Biopsychosocial Risks for Occupational Health and Well-Being Among White-Water Raft Guides

by

Iain S. Wilson

Doctoral Thesis

Submitted in partial fulfilment for the award for Doctor in Philosophy of Loughborough University

September 2015

Abstract

This thesis is concerned with the occupational health of white-water raft guides working in the UK and details how working conditions and practices can lead to an increased risk of unintentional injury or ill-health. Work-related injury and ill-health is a problem across all industries in the UK, with some employees, such as those working in the Outdoor Industry, being more at risk than those working in other industries. Biological and psychosocial factors have been associated with work-related health in a range of occupational settings; however, the majority of previous studies have used non-physical occupational samples, such as office workers. Very little is known about the occupational health risk factors of those working in the Outdoor Industry, such as white-water raft guides, especially as health and safety strategies currently in place are client focused as opposed to provider focused.

This research comprised two studies, adopting a multi-methodological approach. The first utilised an exploratory qualitative approach to investigate what work conditions and practices may influence the health and well-being of white-water raft guides. Semi-structured interviews were conducted with 20 white water raft guides to obtain self-reported data on occupational health. Chronic back trouble was identified as a common problem within the industry with unilateral guiding (guiding on one side) being identified as a known risk factor. Despite this being a known risk factor, interviewees reported high work commitment and persisted in unilateral guiding for perfectionism and to meet the demands of the role.

Data from the initial qualitative study informed the second study; a longitudinal questionnaire-based study examining the biopsychosocial risk factors of work-related injury and ill-health of white-water raft guides across a working season. The survey was distributed nationwide at three time intervals across a working season. All raft guides registered under the British Canoe Union were emailed a link to the online study. Additionally, 11 white-water rafting providers were visited to boost participation. A total of 126 raft guides completed the survey at Early Season, 98 at Mid-Season and 79 at Late Season.

Exploratory data analyses indicated that chronic musculoskeletal conditions (MSC) were problematic for white-water raft guides, with over 90% of participants disclosing at least one condition. Chronic MSCs occurred more frequently than acute trauma injuries and were most prominent during Early Season. Pain in the lower back was the most commonly reported chronic MSC. Longer working hours and guiding bilaterally contributed to lower back pain. Chronic shoulder pain was associated with a greater number of years' experience, however, older participants were less likely to report shoulder complaints.

As working longer hours and participating in a greater amount of physical leisure activity contributed to MSCs, it is possible that white-water raft guides may be impeding their recovery experience. Multilevel analyses were conducted to test longitudinal associations between working conditions and practices, work engagement and the need for recovery. It was identified that increased amounts of physical leisure activity, working on a natural river and high levels of work vigour contributed to a lower need for emotional and physical recovery. However, working on a man-made course and high levels of

absorption increased the need for recovery among white-water raft guides. Indirect effects of working hours and physical leisure activity on the need for recovery were tested by analysing interaction terms between these moderators and the work environment and the components of work engagement. The number of hours worked as a white-water raft guide had no direct or indirect effect on the need for recovery. Physical leisure activity had no indirect effect on the need for recovery.

From the occupational literature there is evidence that working in an intense environment, working longer hours, low levels of vigor, high levels of absorption and a higher need for recovery may contribute to the development of chronic MSCs. Longitudinal multilevel analyses were conducted to test such associations. The results identified that high levels of within-subject vigor was associated with a greater number of chronic MSCs reported. The strength of this relationship weakened as the season progressed. With regards to between-subject associations, raft guides with a greater need for recovery were more likely to report a higher number of chronic MSCs than their peers with a lower need for recovery. This association did not alter over time. No other within or between-subject associations were observed. Finally, neither working hours nor hours of physical leisure activity had a direct or indirect effect on the number of chronic MSCs reported by white-water raft guides across a working season.

This research has established that chronic MSCs, particularly back pain, are problematic for white-water raft guides working in the UK. The thesis argues that improving work vigor and ascertaining sufficient recovery is necessary to reduce the risk of work-related injury and ill-health, particularly during times of high work-load.

Acknowledgements

I would like to express my deepest gratitude to my supervisors, Dr Hilary McDermott and Dr Fehmidah Munir for giving me the opportunity to undertake this PhD. Their continual support has guided me through my time at Loughborough and I will take away much knowledge to where I may head next.

Also I would like to thank the staff and students in the School of Sport, Exercise and Health Sciences for providing a fantastic, kind and supporting working environment. There are too many to name individually, but I I would like to give special thanks to Professor Eef Hogervorst for her wise counsel on how to improve my thesis during my annual reviews. I would also like to express my gratitude to Dr Paula Griffiths and Dr Ian Taylor for sharing their invaluable knowledge on statistical analyses at various stages of this research.

To my family and friends, I wish to thank you for your support and being understanding. You have all stood by me through the highs and the lows, providing the support and encouragement needed to get me to the end.

To Jill, I can't thank you enough for all the love and support you have provided. You have believed in me and help me believe in myself. You have been patient and understanding and are probably very happy to hear that it is now finished.

Finally, I would like to thank Loughborough University for funding this project and providing the training which has set me up for a career in academia.

Publications

Academic Journals

Wilson, I., McDermott, H., & Munir, F. (2016). The role of working hours, work environment and physical leisure activity on the need for recovery following a day's work among UK white-water raft guides: A within-subjects multilevel approach. *Psychology of Sport and Exercise, 23*, 123-131.

Wilson, I., McDermott, H., Munir, F., & Hogervorst, E. (2013). Injuries, ill-health and fatalities in white water rafting and white water paddling. *Sports Medicine 43*(1): 65-75.

Book Chapters

Wilson, I., Folland, J., McDermott, H., & Munir, F. (Accepted). White-water paddlesports: Canoeing, Kayaking and Rafting. In Feletti, F. (ed.) *Extreme Sports Medicine*. Springer Publications.

Conference Precedings

Oral Presentations

McDermott, H., Munir, F., & **Wilson, I.** (2016). Workstyle and the development of musculoskeletal pain among white-water raft guides. In Proceedings of the 12th EAOHP Conference: Occupational Health Psychology in Times of Change: Society and the Workplace (edited by Teoh, K., Dediu, V., Saade, N.J., & Hassard). Presented at the 12th European Academy of Occupational Health Psychology Conference. pp. 181.

Wilson, I., McDermott, H., & Munir, F. (2014). Predictors of injury amongst white-water raft guides working in the UK. In Contemporary Ergonomics and Human Factors 2014: proceedings (edited by Sharples, S. & Shorrock, S. T.). Presented at Ergonomics and Human Factors 3014: Designing for People: research and practice. Taylor & Francis, London, pp. 59-65.

Wilson, I., Munir, F., & McDermott, H. (2013). "It's just part of the job!" Raft guides working with back pain. In Contempory Ergonomics and Human Factors 2013 conference proceedings (edited by M. Anderson). Presented at Ergonomics and Human Factors 2013: Designing for People: research and practice. CRC Press, London, pp. 77-78.

Poster Presentations

McDermott, H., **Wilson, I.**, & Munir, F. (2014). Workstyle and musculoskeletal problems in white-water raft guides. In Proceedings of the 11th EAOHP Conference: 'Looking at the past – planning for the future: Capitalizing on OHP multidisciplinarity (edited by Andreou, N. J. A., Jain, A., Hollis, D., Hassard, J., & Teoh, K.). Poster presented at 11th European Academy of Occupational Health Psychology Conference. pp. 267.

Contents

List of Tables

List of Figures

List of Appendices

List of Abbreviations

MSC	Musculoskeletal Condition
WHO	World Health Organisation
HSE	Health and Safety Executive
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
AALA	Adventure Activities Licensing Authority
AAIAC	Adventure Activities Industry Advisory Committee
BCU	British Canoe Union
SRA	Scottish Rafting Association
IRF	International Rafting Federation
RYA	Royal Yachting Association
SPARC	Sport and Recreation New Zealand
NMQ	Nordic Musculoskeletal Questionnaire
UWES	Utrecht Work Engagement Scale

Thesis Structure

This thesis is presented over nine chapters. Following this introduction the further chapters are structured as follows:

Chapter 1 provides a brief overview of the gap in the literature and highlights the areas of knowledge which this thesis aims to contribute to. Following this, the philosophical standpoint in which this research is approach is discussed. Finally, an overview of the research process is presented.

Chapter 2 reviews the literature relevant to the aims and objectives of this thesis. This includes a comprehensive discussion of the literature relating to injuries, ill-health and fatalities associated with white-water activities.

Chapter 3 presents the first study which comprised semi-structured interviews to explore the work-related health of white-water raft guides working in the UK. The findings are reported and discussed.

Chapter 4 reviews literature relevant to the outcomes of the qualitative study and informs the development of the longitudinal survey study. Specifically, literature relating to psychological health in the work place and how work engagement and the need for recovery relate to these are critically examined. Following this, research examining how work engagement and recovery from work relates to physical health, specifically work-related musculoskeletal conditions, is discussed. The chapter concludes with a discussion of the consequences of presenting to work whilst ill or injured.

Chapter 5 describes the methods utilised to collect data from the longitudinal study. Procedures, measures and analytical techniques are detailed.

Chapter 6 reports the exploratory analyses conducted on the longitudinal data. Injury and working patterns are presented and discussed. Furthermore, predictors of injuries associated with white-water raft guiding are explored and discussed.

Chapter 7 details the multilevel analyses assessing the longitudinal relationships between psychological and physical factors measured from the longitudinal questionnaire study and the need for recovery following work.

Chapter 8 presents the results and discussion relating to the multilevel analyses examining the predictors of chronic MSCs across a working season.

Chapter 9 synthesises the key findings from the interview and longitudinal studies and discusses how these results can be utilised to improve training guidelines for white-water raft guides. Furthermore, this chapter presents the conclusions drawn from this thesis and suggests future direction for research. Finally a critical discussion is detailed regarding the contribution to knowledge from this body of work.

Chapter 1 Introduction

This chapter provides a brief overview of the research gap being addressed in this thesis, including descriptions and definitions of outdoor and white-water activities. The scope of this thesis is then presented alongside the research aims and objectives. This is followed by a discussion of the philosophical standpoint adopted during the research process. Finally, the ethical considerations and thesis structure are presented.

1.1 The research gap: Identifying the biopsychosocial risk factors for workplace injury and ill-health among white-water raft guides

The Health and Safety Executive (HSE) has identified a range of physical and psychosocial factors which can result in negative consequences on the health of workers; these are known as biopsychosocial risk factors (Health and Safety Executive [HSE], 2016). Physical factors, e.g. employee posture, forces on the body and repetition, and psychosocial factors, e.g. tight deadlines, limited control at work and limited breaks, can all contribute to work-related ill-health and well-being (HSE, 2016). Occupational ill-health and well-being is an umbrella term which is concerned with both the physical aspects (e.g. injuries and disease as a result of work) as well as the psychological aspects (e.g. work-related stress, work-related fatigue) of employee health. These broad concepts underpin the theoretical approaches adopted in this thesis. Specific aspects of Biopsychosocial risk factors and occupation health and well-being will be discussed in subsequent sections throughout this body of research.

Work-related injury and ill-health, defined as any injury or illness which has either been caused by or made worse through work, is problematic for most industries in Great Britain (HSE, 2014). Some physically demanding occupations, such as those involving manual labour, present more of a risk of injury than other industries (HSE, 2013). Between 2012 and 2013, 1.2 million people in Great Britain self-reported an injury or ill-health, attributed to work (HSE, 2014). Musculoskeletal conditions (MSCs) account for the majority of cases of self-reported injury and ill-health (HSE, 2014). Similar figures have also been reported across Europe with 52% of work related health problems being MSCs (European Agency for Safety and Health at Work [EASHW], 2010).

Specified work-related injuries, such as those resulting in fractures or loss of consciousness, or incidences of work-related injury or ill-health resulting in over 7 days of absence are considered to be serious and must be reported in the UK by law under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 2013 (HSE, 2015). Across Great Britain, 77,593 cases of work-related injury were officially reported under RIDDOR between 2013 and 2014 (Health and Safety Executive [HSE], 2014). Manual handling accounted for 24% of cases and trip and slip accidents accounted for 28% of all injuries (HSE, 2014).

However, the number of over-7-day injuries reported through RIDDOR is far lower than the 148,000 self-reported over-7-day injuries between 2013 and 2014 (HSE, 2014). These self-reported figures suggest that approximately half of incidents which should be reported under RIDDOR are not actually recorded (HSE, 2014). This could be an issue relating to the non-reporting of work-

related injury and ill-health, or it could be an issue relating to self-report data and the perception of what constitutes as a work-related injury or ill-health.

Historically, injury has been problematic to define, primarily because there is not a scientific distinction between injury and disease (Langley & Brenner, 2004). Within sporting literature, an injury has been defined as a physical complaint (e.g. musculoskeletal problems) as a result of the sport participated in (Fuller et al., 2006). Musculoskeletal problems include a whole range of injuries and dysfunctions of the muscles and joints (da Costa & Vieira, 2010). Clinically diagnosed syndromes (e.g. tenosynovitis and carpal tunnel syndrome) have previously been referred to as musculoskeletal disorders, repetitive strain injuries, overload syndromes and overload injuries, whereas undiagnosed problems (e.g. pain with no known attributable pathology) have previously been described as musculoskeletal complaints (Bugajska et al., 2013; Punnett & Wegman, 2004). For the purpose of this thesis, musculoskeletal conditions [MSCs] will be utilised and will refer to any problem experienced, whether diagnosed or not.

With regards to ill-health, the World Health Organisation [WHO] describes health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 1948). For the purpose of this thesis, ill-health will refer to illness and disease.

Work-related injury and ill-health can result in sickness absenteeism. Across Great Britain, between 2013 and 2014 an estimated 28.2 million days of work were lost to absenteeism (HSE, 2014). Absenteeism costs the Great British economy approximately £12 billion each year (HSE, 2012b). Although the data

provided by the Health and Safety executive covers all sectors, it is not sufficiently detailed to examine individual industries separately. Figures relating to work-related injury and ill-health or sickness absenteeism in the Outdoor Industry are therefore unavailable.

Anecdotal evidence has suggested that workers in the Outdoor Industry are at risk of developing work-related musculoskeletal conditions, such as worn knees and bad backs (Adventure Activities Industry Advisory Committee [AAIAC], 2006). There is currently very little empirical evidence examining the health of those working in the Outdoor Industry. One study examined the work-related health of Mountain Leaders (McDermott & Munir, 2012). This study used qualitative methods to explore the experiences of work-related MSCs and ascertain data on the underlying motives for working with such MSCs. It was identified that back and knee issues were prevalent among Mountain Leaders. Such injuries were perceived as inevitable, and therefore just an anticipated and accepted risk of their occupation. Strategies to reduce the risks of developing work-related MSCs were not commonly reported. Furthermore, due to the freelance nature of their employment, they needed to work in order to be paid (McDermott & Munir, 2012). Although the population is different, there may be similarities between the occupations of Mountain Leaders and white-water raft guides. Further investigation is required to build on the findings of this previous work to examine the extent to which work-related MSCs are a problem for workers in the white-water sector of the Outdoor Industry. This is particularly the case as chronic back pain has been identified as a common work-related MSC among white-water raft guides in the US (Jackson & Verscheure, 2006).

Jackson and Verscheure (2006) conducted a survey among white-water raft guides working in the US in order to identify factors which increase the risk of back pain. Their results indicated that there is a high prevalence of back pain among white-water raft guides, which was attributed to manual handling practices, e.g. loading and unloading equipment from a trailer (Jackson & Verscheure, 2006). Although back pain was highlighted as a serious issue, their study indicated that there may be other work-related MSCs which white-water raft guides are potentially at risk of developing, however, such MSCs were not in the scope of their study. Further investigation is required to identify the types of work-related MSCs raft guides are at risk of and also the risk factors which contribute to such MSCs in order to produce training and guidance in order for raft guides to reduce the risk of damaging their bodies.

The Outdoor Industry is the sector which incorporates recreational and sporting outdoor activities. ‘Outdoor activities’ is the umbrella term for recreational and competitive pursuits which take part in an outdoor setting. Specifically, there are five main classifications; Lakes and Sea (e.g. sailing), Snow (e.g. skiing), Earth (e.g. rambling), Stream (e.g. canoeing) and Air (e.g. paragliding) (EQFOA, 2006). Such activities are popular worldwide (Outdoor Foundation, 2013; Royal Yachting Association [RYA], 2013; Sport and Recreation New Zealand [SPARC], 2009) and have been used for a variety of reasons including recreation, education, skill development and therapeutic purposes (SkillsActive, June 2010).

This thesis concerns those working in the white-water industry which falls under the main industry classification of ‘stream’. White (sometimes referred to as wild) water rivers are defined by the presence, or lack, of water hydraulics.

Hydraulics are formed as the water flows over and around obstacles, creating the features of the river such as rapids (Attenburrow, 1993). River difficulty is graded using the International Scale of River Difficult and ranges from I to VI, based on the gradient, the speed of flow and the nature of the obstacles present (Attenburrow, 1993; Walbridge & Singleton, 2005). The attributes associated with the river grades are described in Table 1.1.

Rivers can be negotiated in various ways; canoeing, kayaking and rafting are popular methods with high numbers of participation worldwide (Outdoor Foundation, 2013; RYA, 2013; SPARC, 2009). This thesis is concerned with white-water raft guiding and distinctions between canoeing and kayaking are therefore not relevant. Any reference to participants of canoeing and kayaking activities (from previous literature) will therefore be referred to under the umbrella term of ‘canoeists’.

Table 1.1: Definition of the River Grades (Attenburrow, 1993; Walbridge & Singleton, 2005)

Grade	Definition
Grade I	Low difficulty river with simple obstructions and regular streams and waves. Hydraulics are small and cannot hold objects.
Grade II	Moderate difficulty river with simple obstructions and irregular streams and waves. Hydraulics are medium sized, some may hold small objects. Small drops are possible. Route is clear and passage free.
Grade III	Difficult river with high, irregular waves and larger hydraulics. Hydraulics will hold objects and push boats around. Stream will have drops and numerous obstructions. Route is still recognisable.
Grade IV	Very difficult river with continuous waves and hydraulics. Hydraulics will hold objects with strong force. Numerous obstructions in the stream, including boulders with undercut currents. Route is not always recognisable, inspection is recommended.
Grade V	Extremely difficult river with narrow passages, steep gradients and drops. Hydraulics are more extreme than Grade IV rivers. Access to the river is usually difficult due to steep banks. Inspection prior to running is essential.
Grade VI	High risk rivers which are generally impossible to run; certain water levels are required to negotiate. Highly recommended to portage around these sections of river.

White-water rafting involves negotiating rivers in an inflatable craft. This can be done using paddles or oars. In the UK, rafts are generally propelled by paddles, where each individual on the raft paddles in order to contribute to generating momentum on the raft. The commercial activity of white-water rafting involves a qualified raft guide providing an experience to a group of paying clients. The paying clients require no previous experience in order to participate. This is because the raft guide is responsible for directing the boat down the river.

White-water raft guiding is a physically active occupation, which also requires the guide to be aware of their personal safety as well as the safety of their clients. As well as being a commercial activity, white-water rafting is a competitive sport worldwide (British Canoe Union [BCU], 2015), however, the competitive form of white-water rafting will not be examined in this thesis.

As previously stated, employees within the Outdoor Industry are at risk of sustaining work-related MSCs (AAIAC, 2006; McDermott & Munir, 2012), yet very little is known about the work-related health of white-water raft guides. Back pain has been attributed to manual handling practices among US white-water raft guides (Jackson & Verscheure, 2006), however employees may be at risk of a range of other musculoskeletal conditions. Research examining injuries associated with other white-water activities, such as canoeing and commercial white-water rafting, have identified a variety of chronic conditions, including tendonitis (Fiore & Houston, 2001; Jackson & Verscheure, 2006; Kameyama, Shibano, Kawakita, Ogawa, & Kumamoto, 1999; Krupnick, Cox, & Summers, 1998; Schoen & Stano, 2002; Wassinger et al., 2011), and acute injuries including lacerations, abrasions, sprains, strains, fractures and dislocations (Fiore & Houston, 2001; Kameyama et al., 1999; Krupnick et al., 1998; O'Hare,

Chalmers, Arnold, & Williams, 2002; Schoen & Stano, 2002; Weiss, 1991; Whisman & Hollenhorst, 1999). It is therefore possible that white-water raft guides are a risk of sustaining both acute and chronic musculoskeletal conditions.

In addition to a lack of knowledge on work-related physical health, very little is known about the work-related psychological well-being of white-water raft guides. Studies from other occupations have identified that work-related fatigue is a significant issue among workers and can impact on individuals' health and their abilities to complete everyday activities, such as work (de Croon, Sluiter, & Frings-Dresen, 2003; Kant et al., 2003; Mallinson, Cella, Cashy, & Holzner, 2006; Sluiter, de Croon, Meijman, & Frings-Dresen, 2003). In addition, the need for recovery, which is an early indicator of work-related fatigue (Jansen, Kant, van Amelsvoort, Nijhuis, & van den Brandt, 2003), can lead to the development of musculoskeletal conditions (Alexopoulos, Tanagra, Konstantinou, & Burdorf, 2006; Elders & Burdorf, 2001; Kuijer, van der Beek, Allard J, van Dieën, Visser, & Frings-Dresen, 2005). The evidence suggests that workers in the Outdoor Industry work long hours and participate in physical leisure activities during their time off (AAIAC, 2006; McDermott & Munir, 2012). It is therefore possible that white-water raft guides may have insufficient rest as a result of their work demands and engagement in physical leisure activities.

However, work engagement, conceptualised as a psychological construct with three components: vigor, dedication and absorption, has been described as a positive state of mind (Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002; van Horn, Taris, Schaufeli, & Schreurs, 2004), and has been suggested to improve the recovery experience following work (Sonnentag & Niessen, 2008;

Sonnentag, Mojza, Demerouti, & Bakker, 2012; Sonnentag, 2003) protecting against the development of work-related fatigue. Furthermore, high levels of work engagement have been associated with improved self-reported health (Demerouti, Bakker, de Jonge, Janssen, & Schaufeli, 2001; Schaufeli, Taris, & Van Rhenen, 2008; Shimazu & Schaufeli, 2009). Although there is evidence that high levels of work engagement, as a whole, have both positive short-term and long-term effects on productivity and health in the workplace, little is known about the long term effects of being over-engaged, which may have negative consequences (Bakker, Albrecht, & Leiter, 2011). As Mountain Leaders have demonstrated characteristics of work engagement (McDermott & Munir, 2012), it is possible that white-water raft guides may also experience high levels of work engagement. The effects of work engagement among white-water raft guides and the effect of this on their physical health and levels of work-related fatigue across a working season requires attention.

This thesis is concerned with the work-related health of those operating as white-water raft guides. With a higher demand for new and existing raft guides to cater for increases in participation, a thorough understanding of how white-water raft guides maintain and manage their health and well-being is required, not only to increase the longevity of their careers in the Outdoor Industry but to also to continue to provide safe activities for paying clientele.

1.2 Research Aims

This thesis will address the following research aims:

- Explore the work-related injuries and ill-health that white-water raft guides experience.
- Identify working conditions and practices which may contribute to or protect against such work-related injuries and ill-health experienced by white-water raft guides.
- Assess the longitudinal effects of work engagement on the need for recovery experienced by white-water raft guides across a working season.
- Examine the longitudinal effects of work engagement on the development of musculoskeletal conditions experienced by white-water raft guides across a working season.
- Analyse the longitudinal effects of the need for recovery on the development of chronic musculoskeletal conditions experienced by white-water raft guides across a working season.
- Determine the accumulative effects of the number of working hours as a white-water raft guide and physical leisure activity on work-related health and well-being. Specifically, the need for recovery and the development of chronic musculoskeletal conditions experienced by white-water raft guides across a working season.

1.3 Research Approach

A Mixed-Methods research approach will be adopted in this research. Mixed-Methods research is concerned with utilising the most appropriate method of data collection in order to answer the research question. It is less concerned with the philosophies informing the methods of data collection (Johnson & Onwuegbuzie, 2004). A variety of methods, both qualitative and quantitative, were utilised to collect data and construct knowledge regarding the health of those working in the white-water rafting industry. It has been argued that utilising multiple methods increases the validity of research, through the technique of triangulation (Creswell & Miller, 2000; Denzin, 1978). The use of qualitative and quantitative methods in triangulation can complement and strengthen the validity of research (Jick, 1979). However, the using of multiple methods may not necessarily increase the validity of the findings; it can simply be used to generate an overarching account of a phenomenon (Moran-Ellis et al., 2006). A series of studies were utilised and integrated throughout this thesis to collate a comprehensive understanding of how health and well-being is influenced and managed by white-water raft guides working in the UK. A visual representation of the research process is presented in Figure 1.1.

LITERATURE REVIEW

A review of relevant literature provided insight into the existing research and gaps in the literature. This informed the interview schedule for the exploratory qualitative study.

↓

EXPLORATORY QUALITATIVE STUDY

Qualified white-water raft guides (N = 20) were invited to participate in an exploratory interview study. Data were recorded, transcribed verbatim and analysed using Thematic Analysis. The findings were utilised to inform the development of a longitudinal survey.

↓

LONGITUDINAL STUDY DATA COLLECTION

Data from qualified (N = 116) and trainee (N = 10) white-water raft guides were collected via either an internet based survey or recruited in person by the researcher from 11 UK white-water rafting providers between March and May (the start of the working season).

All participants were invited to complete the second survey distributed 3 months after initial survey completion. A total of 98 responses were collected (Attrition = 22.22%).

Another 3 months following the second data collection, all participants were invited to complete the final survey. A total of 79 responses were obtained (Attrition = 37.30%).

↓

QUANTITATIVE DATA ANALYSES

Cross-sectional survey data were entered into SPSS and analysed using descriptive, exploratory and inferential statistics.

Longitudinal data were entered into MLwiN and Multilevel Modelling was conducted.

↓

PARTICIPANTS THANKED AND THESIS COMPLETION

Figure 1.1: An overview of the research process

Chapter 2 A Literature Review Relating to Employment, Participation, Safety and Injuries and Ill-Health in the Outdoor White-Water Paddlesports Industry

2.1 Chapter Introduction

This chapter provides a review of the published literature examining injuries, fatalities and illnesses associated with white-water activities. It first provides an overview of participation and safety regulations for activities in the Outdoor Industry. This is followed by an overview of work in this sector. An in-depth review of injuries and ill-health associated with white-water activities is then provided assessing knowledge of work-related injuries and ill-health for those working as white-water raft guides. Finally, the gaps in the literature relating to the work-related health of white-water raft guides are addressed.[1]

2.2 Participation and Safety in the Outdoor Industry in the UK

The Outdoor Industry is a multi-billion pound industry in America (Outdoor Foundation, 2013) and Europe (European Outdoor Group, 2013). In the UK, it has been estimated that between 10 million and 15 million individuals participate in at least one outdoor activity each year (SkillsActive, 2010). For example, in the UK, over 2.8 million adults participated in at least one outdoor boating activity in 2012 (RYA, 2013), and it has been estimated that 181,000

[1] Some of the issues discussed in this chapter are published in
Wilson, I., McDermott, H., Munir, F., & Hogervorst, E. (2013). Injuries, ill-health and fatalities in white-water rafting and white-water paddling. *Sports Medicine, 43*(1), 65-75.
And Wilson, I., Folland, J., McDermott, H., & Munir, F. (In Press). White-water paddlesports medicine: canoeing, kayaking and rafting. In Feletti, F. (eds.) Medicine in Extreme Sports.

people participated in white-water rafting in the UK in 2012 (RYA, 2013). In addition, white-water rafting saw an estimated increase of over 3.6 million participants in 2006 to over 4.3 million participants in 2009 in the US (Outdoor Industry Association, 2010).

It is recognised within UK legislation that there is an inherent risk when participating in outdoor activities. Currently the Young Persons Safety Act, 1995 protect young participants of outdoor activities (Adventure Activities Licensing Authority [AALA], 2002). Following the fatality of four teenagers during an organised canoeing trip in Lyme Bay, the Adventure Activities Licencing Authority [AALA] was established in 1996 under the auspices of the Health and Safety Executive. Although licensing is specific to young people below 18 years of age, the regulations in place to protect the health and safety of these participants should pass on to all users. However, the legislation does not extend to those leading the activities.

Recent proposals have been made to replace the licensing with a code of practice (Lord Young of Graffham, 2010). This is on the understanding that the Health and Safety Executive (HSE) has responsibility to monitor whether providers are adhering to a code of practice. It is unclear what implications, will arise as a result of these proposals. The Scottish Ministers and the Welsh Assembly Government have decided to retain a statutory regime for adventure activities even if legislation is passed that it is no longer required (HSE, 2014).

2.3 Work in the Outdoor Industry

Employment patterns in the Outdoor Industry are diverse as outdoor activities are mainly seasonal in nature. In the UK, the Outdoor Industry grew 3.8% between 2004 and 2009 (SkillsActive, 2010). The Skills Active survey suggests that there are between 60,500 and 88,000 individuals working in this sector, of which approximately 70% are volunteers. It also reports that over 90% of providers of outdoor activities (companies and facilities offering outdoor activities) consist of fewer than 50 permanent employees. The majority of employees are male and aged under 30 years of age. Concern for the industry was expressed because of the lack of retention as workers age. This could result in a loss of valuable skills and experience. Although this survey is slightly dated, data are currently being collected for more recent information.

There are currently 67 licensed providers of white-water rafting in the UK listed under the AALA (HSE, 2012a). Not all of the licensed providers directly offer white-water rafting; some subcontract this activity to other licensed providers. Examples of these include county councils and schools for whom access to white water is difficult. A total of 45 of the licensed providers directly offer white-water rafting in England, Wales or Scotland. There may also be other providers of white-water rafting who offer the activity to individuals over the age of 18 years old, and therefore do not need to hold a license from ALAA.

There are currently 577 qualified white-water raft guides (357 male) registered in England and Wales under the British Canoe Union [BCU] (Sport England, 2013), 117 (98 male) registered with the Scottish Rafting Association (Scottish Rafting Association [SRA], 2013) and 1336 (N of males unspecified) registered

with the International Rafting Federation (International Rafting Federation [IRF], 2013). It is difficult to estimate the number of guides which are currently working in the UK because registration lasts for 3 years, as long as a valid first aid certificate is held. Therefore, there may be individuals registered with the BCU and SRA whom are no longer active. Those raft guides who are working, may have moved to other countries to use their qualifications. Finally, international raft guides may work in the UK but they may not be registered with either the BCU or SRA because their international qualification, e.g. IRF qualification is sufficient evidence of ability and experience to gain employment in the UK. The next section will explore the specific risks associated with white-water activities.

2.4 Morbidity and Mortality associated with White-Water Activities

2.4.1 Injury and Fatality Rates

Although Injury and fatality rates have been published for white-water activities in the US, New Zealand and Japan, there are no published injury or fatality rates associated with white-water activities for the UK. A summary of the injury rates for these other countries can be seen in Table 2.2.

Although the variety of reporting methods makes it impossible to make a comprehensive comparison between data sets, it is evident that none of the published studies report an injury rate specific to employees. As white-water raft guides are professionals, who potentially work on a regular basis, the injury rates generated from the professional, competitive canoeists may be the most appropriate for an estimated comparison. However, in addition to on-water duties, raft guiding also involves land based activities too, including manual

handling, which could increase the risk of injury. A comprehensive understanding of work-related injuries sustained by white-water raft guides is required in order to identify the potential causes of these injuries should be explored. This will provide insight into how to limit the risk of further injuries.

Unlike injury rates, fatalities have been generally reported using a single method of fatalities per 100,000 participants. The number of participants refers to any white-water users and does not distinguish between commercial participants and professional guides. In America, a rate of 2.9 fatalities per 100,000 participants per annum was reported for white-water canoeists (Wittmann, 2000). In New Zealand, for white-water rafters, a much lower rate of 0.16-0.27 per 100,000 participants per annum was reported (O'Hare et al., 2002). The observed difference in fatality rates may be due to the nature of the activities. White-water rafting is a commercial activity led by a professional guide, whereas white-water canoeing may not always be led by a professional. Furthermore, a white-water raft is usually a lot larger in size when compared to a canoe. The experience of the guide and the larger craft size may reduce the risk of an unintentional capsize, keeping clients safe, whereas, white-water canoeists are responsible for their own safety. Boats with lower volume (i.e. canoes) have a greater potential for being overwhelmed by the power of the water.

Table 2.1: Injury Rates for White-Water Rafting and Paddling

White-Water Activity	N	Rate	Data Source	Country of Origin	Reference
Rafting	215 Hospitalisations Identified	1.04-1.81 per 100,000 participants	Hospital Records	New Zealand	(O'Hare et al., 2002)
Rafting	200 Reported Incidents	26.3 per 100,000 participants	Provider Records	USA	(Whisman & Hollenhorst, 1999)
Rafting	142 Providers	0.54 per 1,000 participant hours	Provider Records	New Zealand	(Bentley, Page, & Laird, 2000)
Paddling	142 Providers	0.014 per 1,000 participant hours	Provider Records	New Zealand	(Bentley et al., 2000)
Recreational Paddling	388	2.1 injuries per participant	Survey	USA	(Schoen & Stano, 2002)
Competitive Paddling	288	0.69 injuries per participant	Survey	Japan	(Kameyama et al., 1999)
Competitive Paddling	57	0.46 injuries per participant per year	Survey	USA	(Krupnick et al., 1998)

2.4.2 Acute Injuries Among White-Water Participants

Two types of Injuries, acute and chronic, can be sustained during white-water activities. Acute injuries are incidents of pain that occur rapidly due to a specific event or trauma. Chronic injuries are defined as pain that develops over a period of time, is persisting and long lasting and is recurrent. With regard to acute injuries, evidence suggests that these most often occur to the upper extremities, particularly the shoulder, the head, neck and facial region, with frequent pathologies including lacerations, abrasions, sprains, strains, fractures and dislocations (Fiore & Houston, 2001; Kameyama et al., 1999; Krupnick et al., 1998; O'Hare et al., 2002; Schoen & Stano, 2002; Weiss, 1991; Whisman & Hollenhorst, 1999). These can occur whilst on the river in the boat, on the river outside the boat (sometimes referred to as “swimming”) or on the river bank or shore.

In-boat injuries sustained by white-water canoeists tend to be to the upper body, because the upper body is the most exposed and therefore the most vulnerable part of the body (Fiore & Houston, 2001). However, data from white-water rafting providers indicate that facial injuries are the most common injury associated with this activity (Whisman & Hollenhorst, 1999).

White-water canoeists and rafters who end up “swimming” are at most risk of sustaining injuries to their lower extremities (Fiore & Houston, 2001; O'Hare et al., 2002; Schoen & Stano, 2002; Weiss, 1991; Whisman & Hollenhorst, 1999). These injuries often occur as a result of collisions with obstacles, such as rocks, which are submerged in the water and not visible. Frequent injuries to the lower extremities include lacerations, contusions, abrasions and fractures (O'Hare et

al., 2002; Schoen & Stano, 2002; Whisman & Hollenhorst, 1999). Such injuries are sustained less frequently by expert canoeists, who are more likely to remain in their boats (Fiore, 2003). However, there is no evidence to suggest whether this also applies to white-water raft guides or not.

A number of survey-based studies used to assess injuries in white-water canoeists (Fiore & Houston, 2001; Schoen & Stano, 2002), found that although acute injuries are reported to be short-lived and recovery to be good or complete by most, some form of medical attention is usually required (Fiore & Houston, 2001). As survey data rely on participant recall, it is possible that injuries that did not require medical attention were unreported as those may be less memorable. In addition, injuries which could have contributed to individuals retiring from paddling may not have been captured in this sample. Furthermore, no distinction was made between commercial white-water rafters and the employed raft guides; therefore, very little is known about work-related acute trauma injuries among white-water raft guides.

2.4.3 Chronic Injuries

Several types of chronic injuries have been identified in experienced, professional and competitive white-water users with tendonitis the most frequently reported chronic injury in white-water canoeists (Fiore & Houston, 2001; Jackson & Verscheure, 2006; Kameyama et al., 1999; Krupnick et al., 1998; Schoen & Stano, 2002; Wassinger et al., 2011). Specifically, competitive canoeists are reported to be susceptible to tendonitis due to having insufficient rest between training sessions (Kameyama et al., 1999; Krupnick et al., 1998; Schoen & Stano, 2002). In extreme cases, deformation of the joints can also

occur (Kameyama et al., 1999). It has also been suggested that the stress of the white-water exacerbates overuse injuries, making sufficient rest important (Fiore & Houston, 2001). As raft guides work on white-water on a frequent basis, it is possible that there is a risk of developing chronic injuries such as tendinitis. However, so far the only work-related MSC among white-water raft guides studied is back pain (Jackson & Verscheure, 2006).

Jackson and Verscheure (2006) identified back pain as a problem among white-water raft guides in the US. Land based working practices, particularly tasks associated with lifting and carrying equipment were found to contribute to back pain in white-water raft guides (Jackson & Verscheure, 2006). Despite over three quarters of respondents reporting current back pain, sickness absenteeism was low. Financial concerns and an attitude accepting that back pain is part of the job were reasons given for attending work whilst injured. This is consistent with other research examining work-related health among Mountain Leaders in the UK (McDermott & Munir, 2012). As very little is known about the work-related health of white-water raft guides, exploratory studies are required to identify health problems which may occur and the extent to which these impede the raft guides' ability to function at work.

