feel this is not appropriate, you should contact the Chair of ethics for Sport, Exercise and Rehabilitation Dr Mick Wilkinson via the contact details given above.

Who is funding and organising the study?

This study has not received any funding

If I require further information who should I contact and how?

If you wish to contact the researcher please email

ralph.appleby@northumbria.ac.ukif you would like to contact the researcher's supervisor please email

paul.davis@northumbria.ac.uk

Appendix I (B): Participant Debrief

Participant debrief

What was the purpose of the project?

Within the nursing and organizational settings, burnout has been found to be contagious within groups. The study aimed to investigate whether burnout is contagious in sports teams. Also the study hoped to determine how burnout and emotions is spread within a team. The final purpose of the study was to investigate whether personality traits influenced athlete's perceptions their own and team feelings of burnout as well as their susceptibility to emotion contagion.

How will I find out about the results?

Approximately 12 weeks after taking part, the researcher will email / post you a general summary of the results if you have requested this.

Will I receive any individual feedback?

Individual feedback is not provided as it is not possible given the anonymising of data.

What will happen to the information I have provided?

Data will be stored securely and will remain confidential in accordance with the Data Protection Act. All data will be destroyed after a maximum of 5 years. Data might be used for publication or conference presentation in accordance with the purpose of the research but in all cases confidentiality will be assured.

How will the results be disseminated?

Data might be published in a scientific journal or presented at a conference, but the data will be generalized, and your data / personal information will not be identifiable.

Have I been deceived in any way during the project?

No.

If I change my mind and wish to withdraw the information I have provided, how do I do this?

If, for any reason, you wish to withdraw your data please contact the investigator within a month of your participation stating your participant code (or if you have lost this, your name). After this date, it might not be possible to withdraw your individual data as the results might already have been published. As all data are anonymous, your individual data will not be identifiable in any way.

Appendix I (C): Consent Form

CONSENT FORM

Project Title: **An Examination Of The Influence Of Personality & Team mates On Burnout**

Principal Investigator: **Ralph Appleby**

please tick or initial where applicable

I have carefully read and understood the Participant Information Sheet.	☐
I have had an opportunity to ask questions and discuss this study and I have received satisfactory answers.	☐
I understand I am free to withdraw from the study at any time, without having to give a reason for withdrawing, and without prejudice.	☐
I agree to take part in this study.	☐
I would like to receive feedback on the overall results of the study at the email address given below. Email address………………………………………………………………	☐

Signature of participant... Date....………………..

(NAME IN BLOCK LETTERS)...……………………….

Signature of researcher... Date.....………………..
(NAME IN BLOCK LETTERS).................RALPH PETER APPLEBY……………….

Appendix I (D): Contact Letter

Good morning/afternoon,

As you are aware burnout poses a serious threat to athletes and has become an important field of research aimed at minimizing performance reductions. I am interested in including members of your sports teams in part of my PhD studies under the supervision of Dr Paul Davis. An area of growing interest in sports is the spreading of emotions amongst members of sports teams. In other non-sporting settings, individual's burnout and emotions have been shown to have an effect on their colleagues. The aim of this study will be to examine whether this occurs in sport and identify how this might occur. Willing participants will be asked to complete a series of short questionnaires which would take no longer than 15 minutes.

In return, I am not able to offer any financial rewards or traveling expenses. However, I am willing to lead a session for your sports teams highlighting the value of sport psychology and discuss techniques that may benefit their sporting performance.

I hope you will partake in the study. If you are interest in participating or you would like me to provide any further information regarding my proposal please feel free to contact me or if you would like to contact Dr Paul Davis please email him at paul.davis@northumbria.ac.uk.

Kind regards

Ralph Appleby

Appendix I (E): Questionnaires

Participant number ______

Gender **Male/Female** (please circle)

Age ____

Occupation (e.g., law student, doctor) ___________________________

What team sport do you play? ____________________________

On average, how many hours do you train per week? __________________

How long have you been playing your sport? _____ **Years** ______**Months**

How long have you been playing for this particular team? _____ **Years** ______**Months**

What level of sport are you playing at? (e.g., Uni 1, national) ___________________________

Are you currently injured? **Yes/No** (please circle)

If "Yes" how long have you been injured? ___________

When did your season begin? (e.g., September 1st) ____________________________

When does your season finish? (e.g., May 31st) ____________________________

Please rate your own playing ability on a scale of 1 to 10?

1 2 3 4 5 6 7 8 9 10

Far below average **Far above average**

Please rate your teams playing ability on a scale of 1 to 10?

1 2 3 4 5 6 7 8 9 10

Far below average **Far above average**

Please rate the extent to which the items refer to you participation motivation.

How often do you feel this way?

	Almost never	Rarely	Sometimes	Frequently	Almost always
I'm accomplishing many worthwhile things in {sport}	**1**	**2**	**3**	**4**	**5**
I feel tired from training that I have trouble finding energy to do other things.	1	2	3	4	5
The effort I spend in {sport} would be better doing other things.	**1**	**2**	**3**	**4**	**5**
I feel overly tired from my {sport} participation.	1	2	3	4	5
I am not achieving much in {sport}.	**1**	**2**	**3**	**4**	**5**
I don't care as much about my {sport} as I used to.	1	2	3	4	5
I am not performing up to my abilities in {sport}.	**1**	**2**	**3**	**4**	**5**
I feel "wiped out" from {sport}.	1	2	3	4	5
I'm not into {sport} like I used to be.	**1**	**2**	**3**	**4**	**5**
I feel physically worn out from {sport}.	1	2	3	4	5
I feel less concerned about being successful in {sport} than I used to.	**1**	**2**	**3**	**4**	**5**
I am exhausted by the mental and physical demands of {sport}.	1	2	3	4	5
It seems that no matter what I do, I don't perform as well as I should.	**1**	**2**	**3**	**4**	**5**
I feel successful at {sport}.	1	2	3	4	5
I have negative feeling towards {sport}.	**1**	**2**	**3**	**4**	**5**

Please rate the extent to which the items refer to your teammates participation motivation.

How often do your teammates feel this way?