2.4.4 Prevention of Work-Related Injury

Limited research has been conducted to assess the impact of prevention and intervention strategies to reduce the risk of injuries sustained whilst participating in white-water activities. However, suggestions with regard to MSCs have been made and discussed in the literature.

Advice around reducing back pain has been developed and these include reducing the workload and manual handling of rafts and equipment (Jackson & Verscheure, 2006). Specifically, it has been suggested that the use of pullies and/or a crane to lift rafts may reduce the physical workload placed on the raft guide (Jackson & Verscheure, 2006). Furthermore, Jackson and Verscheure (2006) suggested that white-water raft guides should share the workload among a greater number of employees to reduce the strain on each individual. As white-water rafting providers in the UK may differ to those in the US, it is possible that different strategies are utilised to reduce the risk of MSCs among white-water raft guides. The effectiveness of such strategies and the extent to which these are adhered to warrants further study.

2.4.5 Ill-Health Associated with White-water Activities

Many white-water users are known to be affected by gastrointestinal illnesses, Leptospirosis (Boland et al., 2004; Lee, Dawson, Ward, Surman, & Neal, 1997) and Weil's disease (Philipp, King, & Hughes, 1992). These are most often the result of ingesting contaminated water, either directly from the river or through contact with unclean hands. Lee et al (1997) found that although bacteria levels in the water are associated with the contraction of illnesses in the UK the frequency of exposure is not directly associated with reported illness. This may be due to individuals who participate frequently in white-water canoeing having a greater skill level and likely to capsize less often leading to lower exposure to contaminated water. Furthermore, contamination levels are higher following heavy rainfall, meaning the risk of contracting an illness varies depending on environmental influences. Those who are involved in white-water activities

throughout the year, such as white-water raft guides, may be at greater risk of contracting illnesses from contaminated water.

2.5 Chapter Summary

Outdoor activities are popular worldwide. The increase in popularity may create opportunities for employment and/or increase the demands on those working as instructors. Such demands may increase the risk of workers sustaining or developing a work-related injury or ill-health.

A range of injuries and ill-health have been associated with white-water activities however, studies which have focused on white-water rafting have failed to distinguish between commercial participants and professional guides. Back pain is the only work-related injury associated with white-water raft guiding reported in the literature. However, as white-water raft guides are exposed to the forces and pressures of white-water, it is plausible that they may be at risk of developing other MSCs such as tendonitis, which has been observed with other white-water canoeists. The extent to which work-related injury and ill-health is a problem among white-water raft guides is unknown. Furthermore, little is known about the extent to which work-related injury and ill-health may impede their ability to function generally and at work. Finally, the extent to which working practices contribute to or protect against work-related ill-health requires further investigation so that training and guidelines can be improved and updated. As very little is already known about the health of white-water raft guides, further research initially needs to be exploratory in nature.

Chapter 3 Exploratory Qualitative Study

3.1 Introduction

It was reported in the previous chapters that work-related injury and ill-health is a significant problem across all industries in Great Britain and Europe (HSE, 2014; Parent-Thirion, 2012). Work-related musculoskeletal conditions (MSCs) are the most common type of reported work-related ill-health (HSE, 2014) with employees in some industries being more at risk of an MSC than others. However, whilst the occupational health of some employees within the outdoor industry has been examined, very little is known about the health and well-being of employees working on white-water. More focus has been given to client health and safety. Despite a variety of injuries associated with white-water activities reported in the literature (e.g. Fiore & Houston, 2001; O'Hare et al., 2002; Schoen & Stano, 2002; Whisman & Hollenhorst, 1999; Lee et al., 1997), the only identified work-related injury associated with white-water raft guiding is back pain (Jackson & Verscheure, 2006). Previous research involving Mountain Leaders identified a high prevalence of MSCs and a culture where injury and ill-health are perceived as 'part of the job' (McDermott & Munir, 2012). Mountain Leaders continued to work whilst injured or ill because they were self-employed or worked freelance, meaning that there are no sick leave benefits, therefore if they did not work, they would not get paid. As white-water raft guides may be freelance or work under similar employment conditions, it may therefore be that white-water raft guides adopt a similar approach to working with injuries and ill-health. Therefore a qualitative study to explore the work-related health and well-being of those working as white-water raft guides in the UK was undertaken.

This chapter presents the methods, findings and discussions from the qualitative interview study conducted which addressed the following aims and objectives.

3.1.1 Aims and Objectives

The aim of the study was to explore the work related health of white-water raft guides working in the UK. Specific objectives were to:

- Identify work-related injuries and ill-health experienced by UK based white-water raft guides.
- Explore the potential working practices and conditions related to such injuries and ill-health.
- Understand how UK based white-water raft guides engage with their work.
- Ascertain how they perceive their level of engagement to influence their health and well-being.
- Understand how UK based white-water raft guides manage their health, particularly when work demands are high.
- Comprehend the attitudes of UK based white-water raft guides regarding their work-related health.
- Identify how the occupation of a raft guide in the UK benefits the physical and psychological health of the worker.

3.2 Methods

Semi-structured interviews were used as a way of gaining insight and information about work-related injury among white-water raft guides. This approach allowed flexibility to follow up interesting responses and the investigation of underlying motives. The interviews were conducted face-to-face and also by telephone. This facilitated the inclusion of participants who were geographically dispersed.

3.2.1 Ethics

This research was subject to and in compliance with the requirements of the Loughborough University Ethical Advisory Committee in relation to research with human participants. The University ethical clearance checklist was completed prior to this study and ethical clearance was granted on 4th April 2012. Informed consent was obtained from all participants and they were made aware that all interviews were recorded and that data would remain confidential and that results would be reported in an anonymised form.

3.2.2 Sample

For the interviews, it was important to obtain a range of participants from different white-water backgrounds so that a full understanding of white-water raft guides' approach to their work, and health could be obtained. The sample needed to include a variety of experience (Level 1 Raft Guides to Level 5 Senior Raft Coaches) and a variety of working environments, i.e. individuals working on natural rivers and man-made courses. A range of recruitment

strategies were therefore employed in order to generate the final sample of participants. Initially, an email detailing the aims of the study (Appendix 1) was sent on behalf of the researcher by the English White-Water Rafting Committee to five white-water rafting providers and two white-water rafting coaches. The researcher was included as an addressee in these emails so that reminder emails could be sent. As a result of this e mail the researcher was invited to visit a centre and recruit participants by one of the contacted providers. A snowball sampling technique (Goodman, 1961) was then employed to identify additional participants. This was done by recruited participants introducing the researcher to other white-water raft guides either in person or via email. In addition, one of the white-water rafting coaches invited the researcher to attend a training camp in the UK for raft guides where a further eight participants were recruited. In total 20 participants were interviewed with recruitment ceasing once data saturation was achieved.

3.2.3 Procedure

An interview schedule was developed at the beginning of the study which was informed by the literature. This was piloted on two individuals with white-water rafting experience before producing the final version. As these two individuals were no longer involved with the white-water rafting industry, their interview data did not form part of the final sample. No changes were made to the interview schedule following the pilot interviews. Broad, open-ended questions were used with additional questions to clarify participant responses or probe interesting issues. Such an approach permits respondents to comment on

issues from their own perspective. The interview schedule is shown in Table 3.1.

In total, 14 (70%) Interviews were conducted face-face and 6 interviews by telephone (30%) between April and September 2012. Prior to interview, participants were provided an information sheet explaining the purpose and procedure of the study, this included the general topics which would be included in the interview. Information was provided via email prior to an interview date being organised. Informed consent was collected prior to the interview commencing.

Table 3.1: Interview Schedule

Topic	Questions and Prompts
Personal:	Demographics - NMQ Job *Prompt – Raft Guide, Canoe Instructor, Kayak Instructor, Combination.* Employment Status *Prompt – P/T, F/T, Contract, Casual, Freelance, Unemployed.* *Prompt – Days/Hours per week* *Prompt – Seasonal work.* Qualifications *Prompt – Lv1 Raft Guide, River Leader, Star Awards, First Aid, BCU Recognised.* *Prompt – Date/Year received* *Prompt – Any others? ML, SPA, BCU etc.* Where did you receive your training? *Prompt – England, Wales Scotland, N. Ireland* *Prompt – Sponsored, Self-Funded.* How long have you worked in this industry? *Prompt – Years, Months.* How did you get into this line of work? Where have you previously worked? *Prompt – UK? Abroad?*
Employment:	What does white-water raft guiding involve? Can you describe a typical day at work? *Prompt – Routine activities, warm-ups, delegate interaction.* *Prompt – Is this the same for the whole week?* *Prompt – How many sessions do you guide in a day? How long is a session?* *Prompt – How often do you take breaks?* What Grade river do you guide on? *Prompt – Man-made? Artificial?* Can you tell me about a non-typical day that you have had? When things go wrong at work, how do you manage it or the situation? *Prompt – Persistence, Resilience.* *Prompt – Can you give an example of when this has occurred?* Tell me about the equipment that you use. *Prompt – Raft and Paddle size* *Prompt – Dry suit, BA, Helmet etc…* Does your employer provide the equipment? How often is your equipment checked? *Prompt – Who is responsible for this?* What weather conditions would call a halt to your activities? *Prompt – Wind, Lightening.* *Prompt – Has this ever happened to you?* How do you recover from work? *Prompt – Rest and recuperate.* What do you do to relax? *Prompt – Physical Activity, Read, TV, Party.*

Table 3.1 Continued: Interview Schedule

Topic	Questions and Prompts
Health:	How would you describe your current physical health? *Prompt – V. Good / Good / Average / Poor / V. Poor* How would you describe your current psychological health? *Prompt – V. Good / Good / Average / Poor / V. Poor* Do you smoke? *Prompt – How many per day?* Do you have any chronic illnesses? *Prompt – e.g. Diabetes.* Have you ever had an injury or illness caused by or made worse by your work? *Prompt – Current? Previous? White-Water Work related.* *Prompt – Water based disease, Surfer's Ear, Back Pain, Shoulder problems.* If yes, can you tell me about it? *Prompt – Illness, Injury, Where, How long for, Cause.* Has your mental well-being ever been affected by your work? *Prompt – Stress, Anxiety, Depression.* *Prompt – Current Work? Previous Work? White-water work related.* Have you ever taken time off work because of any other injuries or illnesses? Have you received any medical treatment for a work-related illness? If yes, what treatment have you received? Have common illnesses impacted upon your ability to work? *Prompt – Flu, Common Cold.* Have you ever been to work whilst injured or ill? *Prompt – What type of injury or ill-health?* *Prompt – Why did you not take time off?* What type of work did you do? *Prompt – Light or Normal duties?* *Prompt – Did you have any problems performing any of your tasks?* *Prompt – Did your work make the problem worse?* *Prompt – Could you perform optimally (Perform to high and safe standard)?* Did you report this injury? *Prompt – Why/Why not?* *Prompt – Have you reported injuries on other occasions?* Do you think your job positively affects your health? *Prompt – Well-being, Satisfaction.* If yes, in what way? Are there any injuries or illnesses which you consider to be common in the outdoor white-water sports industry? Any other comments/questions?

During the interviews, each participant was asked to complete the Nordic Musculoskeletal Questionnaire [NMQ] (Kuorinka et al., 1987). This measure provided a thorough assessment of MSCs experienced by white-water raft guides. During telephone interviews, the questions forming this measure were asked by the researcher. Each interview was conducted by the same researcher who had been trained in interview techniques. The interviews lasted between 21 minutes and 95 minutes and were recorded with the knowledge and consent of the interviewees. All of the interviews were subsequently transcribed verbatim.

3.2.4 Measures

The NMQ (Kuorinka et al., 1987) measures difficulties (aches and pains) experienced in the previous 12 months and 7 days and whether pain was activity-limiting in respect of daily activities (Appendix 2). It has been used internationally to assess MSCs in various occupations including nursing (Bernal et al., 2014), kitchen staff (Haukka et al., 2014; Shankar, Shanmugam, & Jayaraman, 2014) and office workers (Mahmud, Kenny, & Rahman, 2012; Wu, He, Li, Wang, & Wang, 2012). The body is broken down into 9 sections, with a diagram to aid the participant to decide which part, if any, has been affected. All questions require a 'Yes/No' answer. Data are scored by calculating the total frequency of 'Yes' responses for each section of the body. Totals are calculated for the frequency of participants reporting at least one MSC in the 12 months prior to interview, at least one activity limiting MSC, at least one MSC which required treatment from a physician and at least one MSC in the seven days prior to interview. Good reliability has been demonstrated with this instrument.

Kappa values between 0.48 and 0.72 were observed in four of the items, a Kappa value of 1 was observed in seven items and a Kappa value of 0.75 or greater was observed in the remainder items (de Barros & Alexandre, 2003).

3.2.5 Inductive Data Analysis

Each interview transcript was read and re-read by the researcher and analysed inductively using Thematic Analysis as described by Braun and Clarke (2006). This followed six steps: familiarisation with the data; generating initial codes; searching for themes; reviewing themes; defining and naming themes; and producing the report. The codes applied to the data by the researcher were validated through comparison whereby a sample of the data was independently coded by an experienced researcher independent of the study. During discussions, no disagreements arose. Quantitative data from the NMQ was collated and frequency counts were calculated via SPSS (Version 21).

3.3 Results

3.3.1 Participants

Following the initial 15 interviews (12 male), data saturation was achieved. To ensure that data saturations was achieved, a further five participants were recruited. In total 20 qualified raft guides (16 male) were therefore interviewed. Participants' ages ranged from 19 to 43 years (mean=28.15$\pm$8.20) and were of average weight according to body mass index (range=20.9 – 30.1, mean=25.16 $\pm$ 2.96). Participants reported having up to 20 years' experience of white-water raft guiding (range=less than 6 months – 20 years, mean=6.69 $\pm$ 7.27), with

qualifications varying from newly qualified British Canoe Union (BCU) Level 1 Raft Guide to BCU Level 5 Senior Raft Coach/Assessor (or equivalent). Participants were currently working in England (n=11, 55%), Wales (n=6, 30%) and Scotland (n=3, 15%) and had experience on River Grades from 2 to 5 based on The International Scale of River Difficulty (British Canoe Union [BCU], 2012; Walbridge & Singleton, 2005). Participants were either working as raft guides full-time (n=7, 35%), part time (n=6, 30%), as freelance guides (n=6, 30%), or were self-employed (n=1, 5%).

Table 3.2: Summary of Demographics of the participants

N=20	Mean ± Standard Deviation	Frequency (%)
Age	28.15 ± 8.20	-
Body Mass Index	25.16 ± 2.96	-
Years' Experience	6.69 ± 7.27	-
Sex		
Male	-	16 (80.00)
Female	-	4 (20.00)
Highest Qualification		
Level 1 Site Specific Raft Guide	-	9 (45.00)
Level 2 Unrestricted Raft Guide	-	5 (25.00)
Level 3 Trip Leader	-	3 (15.00)
Level 4 Raft Coach	-	1 (5.00)
Level 5 Senior Raft Coach	-	2 (10.00)
Employment Status		
Full-Time	-	7 (35.00)
Part-Time	-	6 (30.00)
Freelance	-	6 (30.00)
Self-Employed	-	1 (5.00)
River Grade		
Grade 2 or 3	-	11 (55.00)
Grade 4 or 5	-	9 (45.00)

3.3.2 Self-Reported Health

Self-reported health was rated highly. Nearly all participants described their physical health as being ‘good’ or ‘very good’ (95%, n =19) and over three-quarters (85%, n = 17) described their psychological health as ‘good’ or ‘very good’. One participant described their physical health as average and three stated their psychological health was average. Despite high levels of self-reported physical health, all participants reported experiencing at least one musculoskeletal complaint in the 12 months prior to interview. For over two thirds of participants (70%, n=14), musculoskeletal complaints were experienced in the 7 days leading up to interview. Details of reported musculoskeletal complaints can be seen in Table 3.3.

Table 3.3: Data from the Nordic Musculoskeletal Questionnaire (N=20)

Source of Trouble	Number of participants who reported trouble in last 12 months	Number of participants who reported being prevented from carrying out normal activities due to this trouble in the last 12 months	Number of participants who saw a physician of their trouble in the last 12 months	Number of participants who reported trouble in the last 7 days
Neck	11	4	5	4
Shoulder	11	3	3	5
Upper Back	11	2	1	3
Elbow	3	0	0	1
Wrist/Hand	13	1	2	2
Lower Back	17	5	6	8
Hip/Thigh	10	2	3	3
Knee	8	5	4	4
Ankle/foot	10	4	3	4
Total N	20	14	12	14

3.3.3 Interview Data

Six themes were identified (Table 3.3), of which, four relate to the management of work-related health. These were a) Work-related musculoskeletal conditions and ill-health, b) Working with musculoskeletal conditions, c) Managing work-related musculoskeletal conditions and, d) Recovery during and following work. The remaining themes, Work engagement and Perceived Benefits, identify the

motivations for working as well as the positive outcomes of working as a raft guide.

Table 3.4: Themes and Sub-Themes Identified from the Interview Data

Theme *Sub-Theme*	Example Quotes
Work-Related Musculoskeletal Conditions and Ill-Health	
Causes of Back Pain	*"I would probably say back and neck are the most common injuries. Backs and maybe shoulders from the physical side of guiding. Things like heavy boats, not always using the correct technique, always guiding on one side and not stretching afterwards or warming-up."* (22 year old female with 2 years' experience)
Causes of Upper and Lower Limb Injuries	*"Quite bad wrists because of some of the strokes... So it's holding the t-grip at the top and you are rotating the blade to 30 degree angles in a figure of 8 shape. It's keeping the paddle nice and straight in the water but your wrist is doing the twisting at the bottom."* (19 year old female with almost two years' experience)
Acute and Impact Injuries	*"I fell out of the raft in not very deep water. You feel where you hit the rocks but you don't really know what your limbs are doing, especially your hand. Basically my fingers and thumb went in opposite directions which stretched the tendons which is quite painful."* (26 year old female with 3 years' experience)
Ill-Health	*"Ears and eye infections. I think that was related to being in the water... I've had ear infections for a week or two before, I get big lumps and swellings behind the ear, and I've had general ear drumming. I've usually gone to the doctors for stuff like that to help clear it up."* *(*21 year old female with two years' experience)

Table 3.4 Continued: Themes and Sub-Themes Identified from the Interview Data

Theme *Sub-Theme*	Example Quotes
Working with Musculoskeletal Conditions	
Accepting injury as part of the job	*"Just bumps and scrapes really. Low velocity impact injuries, nothing really to mention. You just get banged around a bit. I've got little small scars in most areas rafting but it's just part of the job really. It's nothing substantial."* (38 year old male with 16 years' experience)
Working for the money	*"More often you get a chance for an extra break within your session if you're on the bank but bank is only half the money so most folks try and get on the water."* (42 year old male with 19 years' experience)
Managing Work-Related Musculoskeletal Conditions	
Use of medication to continue working	*"Originally I was taking some tramadol for this [back] pain. I came off that quite quickly and the exercise out here that I've been getting has almost rehabilitated it. A little bit of self-physio because I haven't actually seen a physio."* (20 year old male with more than two years' experience)
Protective behaviours	*"I actually taught myself to guide on both sides after starting to develop some lower back pain. Now I balance my guiding from left to right. Those incidences of back pain have almost completely ceased. It has been really effective. Guiding on both sides isn't easy. Typically from experience, every guide learns to helm on one side and one side only and when they get to the point of passing their assessment and working as a guide they'll all work on one side only."* (34 year old male with 15 years' experience)
Recovery During and Following Work	
Sustenance during the day	*"If you're not very well prepared and you turn up without any food, there's not time to go and get any or anything. So, I'm normally quite prepared with it but other people can be like 'I haven't eaten anything all day!'. I just wouldn't be able to function, basically."* (23 year old male with less than one years' experience)
Easing musculoskeletal conditions between working days	*"If you do 20 sessions a week, you are going to feel it. At the time it may be ok but then you are going to feel it. Probably in the shoulder, probably in the back. You just need proper rest for a few days and make sure that you have good food."*

	(36 year old male with 20 years' experience)

Table 3.4 Continued: Themes and Sub-Themes Identified from the Interview Data

Theme *Sub-Theme*	Example Quotes
Work Engagement	
Transactional engagement	*"I want to go from being a Level 1 guide to trip leader, to head of centre, to potentially owning my own rafting company in the future. So that's the rafter within me, it's very aspiring to do more."* (20 year old male with two years' experience)
Emotional engagement	*"The sore leg I've got at the moment doesn't stop me at all. I think I'm what you would call old school. I don't let anything stop me. Mostly because I enjoy it so much, I just don't want to miss out."* (43 year old female with 17 years' experience)
Perceived Benefits of Work	
Perceived improvement in physical fitness	*"It's exercise. It's physical activity which is always a good thing. If I was working anywhere else, I don't think I would do any exercise because of time, but obviously I am doing it as I'm working which is quite nice."* (21 year old male with one year' experience)
Social and stimulating environment	*"Well, we get to work in the outdoors, in the fresh air. We get to work physically, in an exciting, stimulating environment that's often challenging. So, from a physical health point of view, working outside, getting the sunshine, getting the fresh air, running around outdoors, that's a big tick."* (37 year old male with 16 years' experience)

3.3.3.1 Work-Related Musculoskeletal Conditions and Ill-Health

All participants reported that the nature of white-water raft guiding presented a risk of sustaining or developing a work-related MSC. These were attributed to the physical demands placed on the body of the raft guide including force, rotation and body position. A 28 year old male with one and a half years' experience explained how he felt that his whole body was at risk:

> *"Ankles are at risk in a raft, knees, hips, back, potentially elbows. It's pretty much the whole connective chain from paddle to raft goes through your whole body and it's a massive overload on the whole thing. So every single joint in the body is at heightened risk."*

Back pain was the most prominent musculoskeletal complaint reported with the majority of participants (n = 18) reporting having experienced back pain in the twelve months prior to interview. Back pain was reported in the upper back by one participant, the lower back by seven participants and in both regions by ten participants. Of those reporting back pain in the previous 12 months, over half reported experiencing back pain in the seven days prior to interview (n = 11). This was primarily in the lower back region only (n = 8). Back pain was an accepted occupational hazard and participants attributed such pain to their work as a raft guide and being due to forces being applied to the back whilst in an unnatural position. A 26 year old male with eight years' experience explained:

"I would say raft guides' backs [are at risk of injury] because it's not a natural position, you are twisted and you are twisting off to one side and you are putting a lot of strain on your back. So I would say that raft guides will probably have lower back pain problems."

This was further acknowledged by a 20 year old male with two years' experience who stated:

"A lot of people do put their backs out because you're sitting at a strange angle. I think it's really important for guides, because a lot of guides will favour one side, it's about moving around and being aware of your physical fitness really."

Participants also recognised that the biomechanical force experienced as a result of negotiating the raft through the turbulent water exposes not only the back but other areas of the body to musculoskeletal injury. One participant, with 16 years' experience described how rotational force related to the position the raft guide can lead to pain:

"If [white-water raft guides] keep their feet in a locked position and twist round too far, then you can create a lot of torqueing forces around your body which then are going to cause some injuries to your body, either your arms, your levers or the muscles in your lower back in this kind of a straining point."

This was also acknowledged by a 21 year old male with only one years' experience:

"You have a very heavy raft and you do a full rotation to try and turn the raft, that's all just off the blade in the water, no resistance off the raft, then that's all on your arms and your core and you're twisting your back as you do it."

The forces on the body aren't limited to affecting the back. A 28 year old participant with one and a half years' experience described how the rotational force also affects his knees:

"I think it's to do with the rotational force through my knee joint through doing large pries and large sweep strokes… …Because my feet are fully connected and locked into position, and my upper body is rotating and there is a large force through my upper body, it causes rotation through my knee joints."

A further 26 year old male with eight years' experience described how the wrists are also at risk of developing tendonitis as a result of the continuous pressure on the wrists:

"The wrists as well, I mean you put a lot of pressure and a lot of tension in your wrists. Like tendonitis in the wrists and muscular lower back problems I would say are probably most common."

Participants recognised that the cumulative effects of exposure to force and rotation whilst white-water raft guiding may limit the longevity of the occupation for some individuals. Two guides specifically commented on how they felt that white-water raft guiding was not a long-term career option because of the

physical demands on the body. A 20 year old male with over two years' experience stated:

> *"It's a great job! I know, I imagine it's not a job you can maintain forever because it's a physical job."*

Furthermore, a 28 year old male with one and a half years' experience reported how he felt that continued exposure to force may impact on his physical capability and lead to injury resulting in a premature departure from his career.

> *"The only one negative would be that injuries which limit me. I probably wouldn't raft full time because of that, because I know you've got a shelf life as a raft guide."*

He went on to explain:

> *"I think that rafting is very punishing on the body, especially the knees and the back. I think if you did it full time, then it would only be so long before your knees got to the point, and potentially your back, got to a point that you couldn't do it anymore and it would impinge on your life. I have a feeling that there are very few raft guides that go a long time without any injuries. I definitely feel that every raft guide is between injuries, certainly injury prone."*

In addition to the development of chronic MSCs, the majority of raft guides (N = 16) reported the risk of sustaining acute trauma injuries. The severity of such injuries reported ranged from requiring little, if any treatment, to needing major medical intervention including surgery. For example, a 20 year old male with

over two years' experience described some of the minor acute traumas which can occur during a working day as a raft guide:

> *"The more minor stuff are, people tend to get finger injuries trying to drain or flip rafts. They bang their shins when they fall out of rafts… …because our course is only waist deep."*

In contrast, a 37 year old male with 16 years' experience described a particular event which resulted in him sustaining more severe acute injuries including soft tissue damage and a hernia:

> *"A client fell out [of the raft] and held onto my buoyancy aid and actually pulled me backwards over the back of the raft. I tore my intercostals muscles, blew my hernia out and caused me a fair bit of discomfort. I thought at the time that I had broken some ribs but it turned out that it was the intercostals and a hernia. So I had an operation on that which is probably one of my more spectacular rafting injuries."*

Acute trauma injuries requiring surgery as part of the recovery process were only reported by two participants. However, acute trauma injuries sustained as a result of a collision, either with clients in the raft or obstacles beneath the surface of the water were reported to occur more frequently. A 21 year old female with two years' experience described how collisions can occur in the raft, including how the guide can be struck by a paddle or a client falling out of their position in the raft:

"I've had a few clients letting go of t-grips to the face, like cheek bones, nose or even been kicked, that sort of thing. Yeah, usually a lot of flips you can catch things or have people land on you, that sort of thing."

A 26 year old male with eight years' experience further stated how he lost a tooth after being struck in the face by a client's paddle:

"I've knocked my tooth out from a paddle before. I think it was a paddle. Just the tee grip to the face and it chipped my front tooth in half."

Collisions can also occur outside of the raft as well as in. Obstacles under the water surface were reported as a hazard by a small number of participants (N = 5). A 43 year old male with 17 years' experience described how he had sustained a minor acute injury to his lower limb after colliding with a submerged obstacle:

"I am currently rubbing my left shin because I banged that on a rock about a week ago when I was on the river rafting. It's fine, it's just a big bruise and a scratch on my shin. I have a big scar on my head that required ten stitches which was when I was being stupid. I had been on the river one day and stupidly jumped into the river after work and banged my head on a rock."

A 21 year old male with one year of experience also recalled an incident where he sustained acute trauma to his lower limbs after colliding with submerged obstacles:

"The odd sort of bashed legs and things like that from swimming down shallow rivers, that sort of thing. I took quite a pasting on both my thighs in [Location], where we flipped at the top of the course and ended up swimming the whole course."

Illnesses were reported by all participants to be rare and typically occurred in locations outside of the UK. Illnesses were not directly caused by the white-water rafting but were associated with the location of work, for example malaria. A 21 year old male with one year of experience stated:

"I've never had an illness from rafting. I guess that I haven't been to the right countries to get an illness. Obviously big rafting locations like Uganda, South Africa and places like that. You hear many stories about people who have had malaria and things like that."

3.3.3.2 Working with Musculoskeletal Conditions

Participants described injuries as being an expected and accepted element of their job. However, the nature of the work meant that raft guides continued to work despite being injured. A 21 year old female with 2 years' experience explained how she felt that injury was part of the work:

"A lot of it, I take as part of the job really. It's only natural if you're going to be doing seven rafts in a weekend, your shoulders are going to ache a little bit you know."

This was also reported by a 20 year old male with two years' experience who explained how he just '*got on with it'*:

"[White-water raft guiding] does batter you but it's the nature of the job really. You know you're going to get injured occasionally, it's essentially quite a dangerous job, things can go wrong. You kind of take it on the chin really, well I do anyway. I know I'm going to get injured at some point, so you just have to crack on and get on with it."

The client-focused nature of raft guiding led to participants feeling that they would let people down if they did not turn up for work. For example, a 21 year old male with one years' experience described how he would feel if he was unable to work:

"I think it would be quite hard to say that because you would feel like you're letting quite a lot of people down, including the company you're working for. I'd like to think that if it was serious enough for that to be the case, then I guess you have to speak up for the greater good at the end of the day."

Furthermore, the client-focused approach led raft guides to push their bodies in order to provide an enjoyable experience for clients. This in turn was seen to result in customer loyalty. A 42 year old male with 19 years' experience explained how providing a great experience would lead to a greater chance customers will return:

"So you make yourself work far beyond what your body is designed to do so that the clients in your raft are safe, having fun and have a great experience so that they want to pay money to your company again."

Whilst participants recognised the risk of acquiring a work-related injury and accepted that musculoskeletal conditions would arise as a result of their work, they also reported obstacles to effective management of such injuries. One such obstacle was the contract nature of employment whereby guides were not protected with sick pay. One 37 year old male raft guide with three years' experience stated:

> *"The thing is, if I don't work I don't get paid."*

A 37 year old male with 16 years' experience explained how an injury would impact on the quality of his life:

> *"You know sometimes the injuries take you out of work for sustained periods of time which is very hard because generally raft guides don't have huge funds behind them so they are working a little bit, what do they say… hand to mouth? You know you're earning, you're spending, you're earning, you're spending, so if you get injured and can't work it's quite tough."*

3.3.3.3 Managing Work-Related Musculoskeletal Conditions

Participants reported self-management of the demands of their work with the risks to their health. A number reported taking ibuprofen as a prophylaxis and also to treat symptoms. A 42 year old male with 19 years' experience described how he took a prescription drug (Diclofenac which is an anti-inflammatory drug) as a preventive measure:

"I take Diclofenac, which is on prescription. I take that occasionally when I think that there is going to be a big demand on my body, so I take that as a precaution. I mainly, if I know I've got a long run of whether it's hill days or rafting trips, I take a minimal dose, which helps lessen injuries and helps to lessen inflammation and puts a bit of a pain block in."

A further participant, a 43 year old male with 17 years' experience, described how taking ibuprofen was common practice among raft guides. However, he went on to describe that this was not a behaviour he practiced himself:

"Back strains, maybe even chronic ones because they don't stop working when they've got problems. I know lots of raft guides who call ibuprofen 'Vitamin I' and they take their vitamins every day. Fortunately I've never done that, I don't like taking pills to do that sort of stuff. If it ever gets that bad, I would just stop and take a rest and make it better."

Other practices described included warming-up and bilateral guiding (A visual representation of bilateral guiding is available in Appendix 3). Although almost all participants (N = 17) discussed these behaviours, they were not always reported as being commonly practiced.

The importance placed on warming-up varied from individual to individual. A 34 year old male with 15 years' experience described stretching to prepare before work and how stretching prepared the muscles in his limbs and back ready for raft guiding:

"I do typically stretch and warm-up. Not extensively but I definitely do it. Before I go out rafting, I will do a short stretch and a loose quick warm-up. It's more of a stretch than a warm-up and that's to all of the major limbs and my back."

A small number of participants (N = 4) explained how some working practises, such as inflating the rafts and the on-water safety brief, were considered to be sufficient preparation for the body prior to the physical demands of their occupation. For example, a 29 year old male with two years' experience described:

"When you get the clients onto the flat water, you sort of go through a warm up with them anyway. You kind of do it with them. It's not an official warm up but you use that. It's not like you're going straight into the white water course stone cold. I suppose, the lifting the rafts out of containers, you don't warm up for that. But before you go down the course, you will have warmed up a little bit. It's almost an unofficial warm up."

Although this may prepare the body for the physical demands, one participant believed that inflating the rafts and the on-water safety brief are insufficient for an actual warm-up. The 38 year old male with 16 years' experience explained:

"I have seen guides doing warm ups but I would say it's a rarity. The only warm up that takes place is for clients and I would definitely sell it as that when I'm instructing, is going through the basic paddling commands on the raft. That can be quiet a reasonable warm up for the clients but for the guides I think it's debateable if any warm up takes place. I myself try and do a few hip circles and that's about it really which is awful really isn't it?"

Not all participants completed warming-up exercises. A 20 year old male with two years' experience described not making time for warming-up exercises despite being informed of the benefits of warming-up in his white-water raft guide training:

> *"I usually just get straight into it. I probably should stretch off before and after but it's not something that I have time to do and do, do. I just get straight on with it. I could probably make time if I wanted to, but because I'm. I try to do a bit of exercise normally anyway, like I've been to the gym this morning, I'm normally quite limber anyway, but yeah stretching probably should be done by most raft guides. It is recommended when you're taught so probably should be done more."*

In addition to warming-up, white-water raft guides are recommended to guide bilaterally (guide on both sides as opposed to guiding on a single preferred side [unilateral guiding]. See Appendix 2) during their training. Guiding bilaterally was reported to protect against back pain, especially over longer careers. A 37 year old male with 16 years' experience explained:

> *"Something else we try and promote is that people guide on both sides and then they're not going to develop one massive shoulder and a big muscle on one side of their back which can pull people's spines out of line as well. I've seen a bit of that, and they keep having to go to a regular chiropractors to get put back in line because they get over developed."*

A 38 year old male with 16 years' experience explained how despite providing this information during the training he delivers, white-water raft guides rarely practice guiding bilaterally:

"I do try and make guides aware of the damage they can cause. They need to guide on both sides to limit that wear. People will definitely have a preference. They will pick one side and they will stay one sided for the rest of their career. It's seldom that you meet people that are aware of the risks and they can guide on both sides."

Despite this, participants did express awareness that unilateral guiding can lead to the overdevelopment of certain muscle groups. These muscle imbalances were reported to contribute to back conditions. A 19 year old male with less than a year of experience explained:

"[White-water raft guiding] affects your whole back, but you tend to get one arm bigger because you are pulling with one arm. Well you can pull with the other arm but it's quite one-sided. The older guides do both sides, they will do one session on one side then the next session on the other side just to even it up."

A 23 year old male with less than a year of experience discussed how he tries to guide bilaterally in order to avoid injuries associated with unilateral guiding:

"I guess a bit of a repetitive strain injury would be sort of expected. People tend to pick one side which they guide on and they stay there throughout sessions. You're staying in this sort of posture for extended periods and putting a lot of effort into one side. I tend to try and do both sides. I'm more comfortable on the right, but I do try and go on the left as well, just to try and avoid becoming lopsided."

A small number of participants reported being aware of the long-term effects of guiding unilaterally. However, bilateral guiding was reported to be a difficult skill to learn. In addition, whilst learning to guide bilaterally, the quality of the sessions provided may be impeded. This created a barrier to developing this skill. A 22 year old female with two years' experience explained:

> *"Personally I can only guide on one side, on my left. I have tried guiding on my right but it feels like I'm a beginner again and it doesn't really work. So most people tend to guide only on one side otherwise it all goes a bit wrong."*

3.3.3.4 Recovery During and Following Work

Participants reported that the physical nature of raft guiding was not only challenging in relation to the physical forces on the body but also in relation to the sustained physical performance required to complete a day's work. A number of participants mentioned the importance of maintaining hydration levels and energy levels yet reported difficulty in managing food and hydration throughout the working day. A 29 year old male with two years' experience stated:

> *"You know sometimes you can have really hard days, between sessions you try and grab a drink and a bit of food and try and keep your energy levels up that way."*

One reported obstacle to maintaining sufficient energy levels was time whereby raft sessions were organised with very little time between sessions leaving

insufficient time for guides to have a break and replenish their energy. This was described by a 21 year old female with 2 years' experience:

> *"[The break is] only 10 or 15 minutes or half an hour break, grab something if you can. I am quite bad, I do skip having food sometimes. It's not good but I do, when you're busy you don't always get time."*

A further participant, a 42 year old male with 19 years' experience also added:

> *"If [the sessions] are running back to back, then they literally run back to back. You have time for a pee, a drink of water, a quick nibble and then you're straight back on the water. This is because your session starts officially 10 minutes before the hour but your session finishes 10 minutes before the hour. You've got no turn round time."*

In addition to managing the energy levels during a working day, participants reported having to manage the daily recovery following work, particularly for aches and pains in the muscles. For example, a 42 year old male with 19 years' experience described how he used over-the-counter remedies and gentle exercise to manage his aches and pains:

> *"I use an over-the-counter cooling gel like remedy and that works really well. I don't particularly do heat packs or pads really. I do saunas and steam rooms when I get the opportunity to. So I do try and take a couple of evenings a month and after a swim, go and spend 2 hours in the sauna in the local pool. That seems to loosen things up enough, then some decent stretches, that's about it."*

In contrast, professional treatment may be sought such as sports massages or physiotherapy. A 21 year old female with two years' experience stated:

> *"I had a lot of pain in my lower back before. In my blades I get a lot of knots, in my shoulder blades so I've had some sport therapists look at it, I had a bit of a nice massage. But ye, just general aches and pains I guess."*

A 37 year old male with three years' experience also stated:

> *"The sort of treatment, flexibility, physio, they are placing specific stretches on me and holding them. I've had an ultrasound, I'm getting a sort of heat therapy as well. Exercises. I have specific exercises to target certain muscle groups to get them firing. Just trying to be more flexible really."*

Gentle mobilisation and stretching was reported to be an effective way of managing musculoskeletal conditions. A 38 year old male with 16 years' experience described how this was more effective than specific treatments:

> *"I've tried a few things. I've tried acupuncture. I've been to a physio and tried ultrasound. Ultrasound, infrared, I used to put a lot of heat on it. What I found worked best really is going for a little bit of a swim and then working through my stretches."*

3.3.3.5 Work Engagement

Participants described their motivations for working as white-water raft guides. In addition to earning money, described as transactional engagement, it is also an occupation which is enjoyed. A 43 year old male with 17 years' experience

disclosed how he used to work in a well-paid occupation but decided to leave to pursue working as a raft guide:

> *"So I find myself to a certain degree stuck but it's kind of consciously stuck because 7 years ago I had a real job and I just went raft guiding at the weekends. I had a real job, a good job, but I decided that I'd prefer to guide full time again so I left that. Made a conscious decision to go raft guiding and find a good paying raft guide job, which I did for five years in Canada."*

Furthermore, a 21 year old male with one year's experience described how white-water raft guiding is a good opportunity to earn money from a job similar to their hobby:

> *"I don't know many people who work in the rafting industry which don't have prior paddling or river knowledge beforehand. There are a few, but they are quite rare. It tends to be a common way for people who paddle, because there's not a lot of money in paddling, it's an easy way to earn a bit of money and not have to look for a full time job I guess."*

Participants also described internal motivations for working which demonstrates emotional engagement. For example, a 21 year old male with one year's experience stated how he enjoys working as a raft guide regardless of the weather and temperature:

> *"I enjoy being on the water, even when it's cold. I enjoy being out there and working with friends. I never get the feeling that I don't want to go to work."*

All participants expressed a lot of enthusiasm when discussing their work as a white-water raft guide. For example, a 19 year old female with one and a half years' experience described how each day is different, even when working with the same work colleagues:

> *"[White-water raft guiding's] something I really enjoy. I love going out and I love meeting new people. Your clients are never the same. Even if they are the same people, they can be different on a different day. It's different to everything else."*

In addition, a 20 year old male with over two years' experience expressed an eagerness to learn which drives him to want to continue to raft guide and develop his skills:

> *"No matter how much you learn, there is always going to be someone who has more knowledge they can pass to you. It's the part of you that always wants to get back on the stick [in control of the raft]. Every time someone takes the stick off your hands, it's the bug that always wants to get back on again."*

In contrast, two participants described how they enjoyed their work so much that they continued to work when they were suffering from a musculoskeletal condition. For example, a 43 year old male with 17 years' experience discussed how the presence of MSCs does not prevent him from working because he would feel he would miss out:

"My dad trained me to play rugby and he said 'play through your injury' and I've taken that very much to heart and I don't let anything stop me. Mostly because I enjoy it so much, I just don't want to miss out."

In addition, over half of participants (N = 11) reported feeling happy when they were working intensely. This was either working long hours with little rest or delivering intense and tiring sessions for clients. For example a 26 year old male with eight years' experience described enjoying his work even when there was little rest during a working day:

"Then the session starts at 10 and finishes at 12. 12.15 the next session starts and finishes at quarter past 2. Then half 2 'til half 4. Then quarter to 5 and so on until 9 at night in the summer. It's not easy, that's for sure. But I do it because I love it. That's why I do it."

Furthermore, a 21 year old male with one year' experience described how working intensely to provide an enjoyable experience for his clients was tiring, however, this was the type of work he preferred:

"If you've got a group of lads on a stag do or whatever and they just want to get wet and for the raft to flip as many times as possible, then that can be a pretty full on session for the guide… …Most guides, including myself, prefer that sort of group. That's the sort of rafting a lot of people in [Name of Location] like to do because it's more fun for me doing that sort of thing. But as I said, that's the most tiring session to do."

However, in enjoying the session, one participant discussed how it is possible for white-water raft guides to get carried away with their sessions. The 26 year

old male with eight years' experience described how raft guides can lose track of time:

> *"It's funny, you say it's a job but it's also a hobby. I think it's the best job in the world. Hands down, the best job in the world so if you are having the best time in the world you can definitely have too much fun and lose track of time… …That can happen quite a bit. [Raft guides] accept that that is the case, they know that they over-ran because they were having a good time so they accept that they are straight off and on to another raft."*

He also described how becoming carried away with working can potentially cause musculoskeletal conditions:

> *"When you get carried away you're throwing the raft into all these crazy positions and manoeuvres and you're twisting your back and your wrists are opening out and they're locking in and all this sort of stuff, holding a line and position, sometimes you don't need to do that."*

3.3.3.6 Perceived Benefits of Work

Despite reporting a range of work-related musculoskeletal conditions participants were enthusiastic about their jobs and reported benefits associated with their work. The physical nature of the work was reported to enhance physical fitness. This was described by a 43 year old male with 17 years' experience who stated:

"I enjoy the physicality of [raft guiding]. That actually helps keep me fit as well as trying to go out and doing running and all that sort of stuff which I don't do very much anymore. I am still quite a fit person as a result of doing my job because it's a physical job. Running up and down rivers, just the general paddling down the river as well so that kind of keeps me fit and strong as well."

A 20 year old male with two years' experience added:

"It keeps you fit. It keeps you going. You don't sit around in an office all day. You don't get lonely. It does give you a good work out. Lots of pulling with 8 people in your boat which is obviously quite hard. You got a lot of lifting. It keeps you physically fit which is good, stops you going to the gym as much. Ye it's nice, so ye I'd say it's beneficial."

In addition to the physical benefits associated with the work, participants discussed how working in a social and stimulating environment was beneficial to their psychological well-being. A 19 year old female with one and a half years' experience stated:

"[White-water raft guiding's] something I really enjoy. I love going out and I love meeting new people. Your clients are never the same. Even if they are the same people, they can be different on a different day. It's different to everything else."

Social interactions with clients and colleagues contributed to the stimulating environment in which white-water raft guides work. The dynamic environment of

the outdoors maintains a level of interest for workers. A 26 year old male with eight years' experience explained:

> *"Just by being outside and being interactive with other people and stuff like that. It's all going to be good for your mental well-being I would imagine. I think in the outdoor industry, you're outdoors, and you're working with people in a dynamic environment, that works for me. I wouldn't say my mental well-being would be as good as it is now if I was working in an office or doing something a bit less stimulating."*

A 22 year old female with two years' experience also commented on how working in an outdoor environment improves her happiness:

> *"I just like being outside and working with a team of people who are really enthusiastic. Being with people who like what they do and you get good vibes off them and you work well together and you have a good day on the water. People tell you what an amazing job you have so yeah it's pretty true to be honest. It makes you feel good at your job and happy."*

3.4 Discussion

The findings from this study suggest that white-water raft guiding is a challenging occupation and white-water raft guides are at high risk of sustaining a work-related MSC. The study identified a variety of work-related MSCs experienced by white-water raft guides including back pain, knee injuries and ankle injuries. The prevalence of musculoskeletal conditions was high with the total sample reporting at least one musculoskeletal condition in the 12 months prior to interview.

Back pain was the predominant condition reported, with 85% (N=17) of the sample reporting low back pain in the 12 months prior to interview. These findings are in line with previous research examining the health of raft guides in the US (Jackson & Verscheure, 2006). In addition to back pain, MSCs were reported by at least half of the sample in all regions of the body except the elbow and knee. This suggests that white-water raft guides' entire bodies may be susceptible to a range of MSCs. This contributes to the empirical and anecdotal evidence that workers in the Outdoor Industry are at risk of developing work-related MSCs (AAIAC, 2006; McDermott & Munir, 2012).

White-water raft guides did not always recover from their injuries sufficiently. As observed previously amongst Mountain Leaders, there is a culture of presenting to work whilst ill or injured (McDermott & Munir, 2012). This behaviour has been defined as sickness presenteeism (Aronsson, Gustafsson, & Dallner, 2000; Johns, 2010). Financial issues were reported as a motivator for engaging in sickness presenteeism, which is consistent with previous literature (Hansen & Andersen, 2008). This could have serious consequences as white-water raft

guides are in positions of responsibility, where they have to be physically and psychologically fit enough to look after their clients. The extent to which white-water raft guides present to work whilst ill or injured requires further attention.

The work-related MSCs reported by participants were perceived as inevitable and were accepted as limiting the longevity of their work as a raft guide. Despite this a number of participants reported to continue working with an injury. In order to achieve this, a small number of raft guides reported using pain relief and anti-inflammatory medication. This behaviour was also evident amongst some mountain leaders (McDermott and Munir, 2012). Although this may allow the raft guide to continue working, the longer term consequences of working with an injury may be severe.

Despite the high prevalence of problems reported, there was still high job satisfaction among participants. This demonstrates that white-water raft guides potentially have a high level of engagement with their work. High levels of work engagement have been associated with positive health outcomes (Peterson et al., 2008) and an improved recovery experience (Siltaloppi, Kinnunen, Feldt, & Tolvanen, 2011; Sonnentag et al., 2012). Further research is required to assess levels of engagement and what the implications are for the work-related health and well-being of white-water raft guides.

It is important to note that the extent to which MSCs are problematic for white-water raft guides may be over-inflated in this small sample. This may be due to individuals who were currently experiencing MSCs being more likely to participate than those who have not experienced work-related MSCs. In order to reduce this bias and build on these findings, a larger scale study is required

to explore the extent to which work-related MSCs may be a problem for white-water raft guides working in the UK. Prospective research is required to assess whether the development of work-related MSCs are due to cumulative effects. As white-water rafting is a seasonal summer activity, it is possible that patterns of work-related MSCs may vary across a working season.

3.5. Chapter Summary and Conclusions

White-water raft guiding is a physically and mentally challenging occupation which entails a risk of various work-related MSCs. In this initial study, back pain was identified as the most prominent work-related MSC reported. Participants reported that work-related MSCs were an anticipated and accepted aspect of their work and continued to work through any MSCs they sustained. Despite the risk of work-related MSCs, participants reported high levels of enthusiasm for their work and described how it benefitted their physical and psychological well-being. A large scale study is required to examine whether work-related MSCs are a problem for white-water raft guides across the entire industry in the UK. Furthermore, the relationships between recovery experience and work engagement and how these effect the health of white-water raft guides requires further investigation. Finally, as white-water raft guiding is a seasonal occupation, longitudinal research will be beneficial to assess how the work-related health of white-water raft guides varies across a working season.

Chapter 4 A Literature Review of Work-Related Health and Well-Being

4.1 Chapter Introduction

The results of the qualitative study identified that MSCs are a serious problem for white-water raft guides. Working practices and insufficient rest were attributed to the development of chronic MSCs. Despite this, participants described being highly emotionally engaged with their work, describing the job as something they 'loved'. There is therefore evidence that white-water raft guides may be highly engaged in their work. Before further research can be conducted, a review of the literature examining work-related psychological and physical health and well-being is required. As very little is known about the occupational health of those working in the Outdoor Industry, literature from other areas was utilised to provide insight into factors associated with work-related health and well-being. Psychological factors (such as work engagement) and physical factors (such as recovery) are discussed with regards to how they influence physical and psychological health and well-being in the workplace.

4.2 Work-Related Psychological Well-Being

4.2.1 Conceptualising Psychological Well-Being

The concept of psychological well-being has been developed by various researchers. One definition of well-being comprised six dimensions; Self-acceptance, Environmental mastery, Autonomy, Positive relations with others,

Personal growth and Purpose in life (Ryff, 1989; Ryff & Keyes, 1995). However, this is a general, context-free model (van Horn et al., 2004). A model specific to occupational well-being has also been developed which includes four core dimensions; affective well-being, aspiration, autonomy and competence (Warr, 1994). These models conceptually overlap, however, neither considers cognitive or psychosomatic aspects of well-being (van Horn et al., 2004). A more recent model of well-being has been developed to incorporate these aspects as well as the affective, social and professional well-being dimensions already considered (van Horn et al., 2004).

According to van Horn et al.'s (2004) model, the Affective dimension is concerned with emotional exhaustion, job satisfaction and organisational commitment (how much an employee identifies with his/her work). Professional well-being is associated with autonomy, aspiration and professional competence. Social well-being is defined by depersonalisation and the degree of functionality to work with others. Cognitive Weariness is conceptualised by work fatigue and cognitive functioning. Finally the Psychosomatic dimension considers psychosomatic complaints such as headaches and back pain. This thesis focuses on individuals' well-being, specifically related to the development of MSCs and psychological fatigue, as opposed to the ability to function with others. Therefore only the Affective well-being, Cognitive Weariness and the Psychosomatic dimensions are addressed.

4.2.2 Psychological Recovery and Fatigue

It was highlighted in the previous chapter that white-water raft guides work long hours and take little time for rest and recovery, especially as some engage in

physical leisure activities which are similar to their work. Evidence from other types of demanding occupations have found that high work demands including long working hours and physically demanding work can lead to work-related fatigue as well as burnout and poor physical and mental health (e.g. Beckers et al., 2004; Geurts & Demerouti, 2003; Van Yperen & Hagedoorn, 2003). There is good evidence that fatigue can impact on individuals' health and their abilities to complete everyday activities, such as work (de Croon et al., 2003; Kant et al., 2003; Mallinson et al., 2006; Sluiter et al., 2003). Insufficient recovery from work itself has also been associated with work-related fatigue (Sluiter et al., 2003). It was identified in the qualitative study that ascertaining sufficient rest was an issue for some raft guides. The effects of how the working hours, physical leisure activity and working environment influence white-water raft guides' recovery experience following work will therefore be tested.

Psychological recovery has been conceptualised as the process in which an individual reduces their physiological and psychological activation, over time, by not utilising the systems concerned (Meijman & Mulder, 1998). More recently it has been conceptualised as the process which allows an individual to replenish their physiological and psychological resources following a stressful situation (Sonnentag & Fritz, 2007). The mechanisms drawn upon to allow this process to occur are psychological detachment from work, relaxation, mastery and control during leisure time. Psychological detachment is distancing oneself from work both physically and mentally (Hartig, Kylin, & Johansson, 2007). Relaxation is associated with leisure activities and is the ability to lower physical and mental activation whilst heightening positive affect (Stone, Kennedy-Moore, & Neale, 1995). Mastery is concerned with learning and challenges which

distract one from their work (Sonnentag & Fritz, 2007). Finally, control during leisure time is the ability to make a choice about how an individual will spend their leisure time, for example what activity to complete as well as how and when (Sonnentag & Fritz, 2007).

The need for recovery is a specific state of well-being which refers to the short-term effects of work-related fatigue and has been conceptualised as the desire to replenish internal resources and recuperate in the time immediately following work (Sluiter, 1999; Sluiter, de Croon, Meijman, & Frings-Dresen, 2003). Individuals who chronically recuperate insufficiently following work are more likely to develop a greater need for recovery (Sonnentag & Fritz, 2007). A prolonged need for recovery has been associated with negative effects, such as reduced productivity at an organisational level and poor health, sick leave and disability at an individual level (de Croon et al., 2003; Kant et al., 2003; Sluiter et al., 2003). Furthermore, the need for recovery has been identified as an early indicator of chronic work-related fatigue and psychological distress (Jansen et al., 2003). Therefore in the present study, the need for recovery will be utilised as an indicator of fatigue among this working population, as there is no previous literature to suggest whether fatigue is a significant issue among this population.

A lack of psychological detachment has been associated with the need for recovery on a daily basis (Sonnentag & Bayer, 2005). This is more common among individuals with higher workloads as their focus on work impacts on their leisure time, thus reducing their psychological detachment from work during leisure hours, resulting in impaired recovery (Sonnentag & Bayer, 2005). Furthermore, employees with high workloads are more likely to work overtime,

consider work and home activities as more effortful and report being more preoccupied with work during home time, when compared to their peers with a lower workload (van Hooff et al., 2007).

The relationship between the number of hours worked and health may resemble a bell curve and therefore may not be linear. Individuals who work too few hours may be at just as much of a risk of negative health consequences as those who work too much (Sparks, Cooper, Fried, & Shirom, 1997). This may explain why not all studies have found a direct association between the number of hours worked and the need for recovery after a working day (Bos, Donders, Schouteten, & Van der Gulden, 2013; Van der Hulst, Van Veldhoven, & Beckers, 2006). However, it could also be that these studies have only focused on non-physically active work such as university and office based administration employees. It is therefore possible that physically active work, such as white-water raft guiding, may require a greater need for recovery at the end of a working day. This was tested in the following hypothesis:

> ***Hypothesis Ia:*** *A greater number of hours worked per month will be associated with a greater need for recovery across a working season.*

Physical activity has been suggested to aid the recovery process and reduce work-related fatigue (Korpela & Kinnunen, 2010; Oerlemans & Bakker, 2014). This is particularly the case when individuals fully detach themselves from work and enter the great outdoors (Korpela & Kinnunen, 2010; Sonnentag & Zijlstra, 2006). Increased time participating in outdoor activities in a natural setting helps with psychological detachment and thus improves recovery (Korpela & Kinnunen, 2010). The need for recovery may also be influenced by the physical

aspect of physically active jobs (Sonnentag & Zijlstra, 2006). It is unknown whether individuals working in a physically active job will gain the same benefits of physical leisure activity from their work. The following hypotheses were therefore tested:

> ***Hypothesis Ib:*** *A greater number of monthly hours of physical leisure activity will be associated with a lower need for recovery across a working season.*
>
> ***Hypothesis II:*** *Working in a natural outdoor environment (i.e. on a natural river), as opposed to working in an artificial environment (i.e. on a man-made course), will be associated with a lower need for recovery.*

However, the relationship with work-related fatigue is reciprocal, meaning that individuals who are experiencing high levels of work-related fatigue are less likely to engage in physical leisure activity (de Vries et al., 2015). Workers in physically active occupations, such as white-water raft guides, may not have the option of completing physically active job tasks, and therefore have to continue working whilst fatigued. The longitudinal study of Dutch workers only considered physical activity during leisure time, therefore work-related physical activity should be considered in future studies.

It is not known whether the effects of high levels of work-related physical activity can reduce work-related fatigue for those who, for example, work in the Outdoor Industry such as white-water raft guides. As rafting can occur on a variety of bodies of water, including natural rivers and man-made courses it is unknown whether being surrounded in a natural or unnatural environment will

affect the need for recovery of white-water raft guides. The following hypotheses were therefore tested:

> ***Hypothesis IIIa:*** *Working longer hours on a natural river will reduce the need for recovery experienced, whereas working longer hours on a man-made course will increase the need for recovery experienced by white-water raft guides.*
>
> ***Hypothesis IIIb:*** *White-water raft guides who work on a natural river and participate in a greater amount of physical leisure activity will experience a lower need for recovery; furthermore an increased amount of physical leisure activity will reduce the need for recovery experienced by those working on man-made courses.*

4.2.3 Work Engagement and Psychological Well-Being

Kahn (1990) described personal engagement as an individual's level of identification with their work. It was theorised that individuals created their preferred work identity, drawing upon physical, cognitive and emotional resources (Kahn, 1990). More recently, work engagement has been conceptualised as a psychological construct with three components: vigor, dedication and absorption, and has been described as a positive state of mind (Schaufeli et al., 2002; van Horn et al., 2004). Work engagement is often measured using the Utrecht Work Engagement Scale (UWES) which assesses vigor, characterised by the levels of energy an individual possesses at work; dedication, characterised by an individual's perception of the value they place on themselves at work; and absorption, characterised by an individual's

investment and attachment to their work (Schaufeli et al., 2002; Schaufeli & Bakker, 2004). This concept emerged as occupational psychology developed a more positive approach as opposed to examining the more negative concept of Burnout (Christian, Garza, & Slaughter, 2011).

Burnout has been described as exhaustion and a lack of efficacy at work (Maslach, Schaufeli, & Leiter, 2001). Specifically, Burnout is a psychological syndrome which can arise as a result of prolonged stress, high job demands and limited resources (Bakker & Demerouti, 2007; Maslach et al., 2001). It has been conceptualised by Exhaustion, Cynicism and Professional Efficacy (Maslach et al., 2001). Exhaustion refers to the state of being overextended and depleted of emotional and physical resources. The Cynicism component refers to the detachment from one's work. The final component, Professional Efficacy, refers to feelings of incompetence and a lack of achievement.

It has been suggested that work engagement and burnout are direct opposites of each other, with low burnout scores equating to high work engagement and vice versa (Maslach & Leiter, 1997). One measure which encompasses both work engagement and burnout is the Oldenburg Burnout Inventory [OLBI] (Demerouti, Bakker, Vardakou, & Kantas, 2003; Demerouti & Bakker, 2008). In addition to the psychological components of Exhaustion and Disengagement, the OLBI also considers the physical strain involved in work. It is argued that the OLBI is an improved measure of Burnout for those working in a physically active job (Demerouti & Bakker, 2008).

Although this may be a beneficial measure for those working in physically active jobs, such as white-water raft guides, it is debatable whether work engagement

and burnout are opposites on the same scale. For example, a literature review discusses the large body of empirical evidence, proposing that there is only a moderate negative relationship between work engagement and burnout inferring that they share conceptual space but should be measured separately (Christian et al., 2011). It is plausible that it may be possible to experience burnout whilst being highly engaged with the job. Evidence from the outdoor industry supports this, highlighting that Mountain Leaders are highly engaged with their work, however they may experience high levels of physical and psychological fatigue (McDermott & Munir, 2012). However, it is unknown whether there is a similar problem among those working as white-water raft guides. Therefore, a measure which assesses the early stages of emotional and physical fatigue following work may be more appropriate than measures of burnout. For this reason, the concept of burnout is not being assessed in this thesis.

Empirical evidence suggests that high levels of work engagement have both positive short-term and long-term effects on productivity and health in the workplace (Bakker et al., 2011). The positive effects of high levels of work engagement include improved productivity (Christian et al., 2011) as well as increased positive emotions, such as happiness, joy and enthusiasm (Bakker, 2009). In addition, engaged employees are more likely to report positive health outcomes and better mental and physical recovery from the previous day of work (Sonnentag et al., 2012).

Specifically, the vigor and dedication components of work engagement have been demonstrated to have a positive effect on recovery. For example, high levels of trait vigor have been associated with a lower need for emotional and

physical recovery following work (Sonnentag & Niessen, 2008). This relationship is reciprocal in that high levels of work engagement leads to a lower need for recovery which in turn leads to high engagement the following working day (Sonnentag et al., 2012). As vigor and dedication (as opposed to absorption which is considered to be a negative construct of work engagement) have been considered to be the core dimensions of work engagement (Gonzalez-Roma, Schaufeli, Bakker, & Lloret, 2006), it is possible that both of these constructs may contribute to improved recovery among white-water raft guides. However, it is possible to become over-engaged, particularly over a long period of time, which can have negative consequences (Sonnentag & Niessen, 2008). This has been described as the 'dark side' of work engagement (Bakker et al., 2011). High levels of the absorption component of work engagement have been associated with working long hours, particularly overtime (Beckers et al., 2004). The following hypothesis tested the longitudinal effects of work engagement on the need for recovery:

> ***Hypothesis IV:*** *Across a working season, vigor and dedication will be negatively associated with the need for recovery, whereas absorption will be positively associated with the need for recovery*.

People who commit high levels of effort to their work have also been reported to work overtime, particularly at weekends (van Hooff, Geurts, Kompier, & Taris, 2007). This can impact on work-life balance which may have negative implications for the individual's health due to a lack of time to recover (Geurts & Demerouti, 2003). Specifically this relates to a lack of psychological detachment from work which impedes an individual's recovery experience (Sonnentag & Bayer, 2005). Although engaged individuals may not be classified as

workaholics because engaged individuals see work as fun (Gorgievski, Bakker, & Schaufeli, 2010) this may contribute to accumulative effect of the need for emotional and physical recovery following work when workloads, indicated by the number of hours worked (Major, Klein, & Ehrhart, 2002), are high and vigor is low (Sonnentag & Niessen, 2008). The qualitative results identified that white-water raft guides work long hours across the working season, similar to other employees in the outdoor industry (AAIAC, 2006; McDermott & Munir, 2012). It is therefore important to measure the longitudinal effects of work engagement and working hours on psychological fatigue. Furthermore, as there is evidence to suggest that vigor and dedication are positive constructs whereas absorption is more negative (Gonzalez-Roma et al., 2006), the constructs of work engagement will be assessed individually. The following hypotheses:

> ***Hypothesis Va:*** *A greater number of monthly hours worked as a white-water raft guide will weaken the negative relationships between the need for recovery and vigor and dedication whereas it will strengthen the positive association between absorption and the need for recovery.*
>
> ***Hypothesis Vb:*** *A greater number of monthly hours of physical leisure activity will weaken the negative relationships between the need for recovery and vigor and dedication whereas it will strengthen the positive association between absorption and the need for recovery.*

4.2.4 Section Summary

There are six aspects which contribute to psychological well-being; self-acceptance, environmental mastery, autonomy, positive relations with others, personal growth and purpose in life. It has been demonstrated that these aspects can be affected through working. The need for emotional and physical recovery following work has been identified as an early indicator of work-related fatigue. Physical activity in a natural outdoor setting has been associated with a reduction in the need for recovery that workers experience. However, the effects of working in a physically active occupation are unknown. Due to the physical demands of raft guiding on white-water, it is therefore possible that white-water raft guides may require a greater need for recovery at the end of a working day. Work engagement has been considered a positive perspective for looking at psychological well-being of employees, particularly when compared to burnout and high levels of work engagement have been associated with improved recovery and self-reported health. However, there is a possibility that workers can become over-engaged which may be detrimental to their health if they are unable to detach from their work. Workers in the Outdoor Industry have been found to work long hours and engage in physical leisure activities which are similar to their work (McDermott & Munir, 2012). This suggests there is a risk that workers in the Outdoor Industry may not detach sufficiently from their work. These findings are limited to one group of employees within a large industry and it is not yet known if the same behaviour is practised by others such as white water raft guides. A positive recovery experience has been associated with reduced stress and improved well-being.

4.3 Physical Health and Well-being

The previous section considered the psychological well-being associated with work. This section will review the evidence of how psychological factors, such as work engagement and the need for recovery can influence physical health, such as the development of MSCs. The interactions between psychological and psychosocial factors with physical health are reviewed, before finally discussing the importance of recovery for physical health. The initial hypothesis examining physical health explored physical factors which may influence the development of MSCs:

> ***Hypothesis VI:*** *The type of river, river grade, number of hours worked as a white-water raft guide and number of hours of physical leisure activity will influence the amount of chronic MSCs reported by white-water raft guides across a working season.*

4.3.1 Work Engagement and Physical Health

There is limited research which has explicitly examined the relationship between work engagement and physical health. However, high levels of work engagement have been associated with positive outcomes of health and is positively associated with physical recovery from the previous day of work (Sonnentag, 2003). Furthermore, the vigor component of work engagement has been associated with positive self-reported health (Shirom, 2010). Cross-sectional analyses have also identified that high levels of work engagement are associated with lower levels of self-reported ill-health (Shimazu & Schaufeli, 2009) and psychosomatic complaints (Demerouti et al., 2001; Schaufeli et al.,

2008). However, the study was cross-sectional in nature, therefore was unable to identify any longitudinal effects that work engagement may have on physical health. Longitudinal studies are required to assess how work engagement affects physical health over time.

Furthermore, the sample from these studies included a variety of different occupations, including those requiring physical effort, such as factory workers (Shimazu & Schaufeli, 2009), and non-physical jobs, such as clerical, office and management roles (Demerouti et al., 2001; Schaufeli et al., 2008; Shimazu & Schaufeli, 2009). None of these studies distinguish between physically active and non-physically active occupations. Therefore, it is unknown whether work engagement is related to physical health among workers in physically active occupations.

Although no relationship has been identified between work engagement and physiological measures of health, such as blood pressure (Langelaan, Bakker, van Doornen, & Schaufeli, 2006; Langelaan, Bakker, Schaufeli, van Rhenen, & van Doornen, 2007), there has been a positive relationship observed between work engagement and self-reported health (Hakanen, Bakker, & Schaufeli, 2006). In particular, the vigour component of work engagement has been associated with positive physical health, for example, health care professionals who were highly engaged, reported fewer back and neck pain problems (Peterson et al., 2008). Further investigation is therefore required as the benefits of being engaged in physically active, sporting occupations, such as white-water raft guiding, are unknown. It is possible that high levels of work engagement may benefit those working as white-water raft guides where back pain has been identified as a problem (Jackson & Verscheure, 2006).

Individuals who work in occupations with high physical demands have been lower levels of work engagement when compared to their peers who work in occupations with lower physical job demands (Christian et al., 2011). It was also identified that working conditions, particularly with environmental hazards and varying levels of noise and temperature were associated with lower levels of work engagement. This may impact on the work engagement experienced by raft guides as their job is physically demanding and they work in varying conditions. However, qualitative work from McDermott and Munir (2012) has highlighted that mountain leaders, who also work in varying environmental conditions, demonstrate characteristics of work engagement, particularly vigour and dedication. Individuals who participate in extreme sports tend to share a similar personality type (Kajtna, Tušak, Barić, & Burnik, 2004), it is therefore possible that white-water raft guides share similar characteristics to Mountain Leaders. Further investigation is required to assess whether workers in other areas of the Outdoor Industry, such as white-water raft guides, demonstrate similar characteristics of work engagement.

4.3.2 The Need for Recovery and the Development of MSCs

Anecdotal evidence has suggested that workers in the outdoor industry work long hours and participate in physically active recreational sports in their leisure time (Adventure Activities Industry Advisory Committee [AAIAC], 2006). This has been observed in Mountain Leaders (McDermott & Munir, 2012), however, little is known about other areas of outdoor work. Chronic injuries have been identified in other white-water activities and have been attributed to insufficient rest and recovery (Kameyama et al., 1999; Krupnick et al., 1998; Schoen &

Stano, 2002). It is therefore possible that white-water raft guides may develop MSCs if they don't rest and recover from work sufficiently, due to the physical and psychological demands associated with the work.

A greater need for recovery has been associated with negative health outcomes (Sluiter et al., 2003; Tsigonia, Tanagra, Linos, Merekoulias, & Alexopoulos, 2009). A prolonged need for recovery can have negative effects for both employees and employers in terms of increased sickness absence (Alexopoulos et al., 2011; de Croon et al., 2003; Tsigonia et al., 2009). It has been suggested that sickness absenteeism can be a result of the development of MSCs (Tsigonia et al., 2009).

Workers in physically active occupations have been reported to have higher levels of need for recovery, for example scaffolders are more likely to experience a greater need for recovery than their supervisors (Elders & Burdorf, 2001). However, the need for recovery among Dutch firefighters is significantly lower than that of Dutch office workers (Bos, Mol, Visser, & Frings-Dresen, 2004). This may be because firefighters are only physically active when they are on call. Regardless of the occupation, the need for recovery has been identified as a significant predictor of chronic MSCs such as back pain (Alexopoulos et al., 2006; Elders & Burdorf, 2001; Kuijer et al., 2005), and shoulder, hand/wrist and knee complaints (Tsigonia, et al., 2009). The MSCs experienced may be specific to the occupation. As back pain is the only work-related MSC reported in the literature, it is possible that the need for recovery may be a significant predictor of back pain as well as other MSCs.

Age has been shown to be positively associated with the need for recovery (Crawford, Graveling, Cowie, & Dixon, 2010; Kiss, De Meester, & Braeckman, 2008; Mohren, Jansen, & Kant, 2010). This suggests that older workers are more likely to experience a greater need for recovery than their younger peers. There may be an interaction between age and the need for recovery as workers are more likely to develop more chronic MSCs as they increase in age (Heiden, Weigl, Angerer, & Müller, 2013). This may particularly be the case for white-water raft guides as workers in the Outdoor Industry may develop more chronic MSCs as a result of the wear and tear on their bodies as a result of the cumulative effects of their work (McDermott & Munir, 2012). This has to be investigated further before conclusions are drawn. However, the need for recovery may be associated with other factors related to home life, as the older workers with the highest need for recovery also had the highest work-life balance demands (Mohren et al., 2010). Furthermore, the need for recovery declined with the greater age bracket assessed in these analyses. These assessments were cross-sectional, therefore, causal relationships cannot be concluded, therefore a prospective approach is required.

Research has examined the effectiveness of vacations for both physical and mental recovery. It has been reported that vacation time has a positive effect on health and well-being (de Bloom et al., 2009; de Bloom et al., 2010; de Bloom et al., 2011). Outdoor activities, specifically winter sports have been associated with an increase in satisfaction and positive mood, also a reduction in tension (de Bloom et al., 2010). Bloom et al. (2010) reported that participants felt healthier and more energised following a vacation which involved winter sports; however these associations were less prominent than satisfaction and positive

moods. In contrast, winter sport vacations have been suggested to be more likely to result in injuries, such as fractures, which will interrupt the recovery process and therefore reduce the self-reported health and well-being of the employee (de Bloom et al., 2011). As white-water raft guiding is a summer sport, it is possible that vacations to recover may not occur during the working season. For this reason, vacations to aid recovery will not be considered in the scope of this thesis.

4.3.3 Section Summary

This section has covered how work-related physical health can be affected by work engagement and work-related fatigue. There is some evidence to suggest that high levels of work engagement may benefit a worker's self-reported physical health and improve recovery following a working day. However, these conclusions have been based on cross-sectional analyses only. Therefore the longitudinal effects of work engagement on physical health require further investigation. Furthermore, the majority of samples in the previous literature have consisted of workers from non-physically active occupations such as employees from clerical and middle management roles. Therefore very little is known about the relationship between work engagement and the development of MSCs among workers in physically active occupations. As white water rafting is a physically active occupation it is possible that workers may become over-engaged and continue to work with MSCs, leading to additional longer term problems. In addition, insufficient recovery from work has been associated with chronic MSCs. Workers in physically active occupations in particular are more likely to report a greater number of MSCs than their non-physically active

supervisors. It is therefore possible that white-water raft guides who have a greater need for recovery may experience more chronic MSCs as a result of their work. Although there is evidence to suggest that summer vacation time can aid recovery from and have positive effects on workers' physical health, white-water raft guiding is a summer occupation and therefore summer vacations may not occur during the working season. Therefore vacations will not be considered in the scope of this thesis. From the evidence presented examining the relationships between work engagement, the need for recovery and the development of chronic MSCs, the following hypotheses were devised and tested:

> ***Hypothesis VII:*** *Low levels of vigor and dedication and high levels of abospriton and a high need for recovery will contribute to chronic MSCs reported by white-water raft guides across a working season.*

> ***Hypothesis VIII:*** *A high workload, indicated by a greater number of hours worked as a white-water raft guide, will exacerbate the relationships stated in hypothesis above.*

4.4 Chapter Summary

Engaged employees are more likely to report positive health outcomes and better mental and physical recovery from the previous day of work (Sonnentag, 2003). Specifically, high levels of vigor has been reciprocally related to a lower need for recovery (Sonnentag et al., 2012), which is an indicator of the early stages of work-related fatigue (Jansen et al., 2003). This could potentially be beneficial for white-water raft guides as their work is physically and psychologically demanding job.

However, it may be possible to become over-engaged over a long period of time, which could result in negative effects on employees' wellbeing (Bakker et al., 2011; Sonnentag & Niessen, 2008). Specifically, the absorption component of work engagement has been associated with long working hours (van Hooff et al., 2007), which in turn can result in negative health implications due to a limited time for recovery (Geurts & Demerouti, 2003). As workers in the Outdoor Industry work long hours (AAIAC, 2006; McDermott & Munir, 2012) it is therefore possible that white-water raft guides may also work long hours across a working season. It is therefore important to measure the longitudinal effects of work engagement and working hours on their psychological fatigue.

High levels of work-related fatigue has been associated with negative health outcomes (Sluiter et al., 2003; Tsigonia et al., 2009) and increased sickness absenteeism (Alexopoulos et al., 2011; de Croon et al., 2003; Tsigonia et al., 2009). Workers in physically active occupations, such as scaffolders are at a greater risk of experiencing a higher need for recovery as well as develop chronic MSCs (Elders & Burdorf, 2001). It is therefore possible that white-water

raft guides may be at risk of experiencing a greater need for recovery and developing MSCs due to the physical nature of their work. As chronic MSCs among canoe and kayakers was usually associated with insufficient rest between training sessions (Kameyama et al., 1999), it is possible that insufficient rest may be an issue for white-water raft guides as anecdotal and empirical evidence has identified that workers in the Outdoor Industry work long hours and also engage in physical activities during their leisure time, thus reducing their recovery time (AAIAC, 2006; McDermott & Munir, 2012). As the qualitative study identified that working conditions and practices contributed to negative aspects of white-water raft guides, a questionnaire study is required to test the wider implications of these findings. Also a prospective approach will be able to address the gaps in the knowledge of how the work-related physical and psychological well-being of white-water raft guides changes across a working season.