	Almost never	Rarely	Sometimes	Frequently	Almost always
My teammates are accomplishing many worthwhile things in {sport}	**1**	**2**	**3**	**4**	**5**
My teammates feel tired from training and are have trouble finding energy to do other things.	1	2	3	4	5
The effort my teammates spend in {sport} would be better doing other things.	**1**	**2**	**3**	**4**	**5**
My teammates feel overly tired from my {sport} participation.	1	2	3	4	5
My teammates are not achieving much in {sport}.	**1**	**2**	**3**	**4**	**5**
My teammates don't care as much about there	1	2	3	4	5

{sport} as they used to.					
My teammates are not performing up to their abilities in {sport}.	**1**	**2**	**3**	**4**	**5**
My teammates feel "wiped out" from {sport}.	1	2	3	4	5
My teammates are not into {sport} like they used to be.	**1**	**2**	**3**	**4**	**5**
My teammates feel physically worn out from {sport}.	1	2	3	4	5
My teammates feel less concerned about being successful in {sport} than they used to.	**1**	**2**	**3**	**4**	**5**
My teammates are exhausted by the mental and physical demands of {sport}.	1	2	3	4	5
It seems that no matter what my teammates do, they don't perform as well as they should.	**1**	**2**	**3**	**4**	**5**
My teammates feel successful at {sport}.	1	2	3	4	5
My teammates have negative feeling towards {sport}	**1**	**2**	**3**	**4**	**5**

Please circle the most appropriate number of each statement which corresponds most closely to your desired response.

	Never true	Occasionally true	Often	Always
If someone I'm talking with begins to cry, get teary-eyed.	**1**	**2**	**3**	**4**
Being with a happy person picks me up when I'm feeling down.	1	2	3	4
When someone smiles warmly at me, I smile back and feel warm inside.	**1**	**2**	**3**	**4**
I get filled with sorrow when people talk about the death of their loved ones.	1	2	3	4
I clench my jaws and my shoulders get tight when I see the angry faces on the news.	**1**	**2**	**3**	**4**
When I look into the eyes of the one I love, my mind is filled with thoughts of romance.	1	2	3	4
It irritates me to be around angry people.	**1**	**2**	**3**	**4**
Watching the fearful faces of victims on the news makes me try to imagine how they might be feeling.	1	2	3	4
I melt when the one I love holds me close.	**1**	**2**	**3**	**4**

I tense when overhearing an angry quarrel.	1	2	3	4
Being around happy people fills my mind with happy thoughts.	**1**	**2**	**3**	**4**
I sense my body responding when the one I love touches me.	1	2	3	4
I notice myself getting tense when I'm around people who are stressed out.	**1**	**2**	**3**	**4**
I cry at sad movies.	1	2	3	4
Listening to the shrill screams of a terrified child in a dentist's waiting room makes me feel nervous.	**1**	**2**	**3**	**4**

How much do you agree with each statement about you as you generally are now, not as you wish to be in the future?

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I'm the life of the party.	**1**	**2**	**3**	**4**	**5**
Sympathize with others' feelings	1	2	3	4	5
Get chores done right away.	**1**	**2**	**3**	**4**	**5**
Have frequent mood swings.	1	2	3	4	5
Have a vivid imagination.	**1**	**2**	**3**	**4**	**5**
Don't talk a lot.	1	2	3	4	5
I'm not interested in other people's problems.	**1**	**2**	**3**	**4**	**5**
Often forget to put things back in their proper place.	1	2	3	4	5
I'm relaxed most of the time.	**1**	**2**	**3**	**4**	**5**
I'm not interested in abstract ideas.	1	2	3	4	5
Talk to a lot of different people at parties.	**1**	**2**	**3**	**4**	**5**
Feel others' emotions.	1	2	3	4	5
Like order.	**1**	**2**	**3**	**4**	**5**
Get upset easily.	1	2	3	4	5
Have difficulty understanding abstract ideas.	**1**	**2**	**3**	**4**	**5**
Keep in the background.	1	2	3	4	5
I'm not really interested in others.	**1**	**2**	**3**	**4**	**5**
Make a mess of things.	1	2	3	4	5
Seldom feel blue.	**1**	**2**	**3**	**4**	**5**
Do not have a good imagination.	1	2	3	4	5

This scale consists of a number of words that describe different feelings and emotions. Read each of the items and mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way in general. Use the following scale to record your answers.

1	2	3	4	5
Very slightly Or not at all	**a little**	**moderately**	**quite a bit**	**extremely**

_____Inspired

_____Alert

_____Excited

_____Enthusiastic

_____Determined

_____Afraid

_____Upset

_____Nervous

_____Scared

_____Distressed

Appendix II

Study Three & Four

A : Participant Information

B : Participant debrief

C : Consent form

D : Questionnaires

Appendix II (A): Participant Information

Participant information

What is the purpose of the study?

The aim of the study is to investigate potential changes in motivation, energy levels, and mood across a season and explore whether these influence athletic performance. Additionally, the study will explore how your physical condition (physiology) and your thoughts may be linked with changes in motivation, energy level, mood, and performance across a season. We will also be measuring cortisol levels via your saliva as a measure of how you are responding to the physical and mental (thoughts) demands of participating in sport.

Why have I been selected to take part?

You have been selected because you play for a competitive team sport and are over 18 years of age.

Do I have to take part?

You are under no obligation to take part and you will not experience any loss of benefit or penalty if you choose not to participate.

What will I have to do?

A researcher will attend three of your training sessions organised through your sports coach. At the first session you will be met by the researcher. The researcher will explain the procedure and address any questions concerning what will be expected of you. Prior to testing the researcher will ask you to complete a medical health questionnaire. Please raise any health issue you may have with the researcher at this time. The researcher will provide pens if required. During testing, the researcher, your teammates and strength and conditioning coach are likely to be present.

Following the briefing the researcher will present you with a consent form to complete, after which you will be asked to provide a small amount of saliva using a passive drool method. The collection of saliva will require you to hold a small plastic tube in your mouth using your lips; you will sit comfortably with your head down and mouth open so that gravity will naturally draw the saliva out of your mouth into the plastic tube. You will hold this position for 2 minutes. At each testing session the data collection process will be explained to you to ensure you are comfortable with the procedure.

The researcher will then ask you to warm up for a maximal effort running task. After which you will be asked to rate how well you think you are going to perform on the fitness test.

The strength and conditioning coach will lead the fitness testing. You will be required to complete the England Rugby Anaerobic Endurance Test. It will involve running maximally between 5, 10 and 20 meter markers for 7 minutes. This may cause some discomfort that is typically associated with undertaking a maximal exertion task; potentially you may feel faint or nauseous. However, this is normal and you are in control of your level of effort and can reduce your effort at any time. During the testing if you feel that you are unable to continue then immediately stop the fitness test and alert the researcher by coming to the side of the track. If feelings of faintness or nausea persist, please inform a member of the research team and appropriate medical attention will be provided. A first aider will be present during the fitness test and for 20 minutes following completion of the test.

You will then be asked to provide another sample of saliva using the passive drool method and you will be asked to record how you think you performed on the fitness test. Following this, you will be asked to complete a computer based task, this will measure your reaction time and how well you are able to make simple decisions. The researcher will then ask you to complete a short series of questionnaires. While there are no questions on the forms that are considered to be invasive or embarrassing, should you wish to omit some answers (for whatever reason) then that is fine. Please feel free to ask the researcher any questions regarding the questionnaire you are completing. Completing the questionnaires should take approximately 15 minutes. Twenty minutes after completing the fitness test you will be asked to provide your third and final saliva sample using the passive drool method. In total the complete testing session should last between 45-50 minutes.

What are the exclusion criteria (i.e. are there any reasons why I should not take part)?

You should not take part in this study if:

You do not play a competitive team sport

You are under 18 years of age

You are currently suffering or recovering from, or are predisposed to any medical condition or illness that prevents you from safely undertaking the activities specified in the section above without exposing yourself to greater risk than you normally experience in usual team training.

What are the possible disadvantages and risks of taking part?

You will be asked to perform a maximal running task for seven minutes; this may cause some physical discomfort. However, as an athlete that participates in team sport regularly this should not be too uncomfortable and you are in control of your level of effort. A familiarisation trial will be performed prior to the full task itself to ensure you are comfortable with the task. Risk will be minimised by the presence of a first aider who will be present during the testing and for 20 minutes after the test. A Strength and Conditioning coach will lead the physical testing. On some rare occasions the passive drool method of saliva collection may cause some temporary dryness inside your mouth however shortly after providing the sample the discomfort will disappear and can be *eliminated with a drink of water which will be provided if you request.*

Will my participation involve any psychological discomfort or embarrassment?

The questionnaires will focus on motivation, energy levels, mood, and the coach-athlete relationship. Taking part in the study should not involve any psychological discomfort; although you are free to withdraw at any point up to a month after participation.

If during the testing process you become aware you are suffering from low motivation, energy levels, and/or mood you are advised to contact your GP or if you are a Northumbria Student, contact Northumbria student well-being service. Alternatively inform the researcher and they will be able to support you in gaining assistance.

Will I have to provide any bodily samples (e.g. blood, saliva)?

Yes, a small (1ml) amount of saliva will be taken from you, at three different time points during each of the testing sessions and this will occur three times over the course of your competitive season, (9 samples in total across the study).

Will my taking part be confidential?

Yes. You will be allocated a participant code which will always be used to identify any data that you provide. Your name and other personal details will not be associated with your data, for example the consent form that you sign will be kept separate from your data.

Only the research team will have access to any identifiable information; paper records will be stored in a locked filing cabinet and electronic information will be stored on a password-protected computer. This will be kept separate from any data and will be treated in accordance with the Data Protection Act.

Who will have access to the information that I provide?

Any information and data gathered during this research study will only be available to the research team identified in the information sheet. Should the research be presented or published in any form, that information will be generalized (i.e., your personal information or data will not be identifiable).

What will happen to the results of the study?

The results will be used in the formation of a Postgraduate thesis that will be examined as part of a Postgraduate degree. Occasionally, some results might be presented at a conference or published in a journal but they will always remain anonymous. All information and data gathered during this research will be stored in line with the Data Protection Act and will be destroyed after a maximum of 3 years following the conclusion of the study. During that time the data may be used by members of the research team only for purposes appropriate to the research question, but at no point will your personal information or data be revealed.

Who has reviewed the study?

The study and its protocol have received full ethical approval from the Department of Sport, Exercise and Rehabilitation Postgraduate ethics system. If you require confirmation of this please contact the chair of postgraduate ethics using the details below and stating the full title and principal investigator of the study:

Dr Mick Wilkinson

Department of Sport, Exercise and Rehabilitation

Northumbria University

Northumberland Road

Newcastle-upon-Tyne

NE1 8ST

0191 243 7097

mic.wilkinson@northumbria.ac.uk

Will I receive any financial rewards / travel expenses for taking part?

No, you will not receive any financial rewards/Travel expenses for taking part in the current study.

How can I withdraw from the project?

The research you will take part in will be most valuable if few people withdraw from it, so please discuss any concerns you might have with the investigators. During the study itself, if you do decide that you do not wish to take any further part then please inform one of the research team as soon as possible. They will facilitate your withdrawal and discuss with you how you would like your data to be treated in the future. After you have completed the research you can still withdraw your data by contacting one of the research team (their contact details are provided in the last section of this form below), give them your participant number or if you have lost this give them your name.

If, for any reason, you wish to withdraw your data please contact the investigator within a month of your participation. After this date, it might not be possible to withdraw your individual data as the results might already have been published. As all data are anonymous, your individual data will not be identifiable in any way.

What happens if there is a problem?

If you are unhappy about anything during or after your participation, you should contact the principal investigator in the first instance. If you feel this is not appropriate, you should contact the Chair of ethics for Sport, Exercise and Rehabilitation: Dr Mick Wilkinson via the contact details given above.

Who is funding and organising the study?

This study has not received any funding

If I require further information who should I contact and how?

If you wish to contact the researcher please email

ralph.appleby@northumbria.ac.uk

if you would like to contact the researcher's supervisor please email

paul.davis@northumbria.ac.uk

Appendix II (B): Participant Debrief

Participant debrief

What was the purpose of the project?