Chapter 5 Methods

Evidence from the occupational health literature identified that high levels of work engagement can have positive effects on employees' health and well-being (Sonnentag, 2003), such as improving the recovery experience (Sonnentag et al., 2012). The cumulative effects of insufficient recovery can result in the development chronic MSCs (Elders & Burdorf, 2001), which may be why white-water raft guides reported MSCs during the interview study. This chapter describes the methods used to collect data from a larger sample across a working season in the UK. It provides an overview of the measures used to assess work engagement, fatigue and MSCs. It concludes with ethical considerations related to the longitudinal research.

5.1 Procedure

In order to assess the work-related health of raft guides working in the UK, an online survey was deemed the most appropriate method to collect data. In order to increase the breadth of knowledge of health in the white-water industry, a large sample was required, which was enabled by the use of an online survey. Furthermore, online surveys have the benefit of reaching geographically dispersed individuals without the cost of paper and postage (Wright, 2005). The survey was distributed at three time points across a working summer season in the UK. This provided insight into the work-related health of raft guides during the early, mid and late season time periods. Early season data collection commenced in April 2013 and continued until June 2013. Follow-up surveys were distributed three months after the completion of the previous survey. Late

season data collection ceased in January 2014. As an incentive to retain participants in the mid and late season data collection time points, participants who fully completed all the surveys were entered into a prize draw to win a Peak UK 15m Bullbag Throw Line, a piece of raft guide equipment, valued at £35 (Please see Appendix 4 for the advertising flier).

5.2 Ethical Considerations

This research was subject to and in compliance with the requirements of the Loughborough University Ethical Advisory Committee in relation to research with human participants. The University ethical clearance checklist was completed for each study in this research. Permission to proceed was acquired prior to the commencement of this study on 4th April 2012. An amendment to the ethical clearance checklist, to allow the inclusion of prize draws to retain participation in the longitudinal study was obtained on the 2nd of July 2013. Informed consent was obtained from all participants and they were made aware that all data would remain confidential and that results would be reported in an anonymised form.

5.3 Survey Design and Measures

The survey was designed online using SurveyMonkey (For the full survey, please see Appendices 5 – 16). Topics included within the survey were informed by previous literature and the qualitative data presented in the previous chapter. At baseline, the survey included demographic questions, including sex, age, height, weight, qualifications (Appendix 7); information about the participants' work and leisure time, including hours worked, hours of

physical activity and questions regarding warm-up exercises (Appendix 8); the Utrecht Work Engagement Scale [UWES] (Schaufeli & Bakker, 2004) (Appendix 9); the Need for Recovery Survey English Version (Veldhoven & Broersen, 2003) (Appendix 10); adapted versions of the Nordic Musculoskeletal Questionnaire [NMQ] (Kuorinka et al., 1987) to measure chronic MSCs (Appendix 11) and acute MSCs (Appendix 12). These measures are described below.

In addition to these measures, data were also collected using the following: questions regarding the participants' use of equipment (Appendix 13); the Danger subscale of the Hypermasculinity Inventory (Mosher & Sirkin, 1984) (Appendix 14); an adapted version of the Outcome-Expectations for Exercise Scale-2 (Resnick, 2005) which specifically looked at expectations for rafting as opposed to exercise in general (Appendix 15) and the Workstyle Short Form (Feuerstein & Nicholas, 2006) (Appendix 16). However, due to missing data and the finalised scope of this thesis, these items were not included in the main analyses of hypotheses testing.

The second time point included fewer items in the survey. This was due to some measurements being stable and therefore only needed measuring once. Reducing the length of the survey is also expected to aid with retaining participants' interest. Items removed from the second and third measurement included questions regarding qualifications. The order in which the measures were presented at each time point was randomised in order to reduce question order bias (Wright, 2005).

The final survey was shortened further, removing questions related to preparation for work (warming-up and equipment checks).

5.3.1 Details about Work and Leisure Time

Participants were requested to recall the number of hours worked during the four weeks prior to the survey. Work was broken down into three sections; hours worked as a white-water raft guide, hours worked in a physically active job excluding white-water raft guiding (e.g., Canoe Instructor, Personal Trainer etc.) and hours worked in a non-physically active job (e.g., Office work, studying etc.). A single question asking participants to recall the total number of hours of physical leisure activity (e.g., Cycling, running, canoeing/kayaking, etc.) was also included.

In regards to raft guiding, participants were asked to provide details regarding the type and grade of river(s) they were currently working on and what the highest qualification they held was. Options for river type included; Always on natural rivers; Mostly on natural rivers but sometimes on man-made courses; Natural rivers and man-made courses equally; Mostly on man-made courses but sometimes on natural rivers; and Always on man-made courses. River type was categorised into three groups ‘Always on natural rivers’ (coded 1); ‘Mixture of natural rivers and man-made courses’ (coded 2); ‘Always man-made courses’ (coded 3) and were utilised in exploratory analyses. River grades ranged from 1 to 5 and participants were instructed to select all that were appropriate. As no responses were provided for river Grade 1, river grades were categorised as ‘Grades 2 – 3’ (coded 0) and ‘Grades 4 – 5’ (coded 1) and utilised in the exploratory analyses. This provided insight into the intensity of the

conditions that the white-water raft guide worked, with the ‘Grade 4 – 5’ category being a more intense work environment.

5.3.2 Protective Behaviours

Participants were asked to identify which areas of the body they stretch and/or mobilise prior to starting work as a raft guide. Warm-up exercises included Increasing Heart Rate (e.g. swim, jog, etc.) and 13 stretching exercises recommended for kayaking and paddlesports (Anderson & Anderson, 2010). Exercises reported received a score of 1 and where no exercise was reported a score of 0. A total of the scores was utilised to provide insight into the number of warming-up exercises completed prior to working for the exploratory analyses. Participants were then asked to state how many minutes, on average, they spend warming-up.

In addition, participants were asked what side they preferred to guide on. Preferred guiding side was split into five options; Always on the left; Mostly on the left but sometimes on the right; Left and right equally; Mostly on the right but sometimes on the left; and Always on the right. Responses of ‘Always Left’ and ‘Always Right’ were then categorised into ‘Unilateral’ (coded 1) and the remaining responses were categorised as ‘Bilateral’ (coded 0).

5.3.3 Recovery

The Need for Recovery Scale (Veldhoven & Broersen, 2003) was utilised to assess whether the participant is recovering substantially. The scale consists of 11 items. Each item involves a statement and requires a “Yes” or “No” answer. Unfavourable answers score a value of 1. A total (ranging from 0 – 11) is calculated from the number of unfavourable responses for each individual. The higher a score is, the higher the need for recovery is. The English version of The Need for Recovery Scale has demonstrated good internal consistency with a Chronbach’s alpha of 0.88 (Veldhoven & Broersen, 2003).

5.3.4 Work Engagement

The English short version of the UWES (Schaufeli & Bakker, 2004) was utilised to assess work engagement. There are three subscales, each measured with three items. Vigour is assessed using the following statements: “At my work, I feel bursting with energy”, “When I get up in the morning, I feel like going to work” and “At my job, I feel strong and vigorous”. Dedication is assessed through the following statements: “I am enthusiastic about my job”, “My job inspires me” and “I am proud of the work that I do”. Finally, the statements which assess Absorption are: “I feel happy when I am working intensely” “I am immersed in my work” and “I get carried away when I’m working”. Items are rated from 0 (never) to 6 (always) on a 7-point scale. Total work engagement is scored calculating the mean score from all nine items for each individual. Calculating the mean score from the three items in each subscale provides a score for each construct within work engagement for each individual. The vigour subscale will be used to assess the level of exhaustion experienced by

the participant. Reliability has been demonstrated in the UWES-9 English version with Cronbach's alpha scores for Vigour (α=0.84), Dedication (α=0.89) and Absorption (α=0.79) (Schaufeli & Bakker, 2004).

5.3.5 Injuries

Chronic musculoskeletal complaints [MSCs] were measured using the Nordic Musculoskeletal Questionnaire ([NMQ] (Kuorinka et al., 1987)). This assesses difficulties (such as aches and pains) experienced by the participant in the previous 12 months and 7 days. It also questions whether daily activities were prevented as a result of the difficulties and whether or not the participant saw a physician for the problem. The body is broken down into 9 sections, with a diagram to aid the participant to decide which part, if any, has been affected. All questions required a 'Yes/No' answer. A response of 'Yes' received a score of 1 and a response of 'No' scored 0. Good reliability has been demonstrated with this instrument. Kappa values between 0.48 and 0.72 were observed in four of the items, a Kappa value of 1 was observed in seven items and a Kappa value of 0.75 or greater was observed in the remainder items (de Barros & Alexandre, 2003). This survey was utilised to generate frequency data for the number of chronic MSCs reported in each body region by the sample population. A total was calculated for each individual by calculating the sum of the scores from all body regions.

Acute Injuries were assessed using an adaption of the NMQ (Kuorinka et al., 1987). Areas of the body were highlighted and participants were asked whether they have experienced a trauma (e.g. an impact injury, cut, bruise, break) to

that area. As with the NMQ, all questions required a ‘Yes/No’ answer. Acute trauma injuries were scored and used in the same manner as chronic MSCs.

5.4 Survey Distribution

The survey was distributed to all 577 (357 male) qualified raft guides registered in the UK via the British Canoe Union internal email. The email contained information describing what the study was about, its importance and a link to the online survey. A description of the research and a link to the survey was also posted on the English White-water Rafting Committee’s website. In addition to the email from the governing body, participants from the previous qualitative study were directly invited to participate in the research and were requested to forward the email to their colleagues and acquaintances who work in the industry. Contacts, known to the researcher, involved with white-water rafting, either commercially or competitively were contacted and requested to forward the email to any known qualified raft guide working in the UK. This technique used to increase awareness of this research is snowball sampling (Goodman, 1961). Individuals who started but did not complete the online survey were invited by email to complete their response. A reminder inviting them to complete their responses was sent out 10 days after the initial email.

In order to increase the chance of participation, white-water rafting providers in the UK were also directly identified and contacted. A list of licensed providers under the Adventure Activities Licensing Authority was identified through the Health and Safety Executive website. Of the 68 registered providers, 23 were identified as providing rafting through third party contracts and therefore did not employ raft guides directly. The 45 remaining providers were contacted via

email. This email explained the research and its importance. Below the message to the provider was the email inviting raft guides to participate in the research. Providers were requested to forward the message on to their employees.

Of these 45 remaining providers, 2 companies were unable to be contacted due to their contact details being out of date. A further 2 providers identified themselves as contracting the white-water rafting activity to a third party company. The third party company was not identified to be contacted directly. A total of 14 providers confirmed that they had received the email and forwarded it to their employees. Of these 14 providers, an invitation to visit the providers, in order to meet the raft guides to promote the research and boost participation, was received from 11 providers.

Paper copies of the survey were distributed to the 11 providers when the researcher visited the sites. Paper copies allowed for multiple participants to complete the survey simultaneously. A researcher being present at the providers' sites created the opportunity for the researcher to promote the research to potential participants and to build a rapport with potential participants. It also provided the opportunity for the researcher to answer any questions participants had. Some providers requested paper copies of the survey to be left with Stamped Addressed Envelopes for employees which were not working on the day of the visit.

Participants were requested to provide a name and email to be contacted by for the second and third data collection periods. Participants were emailed inviting them to continue their participation in the research. The email contained a thank

you for their participation, a reminder of the research and a link to the online survey. Individuals who were recruited from site visits were also informed of the date the researcher was returning to that particular site with the option of a paper copy of the survey. All 11 providers were visited in the same order as the initial data collection with the same time spaced between each visit during the mid-season data collection. Participants were also informed that should they wish, they could be entered into the prize draw if they completed the survey.

The same process was adopted for the late season data collection, however only 6 of the 11 providers were available to be visited. Individuals who did not complete the mid-season survey were still contacted during the late-season data collection.

5.5 Sample

This research is concerned with the prevalence of injury and ill-health among white-water raft guides working in the UK. Therefore a purposive sample was deemed appropriate for this research as it addresses a specific population (Patton, 2002). The inclusion criteria comprised raft guides aged over 18 years of age, holding or working towards a relevant Raft Guide Qualification e.g. BCU or International Raft Federation (IRF) and currently employed in the UK.

5.6 Analyses

Initial analyses were conducted using IBM Statistical Package for Social Sciences (SPSS) version 21. An alpha level of 5% was set to test the level of significance for each hypothesis. Skewness and kurtosis statistics were

checked and histogram plots were visually assessed for normal distribution for all data at interval or ratio level.

Exploratory analyses were conducted initially. These included repeated measures Analysis of Variance (ANOVA) or Friedman (the non-parametric equivalent) tests for longitudinal comparisons, paired t-tests for cross-sectional comparisons and binary logistic regression analyses for cross-sectional associations with a binary dependent variable. These analyses are described in full and presented in Chapter 6.

Longitudinal analyses were conducted using the MLwiN software (Rasbash, Charlton, Browne, Healy, & Cameron, 2009). Repeated measures data were nested within the individual at Level 2 with observations from each time of season at Level 1. These analyses are described in full and presented in Chapters 7 and 8.

Chapter 6 Preliminary Analyses of Questionnaire Data.

6.1 Introduction

This chapter presents the results of the questionnaire data on the prevalence of chronic musculoskeletal conditions (MSCs) and acute trauma injuries experienced over time among UK white water raft guides.

Chronic MSCs are described as aches, pains or discomforts experienced by an individual, which have developed over time, but where there has been no official diagnosis (Bugajska et al., 2013). Acute trauma injuries are specific events which result in an individual experiencing pain and/or damage to their muscles and/or joints. As previously noted, there is very little empirical evidence examining the prevalence of such conditions among white-water raft guides.

To the researcher's knowledge, there is only one published study on work-related injuries among raft guides (Jackson & Verscheure, 2006). This study investigated associations between working practices and working conditions and chronic back pain among US raft guides. It was found that manual handling practices (e.g. loading and unloading equipment), contributed to back pain. The study did not however consider chronic MSCs in other regions of the body or acute trauma injuries. Two tailed hypotheses will therefore be used. Furthermore, the effects of time worked across a working season were not examined. Evidence suggests that novice white-water users are more likely to sustain acute injuries, whereas expert white-water users are more likely to develop chronic MSCs (Fiore & Houston, 2001). As white-water raft guides are qualified, for the purpose of this study, they will be considered as 'expert'. It is

therefore possible that chronic MSCs may be more prevalent than acute trauma injuries among white-water raft guides. This chapter will therefore test and report the following preliminary hypotheses.

6.1.1 Preliminary Hypotheses

Preliminary Hypothesis A: The frequency of chronic musculoskeletal conditions reported by raft guides will increase throughout the season.

Preliminary Hypothesis B: The frequency of acute trauma injuries reported by raft guides will be significantly different when comparing Early, Mid and Late Season.

Preliminary Hypothesis C: Raft Guides will report significantly more chronic MSCs than acute trauma injuries across a working season.

Preliminary Hypothesis D: There will be a difference in the number hours worked (hours worked as a raft guide, hours worked in a physically active job, hours worked in a non-physically active job) by raft guides between Early, Mid and Late Season.

Preliminary Hypothesis E: There will be a difference in the number of hours of recreational physical activity participated in by raft guides, between Early, Mid and Late Season.

6.2 Analyses

Prior to analyses, continuous data were tested for parametric assumptions. Visual checks of histograms with normal distribution curves, skewness

calculations and kurtosis calculations were utilised to assess normal distributions.

Preliminary analyses examined the frequency of chronic MSCs and acute trauma injuries throughout a working season using frequency data.

For Preliminary Hypotheses A and B, repeated measures Analysis of Variance (ANOVA) tests were utilised to compare the difference in the mean number of injuries reported during Early, Mid and Late Season.

For Preliminary Hypothesis C, paired t-tests were utilised to compare the difference between the number of chronic MSCs and the number of acute trauma injuries reported across the working season.

As there is limited literature identifying factors which predict work-related injury among raft guides, exploratory forced entry binary logistic regression analyses were utilised to explore what factors contributed to or protected towards chronic MSCs and acute trauma injuries (0 = 'No injury', 1 = 'Injury'). Sex (1 = 'Male', 2 = 'Female'), age, Body Mass Index (BMI) and years' experience were controlled for in each model. Continuous level independent variables included 'hours worked as a raft guide', 'hours worked in a physically active job', 'hours worked in a non-physically active job', 'hours of physical leisure activity', 'minutes spent warming-up'. Nominal level independent variables included 'river type' (1 = 'Always Natural River', 2 = 'Mix of Natural rivers and Man-Made Courses', 3 = 'Always Man-Made Courses'), 'river grade' (0 = 'Grades 2-3', 1 = 'Grades '3-4') and 'preferred side to guide' (0 = 'Bilateral', 1 = 'Unilateral').

6.3 Results

6.3.1 Description of Participants

A total of 126 (114 male) white-water raft guides completed the survey at baseline (time point 1). Response rates were calculated against the recorded number of white-water raft guides, registered under the BCU. The response rate during Early Season was encouraging with 113 of 577 (20.1%) of qualified raft guides and 13 trainee raft guides completing the survey. Specifically, 101 of a possible 357 (28.3%) qualified male guides completed the survey. However, the response rate of female raft guides was poor with only 12 of 220 (5.5%) of qualified raft guides completing the survey.

Participants' age ranged from 18 to 64 years (Mean = 30.13, SD = 9.7). Overall, participants' weight was within the normal range of Body Mass Index (Mean = 24.49, SD = 3.76). White-water rafting experience ranged from less than one year to 28 years (Mean = 5.50, SD = 6.20). Thirteen participants were trainees (having no formal qualifications [10.3%]), 58 held a Level 1 Site specific qualification (46.0%), 29 held a Level 2 qualification (23.0%) and the remainder were Trip Leaders (11.9%), Raft Coaches (4.0%) and Senior Raft Coaches (4.8%). The majority of participants were employed either full-time (43.9%) or were freelance on casual contracts (37.3%). With regards to working conditions, 51 participants worked solely on a natural river (40.5%), 34 solely on man-made courses (27.0%) and 41 on a mixture of the two (32.5%). The majority of participants worked on either Grade 4 or 5 rapids (54.0%). Participants reported guiding unilaterally (49.2%) or bilaterally (50.8%). A summary of descriptives can be seen in Table 6.1.

Attrition was observed. A total of 98 participants completed the survey at time point 2 (attrition, 22.2% from baseline) and 79 completed the survey at time point 3 (attrition, 37.3% from baseline). Of these, 73 completed all three surveys, 25 completed the survey at time points 1 and 2, a further 6 completed time points 1 and 3. The remaining 22 completed the baseline survey only. Due to limited research having been undertaken in the Outdoor Industry, it is not possible to compare attrition to previous longitudinal studies. An attrition of 34.5% from baseline has been observed and considered as acceptable in longitudinal research (2 time points) in an occupational setting (Mauno, Kinnunen, & Ruokolainen, 2007).

Table 6.1: Summary of Descriptives of Reported Variables

N=126	Mean ± Standard Deviation	Frequency (%)
Age	30.13 ± 9.70	-
Body Mass Index	24.49 ± 3.76	-
Years' Experience	5.50 ± 6.20	-
Sex		
Male	-	114 (90.48)
Female	-	12 (9.52)
Highest Qualification		
Trainee Raft Guide	-	13 (10.32)
Level 1 Site Specific Raft Guide	-	58 (46.03)
Level 2 Unrestricted Raft Guide	-	29 (23.02)
Level 3 Trip Leader	-	15 (11.90)
Level 4 Raft Coach	-	5 (3.97)
Level 5 Senior Raft Coach	-	6 (4.76)
Employment Status		
Full-Time	-	54 (42.86)
Part-Time	-	17 (13.49)
Freelance	-	47 (37.30)
Other	-	8 (6.34)
River Type Worked On		
Natural River	-	51 (40.48)
Mix of Natural River and Man-Made Courses	-	41 (32.54)
Man-Made Courses	-	34 (26.98)
River Grade		
Grade 2 or 3	-	58 (46.03)
Grade 4 or 5	-	68 (53.97)
Preferred Side to Guide		
Unilateral	-	62 (49.21)
Bilateral	-	64 (50.79)

6.3.2 Preliminary data analyses

Prior to testing the preliminary hypotheses, the prevalence of MSCs and acute injuries were explored over time (during Early, Mid and Late Season).

The prevalence of chronic MSCs reported by participants was high with 91.3% of the sample reporting at least one musculoskeletal problem during Early Season, 81.6% during mid-season and 93.7% during late season. Chronic MSCs reported in the lower back and shoulder regions were the most prevalent at all three time points. The least reported chronic MSCs were the hip/thigh during early season (29.4%), the elbow during Mid-Season (21.4%), and the ankle/foot during Late Season (20.3%). The extent to which these injuries limited normal activity varied depending on the location of the injury. MSCs in the lower back were the most limiting at all three time points. An overview of all chronic injuries reported can be seen in Table 6.2.

Table 6.2: Frequency of Chronic MSCs Reported during Early, Mid and Late Season

	Early Season (N=126)		Mid-Season (N=98)		Late Season (N=79)	
	Total Injuries Reported Frequency (%)	Of Which Activity Limiting Frequency (% of reported injury)	Total Injuries Reported Frequency (%)	Of Which Activity Limiting Frequency (% of reported injury)	Total Injuries Reported Frequency (%)	Of Which Activity Limiting Frequency (% of reported injury)
Neck	60 (47.62)	4 (6.67)	27 (27.55)	2 (7.41)	24 (30.38)	1 (4.17)
Shoulder	**82 (65.08)**	**10 (12.20)**	**54 (55.10)**	**5 (9.26)**	**51 (64.56)**	**3 (5.88)**
Elbow	42 (33.3)	2 (3.28)	21 (21.43)	4 (19.05)	34 (43.04)	2 (5.88)
Wrist/ Hand	44 (34.92)	5 (11.90)	34 (34.69)	3 (8.82)	35 (44.30)	4 (11.43)
Upper Back	61 (48.41)	2 (4.55)	29 (29.59)	5 (17.24)	27 (34.18)	2 (7.41)
Lower Back	**87 (69.05)**	**18 (20.69)**	**63 (64.29)**	**13 (20.63)**	**54 (68.35)**	**8 (14.81)**
Hip/ Thigh	37 (29.37)	3 (8.11)	28 (28.57)	1 (3.57)	23 (29.11)	3 (13.04)
Knee	60 (47.62)	7 (11.67)	36 (36.73)	3 (8.33)	33 (41.77)	2 (6.06)
Ankle/ Foot	41 (32.54)	2 (4.88)	26 (26.53)	5 (19.23)	16 (20.25)	2 (12.50)
At Least One MSC	115 (91.27)	33 (28.70)	80 (81.63)	21 (26.25)	74 (93.67)	12 (16.22)

Acute trauma injuries were reported less frequently than chronic MSCs, with 50.0% of the sample reporting an acute trauma during Early Season, 68.4% during Mid-Season and 54.4% during Late Season. During Early Season, the knee (23.0%) was the most frequently reported region for acute trauma injuries. The back was reported to be most frequently injured during Mid-Season (37.8%) and the shoulder during Late Season (35.4%). The proportion of these injuries which limited activity varied depending on region and time point. A full summary of frequencies of acute trauma injuries can be seen in Table 6.3.

Table 6.3: Frequency of Acute Trauma Injuries Reported during Early, Mid and Late Season

	Early Season (N=126)		Mid-Season (N=98)		Late Season (N=79)	
	Total Injuries Reported Frequency (%)	Of Which Activity Limiting Frequency (% of reported injury)	Total Injuries Reported Frequency (%)	Of Which Activity Limiting Frequency (% of reported injury)	Total Injuries Reported Frequency (%)	Of Which Activity Limiting Frequency (% of reported injury)
Neck	17 (13.49)	3 (17.65)	22 (22.45)	3 (13.64)	24 (30.38)	1 (4.17)
Shoulder	21 (16.67)	6 (28.57)	35 (35.71)	5 (14.29)	**28 (35.44)**	**2 (7.14)**
Elbow	9 (7.14)	1 (7.69)	19 (19.39)	2 (10.53)	19 (24.05)	1 (5.26)
Wrist/ Hand	23 (18.25)	2 (22.22)	29 (29.59)	3 (10.34)	22 (27.85)	1 (4.55)
Chest/ Abdomen	13 (10.32)	0 (0.0)	13 (13.27)	1 (7.69)	26 (32.91)	1 (3.85)
Back	28 (22.22)	9 (32.14)	**37 (37.76)**	**9 (24.32)**	24 (30.38)	1 (4.17)
Hip/Thigh	13 (10.32)	1 (7.69)	14 (14.29)	3 (21.43)	17 (21.52)	0 (0.00)
Knee	**29 (23.02)**	**5 (17.24)**	27 (27.55)	4 (14.81)	25 (31.65)	0 (0.00)
Ankle/ Foot	16 (12.70)	2 (12.50)	25 (25.51)	6 (24.00)	22 (27.85)	0 (0.00)
At Least One Acute Trauma	63 (50.00)	18 (28.57)	67 (68.37)	21 (31.34)	43 (54.43)	6 (13.95)

6.3.4 Results relating to Preliminary Hypotheses A and B

Preliminary Hypothesis A: The frequency of chronic musculoskeletal conditions reported by raft guides will increase throughout the season.

In order to test the above hypothesis, a repeated measures ANOVA was conducted. Sphericity was assumed ($W = 1.00$, $p = 0.90$). The results show that overall there was a significant difference in the number of MSCs reported at Early, Mid and Late Season time points ($F_{(2,144)} = 4.66$, $p = 0.01$). Bonferroni pairwise comparisons (Table 6.4) show that significantly more MSCs were reported during Early Season when compared to Mid-Season. No significant differences were identified between Early and Late Season or Mid and Late Season. The comparisons can be seen in Figure 6.1. Although a difference in reported chronic MSCs was observed, the frequency of chronic MSCs did not increase throughout the season, therefore Preliminary Hypothesis A was rejected.

Table 6.4: Pairwise comparisons from Repeated Measures ANOVA.

Comparison	Mean (SE)	p
Early vs	4.37 (0.28)	0.01
Mid	3.49 (0.31)	
Early vs	4.37 (0.28)	0.10
Late	3.70 (0.27)	
Mid vs	3.49 (0.31)	1.00
Late	3.70 (0.27)	

SE=Standard Error

Preliminary Hypothesis B: The frequency of acute trauma injuries reported by raft guides will be significantly different when comparing Early, Mid and Late Season.

A repeated measures ANOVA was utilised to test the above hypothesis. Sphericity was not assumed ($W = 0.75$, $p < 0.005$), therefore the Greenhouse-Geisser statistic was used instead. The results show that overall there was a significant difference in the number of Acute Trauma Injuries reported at Early, Mid and Late Season time points ($F_{(2,115)} = 5.54$, $p = 0.01$). Pairwise comparisons with Bonferroni corrections (Table 6.5) show that significantly fewer Acute Trauma Injuries were reported during Early Season when compared to both Mid and Late Season. No significant differences were identified between Mid and Late Season. Hypothesis B was therefore accepted as a significant difference in the number of acute trauma injuries was observed across the working season. Comparisons can be seen in Figure 6.1.

Table 6.5: Pairwise comparisons from Repeated Measures ANOVA.

Comparison	Mean (SE)	p
Early vs	1.33 (0.20)	0.01
Mid	2.26 (0.29)	
Early vs	1.33 (0.20)	0.01
Late	2.64 (0.41)	
Mid vs	2.26 (0.29)	1.00
Late	2.64 (0.41)	

SE=Standard Error

6.3.5 Results relating to Preliminary Hypothesis C

Preliminary Hypothesis C: Raft Guides will report significantly more chronic MSCs than acute trauma injuries across a working season.

In order to test the above hypothesis, paired t-tests were utilised. Significantly more chronic MSCs were reported when compared to acute trauma injuries during all time points of a working season. The greatest difference was observed during Early Season where a mean of 4.08 (SD = 2.52) chronic MSCs was reported when compared to 1.34 (SD = 1.93) acute trauma injuries ($t = 11.95$, $df = 125$, $p < 0.005$, one tailed). A smaller difference was observed during Late Season where there was a mean of 3.76 (SD = 2.34) chronic MSCs reported compared to a mean of 2.62 (SD = 3.48) acute trauma injuries. This difference was still significant ($t = 2.62$, $df = 78$, $p = 0.01$, one tailed). The smallest difference was observed during Mid-Season where a mean of 3.23 (SD = 2.62) reported chronic MSCs was significantly greater than the mean of 2.26 (SD = 2.36) acute trauma injuries ($t = 4.36$, $df = 97$, $p < 0.005$, one tailed).

When comparing both chronic MSCs and acute trauma injuries, Figure 6.1 suggests that chronic MSCs are more prevalent during early season, but acute trauma injuries increase over time. Despite the increase in acute trauma injuries over time, it is suggested that white-water raft guides experience more chronic MSCs than acute trauma injuries regardless of time of season.

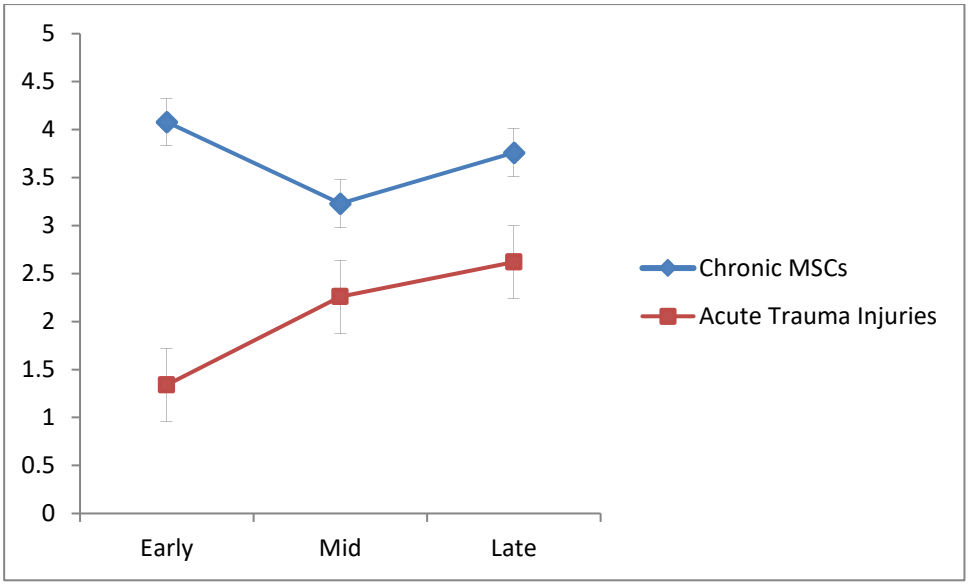


Figure 6.1: Means of Reported Chronic and Acute Injuries During Early, Mid and Late Season

6.3.6 Results relating to Preliminary Hypotheses D and E

As a difference in the number of injuries reported (chronic and acute) was observed between Early and Mid-Season, it is possible that there will be a difference in the number of hours worked across a working season because it is expected that the longer you work, the more injuries you will have. As there is no literature that reports the patterns of hours worked by raft guides across a working season, two-tailed hypotheses were tested.

Preliminary Hypothesis D: There will be a difference in the number hours worked (hours worked as a raft guide, hours worked in a physically active job, hours worked in a non-physically active job) by raft guides between Early, Mid and Late Season.

Preliminary Hypothesis E: There will be a difference in the number of hours of recreational physical activity participated in by raft guides, between Early, Mid and Late Season.

For the Preliminary Hypotheses D and E, as data for these hypotheses were predominantly positively skewed ($-1.68 \leq$ skewness ≤ 36.12), Friedman tests (the non-parametric equivalent of repeated measures ANOVA) were utilised to test the difference in hours worked and hours of physical leisure activity across a working season.

For Preliminary Hypothesis D, Friedman tests identified significant differences in the number of hours worked as a raft guide ($X^2_{(2, 73)} = 38.13$, $p < 0.005$) and the number of hours worked in a physically active job ($X^2_{(2, 73)} = 10.96$, $p < 0.005$) but no significant difference in the hours worked in a non-physically active job ($X^2_{(2, 73)} = 2.07$, $p = 0.36$) at the different time points. Therefore, Preliminary Hypothesis D was accepted with regards to there being a different number of hours worked across a working season as a raft guide and in a physically active job. However, Preliminary Hypothesis D was rejected with regards to there being no difference in the number of hours worked in a non-physically active job across a working season.

Post-hoc Wilcoxon analyses show that respondents worked significantly more hours as a raft guide during Mid-Season when compared to both Early ($Z = 4.29$, $p < 0.005$) and Late Season ($Z = 5.91$, $p < 0.005$). Respondents also worked significantly more hours as a raft guide during Early Season when compared to Late Season ($Z = 3.38$, $p < 0.005$ [Figure 6.2]).

The same pattern of significant differences was also observed for hours worked in a physically active job (Figure 6.2). Significantly more hours were worked during Mid-Season when compared to Early Season ($Z = 2.23$, $p = 0.03$). Significantly fewer hours were worked during Late Season when compared to Early ($Z = 1.99$, $p = 0.05$) and Mid-Season ($Z = 3.42$, $p < 0.005$).

For Preliminary Hypothesis E, no significant difference in the number of hours participated in physical leisure activity was identified between Early, Mid and Late Season by the Friedman test ($X^2_{(2, 73)} = 0.47$, $p = 0.79$). Preliminary Hypothesis E was therefore rejected.

During Early Season, the mean number of hours worked as a raft guide was 34.60 over a four week period. The mean number of hours spent working in a physically active job (excluding raft guiding) over a four week period was 46.35 hours. Figure 6.2, suggests that during Mid-Season the reported number of hours worked increases for both white-water raft guiding and physically active work (excluding raft guiding) increases. This could be due to the summer months being the peak of the season. Hours worked then declines during Late Season (the autumn and winter months).

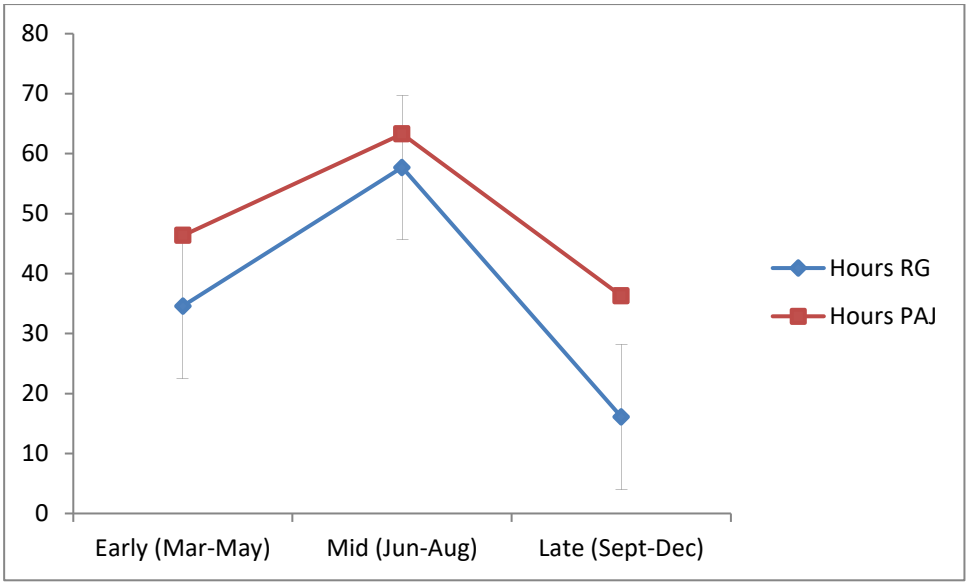


Figure 6.2: Means of Reported Hours of Work as a Raft Guide and Hours Worked in a Physically Active Job During Early, Mid and Late Season

Figure 6.3 suggests that the hours of non-physically active work is fairly stable throughout a working season, however there is a slight decline during the summer months. Physical activity increases throughout the year but only slightly.

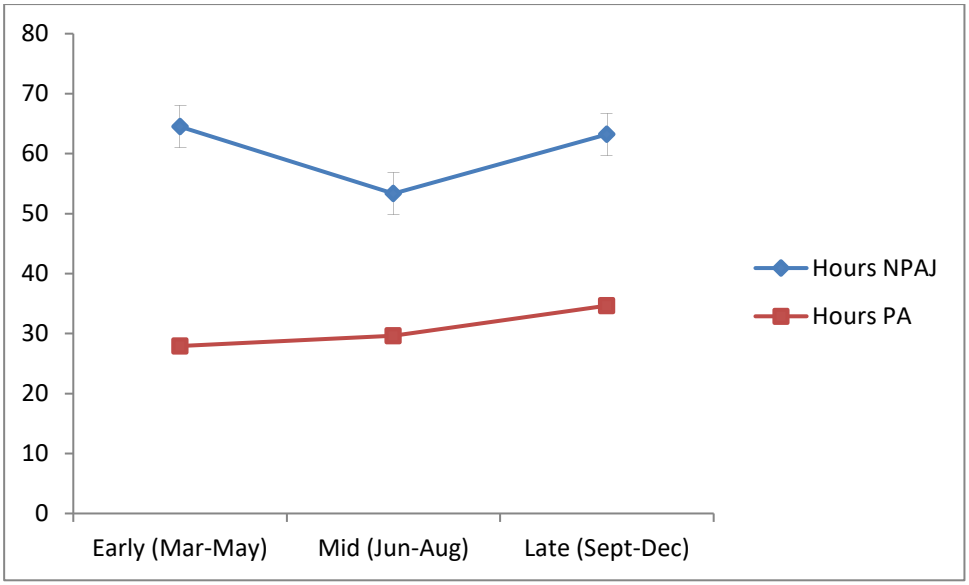


Figure 6.3: Means of Reported Hours Worked in a Non-Physically Active Job and Hours Participated in Physical Leisure Activity During Early, Mid and Late Season

6.3.7 Interim Summary of Preliminary Hypotheses Testing

The key findings from this section are summarised below.