The study aimed to assess how athletes' levels of burnout (including motivation, energy levels, and mood) change across a season. For the most part previous research has only measured athletes' burnout at one time during a season. Our aim was to investigate burnout across a competitive season, whilst also examining possible causes and consequences of burnout including general mood, emotional health and the quality of the coach-athlete relationship. The study also considered how burnout may influence physical and cognitive (decision making) performance. This is important to investigate as it could help us understand why athletes that are run down or burnt out may perform below their expectations. The study measured the potential links between burnout and cortisol (as a measure of the body's stress response), performance on a maximal effort fitness task and cognitive performance on the reaction time task. These two performance measures link into fundamental skills that are important in the majority of team based sports.

How will I find out about the results?

Approximately 12 weeks after completing the final trail, the researcher will email you a general summary of the results if you have requested this.

Will I receive any individual feedback?

Individual feedback is not normally provided, but a summary of the overall findings can be provided if you request this.

What will happen to the information I have provided?

Data will be stored securely and will remain confidential in accordance with the Data Protection Act. All data will be destroyed after a maximum of 5 years. Data might be used for publication or conference presentation in accordance with the purpose of the research but in all cases confidentiality will be assured.

How will the results be disseminated?

Data might be published in a scientific journal or presented at a conference, but the data will be generalized, and your data / personal information will not be identifiable.

Have I been deceived in any way during the project?

No

If I change my mind and wish to withdraw the information I have provided, how do I do this?

If for any reason, you wish to withdraw your data please contact the investigator within a month of your participation stating your participant code (or if you have lost this, your name). After this date, it might not be possible to withdraw your individual data as the results might already have been published. As all data are anonymous, your individual data will not be identifiable in any way.

Appendix II (C): Constent Form

CONSENT FORM

Project Title: **An Examination Of Motivation, Energy Levels, Mood In Sports Teams across A Season**

Principal Investigator: **Ralph Appleby**

please tick or initial where applicable

I have carefully read and understood the Participant Information Sheet.	☐
I have had an opportunity to ask questions and discuss this study and I have received satisfactory answers.	☐
I understand I am free to withdraw from the study at any time, without having to give a reason for withdrawing, and without prejudice.	☐
I agree to take part in this study.	☐
I would like to receive feedback on the overall results of the study at the email address given below. Email address…………………………………………………………………	☐

Signature of participant... Date.....………………..

(NAME IN BLOCK LETTERS)...………………………

Signature of researcher... Date.....………………..

(NAME IN BLOCK LETTERS)................RALPH PETER APPLEBY……………….

Appendix II (D): Questionnaires

GENERAL HEALTH QUESTIONNAIRE

Participant ID: …………………

As you are participating in exercise within this laboratory, please can you complete the following questionnaire. Your co-operation is greatly appreciated.

All information within this questionnaire is considered confidential.

Where appropriate please circle your selected answer.

1. **How would you describe your current level of activity?**

Sedentary / Moderately Active / Highly Active

2. **How would you describe your current level of fitness?**

Very Unfit / Moderately Fit / Trained / Highly Trained

3. **How would you describe your current body weight?**

Underweight / Ideal / Slightly Overweight / Very Overweight

4. **Smoking Habit: -**

Currently a non-smoker Yes / No

Previous smoker Yes / No

If previous smoker, how long since you stopped? ………Years

Regular smoker Yes / No of …… per day

Occasional smoker Yes / No of …… per day

5. **Alcohol Consumption: -**

Do you drink alcohol? Yes / No

If yes then do you -	**have an occasional drink**	**Yes / No**
	have a drink every day?	**Yes / No**
	have more than one drink per day?	**Yes / No**

6. **Have you consulted your doctor within the last 6 months?**

Yes / No

If yes, please give details …………………………………………………..

7. **Are you currently taking any medication (including anti-inflammatory drugs)?**

Yes / No

If yes, please give details …………………………………………………..

8. **Do you, or have you ever suffered from:-**

Diabetes **Yes / No**

Asthma **Yes / No**

Epilepsy **Yes / No**

Bronchitis **Yes / No**

Elevated cholesterol **Yes / No**

High Blood Pressure **Yes / No**

9. **Do you suffer from, or have you ever suffered from any heart complaint or pains in your chest, either associated with exercise or otherwise?**

Yes / No

10. **Is there a history of heart disease in your family?**

Yes / No

11. **Do you feel faint or have spells of severe dizziness when undertaking exercise or otherwise?**

Yes / No

12. **Do you currently have any form of muscle joint injury?**

Yes / No

If yes, please give details …………………………………………………

13. **Have you ever suffered from any knee joint injury or thigh injury?**

Yes / No

If yes, please give details …………………………………………………

14. **Do you currently take any form of nutritional supplement (e.g. creatine, whey and casein protein, HMB, etc)?**

Yes / No

If yes, please give details …………………………………………………

15. **Do you have any food allergies?**

Yes/No

If yes, please give details …………………………………………………

16. **Are you currently on any special diet or have dieted in the past? (e.g. weight loss/ high protein)**

Yes/No

If yes, please give details …………………………………………………………

17. **Is there anything to your knowledge that may prevent you from successfully completing the test that has been explained to you?**

Yes / No

If yes, please give details …………………………………………………..

Please provide any further information concerning any condition/complaint that you suffer from and any medication that you may be taking by prescription or otherwise.

………
……………………………………………

Signature of participant: ………………………………… Date: …………………………..

Signature of test supervisor: ………………………

Participant number ______

Prior to completing the fitness test please rate how well you think you will perform on a scale of 1 to 10?

1 2 3 4 5 6 7 8 9 10

Far below average Far above average

Following the fitness test please rate how well you think you performed on a scale of 1 to 10?

1 2 3 4 5 6 7 8 9 10

Far below average Far above average

Participant number ______

Gender	**Male/Female**	(please circle)
Age	____	
Occupation (e.g., law student, doctor)	__________________________	
What team sport do you play?	___________________________	
What time did you go to sleep?	___________________________	
What time did you wake up?	___________________________	
How long ago did you last eat?	**_____ hours ______minutes**	
On average, how many hours do you train per week?	__________________	
How long have you been playing your sport?	**_____ Years ______Months**	
How long have you been playing for this particular team?	**_____ Years ______Months**	
What level of sport are you playing at? (e.g., Uni 1, national)	__________________________	
Are you currently injured?	**Yes/No**	(please circle)
If "Yes" how long have you been injured?	___________	
Type of injury?	___________________________	

So far this season

How many games have you started?	___________
How many games have you been a substitute?	___________

Please rate your own playing ability on a scale of 1 to 10?

1 2 3 4 5 6 7 8 9 10

Far below average **Far above average**

Please rate your team's playing ability on a scale of 1 to 10?

1 2 3 4 5 6 7 8 9 10

Far below average **Far above average**

Please rate the extent to which the items refer to your teammates participation motivation.

How often do your teammates feel this way?

	Almost never	Rarely	Sometimes	Frequently	Almost always
My teammates are accomplishing many worthwhile things in {sport}	**1**	**2**	**3**	**4**	**5**
My teammates feel tired from training and are have trouble finding energy to do other things.	1	2	3	4	5

The effort my teammates spend in {sport} would be better doing other things.	**1**	**2**	**3**	**4**	**5**
My teammates feel overly tired from their {sport} participation.	1	2	3	4	5
My teammates are not achieving much in {sport}.	**1**	**2**	**3**	**4**	**5**
My teammates don't care as much about there {sport} as they used to.	1	2	3	4	5
My teammates are not performing up to their abilities in {sport}.	**1**	**2**	**3**	**4**	**5**
My teammates feel "wiped out" from {sport}.	1	2	3	4	5
My teammates are not into {sport} like they used to be.	**1**	**2**	**3**	**4**	**5**
My teammates feel physically worn out from {sport}.	1	2	3	4	5
My teammates feel less concerned about being successful in {sport} than they used to.	**1**	**2**	**3**	**4**	**5**
My teammates are exhausted by the mental and physical demands of {sport}.	1	2	3	4	5
It seems that no matter what my teammates do, they don't perform as well as they should.	**1**	**2**	**3**	**4**	**5**
My teammates feel successful at {sport}.	1	2	3	4	5
My teammates have negative feeling towards {sport}	**1**	**2**	**3**	**4**	**5**

Please rate the extent to which the items refer to you participation motivation.

How often do you feel this way?

	Almost never	**Rarely**	**Sometimes**	**Frequently**	**Almost always**
I'm accomplishing many worthwhile things in {sport}	**1**	**2**	**3**	**4**	**5**
I feel tired from training that I have trouble finding energy to do other things.	1	2	3	4	5
The effort I spend in {sport} would be better doing other things.	**1**	**2**	**3**	**4**	**5**
I feel overly tired from my {sport} participation.	1	2	3	4	5
I am not achieving much in {sport}.	**1**	**2**	**3**	**4**	**5**
I don't care as much about my {sport} as I used to.	1	2	3	4	5
I am not performing up to my abilities in {sport}.	**1**	**2**	**3**	**4**	**5**
I feel "wiped out" from {sport}.	1	2	3	4	5
I'm not into {sport} like I used to be.	**1**	**2**	**3**	**4**	**5**
I feel physically worn out from {sport}.	1	2	3	4	5
I feel less concerned about being successful in {sport} than I used to.	**1**	**2**	**3**	**4**	**5**
I am exhausted by the mental and physical demands of {sport}.	1	2	3	4	5
It seems that no matter what I do, I don't perform as well as I should.	**1**	**2**	**3**	**4**	**5**
I feel successful at {sport}.	1	2	3	4	5
I have negative feeling towards {sport}.	**1**	**2**	**3**	**4**	**5**

This scale consists of a number of words that describe different feelings and emotions. Read each of the items and mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way in general. Use the following scale to record your answers.

1	2	3	4	5
Very slightly Or not at all	**a little**	**moderately**	**quite a bit**	**extremely**

____Inspired ____Afraid
____Alert ____Upset
____Excited ____Nervous
____Enthusiastic ____Scared
____Determined ____Distressed

	Strongly disagree						Strongly Agree
I feel close to my coach	**1**	**2**	**3**	**4**	**5**	**6**	**7**
I feel committed to my coach	1	2	3	4	5	6	7
I feel that my sport career is promising with my Coach	**1**	**2**	**3**	**4**	**5**	**6**	**7**
I like my coach	1	2	3	4	5	6	7
I trust my coach	**1**	**2**	**3**	**4**	**5**	**6**	**7**
I respect my coach	1	2	3	4	5	6	7
I feel appreciation for the sacrifices my coach has experienced in order to improve my performance	**1**	**2**	**3**	**4**	**5**	**6**	**7**
When I am coached by my coach, I feel at ease	1	2	3	4	5	6	7
When I am coached by my coach, I feel responsive to his effort	**1**	**2**	**3**	**4**	**5**	**6**	**7**
When I am coached by my coach, I am ready to do my best	1	2	3	4	5	6	7
When I am coached by my coach, I adopt a friendly stance	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Appendix III

Study Five

A : Participant Information

B : Participant Debrief

C : Consent Form

D : Information Sheet for Parents

E : Parents/Guardian Letter

F : Questionnaires

Appendix III (A): Participant Information

Participant information

What is the purpose of the study?

The aim of the study is to investigate potential changes in your motivation, energy levels, mood, physical condition(physiology) across a six week period, in order to explore how these factors may be related with each other and performance outcomes.

Why have I been selected to take part?

You have been selected because you play for Sunderland Academy under 18 squad.

Do I have to take part?

You are under no obligation to take part and your status on the team will not be influenced by participation in the study. As aspects of the study (i.e., the fitness and jumping tests) are being incorporated into your regular training, the club requires you to complete the testing as a player (as part of your training program).

What will I have to do?

At the first session you will be met by the researcher and your S&C (strength and conditioning) coach. The researcher will explain all of the measures, how you will be tested during the study, and be available to answer any questions about the study. During testing, the researcher, your teammates and your S&C coach are likely to be present. After the briefing you will complete an informed consent form before testing starts.