- Lower back pain was the most prevalent chronic MSC, followed by shoulder pain, during Early, Mid and Late Season.
- Acute trauma injuries were most prevalent in the knee and back during Early Season, the back and shoulder during Mid-Season and the shoulder and chest/abdomen during Late Season.
- Respondents reported more chronic injuries during Early Season compared to Mid and Late Season, whereas more acute injuries were reported during Mid and Late Season than Early Season.
- Respondents reported more chronic injuries than acute injuries during Early, Mid and Late Season.
- During Mid-Season, respondents reported working more hours as a raft guide and in physically active jobs (excluding raft guiding) than at Early and Late Season.

6.3.8 Exploratory Binary Logistic Regression Analyses

In order to estimate the odds of what working conditions and practices contribute to, or protect towards injury, forced entry binary logistic regression models were utilised. Sex, age, BMI and years' experience were controlled for in each of the models. Time worked, time spent participating in recreational physical activity, minutes spent warming-up, preferred side to guide, river type and river grade were independent variables. Variables in the models were adjusted to ascertain the best model based on explained variation.

As no significant differences were identified between the number of reported chronic or acute injuries between Mid and Late Season, analyses were conducted on data from Early and Mid-Season. Mid-Season was selected over Late Season due to the greater sample size. The two most prevalent chronic MSCs (shoulder and lower back) were examined along with the two most prevalent acute trauma injuries at Early Season (knee and back) and Mid-Season (shoulder and back).

Early Season Chronic MSCs

The model predicting chronic shoulder conditions during Early Season was significant ($X^2_{(13,\ n=126)} = 34.76$, $p < 0.005$) and explained between 24.3 – 33.5% of the variation. It was identified that older participants were less likely to report chronic shoulder conditions. However, respondents who have a greater number of years' experience rafting were more likely to report a chronic shoulder complaint. In addition, those who participated in more recreational physical activity were more likely to report a chronic complaint in their shoulder. All coefficients can be seen in Table 6.6.

The binary logistic regression predicating chronic lower back conditions during Early Season was not a significant model ($X^2_{(8, n=126)} = 12.71$, $p = 0.12$).

Early Season Acute Trauma Injuries

With regards to acute injuries, the outcome of acute back injuries was predicted ($X^2_{(7, n=126)} = 14.18$, $p = 0.05$), however the outcome of acute knee injuries was not ($X^2_{(8, n=126)} = 12.33$, $p = 0.20$). The significant model explained between 10.7 – 16.4% of the variation of acute back injuries. Those who reported spending longer warming-up were more likely to report a lower back injury. Coefficients of the other independent variables are available in Table 6.6.

Table 6.6: Breakdown of Regression Outputs from Significant Models for Early Season

				95% CI for OR		
Variables Included	B	SE	p (2dp)	Lower	OR	Upper
Chronic Shoulder Pain						
Constant	3.36	2.16	0.12			
Sex	-1.64	0.94	0.08	0.03	0.19	1.24
Age	**-0.12**	**0.04**	**0.00**	**0.83**	**0.89**	**0.96**
BMI	0.02	0.08	0.83	0.88	1.02	1.18
Years' Experience	**0.15**	**0.05**	**0.00**	**1.05**	**1.16**	**1.28**
Hours RG	0.00	0.01	0.81	0.99	1.00	1.01
Hours PAJ	0.01	0.01	0.10	1.00	1.01	1.02
Hours NPAJ	0.01	0.00	0.19	1.00	1.01	1.01
Hours PA	**0.02**	**0.01**	**0.04**	**1.00**	**1.02**	**1.05**
Minutes Warming-Up	0.01	0.03	0.78	0.95	1.01	1.08
Bilateral Guiding	0.39	0.46	0.39	0.61	1.48	3.62
River Type						
Rivers	0.28	0.61	0.65	0.40	1.32	4.37
Rivers and MMC	-0.72	0.61	0.24	0.15	0.49	1.60
River Grade	-0.83	0.50	0.10	0.16	0.44	1.17
Acute Back Pain						
Constant	-4.40	2.08	0.04			
Sex	-0.35	0.84	0.67	0.14	0.70	3.63
Age	-0.02	0.03	0.63	0.93	0.99	1.05
BMI	0.10	0.08	0.17	0.96	1.11	1.29
Hours PAJ	0.01	0.01	0.16	1.00	1.01	1.02
Hours PA	0.01	0.01	0.27	0.99	1.01	1.03
Minutes Warming-Up	**0.07**	**0.03**	**0.02**	**1.01**	**1.07**	**1.13**

SE=Standard Error; dp=Decimal Places; CI=Confidence Intervals; OR=Odds Ratio; BMI=Body Mass Index; RG=Raft Guide; PAJ=Physically Active Job; NPAJ=Non-Physically Active Job; PA=Physical Activity; MMC=Man-Made Course

Mid-Season Chronic MSCs

Both models predicting chronic lower back ($X^2_{(10,\ n=98)} = 23.59$, $p = 0.01$) and shoulder ($X^2_{(8,\ n=98)} = 27.91$, $p < 0.005$) pain during Mid-Season were significant. The models explained between 21.4 – 33.2% of the variation. Similar to early season, older participants were less likely to report a shoulder injury. In addition, those with more years' experience as a raft guide were also more likely to report a chronic shoulder injury, as observed at Early Season. It was also identified that respondents who worked solely on a natural river were more likely to report a chronic shoulder complaint. A greater number of hours worked as a raft guide increased the risk of chronic lower back pain. Furthermore, those who reported guiding bilaterally were also more likely to report a chronic lower back complaint. All coefficients can be seen in Table 6.7.

Mid-Season Acute Trauma Injuries

During Mid-Season, neither of the binary logistic regression predicting acute back ($X^2_{(8,\ n=98)} = 7.60$, $p = 0.47$) or shoulder ($X^2_{(9,\ n=98)} = 6.39$, $p = 0.70$) injuries were significant.

Table 6.7: Breakdown of Regression Outputs from Significant Models for Mid-Season

				95% CI for OR		
Variables Included	B	SE	p (2dp)	Lower	OR	Upper
Chronic Shoulder Pain						
Constant	3.79	2.56	0.14			
Sex	0.15	0.85	0.86	0.22	1.16	6.15
Age	**-0.13**	**0.04**	**0.01**	**0.81**	**0.88**	**0.96**
BMI	-0.05	0.09	0.61	0.79	0.95	1.15
Years' Experience	**0.15**	**0.06**	**0.01**	**1.04**	**1.16**	**1.30**
Hours PA	-0.01	0.01	0.19	0.97	0.99	1.01
Bilateral Guiding	0.57	0.49	0.25	0.67	1.77	4.63
River Type						
Rivers	**1.24**	**0.62**	**0.05**	**1.03**	**3.45**	**11.60**
Rivers and MMC	-0.16	0.61	0.79	0.26	0.85	2.81
Chronic Lower Back Pain						
Constant	1.67	2.60	0.52			
Sex	-0.83	0.96	0.39	0.07	0.44	2.88
Age	-0.01	0.03	0.64	0.93	0.99	1.05
BMI	-0.11	0.09	0.23	0.75	0.90	1.07
Years' Experience	0.08	0.05	0.12	0.98	1.08	1.19
Hours RG	**0.01**	**0.01**	**0.04**	**1.00**	**1.01**	**1.02**
Hours PA	0.02	0.01	0.07	1.00	1.02	1.04
Bilateral Guiding	**1.09**	**0.51**	**0.03**	**1.09**	**2.96**	**8.02**
River Type						
Rivers	0.64	0.65	0.33	0.53	1.90	6.84
Rivers and MMC	0.74	0.63	0.24	0.61	2.11	7.28
River Grade	0.85	0.55	0.13	0.79	2.33	6.90

SE=Standard Error; dp=Decimal Places; CI=Confidence Intervals; OR=Odds Ratio; BMI=Body Mass Index; RG=Raft Guide; PA=Physical Activity; MMC=Man-Made Course

6.3.9 Interim Summary of Binary Logistic Regression Analyses

The key findings from this section are summarised below.

- Overall, the chronic shoulder conditions model was significant at both Early and Mid-Season.
- Older white-water raft guides were less likely to report shoulder conditions at both time points, whereas the increased experience as a white-water raft guide contributed to chronic shoulder conditions at both time points.
- Increased time spent participating in physical activity during Early Season and working solely on natural rivers during Mid-Season contributed to chronic shoulder conditions.
- Acute back injury during Early Season was associated with a greater amount of time spent warming-up.
- Working longer hours as a raft guide and guiding bilaterally both contributed to chronic lower back conditions during Mid-Season.
- Despite more acute trauma injuries being reported during Mid-Season, the binary logistic regression models did not significantly predict acute back or shoulder injuries.

6.4 Discussion

In this study, there was a high prevalence of chronic injuries experienced by raft guides. These findings are in line with a US study identifying back pain in raft guides (Jackson & Verscheure, 2006). This study extends these findings to the UK, in that back pain was the most prevalent chronic MSC reported by participating white-water raft guides. The prevalence of lower back pain in this sample of white-water raft guides is more than double of the global estimates for the general population (69% compared to 31%) (Hoy et al., 2012). In addition, this study has identified that raft guides are at risk of developing chronic MSCs in other regions on the body which has not been previously reported. Despite between 81.6 – 93.7% of participants reporting at least one chronic MSC, only a few of these MSCs were activity limiting. This could mean that the MSCs reported in any area of the body may not be overly severe. However, it could be that white-water raft guides are physically resilient as seen with mountain leaders, who continue to work through injuries in order to get paid (McDermott & Munir, 2012). Further study is required to test resilience in white-water raft guides. In contrast to chronic injuries there was a lower prevalence of acute trauma injuries reported. Nevertheless, half of the sample still reported experiencing at least one acute trauma injury. Almost a third of individuals reporting an acute injury were prevented from completing everyday activities as a result.

It is possible that the prevalence of chronic and acute injuries in this study may be inflated as a result of the sampling technique. As participants were self-selecting, there was a chance that those participating had suffered a recent

injury and may therefore have been more likely to complete the survey than their peers who had not experienced any issues. However, the researcher actively recruited from each provider that was visited, by speaking with each raft guide employed on the day individually, in order to reduce this potential bias.

It was interesting that chronic MSCs were most prevalent during Early Season, rather than Mid-Season where the highest work demands were reported in terms of working hours. Furthermore, during Late Season, an increase in chronic MSCs was reported, This suggests that chronic MSCs dip during mid-season. This contrasts with previous literature which suggests that MSCs accumulate over time (Kumar, 2001). The findings from this study could be due to an adjustment period where the body is adjusting to the demand of the workload. As raft guides may work fewer hours over the winter months it is possible that they may overload their bodies when their working hours increase. This has been observed in factory workers, where new employees are more likely to develop musculoskeletal disorders whilst adjusting to the new job demands (Hakkanen, Viikari-Juntura, & Martikainen, 2001). Further research is needed to confirm if this is the case for white-water raft guides.

In contrast to chronic MSCs, acute injuries increased with exposure from Early to Mid-Season, in line with previous literature (Schoen & Stano, 2002), however, the prevalence increased further during Late Season. This was a surprise as respondents reported working fewer hours and therefore exposure was reduced. It is possible that working on a section of river for a season can increase familiarity with the environment in which they are working. This could lead to accidents as potential risks no longer stand out from the familiar

environment. This is known as a heuristic trap and has been suggested to be related to avalanche accidents with skiers (McCammon, 2004).

The results of Preliminary Hypothesis B suggest that chronic MSCs are more prevalent than acute trauma injuries. This study therefore supports previous literature which suggests that expert white-water users are more likely to develop chronic injuries than sustain acute injuries (Fiore & Houston, 2001). This suggests that raft guides are less likely to have accidents resulting in injuries, however are at risk of overuse injuries.

Following the exploratory binary logistic regression analyses, increased experience was identified as a contributor to shoulder pain. This is unsurprising as previous literature suggests that MSCs can develop through the cumulative effects of a working career in the outdoor industry (McDermott & Munir, 2012). When looking at age, older raft guides were less likely to report a shoulder complaint. This finding does not reflect what is reported in the general population (Thomas, Peat, Harris, Wilkie, & Croft, 2004) and therefore it may be that older raft guides could be more resilient and therefore less likely to report conditions. This finding requires further exploration through detailed qualitative research with older raft guides.

Interestingly, two known protective behaviours were identified as actually contributing to back pain. Warming-up was associated with acute back pain during Early Season and guiding bilaterally was associated with chronic lower back pain during Mid-Season. It could be that when these injuries first occurred, the raft guide's behaviour may have changed in order to reduce the risk of aggravating the injury. Further research is required to investigate how white-

water raft guides manage injuries they have sustained. This may be particularly the case for acute back pain as warming-up has been suggested to reduce the risk of acute injuries (Woods, Bishop, & Jones, 2007). The qualitative data (Chapter 3) suggested that bilateral guiding may reduce the risk of back pain, however it is beyond the scope of this study to examine this. It is possible that raft guiding causes back pain regardless of whether unilateral or bilateral guiding is practiced.

The findings from this study suggest that recovery may be important for injury prevention as increased hours of participation in physical leisure activity contributed to chronic shoulder conditions during early season and longer hours worked as a raft guide contributed to chronic lower back conditions during Mid-Season. These findings suggest that these chronic conditions may be overuse injuries, as seen previously in expert paddlers (Fiore & Houston, 2001). Further investigation is required to assess if these conditions are a result of overuse and therefore a need for recovery.

Despite more acute trauma injuries being reported during Mid-Season, the binary logistic regression models did not significantly predict acute back or shoulder injuries. This suggests that acute traumas could be a result of other factors not yet identified. It is also possible that acute injuries not sustained as a result of rafting but caused elsewhere (e.g. accidents at home) have been reported.

6.5 Summary and Conclusions

This research has identified that chronic lower back pain is a problem for raft guides working in the UK. This is in line with research from the US (Jackson & Verscheure, 2006). In addition, this work has highlighted that the prevalence of chronic MSCs in other body regions may also be problematic. This is particularly the case as chronic MSCs are more prevalent than acute trauma injuries. Furthermore, it has been shown that the prevalence of injuries (acute and chronic) varies throughout a working season. Chronic MSCs are more prevalent during Early Season, whereas acute trauma injuries increase throughout a working season. The binary logistic regression models successfully predicted the outcome of acute back injury during Early Season and chronic lower back conditions during Mid-Season. Models predicting chronic shoulder conditions were significant during both Early and Mid-Season. Unsurprisingly, raft guides with more experience were more likely to report a chronic shoulder complaint; however older raft guides were less likely to do so. Warming-up was associated with acute back pain and bilateral guiding was associated with chronic lower back conditions. It is unclear whether these known protective behaviours actually directly contribute to injury or whether the behaviours have been adopted as a result of the injuries arising. Finally, increased physical leisure activity and work as a raft guide contributed to chronic MSCs suggesting the conditions may be overuse injuries. This suggests that the need for recovery is an important area for future research in this field.

Chapter 7 Predicting the Need for Recovery among White-Water Raft Guides: A Multilevel Approach.

7.1 Introduction

Research presented in the previous chapter identified that working longer hours was associated with lower back pain and increased physical leisure activity was associated with chronic shoulder conditions. Previous research suggests that insufficient emotional and physical recovery at the end of a working day, associated with working long hours, can have negative implications for an individual's health (Geurts & Demerouti, 2003). Furthermore, the absorption component of work engagement has also been associated with working long hours, particularly overtime (Beckers et al., 2004). Taking this evidence into account, this chapter explores the possible associations between work engagement and white-water raft guides' need for recovery after a working day.[2]

The need for recovery has been conceptualised as the extent to which an individual needs to recover from physical and mental fatigue experienced as a result of a day's work (Sluiter, 1999; Sluiter et al., 2003; Sonnentag & Fritz, 2007). Furthermore, the intensity and duration of the fatigue are considered. A prolonged need for recovery has been associated with negative effects, such as reduced productivity at an organisational level and poor health, sick leave and

[2] Some of the issues discussed in this chapter are published in
Wilson, I., McDermott, H., & Munir, F. (2016). The role of working hours, work environment and physical leisure activity on the need for recovery following a day's work among UK white-water raft guides: A within-subjects multilevel approach. *Psychology of Sport and Exercise, 23*, 123-131.

disability at an individual level (de Croon et al., 2003; Kant et al., 2003; Sluiter et al., 2003). Furthermore, the need for recovery has been identified as an early indicator of chronic fatigue and psychological distress (Jansen et al., 2003). Therefore in the present study, the need for recovery will be utilised as an indicator of fatigue among this working population, as there is no previous literature to suggest whether fatigue is a significant issue among this population.

A lack of psychological detachment has been associated with the need for recovery on a daily basis (Sonnentag & Bayer, 2005). This is more common among individuals with higher workloads, which can be indicated by the number of hours worked (Major et al., 2002). This is because employees are so focused on their work it impacts on their leisure time, thus reducing their psychological detachment from work during leisure hours; resulting in impaired recovery (Sonnentag & Bayer, 2005). Furthermore, employees with high workloads are more likely to work overtime, consider work and home activities as more effortful and report being more preoccupied with work during home time, when compared to their peers with a lower workload (van Hooff, Geurts, Beckers, & Kompier, 2011).

Psychological detachment can also be achieved through physical activity, which has been suggested to aid the recovery process and reduce work-related fatigue (Korpela & Kinnunen, 2010; Oerlemans & Bakker, 2014). This is particularly the case when individuals fully detach themselves from work and enter the great outdoors (Korpela & Kinnunen, 2010; Sonnentag & Zijlstra, 2006). It is suggested that increased time participating in outdoor activities in a natural setting helps with psychological detachment and thus improves

recovery (Korpela & Kinnunen, 2010). The need for recovery may also be influenced by the physical aspect of physically active jobs (Sonnentag & Zijlstra, 2006). It is unknown whether individuals working in a physically active job will gain the same benefits of physical leisure activity from their work.

This chapter presents the relationships between hours worked, physical leisure activity and the need for recovery and how the working environment (whether it be a natural river, man-made course or a mixture of the two) influences this relationship. The chapter then presents the longitudinal results of the multilevel analyses assessing the relationships between the components of work engagement and the need for recovery. Finally, the results of the moderation analyses are presented which examine how hours worked and physical leisure activity influence the relationships between work engagement and the need for recovery. The following were therefore hypothesised[3].

7.1.1 Hypotheses

Hypothesis Ia: A greater number of hours worked per month will be associated with a greater need for recovery across a working season.

Hypothesis Ib: A greater number of monthly hours of physical leisure activity will be associated with a lower need for recovery across a working season.

Hypothesis II: Working in a natural outdoor environment (i.e. on a natural river), as opposed to working in an artificial environment (i.e. on a man-made course), will be associated with a lower need for recovery.

[3] Literature informing the development of Hypotheses I – V are fully discussed in Chapter 4.2, from page 68 onwards.

Hypothesis IIIa: Working longer hours on a natural river will reduce the need for recovery experienced, whereas working longer hours on a man-made course will increase the need for recovery experienced by white-water raft guides.

Hypothesis IIIb: White-water raft guides who work on a natural river and participate in a greater amount of physical leisure activity will experience a lower need for recovery; furthermore an increased amount of physical leisure activity will reduce the need for recovery experienced by those working on man-made courses.

Hypothesis IV: Across a working season, vigor and dedication will be negatively associated with the need for recovery, whereas absorption will be positively associated with the need for recovery.

Hypothesis Va: A greater number of monthly hours worked as a white-water raft guide will weaken the negative relationships between the need for recovery and vigor and dedication whereas it will strengthen the positive association between absorption and the need for recovery.

Hypothesis Vb: A greater number of monthly hours of physical leisure activity will weaken the negative relationships between the need for recovery and vigor and dedication whereas it will strengthen the positive association between absorption and the need for recovery.

7.2 Analyses

The repeated measures design was considered to be multi-level with the measurements taken from each observation time period (Early, Mid and Late Season) being nested within the individual. This creates a two-level model, with the repeated measures observations at level one (N = 3 occasions) and the second level being the individual (N = 126 participants). Multilevel analyses were conducted using the MLwiN software (Rasbash et al., 2009).

Multilevel analyses were the most appropriate for the data set obtained as there were missing data due to the attrition throughout the longitudinal study. Multilevel modelling is robust against missing data (Quené & Van den Bergh, 2004) therefore all available data could be included which reduces any biases in the analyses (Hill & Goldstein, 1998). Furthermore, as the data were repeated measures in nature, observations at each time point are likely to be interdependent, i.e. not independent of each other, for example, an individual's levels of work engagement measured during Early Season are likely to influence the same individual's levels of work engagement during follow up measurements. Independence of the variables is not assumed in multilevel analyses (Dierdorff & Ellington, 2012), making this a more suitable technique than ordinary least squares (Snijders & Bosker, 1994).

With regards to data manipulation, independent variables (monthly hours worked as a raft guide; monthly hours of physical leisure activity) were centred for inclusion in the multilevel analyses as this technique reduces the correlation between the slope and intercept of the regression line thus increasing the robustness of the models assessed (Enders & Tofighi, 2007; Nezlek, 2001). As

the hypotheses were concerned with the within subject associations between the need for recovery experienced and hours worked or hours of physical leisure activity (i.e. how the relationships vary over time), predictor variables were centred on the specific mean of each participant, this is centring within cluster (Lüdtke, Robitzsch, Trautwein, & Kunter, 2009). Centring within cluster (CWC) allows for the disentanglement of within and between subject effects of predictors can therefore be disentangled (Lüdtke et al., 2009) thus providing a pure estimation of the within subject relationships between the independent and dependent variables (Enders & Tofighi, 2007). As the hypotheses are concerned with the within subject associations (associations across time) between the need for recovery and various predictor variables, group-mean centring is the most appropriate technique.

Regarding the standardisation of data, standardising level two variables has no implications regarding the coefficients produced as changing the variation in level two variables also changes the standard error which is tested to determine significant results (Nezlek, 2001). This is not the case for level one variables, therefore standardising level one variables can result in the alteration of coefficients and their level of significance (Nezlek, 2001). As the present study is concerned with the within subject (Level 1) differences in the need for recovery, data tested using the multilevel analyses were not standardised.

Hypotheses I, II and IV were concerned with a main effect over time. Time was therefore included in the model alongside independent variables and centred to baseline. To assess whether the main association altered over time, an interaction term between time and the independent variable (i.e.

time*independent variable) was tested to see if model fit improved and whether the interaction was significant.

Hypotheses III and V were concerned with the testing of moderation effects. Moderation was tested using the technique described by Baron and Kenny (1986). This involves testing a direct effect between the independent variable and the dependent variable (Hypotheses I and IV). Following this, a direct association between the moderator and the dependent variable is tested (Hypotheses I and II). Finally, the independent variable and moderator are multiplied together to create an interaction term; the moderation effect is tested by the association between the interaction term and the dependent variable (Hypotheses III and V).

7.3 Results

For details of the participants, see Chapter 5, section 3.1.

7.3.1 Preliminary Analyses

Pearson correlation analyses were utilised to assess the relationships between the nested variables. Means, standard deviations and correlations are presented in Table 7.1.

All covariates (age, BMI and years' experience) were significantly related to each other ($0.13 \geq r \leq 0.51$, $p \leq 0.02$). Age was significantly positively associated with absorption ($r = 0.13$, $p = 0.02$). Years' experience was significantly, positively associated with dedication ($r = 0.13$, $p = 0.03$). Furthermore, age ($r = -0.13$, $p = 0.02$) and BMI ($r = -0.15$, $p = 0.01$) were

negatively associated with the number of hours worked as a raft guide. No other associations were observed between the covariates and the study variables ($-0.07 \leq r \geq 0.11$ $p \geq 0.06$).

With regards to the independent variables, vigor was significantly, positively associated with dedication ($r = 0.74$, $p < 0.005$), absorption ($r = 0.56$, $p < 0.005$) and the number of hours worked as a raft guide ($r = 0.13$, $p = 0.02$). Dedication was positively associated with absorption ($r = 0.57$, $p < 0.05$) and negatively associated with hours of physical leisure activity ($r = -0.14$, $p = 0.02$). No other significant associations were observed between the independent variables ($-0.10 \leq r \geq 0.11$ $p \geq 0.06$).

With regards to associations between the independent variables and the dependent variables, vigor ($r = -0.25$, $p < 0.005$) and dedication ($r = -0.20$, $p < 0.005$) were both significantly, negatively associated with the need for recovery. No other significant associations were observed ($-0.03 \leq r \geq 0.08$ $p \geq 0.19$).

Table 7.1: Means, standard deviations and correlations among the nested study variables (N=303)

	Mean	SD	1	2	3	4	5	6	7	8
1. Age	30.36	10.04	-							
2. Body Mass Index	24.61	2.90	**0.28****	-						
3. Years' Experience	5.51	6.14	**0.51****	**0.13***	-					
4. Vigor	4.09	0.84	0.09	-0.05	0.11	-				
5. Dedication	4.72	0.91	0.10	-0.06	**0.13***	**0.74****	**-**			
6. Absorption	4.23	0.97	**0.13***	-0.05	0.04	**0.56****	**0.57****	-		
7. Need for Recovery	35.34	25.24	-0.02	-0.00	-0.03	**-0.25****	**-0.20****	-0.02	-	
8. Hours Worked as a Raft Guide	37.25	54.18	**-0.13***	**-0.15****	0.01	**0.13***	0.11	0.11	0.04	-
9. Hours of Physical Leisure Activity	30.23	32.39	-0.07	-0.00	-0.01	-0.06	**-0.14***	-0.10	-0.03	-0.02

*p<0.05 **p<0.01

7.3.2 Initial Multilevel Analyses

The first of the multilevel analyses conducted was to create an empty model, i.e. a model without any predictors, to estimate the level of variation explained on an individual level (Level 2 variation) and over time (Level 1 variation). The results show that 37.46% (237.33/[237.33+396.18]) of the variation in the need for recovery is explained by the differences between individuals (Level 2) and that 62.54% (396.18/[237.33+396.18]) of the variation was explained by the differences between time points (Level 1). Following the empty model, covariates (age, body mass index and years' experience) were included. No significant associations were observed between the need for recovery and age (B = -0.03, SE = 0.25, p = 0.91), BMI (B = 0.19, SE = 0.69, p = 0.79), and years' experience (B = -0.08, SE = 0.38, p = 0.83). The inclusion of covariates did not significantly improve the model fit (X^2 = 0.17, df = 3, p = 0.98) and were therefore excluded from the final analyses conducted during hypotheses testing. The coefficients from the empty model and the coefficients model can be seen in Table 7.2.

Table 7.2: Coefficients from the empty model and the model including covariates

Variables	Empty Model		Model Including Covariates	
	Estimation	SE	Estimation	SE
Intercept	34.63	2.01	34.62	2.01
Age			-0.03	0.25
Body Mass Index			0.19	0.69
Years' Experience			-0.08	0.38
2 x log		2715.11		2714.94
X^2				0.17
Df				3
Level 1 Variation	237.33	25.14	237.26	25.14
Level 2 Variation	396.18	64.55	395.74	64.55

*p<0.05 **p<0.01; SE=Standard Error

7.3.3 Results relating to Hypothesis I

Coefficients from the multilevel analyses related to Hypothesis I are presented in Table 7.3. Hypothesis Ia was concerned with the associations between the need for recovery and the number of hours worked as a raft guide in a month. The results show that the inclusion of 'time' and 'monthly hours worked as a raft guide' explained 0.2% of the within subject variation of the need for recovery and did not improve the model fit (X^2 = 0.90, df = 2, p = 0.64). However, neither time (B = 1.10, SE = 1.16, p = 0.34) nor hours worked as a raft guide (B = 0.00, SE = 0.02, p = 0.86) were directly associated with the need for recovery (See Model 1). When testing the relationship between the number of hours worked and the need for recovery over time (Model 2), an additional 2.7% of the within subject variation of the need for recovery experienced was explained. Specifically, a greater number of hours worked was associated with a lower need for recovery following work (B = −0.12, SE = 0.05, p = 0.02) and this relationship strengthened over time (B = 0.12, SE = 0.04, p = 0.003 [see Model 2]).

With regards to Hypothesis Ib, the inclusion of 'time' and 'monthly hours of physical leisure activity' significantly improved the model fit (X^2 = 288.68, df = 2, p < 0.001) but did not explain any of the within subject variation of the need for occupational recovery (Model 3). A greater number of hours of physical leisure activity in a month was significantly associated with a lower need for recovery (B = -0.09, SE = 0.04, p = 0.03). Time was not associated with the need for recovery (B = 1.77, SE = 1.38, p = 0.20). The inclusion of the interaction between time and the number of hours of physical leisure activity indicated that

the relationship between monthly hours of physical leisure activity and the need for occupational recovery did not alter over time (B = 0.08, SE = 0.07, p = 0.23) and did not significantly improve the model fit (X^2 = 1.40, df = 1, p = 0.24 [see Model 4]).

Table 7.3: Results from Multilevel Analyses relating to Hypotheses Ia and Ib

Variable	Hypothesis Ia: Hours worked as a Raft Guide$_{CWC}$ as IV				Hypothesis Ib: Hours of Physical Leisure$_{CWC}$ Activity as IV			
	Model 1		Model 2		Model 3		Model 4	
	Estimation	SE	Estimation	SE	Estimation	SE	Estimation	SE
Intercept	33.80	2.19	33.17	2.17	33.49	2.16	33.36	2.17
Time	1.10	1.16	2.36	1.22	1.77	1.38	1.78	1.36
IV	0.00	0.02	**-0.12***	**0.05**	**-0.09***	**0.04**	**-0.16***	**0.07**
Time*IV			**0.12****	**0.04**			-0.08	0.07
2 x log		2714.21		2705.92		2426.43		2425.03
X^2		0.90		**8.29***		**288.68****		1.40
Df		2		1		2		1
Level 1 Variation	236.82	25.09	230.22	24.39	240.43	28.22	236.03	27.76
Level 2 Variation	394.33	64.29	384.42	62.63	372.45	63.74	378.33	64.21

*p<0.05 **p<0.01; SE=Standard Error; CWC=Centred within cluster

7.3.4 Results relating to Hypothesis II

Engaging in physical leisure activity in a natural outdoor environment has been linked with reducing the need for recovery experienced by workers. It is therefore possible that the environment in which white-water raft guides work may also influence the level of need for recovery experienced. Therefore the following hypothesis was tested:

Hypothesis II: Working in a natural outdoor environment (i.e. on a natural river), as opposed to working in an artificial environment (i.e. on a man-made course), will be associated with a lower need for recovery.

The results from the multilevel analyses assessing whether working environment (i.e. on a natural river or man-made course) was significantly associated with the need for recovery experienced by raft guides are presented in Table 7.4. The inclusion of time and river type (mixture of natural rivers and man-made courses was the reference group) significantly improved the model fit (X^2 = 23.33, df = 3, p < 0.001) and explained 0.24% of the within subject variation of the need for recovery (see Model 5). Working on a natural river was significantly associated with a lower need for recovery (B = −10.06, SE = 4.32, p = 0.02), whereas working on a man-made course was significantly associated with a greater need for recovery (B = 12.45, SE = 4.72, p = 0.001). These relationships did not significantly alter over time for raft guides who work on either the natural rivers (B = −1.16, SE = 2.71, p = 0.67) or man-made courses (B = −2.03, SE = 2.90, p = 0.48 [see Model 6]).

Table 7.4: Results from Multilevel Analyses relating to Hypothesis II

Variable	Model 5		Model 6	
	Estimation	SE	Estimation	SE
Intercept	34.49	3.32	33.68	3.55
Time	0.96	1.15	1.96	1.93
Working on a Natural River	**-10.06***	**4.32**	-9.13	4.78
Working on a Man-Made Course	**12.45****	**4.72**	**14.10****	**5.28**
Time*Working on a Natural River			-1.16	2.71
Time*Working on a Man-Made Course			-2.03	2.90
2 x log		2691.78		2691.28
X^2		**23.33****		0.50
Df		2		2
Level 1 Variation	236.75	25.05	235.98	24.97
Level 2 Variation	312.31	53.95	312.91	53.98

*p<0.05 **p<0.01; SE=Standard Error

7.3.5 Results relating to Hypothesis III

The results from Hypotheses I and II that the relationship between the independent variables, monthly hours worked as a raft guide; monthly hours of physical leisure activity; and type of river worked on, and the need for recovery did not change over time. It was therefore decided that time would be omitted from the testing of Hypothesis II. This allowed for the assessment of a pure interaction effects between the type of river worked on and the number of hours worked per month (Hypothesis IIIa) and the number of hours of physical leisure activity per month (Hypothesis IIIb) on the need for recovery. Furthermore, this allowed for the statistics to remain comprehensive as a three-way moderation (i.e. IV*Moderator*Time) can be overly complex to interpret in a meaningful manner.

It is possible that the environment in which white-water raft guides work could moderate the relationship between the amount of time they spend working and the need for emotional and physical recovery following a day of work. Therefore the following hypothesis was tested:

Hypothesis IIIa: Working longer hours on a natural river will reduce the need for recovery experienced, whereas working longer hours on a man-made course will increase the need for recovery experienced by white-water raft guides.

A visual representation of the moderation effect can be seen in Figure 7.1.

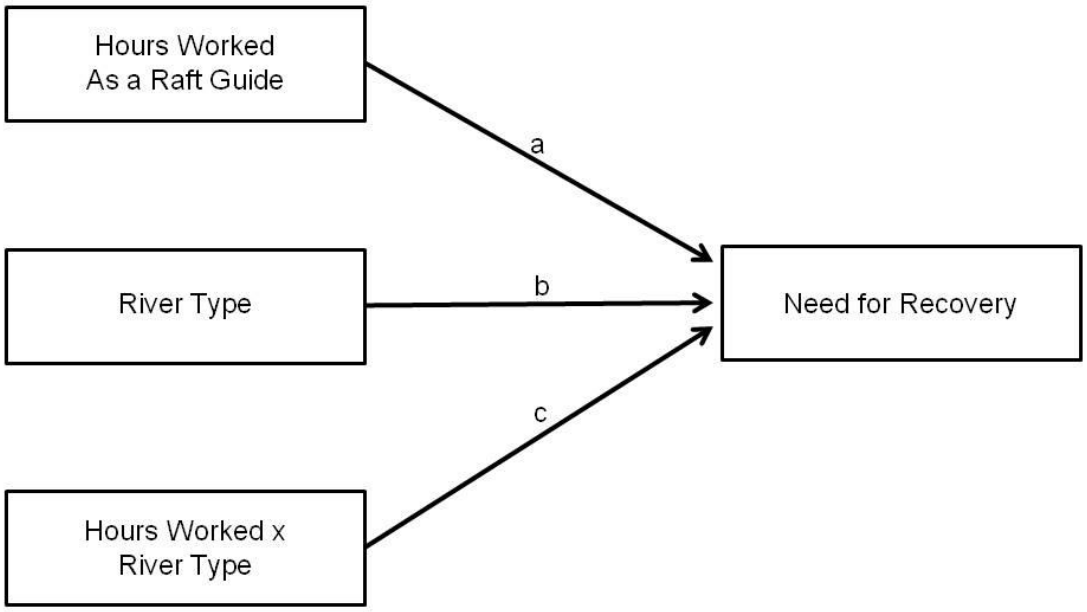


Figure 7.1: A diagram of how the environment in which a raft guide works moderates the relationship between hours worked and the need for recovery

The coefficients from the multilevel analyses relating to the testing of Hypothesis III are presented in Table 7.5. With regards to Hypothesis IIIa, 0.25% of the within subject variation of the need for recovery was explained by the number of hours worked as a raft guide per month and the type of river raft guides worked on (see Model 7). Monthly hours worked as a raft guide was not associated with the need for recovery (B = 0.00, SE = 0.02, p = 0.86), whereas working on a natural river was associated with a lower need for recovery (B = −10.06, SE = 4.32, p = 0.02) and working on a man-made course was associated with a greater need for recovery (B = 12.45, SE = 4.72, p = 0.01).

The inclusion of the two moderation terms, monthly hours worked as a raft guide on a natural river and monthly hours worked on a man-made course, significantly improved the model fit (X^2 = 7.41, df = 2, p = 0.02) and explained a further 3.99% of the within subject variation of the need for recovery (see Model 8). A greater number of monthly hours worked as a raft guide on a natural river did not further reduce the need for occupational recovery experienced (B = 0.04, SE = 0.06, p = 0.43) just as a greater number of hours worked on a man-made course did not increase the need for occupational recovery experienced by white-water raft guides (B = −0.16, SE = 0.08, p = 0.06).