In week 1 and week 6 you will be asked to complete a questionnaire, a sub-maximal YoYo test and Counter Movement Jumps. At each session, the testing procedure will be explained to ensure you are comfortable with the tasks. You will warm up before the running and Counter Movement Jump tasks. You are already familiar with both the sub-maximal YoYo test and Counter Movement Jumps as they are part of your regular training.

During weeks 2, 3, 4 & 5 you will be asked to complete a well-being questionnaire (composed of five short questions) and Counter Movement Jumps.

What are the exclusion criteria (i.e. are there any reasons why I should not take part)?

You should not take part in this study if: you are currently suffering or recovering from, or are predisposed to any medical condition or illness that prevents you from safely undertaking the activities specified in the section above without exposing yourself to greater risk than you normally experience in usual team training.

What are the possible disadvantages and risks of taking part?

You will be asked to perform a running task for six minutes; this may cause some physical discomfort. However as an athlete, this should not be too uncomfortable and you are in control of your level of effort. A familiarisation trial will be performed prior to testing to ensure you are comfortable. Risk will be minimised by a first aider who will be present during the testing and for 20 minutes after. An S&C coach will lead the physical testing.

Will my participation involve any psychological discomfort or embarrassment?

The questionnaires will focus on motivation, energy levels, mood, and the coach-athlete relationship. Taking part in the study should not involve any psychological discomfort; you are however, free to withdraw at any point up during the study.

If during the testing process you become aware you are suffering from low motivation, energy levels, and/or mood you are advised to contact your GP or sport psychology department at SAFC. Alternatively inform the researcher and they will be able to support you in gaining assistance.

Will my taking part be confidential?

You will be issued with an anonymous identification code that will be used to identify their data. All documents containing information will be stored securely in a locked filing cabinet which will only be accessible to the researcher. Any information provided will be used only for the purpose of the study that relates to the providing of informed consent. All electronic data will be stored on password-protected computers.

Who will have access to the information that I provide?

Any information and data gathered during this research study will only be available to the research team identified in the information sheet. Should the research be presented or published in any form, that information will be generalized (i.e., your personal information or data will not be identifiable).

What will happen to the results of the study?

All information and data gathered during this investigation will be stored in line with the Data Protection Act and will be destroyed after a maximum of 5-years following the termination of the study. During that time the data will be used by the research team only for purposes appropriate to the research question; at no point will personal information be revealed.

Who has reviewed the study?

Yes, this study and its protocol have received full ethical approved from the Faculty of Health and Life Sciences Ethics Committee. If you require confirmation of this please contact the Chair of this committee, stating the title of the research project and the name of the principle investigator:

Chair of the Faculty of Health and Life Science Ethics Committe (Dr Mic Wilkinson); Northumberland Building; Northumbria University; Newcastle upon Tyne; NE1 8ST; Email: mic.wilkinson@northumbria.ac.uk

Will I receive any financial rewards / travel expenses for taking part?

No, you will not receive any financial rewards/Travel expenses for taking part in the current study.

How can I withdraw from the project?

The research you will take part in will be most valuable if few people withdraw from it, so please discuss any concerns you might have with the investigators. During the study itself, if you do decide that you do not wish to take any further part then please inform one of the research team as soon as possible. They will facilitate your withdrawal and discuss with you how you would like your data to be treated in the future. After you have completed the research you can still withdraw your data by contacting one of the research team (their contact details are provided in the last section of this form below), give them your participant number or if you have lost this give them your name.

If, for any reason, you wish to withdraw your data please contact the investigator within a month of your participation. After this date, it might not be possible to withdraw your individual data as the results might already have been published. As all data are anonymous, your individual data will not be identifiable in any way.

What happens if there is a problem?

If you are unhappy about anything during or after your participation, you should contact the principal investigator in the first instance. If you feel this is not appropriate, you should contact the Chair of ethics for Sport, Exercise and Rehabilitation: Dr Mick Wilkinson via the contact details given above.

Who is funding and organising the study?

This study has not received any funding

If I require further information who should I contact and how?

If you wish to contact the researcher Ralph Appleby please email

ralph.appleby@northumbria.ac.uk

if you would like to contact the researcher's supervisor Dr Paul Davis please email

paul.davis@northumbria.ac.uk

Appendix III (B) : Participant Debrief

Participant debrief

What was the purpose of the project?

The study aimed to assess how athletes' levels of burnout (including motivation, energy levels, and mood) change across a season. For the most part previous research has only measured athletes' burnout at one time during a season. Our aim was to investigate burnout intensively across a six week period of a competitive season, whilst also examining possible causes and consequences of burnout including general mood, emotions and the quality of the coach-athlete relationship. The study also considered how burnout may influence physical performance. A performance measures link into fundamental skills that are important in the majority of team based sports. This is important to investigate as it could help us understand why athletes that are run down or burnt out may perform below their expectations.

How will I find out about the results?

Approximately 12 weeks after completing the final trail, the researcher will email you a general summary of the results if you have requested this.

Will I receive any individual feedback?

Individual feedback is not normally provided, but a summary of the overall findings can be provided if you request this.

What will happen to the information I have provided?

Data will be stored securely and will remain confidential in accordance with the Data Protection Act. All data will be destroyed after a maximum of 5 years. Data might be used for publication or conference presentation in accordance with the purpose of the research but in all cases confidentiality will be assured.

How will the results be disseminated?

Data might be published in a scientific journal or presented at a conference, but the data will be generalized, and your data / personal information will not be identifiable.

Have I been deceived in any way during the project?

No

If I change my mind and wish to withdraw the information I have provided, how do I do this?

If for any reason, you wish to withdraw your data please contact the investigator within a month of your participation stating your participant code (or if you have lost this, your name). After this date, it might not be possible to withdraw your individual data as the results might already have been published. As all data are anonymous, your individual data will not be identifiable in any way.

Appendix III (C) : Consent Form

CONSENT FORM

Project Title**: <u>An Examination Of Motivation, Energy Levels, Mood In Sports Teams across A Season</u>**

Principal Investigator: **<u>Ralph Appleby</u>**

please tick or initial where applicable

I have carefully read and understood the Participant Information Sheet.	☐
I have had an opportunity to ask questions and discuss this study and I have received satisfactory answers.	☐
I understand I am free to withdraw from the study at any time, without having to give a reason for withdrawing, and without prejudice.	☐
I agree to take part in this study.	☐
I would like to receive feedback on the overall results of the study at the email address given below. Email address…………………………………………………………………	☐

Signature of participant.. Date...………………..