Table 7.5: Results from Multilevel Analyses relating to Hypothesis III

Variables	Monthly hours worked as a raft guide as the IV				Monthly hours worked of physical leisure activity as the IV			
	Model 7		Model 8		Model 9		Model 10	
	Estimation	SE	Estimation	SE	Estimation	SE	Estimation	SE
Intercept	34.47	3.33	34.23	3.32	33.44	3.26	33.39	3.26
Time	0.98	1.16	1.28	1.14	1.64	1.37	1.73	1.37
IV	0.00	0.02	-0.00	0.05	**-0.10****	**0.04**	-0.12	0.09
Natural River	**-10.06***	**4.32**	**-10.03***	**4.32**	**-9.25***	**4.24**	**-9.52***	**4.25**
Man-Made Courses	**12.45****	**4.72**	**12.45****	**4.72**	**13.92****	**4.63**	**13.86***	**4.63**
IV_{cwc}*Natural River			0.04	0.06			-0.07	0.13
IV_{cwc}*Man-Made Course			-0.16	0.08			0.06	0.10
2 x log		2691.75		2684.34		2402.05		2400.69
X^2		**23.36****		**7.41***		**313.06****		1.36
df		4		2		4		2
Level 1 Variation	236.72	25.05	227.22	24.05	241.57	28.31	239.43	28.30
Level 2 Variation	312.29	53.95	316.15	53.856	282.46	52.58	283.29	52.60

*p<0.05 **p<0.01; SE=Standard Error; CWC=Centred within cluster

It has been suggested that an increased amount of time spent engaging in physical leisure activity in a natural outdoor environment can improve the recovery experience of workers. The following hypothesis was therefore tested:

Hypothesis IIIb: White-water raft guides who work on a natural river and participate in a greater amount of physical leisure activity will experience a lower need for recovery; furthermore an increased amount of physical leisure activity will reduce the need for recovery experienced by those working on man-made courses.

A visual representation of the moderation effect can be seen in Figure 7.2.

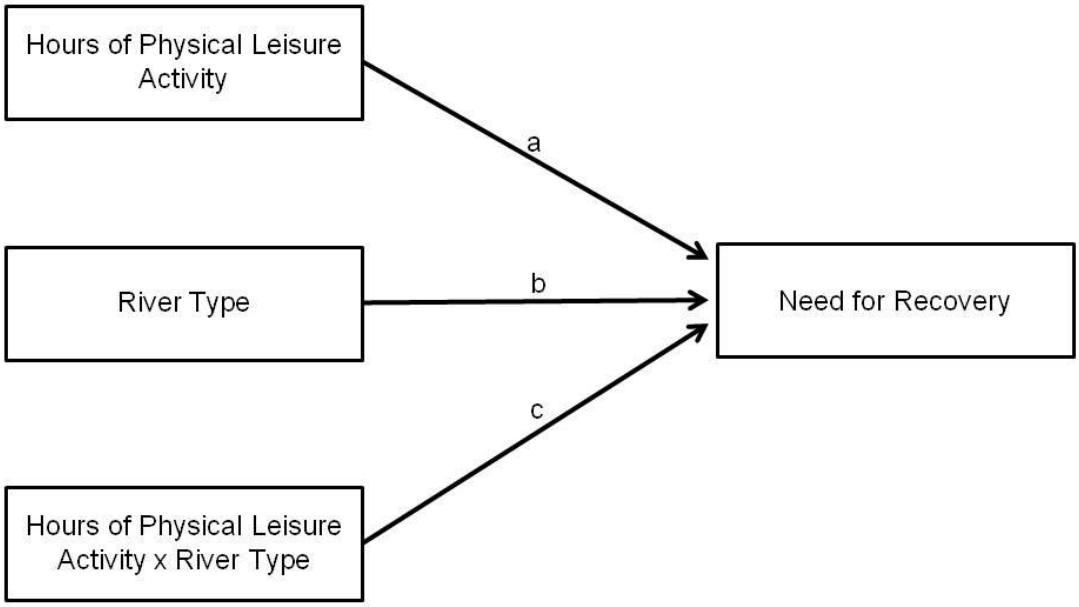


Figure 7.2: A diagram of how the environment in which a raft guide works moderates the relationship between hours of physical leisure activity and the need for recovery

When testing Hypothesis IIIb, the initial step was to test direct associations between the number of hours of physical leisure activity, the river type worked on and the need for occupational recovery experienced. By including the monthly hours of physical leisure activity and type of river worked on significantly improved the model fit (X^2 = 313.06, df = 4, p < 0.001) but did not explain any of the within subject variation of the need for occupational recovery experienced (see Model 9). Specifically, a greater number of hours of physical leisure activity participated in per month (B = −0.10, SE = 0.04, p = 0.02) and working on a natural river (B = −9.25, SE = 4.24, p = 0.02) were associated with a lower need for occupational recovery, whereas working on a man-made course was associated with a greater need for occupational recovery (B = 13.92, SE = 4.63, p = 0.002). The inclusion of the interaction terms did not explain any of the within subject variation of the need for occupational recovery and thus did not improve the model fit (X^2 = 1.36, df = 2, p = 0.51 [see Model 10]). Participating in a greater number of hours of physical leisure activity per month combined with working on a natural river was not associated with a lower need for occupational recovery (B = −0.07, SE = 0.13, p = 0.60). Furthermore, a greater number of hours of physical leisure activity combined with working on artificial man-made courses was not associated with the need for occupational recovery experienced either (B = 0.06, SE = 0.10, p = 0.60).

7.3.6 Interim Summary of Results relating to Hypotheses I, II and III

The key findings from this section are summarised below.

- The number of hours worked as a white-water raft guide per month had a significant, negative association with the need for recovery experienced.
- An increased amount of physical leisure activity lowered the need for recovery experienced by white-water raft guides.
- Working on a natural river reduced the need for recovery, whereas, working on a man-made course increased the need for recovery experienced by white-water raft guides.
- The strength of the relationship between the number of hours worked and the need for recovery experienced increased over time.
- The relationships between hours of physical leisure activity and work environment with the need for recovery did not alter over time.
- The number of hours worked did not interact with the environment worked in when predicting the need for recovery.
- The relationship between physical leisure activity and the need for recovery was unaffected by the environment in which white-water raft guides worked in.

7.3.7 Results relating to Hypothesis IV

Previous literature has identified that high levels of vigor and dedication can aid in the reduction of work-related fatigue, however, workers who are highly absorbed in their work may think about or complete work tasks during their leisure time. The following hypothesis was derived and tested:

Hypothesis IV: Across a working season, vigor and dedication will be negatively associated with the need for recovery, whereas absorption will be positively associated with the need for recovery.

The coefficients of the multilevel analyses relating to Hypothesis IV are presented in Table 7.6. The results indicate that time and the components of work engagement accounted for 2.79% of the within subject variation of the need for recovery experienced but failed to significantly improve the model fit (χ^2 = 5.47, df = 4, p = 0.14 [see Model 11]). None of the independent variables were significantly associated with the need for recovery (p ≥ 0.11). However, assessing the relationships between the components of work engagement and the need for recovery over time by including the interaction terms (time*vigor; time*dedication; time*absorption) significantly improved the model fit (χ^2 = 8.70, df = 3, p = 0.03) and explained a further 2.06% of the within subject variation of the need for recovery (see Model 12). High levels of vigor were directly associated with a lower need for recovery (B = -13.08, SE = 4.44, p = 0.003) and this negative relationship strengthened over time (B = 11.08, SE = 4.12, p = 0.01). Dedication was not significantly associated with the need for recovery (B = 6.23, SE = 4.20, p = 0.14). This relationship only became weaker over time (B = -8.62, SE = 4.00, p = 0.03). Finally, high levels of absorption were associated

with a higher need for recovery (B = 6.87, SE = 3.41, p = 0.04), although this relationship did not alter over time (B = -4.33, SE = 3.38, p = 0.20).

Table 7.6: Results from Multilevel Analyses relating to Hypothesis IV

Variables	Model 11		Model 12	
	Estimation	SE	Estimation	SE
Intercept	33.95	2.19	33.47	2.16
Time	0.89	1.16	1.06	1.16
$Vigor_{CWC}$	-3.18	2.47	**-13.08****	**4.44**
$Dedication_{CWC}$	-1.46	2.39	6.23	4.20
$Absorption_{CWC}$	3.12	1.98	6.87	3.41
$Time*Vigor_{CWC}$			**11.08****	**4.12**
$Time*Dedication_{CWC}$			**-8.62***	**4.00**
$Time*Absorption_{CWC}$			-4.33	3.38
2 x log		2709.64		2700.14
Δ 2 x log		5.47		**8.70***
df		3		3
Level 1 Variation	230.71	24.45	225.81	23.92
Level 2 Variation	397.42	64.30	377.35	61.49

*p<0.05 **p<0.01; SE=Standard Error; CWC=Centred within cluster

7.3.8 Results relating to Hypothesis V

Hypothesis Va is concerned with whether the relationships between the components of work engagement and the need for recovery are strengthened or weakened by the monthly number of hours worked as a raft guide. Specifically, the following hypothesis was tested.

Hypothesis Va: A greater number of monthly hours worked as a white-water raft guide will weaken the negative relationships between the need for recovery and vigor and dedication whereas it will strengthen the positive association between absorption and the need for recovery.

A visual representation of the moderation effect can be seen in Figure 7.3.

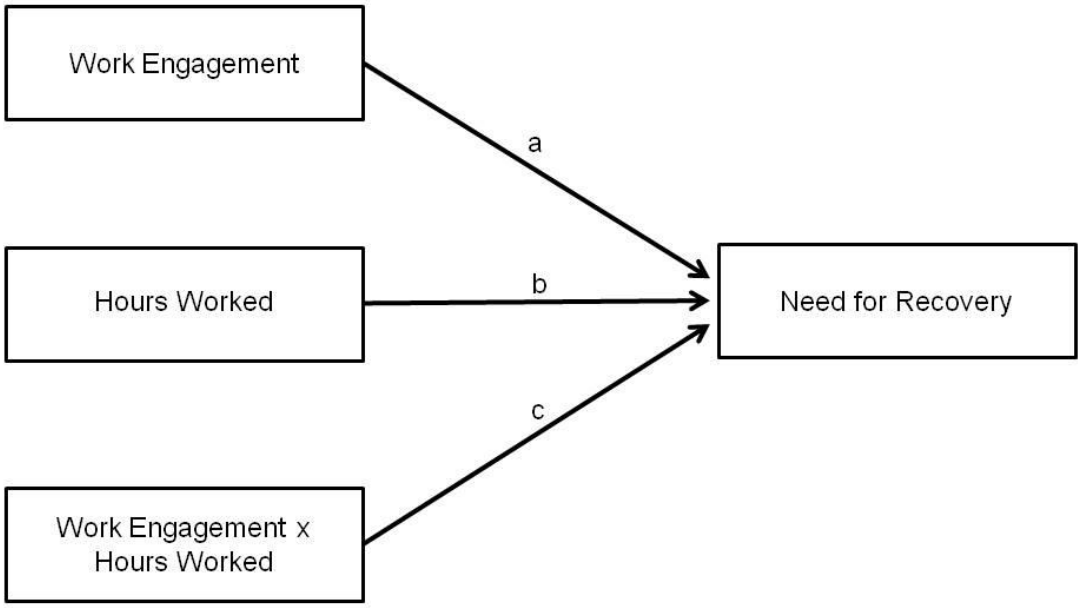


Figure 7.3: A diagram of how the environment in which a raft guide works moderates the relationship between hours worked and the need for recovery

The results of the multilevel analyses relating to Hypothesis Va are presented in Table 7.7. The results identify that including the monthly hours worked as a raft guide and the components of work engagement only explained 2.79% of the within subject variance of the need for recovery experienced (see Model 13). None of the variables were significantly associated with the need for recovery ($p \geq 0.11$). Model 14 tested the interaction effects between the individual components of work engagement and the number of hours worked as a white-water raft guide on the need for recovery across the working season. The inclusion of these interaction terms (vigor*hours worked as a raft guide;

dedication*hours worked as a raft guide; absorption*hours worked as a raft guide) did not significantly improve the model fit (χ^2 = 2.81, df = 3, p = 0.42) and did not further explain any of the within subject variation of the need for recovery. None of the variables, nor the interaction terms significantly predicted the need for recovery experienced by white-water raft guides ($p \geq 0.09$).

Table 7.7: Results from Multilevel Analyses relating to Hypothesis Va

Variables	Model 13		Model 14	
	Estimation	SE	Estimation	SE
Intercept	33.94	2.19	33.94	2.17
Time	0.90	1.17	0.81	1.18
$Vigor_{cwc}$	-3.19	2.47	-2.79	2.52
$Dedication_{cwc}$	-1.45	2.40	-2.24	2.46
$Absorption_{cwc}$	3.12	1.98	3.34	1.99
Hours RG_{cwc}	0.00	0.02	-0.00	0.03
$Vigor_{cwc}$* Hours RG_{cwc}			-0.08	0.09
$Dedication_{cwc}$* Hours RG_{cwc}			-0.08	0.10
$Absorption_{cwc}$* Hours RG_{cwc}			0.01	0.07
2 x log		2709.64		2706.83
X^2		5.47		2.81
df		5		3
Level 1 Variation	230.71	24.45	231.36	24.50
Level 2 Variation	397.40	64.30	384.03	62.69

*p<0.05 **p<0.01; SE=Standard Error; CWC=Centred within cluster

Hypothesis Vb: The number of hours of physical leisure activity will moderate the relationships between vigor, dedication and absorption and the need for recovery across a working season.

A visual representation of the moderation effect can be seen in Figure 7.4.

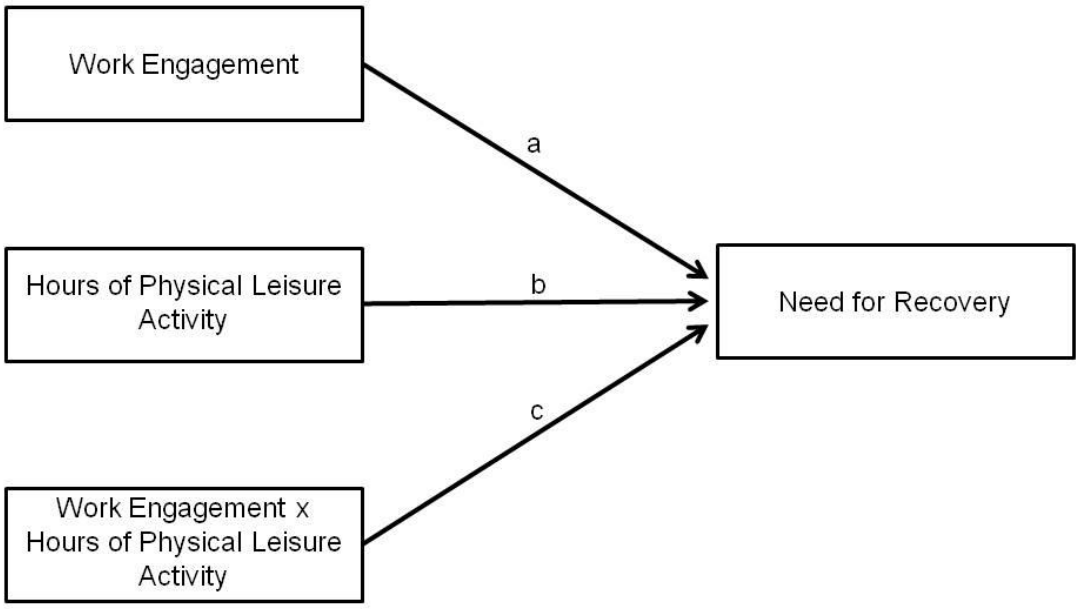


Figure 7.4: A diagram of how the environment in which a raft guide works moderates the relationship between hours worked and the need for recovery

Table 7.8 presents the coefficients from the multilevel analyses which tested Hypothesis Vb. The results from Model 15 show that there was a significant improvement in the model fit when the components of work engagement and the monthly number of hours of physical leisure activity were included (χ^2 = 293.86, df = 5, p < 0.005). The inclusion of these variables accounted for 2.59% of the within subject variance in the need for recovery among white-water raft guides. A greater number of hours of physical leisure activity was significantly associated with a lower need for recovery (B = -0.09, SE = 0.04, p = 0.04). No other significant associations were observed (p ≥ 0.10).

The moderation effects of a greater number of hours of physical leisure activity either strengthening or weakening the relationships between the components of work engagement and the need for recovery were tested in Model 16. The inclusion of the interaction terms did not significantly improve the model fit (χ^2 = 1.19, df = 3, p = 0.76) and only explained a further 2.53% of the within subject variance of the need for recovery experienced by white-water raft guides. A greater number of hours of physical leisure activity across a working season significantly predicted the need for recovery experienced by white-water raft guides (B = -0.09, SE = 0.04, p = 0.02). The number of hours of physical leisure activity had no influence on the relationship between levels of vigor and the need for recovery (B = -0.06, SE = 0.17, p = 0.73), levels of dedication and the need for recovery (B = 0.04, SE = 0.12, p = 0.74), nor the levels of absorption and the need for recovery (B = 0.13, SE = 0.15, p = 0.38).

Table 7.8: Results from Multilevel Analyses relating to Hypothesis Vb

Variables	Model 15		Model 16	
	Estimation	SE	Estimation	SE
Intercept	33.68	2.17	33.75	2.19
Time	1.34	1.39	1.31	1.37
$Vigor_{cwc}$	-4.28	2.67	-4.25	2.64
$Dedication_{cwc}$	-0.83	2.56	-1.12	2.54
$Absorption_{cwc}$	3.42	2.09	3.50	2.08
Hours PLA_{cwc}	**-0.09***	**0.04**	**-0.09***	**0.04**
$Vigor_{cwc}$*Hours PLA_{cwc}			-0.06	0.17
$Dedication_{cwc}$*Hours PLA_{cwc}			0.04	0.12
$Absorption_{cwc}$*Hours PLA_{cwc}			0.13	0.15
2 x log		2421.25		2420.06
X^2		**293.86****		1.19
df		5		3
Level 1 Variation	231.18	27.14	225.19	26.47
Level 2 Variation	379.03	63.91	392.47	65.10

*p<0.05 **p<0.01; SE=Standard Error; CWC=Centred within cluster

7.3.9 Interim Summary of Results relating to Hypotheses IV and V

The key findings from this section are summarised below.

- There is evidence that high levels of vigor protect against the development of the need for recovery.
- This relationship strengthened across the working season.
- High levels of absorption were associated with a greater need for recovery.
- This relationship did not alter over time.
- Dedication had no direct effect on the need for recovery and this relationship only weakened as times passed.
- A greater number of hours worked as a raft guide had no effect on the relationships between the components of work engagement and the need for recovery.
- A greater number of hours of physical leisure activity had no effect on the relationships between the components of work engagement and the need for recovery.

7.4 Discussion

The physical and psychological factors which contributed to white-water raft guides' levels of need for recovery experienced following a working day, across a working season were examined in this chapter. The mean score in this study for the need for emotional and physical recovery reported by white-water raft guides across a working season (35.34) was higher than the mean score reported in studies examining office workers (32.2) (van der Starre, Coffeng, Hendriksen, van Mechelen, & Boot, 2013) but similar to those examining truck drivers over a two year period (33.2 – 37.4) (de Croon et al., 2003). This suggests that white-water raft guides may be at greater risk of developing a greater need for recovery than other occupations. With regards to work engagement, the mean vigor score (4.09) were classified as 'Average', whereas mean score for dedication (4.72) and absorption (4.23) bordered 'Average' to 'High' scores, when compared to the normative data (Schaufeli & Bakker, 2004). Although white-water raft guides may have average to above-average levels of work engagement, there is scope to increase and improve their levels of vigor and dedication which have been shown to have positive benefits for psychological and physical health (Schaufeli et al., 2008).

The multilevel analyses presented in this chapter highlighted the following key findings. The number of hours worked per month had no direct effect on the need for recovery, however, a greater number of hours of physical leisure activity reduced the need for recovery experienced by white-water raft guides. In addition, working on a natural river, as opposed to a man-made course, significantly reduced the need for recovery experienced by white-water raft

guides. High levels of vigor protected against the development of the need for recovery, and this relationship got stronger across the working season. Furthermore, high levels of absorption increased the need for recovery experienced by white-water raft guides, but this relationship did not alter as the season progressed.

With regards to Hypothesis I (original literature discussion in Chapter 4.2.2, page 69), a greater number of hours worked per month as a white-water raft guide had no direct effect on the need for recovery. This was unexpected within this population, as white-water raft guiding is a physically and psychologically demanding occupation (Arnould & Price, 1993). It is possible that any negative consequences which may arise as a result of a greater number of hours worked may be negated by other aspects of the occupation, for example, the physical activity and the environment in which they work (e.g. Korpela & Kinnunen, 2010; Oerlemans et al., 2014). Although a significant difference has been observed in the number of hours worked across a working season, with a greatest amount during Mid-Season, the relationship between hours worked and the need for recovery did not alter over time. This could be further evidence that there is no direct relationship between the number of hours worked and white-water raft guides' need for recovery. It could also be related to fitness. It has been observed that footballers who start the season with a lower fitness will experience a greater fatigue throughout the season regardless of their fitness which develops as the season progresses (Lago-Penas, Rey, Lago-Ballesteros, Dominguez, & Casais, 2013).

As hypothesised, a greater amount of physical leisure activity was associated with a lower need for recovery. However, this relationship did not significantly

change across the working season. This suggests that engaging in physical activities can have a positive effect on employee well-being by reducing work-related fatigue. As the 'need for recovery scale' measures both physical and psychological fatigue, it is not possible to unpick specifically whether physical activity improves physiological, psychological and cognitive health and thus reduces the level of effort required to complete daily tasks such as work (Colcombe & Kramer, 2003) or whether it provides a distraction from work aiding the psychological recovery from work (Sonnentag & Bayer, 2005). As there were no significant differences between the amount of physical activity completed at the different times of the season, it was unsurprising that the relationship between physical leisure activity and the need for recovery did not alter across the working season.

The multilevel models related to Hypothesis II (original literature discussion in Chapter 4.2.2, page 69) identified that the type of river worked on had a direct effect on the need for recovery following a day's work. It showed that working in a natural environment could reduce the levels of need for recovery, whereas, working on a man-made course increased the amount of need for recovery. This builds on previous literature, showing that being immersed in a natural, outdoor environment may aid with the recovery process (Korpela & Kinnunen, 2010). Previous research has demonstrated this with regard to physical leisure activities, however, the current study extends this to the working environment. This could be related to the positive effects of being in the outdoors (De Vries et al., 2015; De Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003). However, this is not the case for man-made courses which are also situated in outdoor areas, such as country parks. Having concrete surroundings may reduce the

stimulating environment in which a river in a natural outdoor setting provides (Korpela & Kinnunen, 2010). Having the outdoor setting of a natural river may reduce the perceptions of being at work and the time spent working may be perceived closer to physical leisure activity. Alternatively, the effects may stem from an organisational level as different white-water rafting providers tend to operate on either natural rivers or man-made courses.

Interestingly, a greater number of hours worked did not increase the strength of the observed relationships between river type and the need for recovery as expected in Hypothesis IIIa (original literature discussion in Chapter 4.2.2, page 69). It is therefore possible that the environment worked in is more important than the amount of time spent working in that environment. Further investigation is required to unpick the specific occupational characteristics, whether it may be the working environment or the operational structure and job demands of the providers on natural rivers, as to why working on a natural river, as opposed to man-made courses, can reduce the levels of need for recovery among raft guides.

Similarly, a greater number of hours of physical leisure activity did not influence the relationship between the type of river worked on and the need for recovery as hypothesised. This suggests that the benefits of physical leisure activity are separate to the working environment. As it was not recorded where physical leisure activity was undertaken, it is possible that the physical leisure activity undertaken may have occurred in an artificial environment (e.g. a gym) or in a natural outdoor setting. As the number of hours worked in the different environments did not influence the need for recovery, it is possible that the location of the physical activity may also be insignificant. Further investigation

into the effects of working location (i.e. in a natural outdoor setting or an artificial outdoor setting) and the choice of location for physical leisure activity has on the need for recovery is required.

With regards to Hypothesis IV (original literature discussion in Chapter 4.2.3, page 74), vigor was negatively related to the need for recovery as expected. This is consistent with previous literature (Sonnentag & Niessen, 2008). Although it has been suggested that maintaining high levels of work engagement may have negative consequences and result in fatigue (Bakker et al., 2011; Sonnentag & Niessen, 2008), this does not appear to be the case for white-water raft guides. This could be related to the physical aspect of the occupation where a high level of energy is constantly required whilst rafting. Furthermore, physical activity has been suggested to increase levels of work engagement on the following day (ten Brummelhuis & Bakker, 2012). It is therefore possible that the physical activity achieved through the raft guiding may maintain levels of vigor for those who with previous high levels. In contrast, it is possible that those with low levels of vigor may exhaust themselves over time. The levels of energy at work may impact on the physical health of white-water raft guides. Further investigation is required to assess how levels of vigor and the early stages of fatigue affect the number of chronic MSCs reported by white-water raft guides.

In the current study, it was expected to be found that dedication would be negatively related to the need for recovery, as seen with the nested correlations. However, the multilevel analyses identified that dedication had no significant effect on the need for recovery among raft guides. One reason why this may be the case is that vigor and dedication are considered to be the

positive components of work engagement (Gonzalez-Roma et al., 2006) and although work engagement, as a whole, has been associated with positive health outcomes (Schaufeli et al., 2008), vigor may be more important when considering fatigue.

Multilevel analyses indicated that higher levels of absorption contributed to a higher need for recovery following work. This supports previous literature which has discussed that sustaining high levels of energy committed to work would result in negative consequences such as fatigue (Bakker et al., 2011; Sonnentag & Niessen, 2008). Individuals who are highly absorbed in their work by working overtime may find it more difficult to detach themselves from work (Beckers et al., 2004), and therefore are more likely to require a higher need for recovery. The present study has demonstrated that prolonged high levels of absorption can result in the early stages of chronic fatigue from work. It is unknown whether the high levels of absorption have a negative impact on the physical health of white-water raft guides. This requires further investigation.

It was expected that the number of hours worked as a white-water raft guide and the number of hours of physical leisure activity would moderate the relationships between the components of work engagement and the need for emotional and physical recovery following work (Hypothesis V [Original literature discussion in Chapter 4.2.3, page 74]). However, no significant interaction effects were observed. This was surprising as interaction effects between the number hours worked and work engagement has previously been reported (Sonnentag & Niessen, 2008). Furthermore, high levels of absorption have been associated with longer working hours (Beckers et al., 2004), which in turn has been significantly associated with a greater need for recovery (Geurts

& Demerouti, 2003). It is possible that this is because white-water raft guides may perceive their work as fun which may mean that the job demands associated with working hours have limited effect on either work engagement or the need for recovery. The extent to which physically active, sporting occupations are perceived as work and how this affects the relationships between psychological resources and fatigue requires further attention.

In addition to no interaction effects being observed, hours worked as a raft guide had no direct effect on the need for recovery. This is consistent with previous findings (Bos et al., 2013; Van der Hulst et al., 2006). This was an unexpected finding according to the hypothesis, as white-water raft guiding is a physically and psychologically demanding occupation (Arnould & Price, 1993). It is possible that any negative consequences which may arise as a result of the job demands may be negated by the stimulating environment in which they work. Particularly as physical activity in an outdoor setting has been associated with a reduced need for recovery (Korpela & Kinnunen, 2010; Oerlemans et al., 2014). However, this research examined physical leisure activity, not physically active jobs. Interestingly, physical leisure activity had no direct effect on the need for recovery either. It is possible that the physical activities in which white-water raft guides engage in are not too dissimilar from their work, as suggested by anecdotal and empirical evidence (AAIAC, 2006; McDermott & Munir, 2012). It is therefore possible that the benefits from physical activity providing a distraction and aiding with psychological detachment from work (Sonnentag & Bayer, 2005) is not achieved. It has been suggested that working long hours and then engaging in physically active leisure activities may increase the risk of chronic MSCs (AAIAC, 2006; McDermott & Munir, 2012). The effects of work

and physical leisure activities on white-water raft guides' physical health has yet to be tested.

7.5 Summary and Conclusions

It has been identified that the levels of white-water raft guides' work engagement and the environmental surroundings of their work affect their levels of need for recovery following a day's work. Specifically, high levels of vigor and working on a natural river reduced the need for recovery, whereas high levels of absorption and working on a man-made course increased it. Working on a natural river, which may provide a more stimulating environment (Korpela & Kinnunen, 2010), may reduce the levels of need for recovery experienced. However, it is unknown what effects working in different environments has on white-water raft guides' physical well-being. Although the number of hours of work as a white-water raft guide and the number of hours of physical leisure activity had no direct effect on the level of need for recovery white-water raft guides experience, it may influence their well-being in a different way. High levels of vigor reduced the levels of need for recovery, whereas, high levels of absorption increased white-water raft guides' need for recovery. Maintaining high levels of energy in the workplace can have benefits for physical and psychological well-being, such as reduced levels of fatigue (Schaufeli et al., 2008). However, being too absorbed in ones' work prevents psychological detachment which can result in negative consequences (Bakker et al., 2011; Sonnentag & Niessen, 2008). The results presented in this chapter explored how these factors influenced the early stages of work-related fatigue, however, further analyses are required to assess how these factors affect work-related MSCs. Further research to investigate the effects of the number of hours worked, physical leisure activity, work engagement and the need for recovery have on the development of chronic MSCs is required.

Chapter 8 Predicting Chronic Musculoskeletal Conditions among White-Water Raft Guides: Multilevel Analyses of Longitudinal Data

8.1 Introduction

Results presented in the previous chapter identified that working on a natural river and high levels of vigor protect against the need for recovery, whereas, working on a man-made course and high levels of absorption contribute to a higher need for recovery. Individuals who experience low levels of work engagement (Peterson et al., 2008) and a higher need for emotional and physical recovery following a day's work (de Croon et al., 2003) are more likely to report a MSC. Considering this evidence, this chapter presents the results from longitudinal analyses looking at how work engagement and the need for recovery are related to the number of chronic MSCs reported by white-water raft guides across a working season.

It has been suggested that working long hours can have negative consequences on physical and psychological health (Raediker, Janßen, Schomann, & Nachreiner, 2006). For example, nurses who work long hours were more likely to report shoulder and back MSCs (Trinkoff, Le, Geiger-Brown, Lipscomb, & Lang, 2006). Furthermore, truck drivers with a higher need for emotional and physical recovery following work were also more likely to report chronic back conditions, than those with a lower need for recovery (de Croon et al., 2003). These studies looked at the longitudinal effects of psychological or psychosocial factors when predicting work-related MSCs. It is therefore

possible that white-water raft guides, who work in a physically active occupation, may accumulate injuries if engagement at work is low and recovery is insufficient.

Although the need for recovery has been associated with the development of chronic MSCs, it has been reported that physical factors, such as workloads, were better predictors of MSCs among nurses than psychological measures (Trinkoff et al., 2006). It is therefore possible that the physical demands from the working environment, the number of hours worked, and the amount of physical leisure activity may influence the development of chronic MSCs among white-water raft guides working in the UK.

Previous literature has identified that the need for emotional and physical recovery following work accumulates over time, especially when workloads (indicated by the number of hours worked (Major et al., 2002)) are high and vigour is low (Sonnentag & Niessen, 2008). These factors may interact as evidence suggests that low levels of work engagement combined with high workloads was associated with more negative physical symptoms, including chronic MSCs, among soldiers (Britt, Castro, & Adler, 2005). It is therefore possible that white-water raft guides who report a lower level of work engagement and work long hours may experience a greater number of chronic MSCs.

However, the relationship between the number of hours worked and health may not be linear and may actually resemble a bell curve (Sparks et al., 1997). This suggests that individuals who work too few hours as well as longer hours may be at greater risk of negative health consequences (Sparks et al., 1997). This

may explain why not all studies have found a direct association between the number of hours worked and the development of chronic MSCs (Tucker & Rutherford, 2005). However, it could also be that these studies have only focused on non-physically active work such as university and office based administration employees. It is therefore possible that physically active work, such as white-water raft guiding, may create a greater risk of chronic MSCs.

This chapter presents the results of the multilevel analyses examining how physical factors, including river type, river grade, hours worked and physical leisure activity, contribute to or protect against chronic MSCs reported by white-water raft guides. The relationships between work engagement, the need for recovery and chronic MSCs and how these are influenced by the time of season are also reported. Finally, how the number of hours worked influences the relationships between the components of work engagement, the need for recovery and chronic MSCs will be presented. The following were therefore hypothesised[4].

8.1.1 Hypotheses

Hypothesis VIa: The type of river, river grade, number of hours worked as a white-water raft guide and number of hours of physical leisure activity will influence the amount of chronic MSCs reported by white-water raft guides across a working season (within subject variations).

[4] A full discussion of the literature informing the development of Hypotheses VI – VIII can be found in Chapter 4.3, from page 79 onwards.

Hypothesis VIb: The type of river, river grade, number of hours worked as a white-water raft guide and number of hours of physical leisure activity will influence the amount of chronic MSCs reported by white-water raft guides across a working season (between subject variations).

Hypothesis VIIa: Low levels of vigor and dedication and high levels of absorption and a high need for recovery will contribute to chronic MSCs reported by white-water raft guides across a working season (within subject variations).

Hypothesis VIIb: Low levels of vigor and dedication and high levels of absorption and a high need for recovery will contribute to chronic MSCs reported by white-water raft guides across a working season (between subject variations).

Hypothesis VIIIa: A high workload, indicated by the number of hours worked as a white-water raft guide, will exacerbate the relationships stated in Hypotheses VII (within subject variations).

Hypothesis VIIIb: A high workload, indicated by the number of hours worked as a white-water raft guide, will exacerbate the relationships stated in Hypotheses VII (between subject variations).

8.2 Analyses

As with the previous chapter, the repeated measures design can be considered as multi-level, with the measurements taken from Early, Mid and Late Season being nested within the individual. This creates a two-level model, with the

repeated measures at level one (N = 3 occasions) and the second level being the individual (N = 126 participants). A total of 303 observations were included in the analyses. Mean scores and standard deviations were calculated for the nested variables. Furthermore, correlations between the nested variables were also conducted.

As described in Chapter 6.2, multilevel analyses were the most appropriate for the data set obtained as there were missing data due to the attrition throughout the longitudinal study. Multilevel modelling is robust against missing data (Quené & Van den Bergh, 2004) therefore all available data could be included which reduces any biases in the analyses (Hill & Goldstein, 1998). Data were not standardised, as this affects the standard error in Level 1 coefficients (Nezlek, 2001), which would be detrimental to the analyses.

For hypotheses addressing the within subject associations with the number of chronic MSCs reported by white-water raft guides, centring within cluster (CWC) techniques were used. Centred within cluster variables do not correlate with Level 2 variables, thus creating a pure within subjects estimation of the relationship between the independent variables and the dependent variable (Enders & Tofighi, 2007). Independent variables were grand-mean centred (CGM) for hypotheses testing the between subject estimations of the relationships between the independent variables and the dependent variable. Centring variables is essential for increasing the robustness of the models assessed (Nezlek, 2001; Enders & Tofighi, 2007) and also to be able to assess interaction effects in the analyses testing hypotheses concerned with moderation effects (Baron & Kenny, 1986).

8.3 Results

For details of the participants, see Chapter 6, section 3.1.

8.3.1 Preliminary Analyses

Prior to multilevel analyses being conducted, means and standard deviations were calculated for the nested variables. Furthermore, correlations between the nested variables were calculated. Means, standard deviations and correlations are presented in Table 8.1.

The only significant relationship identified following the inclusion of the nested chronic MSCs variable was with the need for recovery. The need for recovery was also significantly, positively associated with the number of chronic MSCs reported ($r = 0.16$, $p = 0.01$). No other variables were significantly associated with the number of chronic MSCs reported ($-0.04 \geq r \leq 0.10$, $p \geq 0.08$). For a full description of the correlations, see Chapter 6.3.1.

Prior to testing the hypotheses, an empty model was conducted to establish the within and between subject variations in the number of chronic MSCs reported. The results identified that 60.82% of the variation in chronic MSCs was accounted for by within subject variation and that 39.18% of the variation in chronic MSCs was accounted for by the between subject variation. Following the empty model, covariates were added to assess whether these should be included in further analyses. Years' experience was significantly associated with the number of chronic MSCs reported ($B = 0.07$, $SE = 0.03$, $p = 0.04$), however, age ($B = -0.04$, $SE = 0.02$, $p = 0.08$) and BMI ($B = 0.07$, $SE = 0.06$, $p = 0.25$) were not associated with chronic MSCs.

Table 8.1: Means, standard deviations and correlations among the nested study variables (N=303)

	Mean	SD	1	2	3	4	5	6	7	8	9
1. Age	30.36	10.04	-								
2. Body Mass Index	24.61	2.90	**0.28****	-							
3. Years' Experience	5.51	6.14	**0.51****	**0.13***	-						
4. Vigor	4.09	0.84	0.09	-0.05	0.11	-					
5. Dedication	4.72	0.91	0.10	-0.06	**0.13***	**0.74****	**-**				
6. Absorption	4.23	0.97	**0.13***	-0.05	0.04	**0.56****	**0.57****	-			
7. Need for Recovery	35.34	25.24	-0.02	-0.00	-0.03	**-0.25****	**-0.20****	-0.02	-		
8. Hours Worked as a Raft Guide	37.25	54.18	**-0.13***	**-0.15****	0.01	**0.13***	0.11	0.11	0.04	-	
9. Hours of Physical Leisure Activity	30.23	32.39	-0.07	-0.00	-0.01	-0.06	**-0.14***	-0.10	-0.03	-0.02	-
10. Number of Chronic MSCs Reported	3.72	2.53	-0.04	0.09	0.10	0.07	0.06	0.02	**0.16****	0.08	0.07

*p<0.05 **p<0.01

This was supported by the inclusion of the covariates did not significantly improve the model fit (χ^2 = 5.76, df = 3, p = 0.12). Years' experience will therefore be controlled for when hypothesis testing. The results from the empty model and the model including covariates are presented in Table 8.2.