(NAME IN BLOCK LETTERS)...……………………….

Signature of researcher.. Date...………………..

(NAME IN BLOCK LETTERS).................RALPH PETER APPLEBY……………….

Appendix III (D): Information Sheet for Parents

TITLE OF PROJECT: An Examination Of Burnout In Sports Teams across a six week period

Principal Investigator: *Mr. Ralph Appleby*

1. What is the purpose of the project?

The aim of the study is to investigate potential changes in your son's motivation, energy levels, mood, physical condition(physiology) across a six week period in order to explore how these factors may be related with each other and performance outcomes.

2. Why has my son been selected to take part?

Your son has been selected to participate in the study because they play for the Sunderland Academy under 18 squad

3. What will my son have to do?

If your son decides to participate in the 6-week study, at the first session they will be met by the researcher and their S&C (strength and conditioning) coach. The researcher will explain all of the measures, how they will be tested during the study, and be available to answer any questions your son may have about the study. During testing, the researcher, your son's teammates and their S&C coach are likely to be present. After the briefing your son will complete an informed consent form before testing starts.

In week 1 and week 6 your son will be asked to complete a questionnaire, a sub-maximal YoYo test and Counter Movement Jumps. At each session the testing procedure will be explained to ensure your son is comfortable with the tasks. The researcher will ask your son to warm up before the running and Counter Movement Jump tasks. Your son is already familiar with both the sub-maximal YoYo test and Counter Movement Jumps as part of their regular training. For your information, during the Sub-maximal YoYo test your son will run for 6 minutes consisting of repeated 20-m shuttle runs at increasing speeds guided by a recording played on a CD player. The Counter Movement Jumps require your son to jump three times on each occasion following the same instructions.

During weeks 2, 3, 4 & 5 your son will be asked to complete a well-being questionnaire (composed of five short questions) and Counter Movement Jumps.

4. What are the exclusion criteria (i.e. are there any reasons why my son/daughter should not take part)?

Your son should not take part in the present investigation if they: (1)Do not play for SAFC; (2) Are *currently suffering or recovering from, or are predisposed to any medical condition or illness that prevents your son from safely undertaking the activities specified in the section above without exposing them to greater risk than your son normally experience in usual team training*

5. Will my son's participation involve any physical discomfort?

Your son will be asked to perform a running task for six minutes; this may cause some physical discomfort. However as an athlete that regularly participates in sport, this should not be too uncomfortable and your son is in control of their level of effort. A practice trial will be performed to ensure your son is comfortable with the task. Risk will be minimised by a first aider being present during the testing and for 20 minutes after. An S&C coach will lead the physical testing.

6. Will my son's participation involve any psychological discomfort or embarrassment?

The questionnaires will focus on motivation, energy levels, mood, and the coach-athlete relationship. Taking part in the study should not involve any psychological discomfort; although your son is free to withdraw at any point up to a month after participation.

If during the testing process you or your son become aware your son is suffering from low motivation, energy levels, and/or mood you are advised to contact your GP or sport psychology department at SAFC. Alternatively the researcher can be informed and they will be able to support you and your son in gaining assistance.

7. How will confidentiality be assured?

Your son will be issued with an anonymous identification code that will be used to identify their data. All documents containing information about your son will be stored securely in a locked filing cabinet which will only be accessible to the researcher. Any information provided will be used only for the purpose of the study that relates to the providing of informed consent. All electronic data will be stored on password-protected computers.

8. Who will have access to the information that me and my son provide?

SAFC staff will not be reviewing any of the athletes' individual data. Any information and data gathered from your son will only be available to the Principal Investigator identified in the information sheet (Ralph Appleby) and members of the research team.

9. How will my son's information be stored / used in the future?

All information and data gathered from your son during this investigation will be stored in line with the Data Protection Act and will be destroyed after a maximum of 5-years following the termination of the study. During that time the data will be used by the research team only for purposes appropriate to the research question; at no point will personal information be revealed.

10. Has this investigation received appropriate ethical clearance?

Yes, this study and its protocol have received full ethical approved from the Faculty of Health and Life Sciences Ethics Committee. If you require confirmation of this please contact the Chair of this committee, stating the title of the research project and the name of the principle investigator:

Chair of the Faculty of Health and Life Science Ethics Committe (Dr Mic Wilkinson); Northumberland Building; Northumbria University; Newcastle upon Tyne; NE1 8ST; Email: mic.wilkinson@northumbria.ac.uk

11. How can I withdraw my son from the project?

If you choose to have your son withdraw any anytime please do not hesitate to contact the Principal Investigator (Ralph Appleby) as soon as possible at ralph.appleby@northumbria.ac.uk, giving your son's confidential participant number code provided to your son to have their data deleted. After one month after the end of the study it may not be possible to withdraw the data.

12. If I require further information who should I contact and how?

At any time, leading up to or throughout the investigation, you wish to speak to one of our research members please do not hesitate to contact the Principal Investigator (Ralph Appleby) Address:

Mr. Ralph Appleby

PhD Research Student

Department of Sport, Exercise and Rehabilitation

Northumbria University

NE1 8ST

Email: ralph.appleby@northumbria.ac.uk

I would like to thank you for giving your time and reading this document.

Appendix III (E) : Parents/Guardian Letter

Dear parent and/or guardian,

Your son has been invited to participate in a study conducted as part of a PhD program. The aim of the study is to investigate potential changes in motivation, energy levels, and mood across a six week period and explore whether these influence athletic performance. Additionally, the study will explore how your son's physical condition (physiology) is impacted by changes in motivation, energy level, mood, and performance across a six week period. Please see the included parental information sheet. Your son's status in the team will not be impacted upon by the answers they provide.

If you do not wish your son to be included in the study, please complete the section below and return to Andrew Baylis.

Kind Regards

Ralph Appleby , MSc

Postgraduate Researcher

Department of Sport, Exercise and Rehabilitation

Faculty of Health and Life Sciences

Northumbria University

NE1 8ST

I would like to withdraw ____________________ (enter name), from participation in the study

____________________ ______________________

(Name) (Signature)

Appendix III (F) : Questionnaires

Participant number ______

Age	**____**
Position	**___________________________**
What time did you go to sleep last night?	**____________________________**
What time did you wake up this morning?	**____________________________**
How long ago did you last eat?	**_____ hours ______minutes**
On average, how many hours do you train per week?	**__________________**
How long have you been playing your sport?	**_____ Years ______Months**
How long have you been playing for this particular team?	**_____ Years ______Months**
Are you currently injured?	**Yes/No** (please circle)
If "Yes" how long have you been injured?	**___________**
Type of injury?	**____________________________**
So far this season	
How many games have you started?	**___________**
How many games have you been a substitute?	**___________**

Please rate your own current playing ability relative to your usual level of performance on a scale of 1 to 10?

1 2 3 4 5 6 7 8 9 10

Far below average **Far above average**

Please rate your team's current playing ability relative to their usual level of performance on a scale of 1 to 10?

1 2 3 4 5 6 7 8 9 10

Far below average **Far above average**

Please rate the extent to which the items refer to your teammates participation motivation.

How often do your teammates feel this way?

	Almost never	Rarely	Sometimes	Frequently	Almost always
My teammates are accomplishing many worthwhile things in {sport}	**1**	**2**	**3**	**4**	**5**
My teammates feel tired from training and are have trouble finding energy to do other things.	1	2	3	4	5
The effort my teammates spend in {sport} would be better doing other things.	**1**	**2**	**3**	**4**	**5**
My teammates feel overly tired from their {sport} participation.	1	2	3	4	5
My teammates are not achieving much in {sport}.	**1**	**2**	**3**	**4**	**5**
My teammates don't care as much about there {sport} as they used to.	1	2	3	4	5
My teammates are not performing up to their abilities in {sport}.	**1**	**2**	**3**	**4**	**5**
My teammates feel "wiped out" from {sport}.	1	2	3	4	5
My teammates are not into {sport} like they used to be.	**1**	**2**	**3**	**4**	**5**
My teammates feel physically worn out from {sport}.	1	2	3	4	5
My teammates feel less concerned about being successful in {sport} than they used to.	**1**	**2**	**3**	**4**	**5**
My teammates are exhausted by the mental and physical demands of {sport}.	1	2	3	4	5
It seems that no matter what my teammates do, they don't perform as well as they should.	**1**	**2**	**3**	**4**	**5**
My teammates feel successful at {sport}.	1	2	3	4	5
My teammates have negative feeling towards {sport}	**1**	**2**	**3**	**4**	**5**

Please rate the extent to which the items refer to you participation motivation.

How often do you feel this way?

	Almost never	Rarely	Sometimes	Frequently	Almost always
I'm accomplishing many worthwhile things in {sport}	**1**	**2**	**3**	**4**	**5**
I feel tired from training that I have trouble finding energy to do other things.	1	2	3	4	5
The effort I spend in {sport} would be better doing other things.	**1**	**2**	**3**	**4**	**5**
I feel overly tired from my {sport} participation.	1	2	3	4	5
I am not achieving much in {sport}.	**1**	**2**	**3**	**4**	**5**
I don't care as much about my {sport} as I used to.	1	2	3	4	5
I am not performing up to my abilities in {sport}.	**1**	**2**	**3**	**4**	**5**
I feel "wiped out" from {sport}.	1	2	3	4	5
I'm not into {sport} like I used to be.	**1**	**2**	**3**	**4**	**5**
I feel physically worn out from {sport}.	1	2	3	4	5

I feel less concerned about being successful in {sport} than I used to.	**1**	**2**	**3**	**4**	**5**
I am exhausted by the mental and physical demands of {sport}.	1	2	3	4	5
It seems that no matter what I do, I don't perform as well as I should.	**1**	**2**	**3**	**4**	**5**
I feel successful at {sport}.	1	2	3	4	5
I have negative feeling towards {sport}.	**1**	**2**	**3**	**4**	**5**

This scale consists of a number of words that describe different feelings and emotions. Read each of the items and mark the appropriate answer in the space next to that word. Indicate to what extent *you have felt* this way in gerneral. Use the following scale to record your answers.

1	2	3	4	5
Very slightly Or not at all	**a little**	**moderately**	**quite a bit**	**extremely**

____Inspired ____Afraid

____Alert ____Upset

____Excited ____Nervous

____Enthusiastic ____Scared

____Determined ____Distressed

This scale consists of a number of words that describe different feelings and emotions. Read each of the items and mark the appropriate answer in the space next to that word. Indicate to what extent you perceive *your teammates* as feeling this way in general. Use the following scale to record your answers.

1	2	3	4	5
Very slightly Or not at all	**A little**	**Moderately**	**Quite a bit**	**Extremely**

____Inspired ____Afraid

____Alert ____Upset

____Excited ____Nervous

____Enthusiastic ____Scared

____Determined ____Distressed

	Strongly disagree						Strongly Agree
I feel close to my coach	**1**	**2**	**3**	**4**	**5**	**6**	**7**
I feel committed to my coach	1	2	3	4	5	6	7
I feel that my sport career is promising with my Coach	**1**	**2**	**3**	**4**	**5**	**6**	**7**
I like my coach	1	2	3	4	5	6	7
I trust my coach	**1**	**2**	**3**	**4**	**5**	**6**	**7**
I respect my coach	1	2	3	4	5	6	7
I feel appreciation for the sacrifices my coach has experienced in order to improve my performance	**1**	**2**	**3**	**4**	**5**	**6**	**7**
When I am coached by my coach, I feel at ease	1	2	3	4	5	6	7
When I am coached by my coach, I feel responsive to his effort	**1**	**2**	**3**	**4**	**5**	**6**	**7**
When I am coached by my coach, I am ready to do my best	1	2	3	4	5	6	7
When I am coached by my coach, I adopt a friendly stance	**1**	**2**	**3**	**4**	**5**	**6**	**7**