Table 8.2: Coefficients from the empty model and the model including covariates

Variables	Empty Model		Model Including Covariates	
	Estimation	SE	Estimation	SE
Intercept	3.71	0.18	3.70	0.18
Age			-0.04	0.02
Body Mass Index			0.07	0.06
Years' Experience			**0.07***	**0.03**
2 x log		1386.17		1380.41
X^2				5.76
Df				3
Level 1 Variation	3.88	0.41	3.89	0.41
Level 2 Variation	2.50	0.56	2.30	0.53

*p<0.05 **p<0.01; SE=Standard Error

8.3.2 Results relating to Hypothesis VI

It is possible that the physical demands related to the work conditions, workload and additional physical activity undertaken during leisure time could contribute to or protect against the number of chronic MSCs experienced by white-water raft guides. The following hypothesis was therefore tested.

Hypothesis VI: The type of river, river grade, number of hours worked as a white-water raft guide and number of hours of physical leisure activity will influence the amount of chronic MSCs reported by white-water raft guides across a working season.

The coefficients of the multilevel analyses testing Hypothesis VI are presented in Table 8.3. It can be seen that the inclusion of the independent variables (river grade, river type, monthly hours worked as a raft guide and monthly hours of physical leisure activity) significantly improved the model fit ($\chi^2 = 145.49$, df = 7, $p < 0.005$) however did not explain any of the within subject variation of the number of chronic MSCs reported by raft guides. None of the variables were significantly associated with the number of chronic MSCs reported ($p \geq 0.28$). In order to test for the effects over time, time interaction terms were included in Model 2. The inclusion of the time interaction terms did not significantly improve the model fit ($\chi^2 = 2.24$, df = 5, $p = 0.82$), nor did it explain any of the within subject variation. Specifically, none of the other relationships between the independent variables and the number of chronic MSCs reported were significant ($p \geq 0.16$) nor did these relationship change over time ($p \geq 0.22$).

Table 8.3: Coefficients from the multilevel analyses testing the within subject effects of physical factors predicting the number of chronic MSCs across a working season

Variable	Model 1		Model 2	
	Estimation	SE	Estimation	SE
Intercept	3.73	0.42	3.45	0.47
Time	-0.25	0.17	0.19	0.39
Years' Experience	0.03	0.03	0.03	0.03
River Grade 4-5	0.10	0.40	0.23	0.46
Natural River	0.48	0.44	0.72	0.51
Man-Made Course	-0.18	0.49	0.18	0.58
Hours Worked as a Raft Guide$_{CWC}$	-0.00	0.00	-0.00	0.01
Hours of Physical Leisure Activity$_{CWC}$	0.00	0.01	-0.00	0.01
River Grade 4-5*Time			-0.20	0.37
Natural River*Time			-0.40	0.42
Man-Made Course*Time			-0.56	0.46
Hours RG$_{CWC}$*Time			0.00	0.01
Hours PLA$_{CWC}$*Time			0.01	0.01
2 x log		1240.68		1238.44
X^2		**145.49****		2.24
Df		7		5
Level 1 Variation	3.99	0.46	3.95	0.46
Level 2 Variation	2.36	0.58	2.34	0.58

*p<0.05 **p<0.01; SE=Standard Error; CWC=Centred within cluster

The coefficients of the multilevel analyses testing the between subject effects of work environment, hours worked and physical leisure activity on the number of chronic MSCs reported by white-water raft guides are presented in Table 8.4. It can be seen that the inclusion of the independent variables (river grade, river type, monthly hours worked as a raft guide and monthly hours of physical leisure activity) significantly improved the model fit (χ^2 = 146.47, df = 7, p < 0.005) however did not explain any of the between subject variation of the number of chronic MSCs reported by raft guides. None of the variables were significantly associated with the number of chronic MSCs reported (p ≥ 0.23). In order to test for the between subject effects across a working season, time interaction terms were included in Model 4. The inclusion of the time interaction terms did not significantly improve the model fit (χ^2 = 2.42, df = 5, p = 0.79), nor did it explain any of the between subject variation. Specifically, none of the other relationships between the independent variables and the number of chronic MSCs reported were significant (p ≥ 0.22) nor did these relationship change over time (p ≥ 0.43).

Table 8.4: Coefficients from the multilevel analyses testing the between subject effects of physical factors predicting the number of chronic MSCs across a working season

Variable	Model 3		Model 4	
	Estimation	SE	Estimation	SE
Intercept	3.76	0.42	3.58	0.48
Time	-0.25	1.73	-0.28	0.38
Years' Experience	0.03	0.03	0.03	0.03
River Grade 4-5	0.10	0.41	0.13	0.48
Natural River	0.44	0.44	0.64	0.51
Man-Made Course	-0.22	0.49	0.15	0.58
Hours Worked as a Raft Guide$_{CGM}$	0.00	0.00	0.00	0.00
Hours of Physical Leisure Activity$_{CGM}$	0.01	0.01	0.01	0.01
River Grade 4-5*Time			-0.10	0.39
Natural River*Time			0.33	0.42
Man-Made Course*Time			-0.20	0.45
Hours RG$_{CGM}$*Time			-0.00	0.00
Hours PLA$_{CGM}$*Time			-0.00	0.01
2 x log		1239.70		1237.28
X^2		**146.47****		2.42
Df		7		5
Level 1 Variation	3.99	0.47	3.91	0.46
Level 2 Variation	2.32	0.58	2.37	0.58

*p<0.05 **p<0.01; SE=Standard Error; CGM=Grand-Mean Centred

8.3.3 Interim Summary of the Results relating to Hypothesis VI

The key findings from this section are summarised below.

- Work environment, and within subject variations in the number of hours worked as a white-water raft guide and physical leisure activity had no effect on the number of chronic MSCs.
- These relationships did not alter over time.
- No significant between subject effects were observed when assessing the relationships between work environment, hours worked and physical leisure activity when predicting chronic MSCs.
- These relationships did not alter over time either.

8.3.4 Results relating to Hypothesis VII

Chronic MSCs have been suggested to be more prevalent among workers who experience lower levels of engagement with their work and require a greater need for recovery. It is therefore possible that levels of work engagement and the need for recovery may also be related among white-water raft guides working in the UK. Therefore the following hypothesis was derived and tested.

Hypothesis VII: Low levels of vigor and dedication and high levels of absorption and a high need for recovery will contribute to chronic MSCs reported by white-water raft guides across a working season.

It can be seen in Table 8.5 that the overall model fit did not significantly improve following the inclusion of the components of work engagement and the need for recovery (χ^2 = 7.21, df = 6, p = 0.30). The results identified that the number of chronic injuries reduced over time (B = -0.30, SE = 0.15, p = 0.04), however, vigor (B = 0.16, SE = 0.32, p = 0.62), dedication (B = -0.15, SE = 0.31, p = 0.63), absorption (B = 0.11, SE = 0.25, p = 0.66), and the need for recovery (β = 0.01, SE = 0.01, p = 0.42) had no direct effect on the number of chronic MSCs experienced by raft guides. Interaction terms between time and the components of work engagement and the need for recovery were entered into Model 6 to assess whether these relationships altered over time. The inclusion of these variables did not significantly improve the model fit (χ^2 = 5.91, df = 4, p = 0.21) and only explained a further 4.12% of the within subject variance of chronic MSCs reported by white-water raft guides. A higher level of vigor was significantly associated with an increased number of chronic MSCs reported (B = 1.06, SE = 0.55, p = 0.05), however, this association significantly weakened

over time (B = -0.96, SE = 0.49, p = 0.05). No other significant direct or indirect effects were observed (p ≥ 0.29).

High levels of within subject vigor were significantly associated with a greater number of chronic MSCs, however this effect reduced over time. No other direct or indirect effects were observed, therefore Hypothesis VIIa was rejected.

With regards to Hypothesis VIIb, the inclusion of the grand mean centred independent variables to test between subject variations in chronic MSCs significantly improved the model fit (χ^2 = 15.11, df = 6, p = 0.02) but only accounted for 3.35% of the between subject variance in chronic MSCs (See Model 7). The results identify that individuals who have a greater need for recovery were associated with a higher number of chronic MSCs (B = 0.02, SE = 0.01, p < 0.005). There was a significant reduction in chronic MSCs reported across time (B = -0.29, SE = 0.14, p = 0.04), however years' experience was not significantly related to the number of chronic MSCs reported (B = 0.04, SE = 0.03, p = 0.16). No other associations were identified between the independent variables and chronic MSCs reported by white-water raft guides (p ≥ 0.26). To test whether the associations changed across the working season, interaction terms were created between the independent variables and time (see Model 8). The inclusion of the interaction terms did not significantly improve the model fit (χ^2 = 2.60, df = 4, p = 0.63) and only accounted for an additional 1.03% of the between subject variance in the number of chronic MSCs reported. None of the relationships between the independent variables and the number of chronic MSCs altered over time (p ≥ 0.10).

Hypothesis VIIb was partially accepted as individuals who had a greater need for recovery were associated with having a greater number of chronic MSCs. However, the components of work engagement had no effect on the number of chronic MSCs experienced by white-water raft guides. Furthermore, no effects of time were observed.

Table 8.5: Multilevel analyses output for vigor, dedication, absorption and the need for recovery predicting chronic MSCs

Variables	Hypothesis VIIa (CWC)				Hypothesis VIIb (CGM)			
	Model 5		Model 6		Model 7		Model 8	
	Estimation	SE	Estimation	SE	Estimation	SE	Estimation	SE
Intercept	3.94	0.22	3.92	0.22	3.94	0.21	3.95	0.21
Time	**-0.30***	**0.15**	**-0.28***	**0.14**	**-0.29***	**0.14**	**-0.28***	**0.14**
Years' Experience	0.04	0.03	0.04	0.03	0.04	0.03	0.04	0.03
$Vigor_{CWC}$	0.16	0.32	**1.06***	**0.55**	0.29	0.25	0.38	0.33
$Dedication_{CWC}$	-0.15	0.31	-0.27	0.51	0.02	0.24	-0.01	0.30
$Absorption_{CWC}$	0.11	0.25	0.20	0.41	-0.06	0.19	-0.08	0.23
Need for $Recovery_{CWC}$	0.01	0.01	0.02	0.02	**0.02****	**0.01**	**0.03****	**0.01**
$Vigor_{CWC}$*Time			**-0.96***	**0.49**			-0.05	0.28
$Dedication_{CWC}$*Time			0.15	0.47			-0.02	0.25
$Absorption_{CWC}$*Time			-0.12	0.40			-0.01	0.20
Need for $Recovery_{CWC}$*Time			-0.01	0.02			-0.01	0.01
2 x log		1378.96		1373.05		1371.06		1368.46
X^2		7.21		5.91		**15.11***		2.60
Df		6		4		6		4
Level 1 Variation	3.75	0.40	3.59	0.38	3.75	0.40	3.71	0.39
Level 2 Variation	2.53	0.55	2.66	0.56	2.27	0.52	2.26	0.52

*p<0.05 **p<0.01; SE=Standard Error; CWC=Centred within cluster; CGM=Grand-Mean Centred

8.3.5 Interim Summary of Results relating to Hypotheses VII

The key findings from this section are summarised below.

- Across a working season, high levels of vigor contributed to a greater number of chronic MSCs reported by white-water raft guides.
- The strength of this relationship decreased as the season progressed.
- No other within subject effects were observed when testing relationships between dedication, absorption, the need for recovery and the number of chronic MSCs reported.
- Individuals who had a greater need for recovery were more likely to report a greater number of chronic MSCs than those with a lower need for recovery.
- No other between subject effects were observed.
- The between subjects effects of work engagement and the need for recovery on the development of chronic MSCs did not change over time.

8.3.6 Results relating to Hypothesis VIII

Workload psychological factors have been related to work-related chronic MSCs. For example, individuals who work long hours and have a greater need for recovery or are less engaged with their work are more likely to report a chronic MSC. This could also be possible among white-water raft guides, the following hypothesis was therefore tested.

Hypothesis VIIIa: A high workload, indicated by the number of hours worked as a white-water raft guide, will exacerbate the relationships stated in Hypotheses VII (within subject associations).

Hypothesis VIIIb: A high workload, indicated by the number of hours worked as a white-water raft guide, will exacerbate the relationships stated in Hypotheses VII (between subject associations).

The results of the within subjects multilevel analyses testing the direct effects of vigor, dedication, absorption and the need for recovery on the number of chronic MSCs experienced, and the indirect effects of monthly hours worked as a white-water raft guide on the number of chronic MSCs experienced are presented in Table 8.6. The inclusion of the independent variables, vigor, dedication, absorption and the need for recovery, and the moderator, hours worked as a raft guide, did not significantly improve the model fit ($\chi^2 = 7.43$, df = 7, p = 0.39) and did not further explain any of the within subject variation of chronic MSCs reported. Specifically, none of the study variables were significantly associated with the number of chronic MSCs reported by each raft guide ($p \geq 0.32$). When testing the within subject, indirect effect of hours worked on the number of chronic MSCs, the inclusion of the interaction terms did not

significantly improve the model fit (χ^2 = 1.18, df = 4, p = 0.88) and only explained a further 3.61% of the within subject variation of the chronic MSCs reported by each raft guide. The number of hours worked by each raft guide did not interact with their levels of vigor (B = 0.00, SE = 0.01, p = 0.79), dedication (B = -0.01, SE = 0.01, p = 0.40), absorption (B = 0.01, SE = 0.01, p = 0.45) or need for recovery (B = 0.00, SE = 0.00, p = 1.00) when predicting the number of chronic MSCs they experienced.

Table 8.6: Multilevel model output for the between subject variations of vigor, dedication, absorption and the need for recovery and the indirect effects of hours worked as a white-water raft guide when predicting chronic MSCs

Variables	Model 9		Model 10	
	Estimation	SE	Estimation	SE
Intercept	3.95	0.21	3.94	0.22
Time	**-0.31***	**0.15**	**-0.31***	**0.15**
Years' Experience	0.04	0.03	0.04	0.30
$Vigor_{CWC}$	0.16	0.32	0.13	0.32
$Dedication_{CWC}$	-0.16	0.31	-0.19	0.31
$Absorption_{CWC}$	0.12	0.25	0.13	0.25
Need for $Recovery_{CWC}$	0.01	0.01	0.01	0.01
Hours Worked as a Raft $Guide_{CWC}$	-0.00	0.00	-0.00	0.00
$Vigor_{CWC}$*Hours Worked as a Raft $Guide_{CWC}$			0.00	0.01
$Dedication_{CWC}$* Hours Worked as a Raft $Guide_{CWC}$			-0.01	0.01
$Absorption_{CWC}$* Hours Worked as a Raft $Guide_{CWC}$			0.01	0.01
(Need for $Recovery_{CWC}$* Hours Worked as a Raft $Guide_{CWC}$			0.00	0.00
2 x log		1378.74		1376.92
X^2		7.43		1.18
df		7		4
Level 1 Variation	3.86	0.41	3.74	0.39
Level 2 Variation	2.44	0.55	2.49	0.55

*p<0.05 **p<0.01; SE=Standard Error; CWC=Centred within cluster

The between subject effects of work engagement, need for recovery, hours worked as a raft guide on the number of chronic MSCs reported by white-water raft guides were tested by Hypothesis VIIIb. The coefficients from the multilevel analyses are presented in Table 8.7. The inclusion of the components of work engagement, the need for recovery and hours worked as a white-water raft guide significantly improved the model fit (χ^2 = 15.17, df = 7, p = 0.03), and explained 3.09% of the between subject variation in chronic MSCs reported by white-water raft guides. A greater need for recovery was significantly associated with an increased number of chronic MSCs reported by white-water raft guides (B = 0.02, SE = 0.01, p < 0.005). No other significant direct associations were observed (p ≥ 0.64). Indirect associations were tested by including interaction terms between the independent variables, vigor, dedication, absorption and the need for recovery and the moderator, hours worked as a raft guide. The model fit did not significantly improve (χ^2 = 1.15, df = 4, p = 0.89) with the inclusion of the interaction terms. The monthly number of hours worked did not have an indirect effect on the number of chronic MSCs reported by white-water raft guides (p ≥ 0.23).

Hypothesis VIII was rejected as the monthly number of hours worked as a white-water raft guide did not have an indirect effect on the number of chronic MSCs reported when testing both within and between subject effects.

Table 8.7: Multilevel model output for the between subject variations of vigor, dedication, absorption and the need for recovery and the indirect effects of hours worked as a white-water raft guide when predicting chronic MSCs

Variables	Model 11		Model 12	
	Estimation	SE	Estimation	SE
Intercept	3.94	0.21	3.94	0.21
Time	-0.29	0.15	-0.27	0.15
Years' Experience	0.04	0.03	0.04	0.03
$Vigor_{GMC}$	0.28	0.25	0.26	0.26
$Dedication_{GMC}$	0.02	0.24	0.03	0.24
$Absorption_{GMC}$	-0.06	0.19	-0.05	0.19
Need for $Recovery_{GMC}$	**0.02****	**0.01**	**0.02****	**0.01**
Hours Worked as a Raft $Guide_{GMC}$	0.00	0.00	0.00	0.00
$Vigor_{GMC}$*Hours Worked as a Raft $Guide_{GMC}$			-0.01	0.01
$Dedication_{GMC}$*Hours Worked as a Raft $Guide_{GMC}$			0.00	0.01
$Absorption_{GMC}$*Hours Worked as a Raft $Guide_{GMC}$			0.00	0.00
(Need for $Recovery_{GMC}$*Hours Worked as a Raft $Guide_{GMC}$			-0.00	0.00
2 x log		1371.00		1369.85
X^2		15.17		1.15
df		7		4
Level 1 Variation	3.76	0.40	3.72	0.39
Level 2 Variation	2.26	0.52	2.29	0.52

*p<0.05 **p<0.01; SE=Standard Error; CGM=Grand-Mean Centred

8.3.7 Interim Summary of Results relating to Hypotheses VIII

The key findings from this section are summarised below.

- No direct effects were observed between work engagement, need for recovery and hours worked on the number of chronic MSCs reported across the working season.
- The number of hours worked did not interact with the levels of work engagement or need for recovery as hypothesised.
- Individuals with a greater need for recovery were more likely to report a greater number of chronic MSCs.
- No other direct effects were observed from the between subject effects tested.
- The between subject number of hours worked did not interact with the between subject levels of work engagement and need for recovery when predicting the number of chronic MSCs experienced.

8.4 Discussion

From this work it has been identified that the physical factors, including the type of river, river grade and hours of physical activity, either associated with work or leisure time, have no direct effect on the development of chronic MSCs. This was regardless of the time of season, even when a greater number of hours were worked during mid-season. With regards to the psychological factors, the within subject effects of vigor contributed to the development of chronic MSCs, however, this relationship weakened over time. White-water raft guides with a greater need for recovery were more likely to develop a greater number of chronic MSCs. Although it was observed that there was a significant change in the number of chronic injuries across a working season, the relationships between the psychological factors and the development of chronic MSCs did not change. Finally it was identified that the number of hours worked as a white water raft guide had no direct or indirect effect on the development of chronic MSCs.

With regards to Hypothesis VI (original literature discussion in Chapter 4.3, page 79), It was expected that the physical factors would have a direct effect on the development of chronic MSCs as a greater number of hours of physical leisure activity and working on a natural river was associated with a higher risk of reporting chronic shoulder conditions, and working longer hours as a white-water raft guide was associated with a greater risk of reporting chronic lower back pain (Chapter 6.3.8). However none of the physical factors measured had a direct effect on the number of chronic MSCs reported. This may be because the specific physical factors may be directly related to the specific chronic

MSCs reported in Chapter 6.3.8 and may not influence the number of chronic MSCs experienced as a whole. Further investigation into the direct effects physical factors have on specific chronic MSCs, such as the lower back and shoulder, are required.

This was surprising as high workloads, have been shown to be associated with the development of MSCs in other occupations, such as back pain among nurses (Trinkoff et al., 2006). However, as white-water rafting is a sporting occupation, it is possible that longer working hours may increase physical fitness, which may partially protect against the development of chronic MSCs. Furthermore, the relationship between hours worked and physical and psychological health has been suggested to resemble a bell curve as opposed to being linear (Sparks et al., 1997). This may explain why no direct relationship was identified by the multilevel analyses.

With regards to the physical aspects of the river (river type and grade), it is possible that white-water raft guides are skilled enough to avoid the development on chronic MSCs as they are trained to work on that specific river. This may explain why a direct effect on chronic MSCs was not observed. However, this may take a greater toll over time, as observed with Mountain Leaders job' (McDermott & Munir, 2012) as a greater number of years' experience contributed to the number of chronic MSCs reported by white-water raft guides.

As workers in the Outdoor Industry have been reported to engage in physical activity in their leisure time on top of their physically active work (AAIAC, 2006; McDermott & Munir, 2012), it was expected that an increase in physical leisure

activity may have a direct effect on the number of chronic MSCs. However, this was not the case.

When testing Hypothesis VIIa (original literature discussion in Chapter 4.3.3, page 85), it was identified that the within subject differences in vigor were associated with the number of chronic MSCs. Specifically, individuals with higher levels of vigor were more likely to have more chronic MSCs. It is possible that white-water raft guides may continue to work with MSCs if they are feeling vigorous enough, and therefore do not rest sufficiently, as observed with Mountain Leaders (McDermott & Munir, 2012). Interestingly, neither dedication nor absorption were significantly related to the number of chronic MSCs reported by white-water raft guides. This contrasts with previous literature which identified that high levels of work engagement, particularly vigor, can protect against the development of MSCs (Sonnentag & Niessen, 2008).

With regards to the between subject effects, a greater need for recovery following work contributed to the number of chronic MSCs reported by white-water raft guides. This suggests that white-water raft guides who are experiencing the early stages of work-related fatigue are more likely to develop a greater number of chronic MSCs than their peers. This is in line with other studies, such as a two year study which identified that a greater need for recovery predicts chronic back pain among coach drivers (de Croon et al., 2003).

Furthermore, when testing Hypothesis VIII (original literature discussion in Chapter 4.3.3, page 85), the number of hours did not moderate the relationship

between work engagement and chronic MSCs. This contradicts research which has shown that soldiers who work long hours and have low levels of engagement are more likely to develop chronic MSCs (Britt et al., 2005). Additionally, absorbed workers have been shown to work longer hours (van Hooff et al., 2007) which in turn has been linked to negative health outcomes, such as MSCs (Raediker et al., 2006; Trinkoff et al., 2006). However this is not the case among white-water raft guides. It is possible that the measures used were not sensitive enough as they were self-reported. It is possible that white-water raft guides enjoy their occupation so much that they do not perceive their job as work but more of a hobby as discussed in the qualitative data (Chapter 3.4.4.5). If this is the case then the influence of work engagement and hours worked may be minimal. Furthermore, as already mentioned, the chronic MSCs may have developed over a greater amount of time than a single working season. Therefore measures taken within the single season may have limited effect on the chronic MSCs reported. A longer term study examining the cumulative impact on raft guides over several seasons may provide more insight into the development of chronic MSCs.

Although physical and psychological factors had no direct effect on the number of chronic MSCs developed across a working season, there is evidence that the accumulative effects may be longer term across a working career. Further investigation is required to assess the accumulative effects of the longer term working in a physically active occupation. A greater need for recovery contributed to a greater number of chronic MSCs reported as expected. Furthermore, the reciprocal relationship between the need for recovery following work and chronic MSCs requires further investigation. Structural

Equation Modelling would be an appropriate method to test hypotheses related to reciprocal relationships.

It is still unclear exactly what contributes to the development of chronic MSCs among white-water raft guides as physical (the number of hours worked), psychological (work engagement and the need for recovery) factors have a limited effect. Further research investigating the day to day working practices would provide useful insight into understanding the pattern of injury observed. Furthermore, ergonomic assessment of the cumulative effect of forces transferred through the body is essential.

Chapter 9 Discussion

This research has examined physical and psychological factors associated with work-related health of white-water raft guides. Specifically, it was concerned with work-related fatigue following a day's work and the development of MSCs. Work-related ill-health is a serious problem, particularly for those working in the Outdoor Industry (AAIAC, 2006; McDermott & Munir, 2012). Although various injuries and illnesses have been associated with white-water raft guides, chronic back pain is the only work-related ill-health identified among white-water raft guides (Jackson & Verscheure, 2006). Research from other industries have identified that the number of hours worked (e.g. Major et al., 2002), amount of physical leisure activity (e.g. Oerlemans & Bakker, 2014), being outside in the natural environment (e.g. Korpela & Kinnunen, 2010), levels of engagement at work (e.g. Peterson et al., 2008) have been associated with both positive and negative aspects of work-related health, for example fatigue (e.g. Sluiter et al., 2003) and the development of MSCs (e.g. Elders & Burdorf, 2001). The current body of research has explored injuries and ill-health associated with white-water raft guiding and identified potential causes of such work-related ill-health. Analyses have been conducted to assess how hours worked, physical leisure activity, work environment and engagement at work are related to work-related fatigue and the development of chronic MSCs. The key findings of this body of research are presented below.

9.1 Summary of Key Findings

The findings from this research suggest that white-water raft guiding is a challenging occupation and white-water raft guides are at high risk of work-related injury and ill-health. It was initially identified from the interview study that work-related musculoskeletal conditions (MSCs) are a serious issue among white-water raft guides working in the UK, with back pain being the most prominent problem. Despite raft guides experiencing work-related MSCs, they continue to work, with a small number using anti-inflammatory medication in order to do so. These findings were supported by the preliminary results from the longitudinal study where between 81.6 – 93.7% of participants reported at least one MSC, with lower back pain being the most prevalent, during the working season. A maximum of 28.7% of these conditions were activity limiting suggesting the majority respondents continued to work despite experiencing MSCs. A summary of the hypotheses tested throughout this thesis are presented in Table 9.1.

With regards to musculoskeletal conditions, chronic problems were reported more frequently than acute trauma injuries throughout the working season. This was regardless of there being significantly fewer chronic MSCs reported at Mid-Season when compared to Early Season. This supported the findings from the qualitative interview data which identified that acute injuries occurred less frequently than chronic MSCs.

Specific examination of the two most frequently reported chronic MSCs identified that a higher number of hours of physical leisure activity, a greater number of hours worked as a white-water raft guide and guiding bilaterally were

associated with chronic lower back pain and that younger participants and respondents with a greater number of years' experience were more likely to report a chronic shoulder injury.

Due to the greater number of hours worked as a white-water raft guide and physical leisure activity, it was suspected that raft guides may not be ascertaining sufficient recovery following work. Therefore, predictors of the need for physical and emotional recovery following work were assessed using multilevel analyses. High levels of vigor and working solely on a natural river reduced the levels of the early stages of work-related fatigue. However, high levels of absorption and working on a man-made course contributed to a higher need for recovery following work. Interestingly, the time of season, hours worked as a white-water raft guide and physical leisure activity had no direct or moderating effects on the levels of need for recovery experienced by white-water raft guides following work.

Multilevel analyses identified that high levels of within subject vigor was associated with a greater number of chronic MSCs experienced. This association became less prominent as the season progressed. Furthermore, raft guides with a greater need for recovery following work were more likely to experience more chronic MSCs than their peers with a lower need for recovery. This did not change over time. No other within or between subject associations were observed between the study variables and the development of chronic MSCs. Finally, the number of hours worked had no direct or interacting effect on the number of chronic MSCs experienced. This is despite a greater number of hours being associated with chronic lower back pain.

Table 9.1: Summary of hypotheses tested throughout this thesis

Hypothesis Tested	Chapter, Page	Results	Chapter, Page
Hypothesis Ia: A greater number of hours worked per month will be associated with a greater need for recovery across a working season.	4.2.2, p. 69	**Hypothesis rejected** – an increase in working hours predicted a lower need for recovery. This relationship strengthened over time.	7.3.3, p. 141
Hypothesis Ib: A greater number of monthly hours of physical leisure activity will be associated with a lower need for recovery across a working season.	4.2.2, p. 69	**Hypothesis partially accepted** – A greater amount of physical leisure activity predicted a lower need for recovery, however, this relationship did not change over time.	7.3.3, p. 141
Hypothesis II: Working in a natural outdoor environment (i.e. on a natural river), as opposed to working in an artificial environment (i.e. on a man-made course), will be associated with a lower need for recovery.	4.2.2, p. 69	**Hypothesis partially accepted** – Working on a natural river reduced the need for recovery raft guides experienced, whereas working in an artificial environment increased the need for recovery experienced by raft guides, however, these relationships did not vary over time.	7.3.4, p. 144
Hypothesis IIIa: Working longer hours on a natural river will reduce the need for recovery experienced, whereas working longer hours on a man-made course will increase the need for recovery experienced by white-water raft guides.	4.2.2, p. 69	**Hypothesis rejected** – The environment worked in (i.e. natural or man-made) did not influence the relationship between working hours and the need for recovery experienced by raft guides.	7.3.5, p. 146
Hypothesis IIIb: White-water raft guides who work on a natural river and participate in a greater amount of physical leisure activity will experience a lower need for recovery; furthermore an increased amount of physical leisure activity will reduce the need for recovery experienced by those working on man-made courses.	4.2.2, p. 69	**Hypothesis rejected** – The environment worked in (i.e. natural or man-made) did not influence the relationship between physical leisure activity and the need for recovery experienced by raft guides.	7.3.5, p. 146

Table 9.1 Continued: Summary of Hypotheses tested throughout this thesis

Hypothesis Tested	Chapter, Page	Results	Chapter, Page
Hypothesis IV: Across a working season, vigor and dedication will be negatively associated with the need for recovery, whereas absorption will be positively associated with the need for recovery.	4.2.3, p. 74	**Hypothesis partially accepted** – High levels of vigor protected against a greater need for recovery; this relationship strengthened over time. High levels of absorption contributed to a greater need for recovery, however, this association weakened over time.	7.3.7, p. 153
Hypothesis Va: A greater number of monthly hours worked as a white-water raft guide will weaken the negative relationships between the need for recovery and vigor and dedication whereas it will strengthen the positive association between absorption and the need for recovery.	4.2.3, p. 74	**Hypothesis rejected** – The number of hours worked had neither a direct nor indirect effect on the need for recovery when tested alongside the components of work engagement.	7.3.8, p. 155
Hypothesis Vb: A greater number of monthly hours of physical leisure activity will weaken the negative relationships between the need for recovery and vigor and dedication whereas it will strengthen the positive association between absorption and the need for recovery.	4.2.3, p. 74	**Hypothesis rejected** – The number of hours of physical leisure activity had neither a direct nor indirect effect on the need for recovery when tested alongside the components of work engagement.	7.3.8, p. 155
Hypothesis VIa: The type of river, river grade, number of hours worked as a white-water raft guide and number of hours of physical leisure activity will influence the amount of chronic MSCs reported by white-water raft guides across a working season (within subject variations).	4.3, p. 79	**Hypothesis rejected** – None of the independent variables were significantly associated with the number of chronic MSCs reported when testing the within subject effects.	8.3.2, p. 179

Table 9.1 Continued: Summary of Hypotheses tested throughout this thesis

Hypothesis Tested	Chapter, Page	Results	Chapter, Page
Hypothesis VIb: The type of river, river grade, number of hours worked as a white-water raft guide and number of hours of physical leisure activity will influence the amount of chronic MSCs reported by white-water raft guides across a working season (between subject variations).	4.3, p.79	**Hypothesis rejected** – None of the independent variables were significantly associated with the number of chronic MSCs reported when testing the between subject effects.	8.3.2, p. 179
Hypothesis VIIa: Low levels of vigor and dedication and high levels of absorption and a high need for recovery will contribute to chronic MSCs reported by white-water raft guides across a working season (within subject variations).	4.3.3, p. 85	**Hypothesis rejected** – None of the independent variables were significantly associated with the number of chronic MSCs reported when testing the within subject effects.	8.3.4, p. 185
Hypothesis VIIb: Low levels of vigor and dedication and high levels of absorption and a high need for recovery will contribute to chronic MSCs reported by white-water raft guides across a working season (between subject variations).	4.3.3, p. 85	**Hypothesis rejected** – None of the independent variables were significantly associated with the number of chronic MSCs reported when testing the between subject effects.	8.3.4, p. 185
Hypothesis VIIIa: A high workload, indicated by the number of hours worked as a white-water raft guide, will exacerbate the relationships stated in Hypotheses VII (within subject variations).	4.3.3, p. 85	**Hypothesis rejected** – The monthly number of hours worked as a white-water raft guide did not have an indirect effect on the number of chronic MSCs reported when testing the within subject effects.	8.3.6, p. 190
Hypothesis VIIIb: A high workload, indicated by the number of hours worked as a white-water raft guide, will exacerbate the relationships stated in Hypotheses VII (between subject variations).	4.3.3, p. 85	**Hypothesis rejected** – The monthly number of hours worked as a white-water raft guide did not have an indirect effect on the number of chronic MSCs reported when testing the between subject effects.	8.3.6, p. 190

9.2 Contribution to Knowledge

9.2.1 Work-Related Health among White-Water Raft Guides

This thesis has contributed to knowledge by expanding upon research which has examined injuries and ill-health associated with white-water activities. Specifically, it has established that back pain is a significant problem for white-water raft guides working in the UK as it is for US raft guides (Jackson & Verscheure, 2006). Jackson and Verscheure (2006) identified that back pain among white-water raft guides was caused by manual handling practices, such as the loading and unloading of equipment from a trailer and stacking rafts greater than five high. From the interview data, unilateral guiding was identified as a risk factor of back pain among raft guides, as well as the forces being transferred through the body. These are additional working practices which have been attributed to the development of chronic back pain. Quantitative analyses, further added that longer working hours was associated with a greater risk of lower back pain. However, bilateral guiding was associated with lower back pain as opposed to unilateral guiding. It is possible that raft guides who practice bilateral guiding may have already had back pain and therefore changed their behaviour to prevent their lower back MSC worsening. This demonstrates how other work-related conditions and practices contribute to white-water raft guides working in the UK.

Furthermore, it has been identified that raft guides are at risk of other MSCs, not just chronic back pain. For example, the interview data identified that raft guides are at risk of knee injuries and the longitudinal study identified that

chronic shoulder conditions are common among raft guides. These tended to be chronic MSCs as opposed to acute trauma injuries. This builds on the literature which has examined injuries associated with white-water activities (e.g. Fiore & Houston, 2001; Jackson & Verscheure, 2006; O'Hare et al., 2002; Schoen & Stano, 2002; Whisman & Hollenhorst, 1999) showing that white-water raft guides are experts and are therefore at greater risk of chronic MSCs.

White-water raft guides also reported that MSCs are an expected and accepted part of the job, which is consistent with the perceptions of Mountain Leaders (McDermott & Munir, 2012). Additionally, white-water raft guides continued to work through MSCs as they are not protected by sick pay. This was also consistent with the reports from Mountain Leaders (McDermott & Munir, 2012). As the findings of this body of research are consistent with McDermott and Munir's (2012) study, this builds evidence that although the environments in which Mountain Leaders and white-water raft guides work are very different, there are similarities between how the workers approach and perceive their work. This thesis has contributed to evidence that the findings from such unique populations are potentially transferable to other workers in the Outdoor Industry. Finally, the findings of this thesis have demonstrated that the development of MSCs varies across a working season, where it was previously thought that MSCs would cumulate over time (McDermott & Munir, 2012).

Overall, this research has built on the limited existing research examining the health of workers in the Outdoor Industry and providing empirical evidence for the anecdotal evidence suggesting that there are risks of developing work-related MSCs whilst working in the Outdoor Industry (AAIAC, 2006).

9.2.2 Factors Relating to the Need for Recovery among White-Water Raft Guides

With regards to the need for recovery, the multilevel analyses related to Hypothesis II identified that the type of river worked on had a direct effect on the need for recovery following a day's work. It showed that working in a natural environment could reduce the levels of need for recovery, whereas, working on a man-made course increased the amount of need for recovery. This builds on previous literature, showing that being immersed in a natural, outdoor environment may aid with the recovery process (Korpela & Kinnunen, 2010). Previous research has demonstrated this with regard to physical leisure activities, however, the current study extends this to the working environment. This could be related to the positive effects of being in the outdoors (De Vries et al., 2003). However, this is not the case for man-made courses which are also situated in outdoor areas, such as country parks. Having concrete surroundings may reduce the stimulating environment in which a river in a natural outdoor setting provides (Korpela & Kinnunen, 2010). Having the outdoor setting of a natural river may reduce the perceptions of being at work and the time spent working may be perceived closer to physical leisure activity. This is supported by the findings from the interview study, where white-water raft guiding was described as a *'hobby'* by some participants. Furthermore, participants described the benefits of working in a stimulating environment outdoors. In contrast, the effects may stem from an organisational level as different white-water rafting providers tend to operate on either natural rivers or man-made courses.

With regards to the relationships between work engagement and the need for recovery, Hypothesis IV, vigor was negatively related to the need for recovery as expected. This is consistent with previous literature (Sonnentag & Niessen, 2008). Although it has been suggested that maintaining high levels of work engagement may have negative consequences and result in fatigue (Bakker et al., 2011; Sonnentag & Niessen, 2008), this does not appear to be the case for white-water raft guides. This could be related to the physical aspect of the occupation where a high level of energy is constantly required whilst rafting. Furthermore, physical activity has been suggested to increase levels of work engagement on the following day (ten Brummelhuis & Bakker, 2012). It is therefore possible that the physical activity achieved through the raft guiding may maintain levels of vigor for those who with initial high levels of vigor. In contrast, it is possible that those with low levels of vigor may exhaust themselves over time. If this is the case, strategies to increase vigor among white-water raft guides or other individuals working in sporting or physically active jobs, prior to starting work may be beneficial.

In the longitudinal study, it was expected to be found that dedication would be negatively related to the need for recovery, as seen with the nested correlations. However, the multilevel analyses identified that dedication had no significant impact on the need for recovery among raft guides. One reason why this may be the case is that vigor and dedication are considered to be the positive components of work engagement (Gonzalez-Roma et al., 2006) and although work engagement, as a whole, has been associated with positive health outcomes (Schaufeli et al., 2008), vigor may be more important when considering fatigue. Although high levels of work engagement have been

associated with positive health outcomes (Bakker et al., 2011; Christian et al., 2011), the energy from vigor appears to be more directly associated with levels of work-related fatigue than dedication among white-water raft guides. This suggests that vigor is a more important construct for those working in physically active occupations.

The multilevel analyses indicated that higher levels of absorption contributed to a higher need for recovery following work. This supports previous literature which has discussed that sustaining high levels of energy committed to work would result in negative consequences such as fatigue (Bakker et al., 2011; Sonnentag & Niessen, 2008). The present study contributes to this literature that high levels of the absorption component of work engagement in particular contribute to the early stages of work-related physical and psychological fatigue. This study further contributes knowledge to the theory of recovery which states that psychological detachment from work is a key component for recovery from work (Sonnentag, 2003; Zijlstra & Sonnentag, 2006). For example, individuals who are highly absorbed in their work by working overtime may find it more difficult to detach themselves from work (Beckers et al., 2004), and therefore are more likely to require a higher need for recovery. The present study has demonstrated that prolonged high levels of absorption can result in the early stages of chronic fatigue from work.

With regards to the number of hours worked as a white-water raft guide and the number of hours of physical leisure activity, it was expected that these would moderate the relationships between the components of work engagement and the need for emotional and physical recovery following work. However, no significant interaction effects were observed. This was surprising as interaction

effects between the number of hours worked and work engagement has previously been reported (Sonnentag & Niessen, 2008). Furthermore, high levels of absorption have been associated with longer working hours (Beckers et al., 2004), which in turn has been significantly associated with a greater need for recovery (Geurts & Demerouti, 2003). It is possible that this is because white-water raft guides may perceive their work as fun which may mean that the job demands associated with working hours have limited effect on either work engagement or the need for recovery.

In addition to no interaction effects being observed, hours worked as a raft guide had no direct effect on the need for recovery. This is consistent with previous findings (Bos et al., 2013; Van der Hulst et al., 2006). This was unexpected finding according to our hypothesis, as white-water raft guiding is a physically and psychologically demanding occupation (Arnould & Price, 1993). It is possible that any negative consequences which may arise as a result of the job demands may be negated by the stimulating environment in which they work. Particularly as physical activity in an outdoor setting has been associated with a reduced need for recovery (Korpela & Kinnunen, 2010; Oerlemans et al., 2014). However, this research examined physical leisure activity, not physically active jobs. Interestingly, physical leisure activity had no direct effect on the need for recovery either. It is possible that the physical activities in which white-water raft guides engage in are not too dissimilar from their work, as suggested by anecdotal and empirical evidence (AAIAC, 2006; McDermott & Munir, 2012). It is therefore possible that the benefits from physical activity providing a distraction and aiding with psychological detachment from work (Sonnentag & Bayer, 2005) is not achieved. Furthermore, the measure for the need for

recovery assesses the early stages of both physical and psychological fatigue but does not separate these into sub-categories. The unpicking of whether physical or psychological fatigue is more predominant may provide more insight into how physically active work and physical leisure activity affect fatigue is appropriate.

9.2.3 How Work Engagement and the Need for Recovery Relate to Musculoskeletal Conditions

Chronic MSCs were identified as a serious problem for white-water raft guides across a working season. It was therefore expected that the levels of the individual components of work engagement and the need for recovery would be directly related to the number of chronic MSCs experienced by white-water raft guides working in the UK. However, the components of work engagement had no significant effects on the number of chronic MSCs reported by white-water raft guides. This contradicts previous literature which has identified that high levels of vigor have been associated with positive physical health (Shirom, 2010). This is not related to the data on the chronic MSCs being self-reported as high levels of work engagement have been associated with improved self-reported health (Hakanen et al., 2006; Sonnentag, 2003). For example, health care professionals who were highly engaged, reported fewer back and neck pain problems (Peterson et al., 2008). It is possible that the levels of the components of work engagement may be related to specific chronic MSCs reported, as opposed to MSCs in general. Furthermore, working conditions, such as physical demands and varying levels of noise and temperature have been shown to limit the positive effects of work engagement (Christian et al.,

2011). It is therefore possible that any benefits gained from higher levels of work engagement may be limited by the physical demands and working environment of the occupation i.e. the physically active aspects in the natural environment which may vary depending on the weather etc.

Finally, there may not have been enough variety in the between person levels of work engagement. It has been suggested that there are individual differences in work engagement related to personality, for example, extroverted individuals tend to have a higher work engagement (Langelaan et al., 2006). However, individuals who participate in extreme sports tend to share a similar personality type (Kajtna et al., 2004) which may explain why there is no significant variation between levels of work engagement and chronic MSCs experienced.

As expected, a greater need for recovery contributed to chronic MSCs. This supports the previous literature which have identified associations between a high need for recovery and negative health outcomes (Sluiter et al., 2003; Tsigonia et al., 2009). Although prolonged high need for recovery has been associated with sickness absence (Alexopoulos et al., 2011; de Croon et al., 2003) particularly as a result of the development of chronic MSCs (Tsigonia et al., 2009), this may not be the case for white-water raft guides as the results from the qualitative study and preliminary analyses suggest that raft guides continue to work with MSCs. This may have longer term consequences, such as developing a greater number of chronic MSCs throughout their career, as observed with the positive relationship between the number of years' experience and the number of chronic MSCs reported.

This body of research has contributed to previous literature which has identified that a greater need for recovery contributes to the development of chronic MSCs among workers in physical occupations (Elders & Burdorf, 2001). This extends to workers in physically active sporting occupations as well as workers in construction which have previously been assessed (Elders & Burdorf, 2001).

9.3 Wider Implications of this Body of Research

The findings of this body of research have a variety of implications either specific for white-water raft guides or wider for other physically active sporting occupations.

With regards to training and guidance for white-water raft guides, the findings of this body of research suggest that white-water raft guides should engage in more protective behaviours to protect themselves from the development of chronic MSCs. Further information should be provided about the benefits of engaging in protective behaviours, such as bilateral guiding and warming-up exercises and also the consequences of not engaging in practicing such behaviours. Providing the information is not sufficient, follow ups are required to encourage the protective behaviours to be practiced.

Furthermore, as part of white-water raft guide training, the importance of rest and recovery should be covered. This thesis has identified that the early stages of fatigue that white-water raft guides experience can be increased by being too absorbed in their work. Strategies to psychologically detach from raft guiding, such as engaging in leisure activities which are not related to white-water activities should be promoted during the provision of training and guidance.

Reducing the levels of need for recovery can reduce the risk of developing chronic MSCs over time.

It is possible that the relationship between chronic MSCs and the need for recovery is reciprocal. Working with a chronic MSC may lead to detrimental effects over time. Where possible, white-water raft guides should attempt to rest and recovery after sustaining an MSC.

All of these points are not limited to white-water raft guides. The results from this thesis have supported the findings that Mountain Leaders work through MSCs (McDermott & Munir, 2012). It is therefore plausible to generalise these findings to other areas of the Outdoor Industry and other physically active sporting occupations, particularly when workers are freelance in nature.

9.4 Strengths and Limitations

This body of research has contributed to existing literature by providing detailed insight into the health of white-water raft guides and what work-related factors are associated with their health. The longitudinal study is the first prospective study to examine health in the Outdoor Industry, examining both physical and psychological factors. This was a successful study as although there was an attrition of 34.5% from baseline, this level is considered acceptable in longitudinal occupational research (Mauno et al., 2007). The findings from this longitudinal research highlighted that workers in physically active, sporting occupations may be at risk of experiencing high levels of the early stages of fatigue as a result of their work which can lead to the development of a number of chronic MSCs.

Despite the clear contribution to knowledge this thesis has made, it is limited in the way that it has addressed ‘biopsychosocial risks’. The scope of this thesis focused on high workloads, indicated by the number of working hours; however, there are other factors not addressed. The HSE has identified that psychosocial factors, such as tight deadlines, limited control at work, monotony, repetition, limited breaks and perceptions of excessive work demands can all contribute to stress (HSE, 2016). Furthermore, physical factors, including employee posture, forces on the body and repetition can result in the development of MSCs (HSE, 2016). Such issues were attempted to be addressed using the Workstyle Short Form (Feuerstien & Nicholas, 2006), however, insufficient data were ascertained to draw robust conclusions from analyses, therefore the concept of Workstyle was excluded from the scope of this thesis.

Although the samples for both studies were recruited from a variety of different locations and white-water providers operating on different types of river (i.e., natural or manmade as well as different river grades), there was no data available from the governing body to assess the extent to which the sample was representative of the entire population. Furthermore, the sample was self-selecting for both the qualitative interview and longitudinal studies. It is therefore possible that there may be a slight bias in the data. For example, individuals who experienced more chronic MSCs or were more engaged with their work may have been more willing to participate in the studies as opposed to their peers. This may mean that the number of MSCs, levels of work engagement and levels of the need for recovery reported may be slightly inflated. However, if this was the case for the interview study, it was balanced out by the quantitative study. This was supported by there being no significant

differences between the demographic characteristics, number of hours worked, levels of work engagement and need for recovery, of those who completed the follow-up surveys when compared to those that didn't. This suggests that the sample has maintained the same level of representation of the general population despite attrition.

Additionally, the sample size in both the initial qualitative study and the longitudinal survey study were relatively small. Although, only 20 participants were interviewed, data saturation was achieved following 15 interviews. This suggests that collecting a larger sample for the qualitative study would not have been necessary. However, a larger sample in the longitudinal study would have been beneficial. It is difficult to identify whether non-significant findings were as a result of there being no effect to observe or the study having insufficient power; i.e., too small a sample. In contrast, recruitment was conducted thoroughly, in order to ascertain as large a sample as possible. As the study was initiated at the start of the season, fewer raft guides were potentially working, thus limiting the sample available to recruit.

Related to the above point, there was a particularly small sample of female guides who participated in both the interview and longitudinal studies. Although there are 220 female raft guides (38.13% of the overall registered raft guides) registered under the British Canoe Union (Sport England, 2013), there was a female representation of 20% for the interview sample and less than 10% for the longitudinal study. However, the number of registered raft guides is only an estimated figure. This is because the qualification of a raft guide is maintained for the duration of a valid first aid certificate, therefore, raft guides who are no longer operating in Great Britain, either because they are operating abroad or

no longer operating as a raft guide, will remain registered. It is therefore possible that the sample obtained in these studies may be more representative of the population at the time of recruitment than the figures suggest. Without employee records, which were not obtainable, it is not possible to know how many white water raft guides are operational. Furthermore, the sample of qualified male raft guides (N = 104) represents over a quarter (27.59%) of the registered raft guides (N = 377). Therefore the findings of this body of research may be confidently generalised to the population of male raft guides.

Another limitation relates to self-report data. Self-report data relies on participants providing accurate information. However, self-reported hours worked and hours of physical leisure activity have been shown to be inaccurate in some cases (Shephard, 2003). Additionally, it has not been possible to determine the extent to which individuals are physically active during their working day, particularly as a validated measure of physical activity has not been used in this research. A more sensitive measure, such as employee data or daily diary data, combined with the use of physical activity devices, such as accelerometers, may be more appropriate than the recall of monthly hours worked for future studies. This would allow for the unpicking of the amount and intensity of physical activity conducted during a working day as well as some duties undertaken by white-water raft guides may not be physical in nature. However, the self-report survey design was the most appropriate design for the current study which aimed to collect data from a large sample from a geographically diverse population. Furthermore, the present research is the first study to examine the need for occupational recovery among those working in a physically active, sporting occupation. It was therefore important to note the

number of hours worked in a physically active occupation as opposed to measuring the specific number of hours of physical activity during the working day.

9.5 Future Direction

The findings of this body of research have implications for white-water raft guides, but also other workers in physically active, sporting occupations. Although it has been identified that chronic MSCs are a common problem for white-water raft guides, it is still unclear what factors contribute to these. Ergonomic assessment examining how the accumulative effects of the forces applied through the body impacts on the development of chronic MSCs is essential. Such examination is not limited just to the sample of white-water raft guides, but those working in the Outdoor Industry.

The reciprocal relationships between work engagement and the need for recovery and the need for recovery and chronic MSCs require further analyses. Structural Equation Modelling (SEM) would have been an appropriate analysis to assess this relationship, however the attrition throughout the study meant that it was not possible to conduct these analyses as a larger sample was required for a better model fit (Fan, Thompson, & Wang, 1999; Hooper, Coughlan, & Mullen, 2008). It may have been possible to conduct imputations for missing data (Efron, 1994), however, as data were missing for almost 50 participants, this would not have been a suitable practice. Further research with a larger sample size would be necessary to examine this reciprocal relationship.

With regards to interventions, targeting the levels of work engagement will be beneficial. Specifically this would involve methods to increase levels of vigor and decrease levels of absorption to see the effects it has on the need for recovery among those working in physically active sporting occupations. One possible strategy to reduce the level of absorption would be to encourage leisure activities which are dissimilar to the tasks completed at work. This would allow for psychological detachment to occur which can improve the recovery experience following work. By reducing the levels of the need for recovery experienced, the risk of developing chronic MSCs could also be reduced among workers in physically active, sporting occupations.

Further examination of the longitudinal effects of working in a physically active, sporting occupation across a career on the development of MSCs is essential. This body of research has identified that protective behaviours, such as preparing the body for the physical demands of the job before starting or practicing specific behaviours (e.g. bilateral guiding), could prevent the development or exacerbation of chronic MSCs. Behaviour change interventions could actively encourage workers in physically active, sporting occupations to engage in protective behaviours. This could involve simple visual cues, such as posters around the workplace demonstrating and encouraging protective behaviours, for example a poster of warming-up exercises which could include diagrams of how to perform the exercises whilst also acting as a visual stimulus encouraging the behaviour.

Intervention incorporating the delivery of training and guidance would be beneficial. Evidence from the interview demonstrates that white-water raft guides are aware of the risks of (not) practicing some behaviours but have

chosen to ignore advice and guidance delivered during training. Research examining the effectiveness of the delivery of training may be beneficial. This could involve following up on training on an agreed regular basis, to establish the extent to which training is being put into practice. One particular behaviour to focus on could be bilateral guiding among white-water raft guides. Teaching guides to bilaterally guide earlier in their career may improve the skills required to continue this practice. Teaching basketball players to dribble bilaterally early on increases their ability to do so later in their career (Stöckel, Weigelt, & Krug, 2011). This may be applicable to raft guides' skill acquisition.

9.6 Chapter Summary and Conclusions

Data from both the interview and longitudinal studies highlighted that chronic MSCs, particularly chronic back pain, are a serious problem among white-water raft guides. With regards to the early stages of work-related fatigue, high levels of vigor and working on a natural river reduced the levels of need for recovery following work experienced. High levels of absorption and working in a man-made course increased the need for recovery raft guides experienced. The findings relating to chronic MSCs reported by white-water raft guides contributes to the existing literature which has suggested that chronic MSCs are a serious problem in the Outdoor Industry (Jackson & Verscheure, 2006; AAIAC, 2006; McDermott & Munir, 2012). Furthermore it builds on the academic knowledge, showing how the pattern of MSCs alters across a working season. With regards to work-related fatigue, high levels of vigor and working on a natural river reduces the need for recovery white-water raft guides require. This is because the high levels of energy protect against work-related fatigue (Sonnentag, 2003; Sonnentag & Niessen, 2008; Sonnentag et al., 2012). Additionally, a greater amount of leisure time spent in an outdoor, natural setting has been suggested to improve the recovery experience (Korpela & Kinnunen, 2010). The current study extends this to working in a natural environment as the evidence from the longitudinal study shows working on a natural river protects against the early stages of the need for recovery. This is further supported by the results which identified that working on a man-made course contributes to a greater need for recovery. Although the raft guides are working outside, they are probably not gaining the benefits of the outdoor setting being natural. Additionally, high levels of absorption contribute

to a higher need for recovery, which is likely to be a result of not achieving sufficient psychological detachment from work (Sonnentag & Bayer, 2005). These findings highlight that the components of work engagement should be measured separately as vigor was significantly negatively related with the need for recovery, whereas absorption has a significant, positive effect on it. High levels of need for recovery also contributed to a greater number of chronic MSCs experienced. This is consistent with previous literature (Sluiter et al 2003; Tsigonia et al, 2009).

Structural Equation Modelling (SEM) would be beneficial to assess the reciprocal relationship between the components of work engagement and the need for recovery, as well as between the need for recovery and chronic MSCs reported. However, a greater sample size (N = 150) was required to be able to generate an acceptable model fit (Fan et al., 1999; Hooper et al., 2008). Additionally, intervention studies to assess how increasing levels of vigor and reducing levels of absorption and how this affects individuals' need for emotional and physical recovery following work would be beneficial. Such intervention studies would not just be beneficial to workers in the white-water rafting industry but any worker in a physically active, sporting occupation. Finally, intervention to improve the effectiveness of training and guidance would be beneficial so that information regarding protective behaviours is not just provided to trainees but also implemented by them.

References

Adventure Activities Industry Advisory Committee [AAIAC]. (2006). *Surviving a career in adventure activities.*

Adventure Activities Licensing Authority [AALA]. (2002). Adventure activities licensing authority information: From Lyme Bay to licensing. Retrieved from http://www.aals.org.uk/lymebay01.html

Alexopoulos, E. C., Tanagra, D., Detorakis, I., Gatsi, P., Goroyia, A., Michalopoulou, M., & Jelastopulu, E. (2011). Knee and low back complaints in professional hospital nurses: Occurrence, chronicity, care seeking and absenteeism. *Work: A Journal of Prevention, Assessment and Rehabilitation, 3*8(4), 329-335.

Alexopoulos, E. C., Tanagra, D., Konstantinou, E., & Burdorf, A. (2006). Musculoskeletal disorders in shipyard industry: Prevalence, health care use, and absenteeism. *BMC Musculoskeletal Disorders,* 7, 88. doi:1471-2474-7-88 [pii]

Anderson, R. A., & Anderson, J. E. (2010). Kayaking. *Stretching 30th aniversary editio*n (pp. 172-173). California, USA: Shelter Publications Inc.

Arnould, E. J., & Price, L. L. (1993). River magic: Extraordinary experience and the extended service encounter. *Journal of Consumer Research, 20*(1)24-45.

Aronsson, G., Gustafsson, K., & Dallner, M. (2000). Sick but yet at work. an empirical study of sickness presenteeism. *Journal of Epidemiology and Community Health, 5*4(7), 502-509. doi:10.1136/jech.54.7.502

Attenburrow, M. (1993). White water safety and rescue. In R. Rowe (Ed.), *Canoeing handbook: The official handbook of the british canoe union* (2nd ed., pp. 223-247). UK: Biddles LimitedBiddles Limited.

Bakker, A. (2009). Building engagement in the workplace. In R. Burke, & C. Cooper (Eds.), *The peak performing organizatio*n (pp. 50-72). New York: Routledge.

Bakker, A., & Demerouti, E. (2007). The job demands resources model: State of the art*. Journal of Managerial Psychology, 2*2(3), 309-328.

Bakker, A. B., Albrecht, S. L., & Leiter, M. P. (2011). Key questions regarding work engagement*. European Journal of Work and Organizational Psychology, 2*0(1), 4-28. doi:10.1080/1359432X.2010.485352

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations*. Journal of Personality and Social Psychology, 5*1(6), 1173-1182.

Beckers, D., van der Linden, D., Smulders, P., Kompier, M., van Veldhoven, M., & van Yperen, N. (2004). Working overtime hours: Relations with fatigue, work motivation, and the quality of work*. Journal of Occupational and Environmental Medicine, 4*6(12), 1282-1289. doi:10.1097/01.jom.0000147210.95602.50

Bentley, T. A., Page, S. J., & Laird, I. S. (2000). Safety in New Zealand's adventure tourism industry: The client accident experience of adventure tourism operators*. Journal of Travel Medicine,* 7(5), 239-245.

Bernal, D., Campos-Serna, J., Tobias, A., Vargas-Prada, S., Benavides, F. G., & Serra, C. (2014). Work-related psychosocial risk factors and musculoskeletal disorders in hospital nurses and nursing aides: A systematic review and meta-analysis. *International Journal of Nursing Studies, 52*(2), 635-648.

Boland, M., Sayers, G., Coleman, T., Bergin, C., Sheehan, N., Creamer, E., Zochowski, W. (2004). A cluster of leptospirosis cases in canoeists following a competition on the River Liffey. *Epidemiology and Infection, 132*(2), 195-200. doi:10.1017/S0950268803001596

Bos, J. T., Donders, N. C. G. M., Schouteten, R. L. J., & Van der Gulden, J. W. J. (2013). Age as a moderator in the relationship between work-related characteristics, job dissatisfaction and need for recovery. *Ergonomics, 5*6(6), 992-1005.

Bos, J., Mol, E., Visser, B., & Frings-Dresen, M. (2004). Risk of health complaints and disabilities among Dutch firefighters. *International Archives of Occupational and Environmental Health, 7*7(6), 373-382.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology,* 3(2), 77-101.

British Canoe Union [BCU]. (2015). White water rafting homepage. Retrieved from http://bcu.org.uk/our-sport/white-water-rafting/

Britt, T. W., Castro, C. A., & Adler, A. B. (2005). Self-engagement, stressors, and health: A longitudinal study. *Personality & Social Psychology Bulletin, 3*1(11), 1475-1486. doi:31/11/1475 [pii]

Bugajska, J., Żołnierczyk-Zreda, D., Jędryka-Góral, A., Gasik, R., Hildt-Ciupińska, K., Malińska, M., & Bedyńska, S. (2013). Psychological factors at work and musculoskeletal disorders: A one year prospective study. *Rheumatology International, 3*3(12), 2975-2983.

Christian, M. S., Garza, A. S., & Slaughter, J. E. (2011). Work engagement: A quantitative review and test of its relations with task and contextual performance. *Personnel Psychology, 6*4(1), 89-136. doi:10.1111/j.1744-6570.2010.01203.x

Colcombe, S., & Kramer, A. F. (2003). Fitness effects on the cognitive function of older adults: A meta-analytic study. *Psychological Science, 1*4(2), 125-130.

Crawford, J. O., Graveling, R. A., Cowie, H. A., & Dixon, K. (2010). The health safety and health promotion needs of older workers. *Occupational Medicine (Oxford, England), 6*0(3), 184-192. doi:10.1093/occmed/kqq028 [doi]

Creswell, J., & Miller, D. (2000). Determining validity in qualitative inquiry. *Theory into Practice, 3*9(3), 124-130.

da Costa, B. R., & Vieira, E. R. (2010). Risk factors for work-related musculoskeletal disorders: A systematic review of recent longitudinal studies. *American Journal of Industrial Medicine, 5*3(3), 285-323.

de Barros, E. N. C., & Alexandre, N. M. C. (2003). Cross-cultural adaptation of the Nordic musculoskeletal questionnaire. *International Nursing Review, 5*0(2), 101-108. doi:10.1046/j.1466-7657.2003.00188.x

de Bloom, J., Geurts, S. A. E., Sonnentag, S., Taris, T., de Weerth, C., & Kompier, M. A. J. (2011). How does a vacation from work affect employee health and well-being*? Psychology & Health, 2*6(12), 1606-1622. doi:10.1080/08870446.2010.546860

de Bloom, J., Geurts, S. A. E., Taris, T. W., Sonnentag, S., de Weerth, C., & Kompier, M. A. J. (2010). Effects of vacation from work on health and well-being: Lots of fun, quickly gone*. Work and Stress, 2*4(2), 196-216. doi:10.1080/02678373.2010.493385

de Bloom, J., Kompier, M., Geurts, S., de Weerth, C., Taris, T., & Sonnentag, S. (2009). Do we recover from vacation? Meta-analysis of vacation effects on health and well-being*. Journal of Occupational Health, 5*1(1), 13-25.

de Croon, E. M., Sluiter, J. K., & Frings-Dresen, M. H. (2003). Need for recovery after work predicts sickness absence: A 2-year prospective cohort study in truck drivers*. Journal of Psychosomatic Research, 5*5(4), 331-339.

de Vries, J. D., Claessens, B. J., van Hooff, M. L., Geurts, S. A., van den Bossche, Seth NJ, & Kompier, M. A. (2015). Disentangling longitudinal relations between physical activity, work-related fatigue, and task demands*. International Archives of Occupational and Environmental Health,* 1-13.

De Vries, S., Verheij, R. A., Groenewegen, P. P., & Spreeuwenberg, P. (2003). Natural environments-healthy environments? An exploratory analysis of the relationship between greenspace and health*. Environment and Planning A, 3*5(10), 1717-1732.

Demerouti, E., Bakker, A., Vardakou, I., & Kantas, A. (2003). The convergent validity of two burnout instruments: A multitrait-multimethod analysis. *European Journal of Psychological Assessment, 1*9(1), 12-23.

Demerouti, E., & Bakker, A. (2008). The Oldenburg Burnout Inventory: A good alternative to measure burnout and engagement. In J. Halbesleben (Ed.), *Handbook of stress and burnout in health care*. Hauppauge, NY: Nova Science.

Demerouti, E., Bakker, A., de Jonge, J., Janssen, P., & Schaufeli, W. (2001). Burnout and engagement at work as a function of demands and control. *Scandinavian Journal of Work Environment & Health, 2*7(4), 279-286.

Denzin, N. (1978). *The research act: A theoretical orientation to sociological method*s (2nd ed.). New York: McGraw-Hill.

Dierdorff, E. C., & Ellington, J. K. (2012). Members matter in team training: Multilevel and longitudinal relationships between goal orientation, Self-Regulation, and team outcomes. *Personnel Psychology, 6*5(3), 661-703.

Efron, B. (1994). Missing data, imputation, and the bootstrap. *Journal of the American Statistical Association, 8*9(426), 463-475.

Elders, L. A., & Burdorf, A. (2001). Interrelations of risk factors and low back pain in scaffolders. *Occupational and Environmental Medicine, 5*8(9), 597-603.

Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods, 1*2(2), 121.

EQFOA. (2006). *Industry occupational map for the outdoor sector*.Leonardo EQF Outdoor Animators.

European Agency for Safety and Health at Work [EASHW]. (2010). *OSH in figures: Work-related musculoskeletal disorders in the EU - facts and figures*. Luxembourg: EASHW.

European Outdoor Group. (2013). Market research. Retrieved from http://www.europeanoutdoorgroup.com/market-research

Fan, X., Thompson, B., & Wang, L. (1999). Effects of sample size, estimation methods, and model specification on structural equation modeling fit indexes. *Structural Equation Modeling: A Multidisciplinary Journal,* 6(1), 56-83.

Feuerstein, M., & Nicholas, R. A. 2006. Development of a short form of the Workstyle measure. *Occupational Medicine, 56*(2), 94-99.

Fiore, D. C. (2003). Injuries associated with whitewater rafting and kayaking. *Wilderness & Environmental Medicine, 1*4(4), 255-260. doi:10.1580/1080-6032(2003)14[255:IAWWRA]2.0.CO;2

Fiore, D. C., & Houston, J. D. (2001). Injuries in whitewater kayaking. *British Journal of Sports Medicine, 3*5(4), 235-241. doi:10.1136/bjsm.35.4.235

Fuller, C. W., Ekstrand, J., Junge, A., Andersen, T. E., Bahr, R., Dvorak, J., Meeuwisse, W. H. (2006). Consensus statement on injury definitions and data collection procedures in studies of football (soccer) injuries. *Scandinavian Journal of Medicine & Science in Sports, 1*6(2), 83-92.

Geurts, S., & Demerouti, E. (2003). Work non-work interface: A review of theories and findings. In Schabracq, M., Winnubst, J., & Cooper C. (Eds.), *The handbook of work and health psychology* (2nd ed., pp. 279-312). Chichester, UK: Wiley.

Gonzalez-Roma, V., Schaufeli, W., Bakker, A., & Lloret, S. (2006). Burnout and work engagement: Independent factors or opposite poles? *Journal of Vocational Behavior, 68*(1), 165-174. doi:10.1016/j.jvb.2005.01.003

Goodman, L. A. (1961). Snowball sampling. *Annals of Mathematical Statistics, 32*(1), 148-170. doi:10.1214/aoms/1177705148

Gorgievski, M. J., Bakker, A. B., & Schaufeli, W. B. (2010). Work engagement and workaholism: Comparing the self-employed and salaried employees. *Journal of Positive Psychology, 5*(1), 83-96. doi:10.1080/17439760903509606

Hakanen, J., Bakker, A., & Schaufeli, W. (2006). Burnout and work engagement among teachers. *Journal of School Psychology, 43*(6), 495-513. doi:10.1016/j.jsp.2005.11.001

Hakkanen, M., Viikari-Juntura, E., & Martikainen, R. (2001). Job experience, work load, and risk of musculoskeletal disorders. *Occupational and Environmental Medicine, 58*(2), 129-135.

Hansen, C. D., & Andersen, J. H. (2008). Going ill to work - what personal circumstances, attitudes and work-related factors are associated with sickness presenteeism? *Social Science & Medicine, 67*(6), 956-964. doi:10.1016/j.socscimed.2008.05.022

Hartig, T., Kylin, C., & Johansson, G. (2007). The telework tradeoff: Stress mitigation constrained restoration. *Applied Psychology: An International Review, 56*(2), 231-253.

Haukka, E., Kaila-Kangas, L., Luukkonen, R., Takala, E. P., Viikari-Juntura, E., & Leino-Arjas, P. (2014). Predictors of sickness absence related to musculoskeletal pain: A two-year follow-up study of workers in municipal kitchens. *Scandinavian Journal of Work, Environment & Health, 40*(3), 278-286. doi:10.5271/sjweh.3415 [doi]

Health and Safety Executive [HSE]. (2012a). Adventure activities licensing. Retrieved from http://www.hse.gov.uk/aala/index.htm

Health and Safety Executive [HSE]. (2012b). Sickness absence survey. Retrieved from http://www.hse.gov.uk/waste/survey.htm

Health and Safety Executive [HSE]. (2013). *Health and safety executive annual statistics report 2012/2013*. UK: HSE.

Health and Safety Executive [HSE]. (2014). *Health and safety executive annual statistics report 2013/2014*. UK: HSE.

Health and Safety Executive [HSE]. (2015). RIDDOR - reporting of injuries, diseases and dangerous occurrences regulations 2013. Retrieved from http://www.hse.gov.uk/riddor/

Health and Safety Executive [HSE]. (2016). What are psychosocial risk factors? Retrieved from http://www.hse.gov.uk/msd/mac/psychosocial.htm

Heiden, B., Weigl, M., Angerer, P., & Müller, A. (2013). Association of age and physical job demands with musculoskeletal disorders in nurses. *Applied Ergonomics, 4*4(4), 652-658.

Hill, P. W., & Goldstein, H. (1998). Multilevel modeling of educational data with cross-classification and missing identification for units. *Journal of Educational and Behavioral Statistics, 2*3(2), 117-128.

Hooper, D., Coughlan, J., & Mullen, M. (2008). Structural equation modelling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods, 6*(1), 53-60.

Hoy, D., Bain, C., Williams, G., March, L., Brooks, P., Blyth, F., Buchbinder, R. (2012). A systematic review of the global prevalence of low back pain. *Arthritis & Rheumatism, 6*8(6), 2028-2037.

International Rafting Federation [IRF]. (2013). International rafting federation certified Guides/Instructors. Retrieved from http://www.internationalrafting.com/gte/certified-guides/

Jackson, D. M., & Verscheure, S. K. (2006). Back pain in whitewater rafting guides. *Wilderness & Environmental Medicine, 1*7(3), 162-170.

Jansen, N., Kant, I., van Amelsvoort, L., Nijhuis, F., & van den Brandt, P. (2003). Need for recovery from work: Evaluating short-term effects of working hours, patterns and schedules. *Ergonomics, 4*6(7), 664-680.

Jick, T. (1979). Mixing qualitative and quantitative methods: Triangulation in action. *Administrative Science Quarterly, 2*4(4), 602-611.

Johns, G. (2010). Presenteeism in the workplace: A review and research agenda. *Journal of Organizational Behavior, 3*1(4), 519-542. doi:10.1002/job.630

Johnson, R., & Onwuegbuzie, A. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 3*3(7), 14-26.

Kahn, W. (1990). Psychological conditions of personal engagement and disengagement at work. *Academy of Management Journal, 3*3(4), 692-724. doi:10.2307/256287

Kajtna, T., Tušak, M., Barić, R., & Burnik, S. (2004). Personality in high-risk sports athletes. *Kineziologija, 3*6(1), 24-34.

Kameyama, O., Shibano, K., Kawakita, H., Ogawa, R., & Kumamoto, M. (1999). Medical check of competitive canoeists. *Journal of Orthopaedic Science: Official Journal of the Japanese Orthopaedic Association,* 4(4), 243-9. doi:10.1007/s007760050099

Kant, I. J., Bultmann, U., Schroer, K. A., Beurskens, A. J., Van Amelsvoort, L. G., & Swaen, G. M. (2003). An epidemiological approach to study fatigue in the working population: The Maastricht cohort study. *Occupational and Environmental Medicine, 60 Suppl* 1, i32-9.

Kiss, P., De Meester, M., & Braeckman, L. (2008). Differences between younger and older workers in the need for recovery after work. *International Archives of Occupational and Environmental Health, 8*1(3), 311-320.

Korpela, K., & Kinnunen, U. (2010). How is leisure time interacting with nature related to the need for recovery from work demands? Testing multiple mediators. *Leisure Sciences, 3*3(1), 1-14.

Krupnick, J. E., Cox, R. D., & Summers, R. L. (1998). Injuries sustained during competitive white-water paddling: A survey of athletes in the 1996 Olympic Trials. *Wilderness & Environmental Medicine, 9*(1), 14-18. doi:10.1580/1080-6032(1998)009[0014:ISDCWW]2.3.CO;2

Kuijer, P., van der Beek, Allard J, van Dieën, J. H., Visser, B., & Frings-Dresen, M. H. (2005). Effect of job rotation on need for recovery, musculoskeletal complaints, and sick leave due to musculoskeletal complaints: A prospective study among refuse collectors. *American Journal of Industrial Medicine, 4*7(5), 394-402.

Kumar, S. (2001). Theories of musculoskeletal injury causation. *Ergonomics, 4*4(1), 17-47.

Kuorinka, I., Jonsson, B., Kilbom, A., Vinterberg, H., Bieringsorensen, F., Andersson, G., & Jorgensen, K. (1987). Standardized Nordic questionnaires for the analysis of musculoskeletal symptoms. *Applied Ergonomics, 1*8(3), 233-237. doi:10.1016/0003-6870(87)90010-X

Lago-Penas, C., Rey, E., Lago-Ballesteros, J., Dominguez, E., & Casais, L. (2013). Seasonal variations in body composition and fitness parameters according to individual percentage of training completion in professional soccer players: Original research article. *International SportMed Journal, 1*4(4), 205-215.

Langelaan, S., Bakker, A., van Doornen, L., & Schaufeli, W. (2006). Burnout and work engagement: Do individual differences make a difference*? Personality and Individual Differences, 4*0(3), 521-532. doi:10.1016/j.paid.2005.07.009

Langelaan, S., Bakker, A. B., Schaufeli, W. B., van Rhenen, W., & van Doornen, L. J. P. (2007). Is burnout related to allostatic load*? International Journal of Behavioral Medicine, 1*4(4), 213-221.

Langley, J., & Brenner, R. (2004). What is an injury*? Injury Prevention, 1*0(2), 69-71.

Lee, J. V., Dawson, S. R., Ward, S., Surman, S. B., & Neal, K. R. (1997). Bacteriophages are a better indicator of illness rates than bacteria amongst users of a white water course fed by a lowland river*. Water Science and Technology, 3*5(11-12), 165-170. doi:10.1016/S0273-1223(97)00253-9

Lord Young of Graffham. (2010). *Common sense common safety*. London, UK: HM Government.

Lüdtke, O., Robitzsch, A., Trautwein, U., & Kunter, M. (2009). Assessing the impact of learning environments: how to use student ratings of classroom or school characteristics in multilevel modelling. *Contemporary Educational Psychology, 34*(2), 120–131.

Mahmud, N., Kenny, D. T., & Rahman, H. A. (2012). The effect of workplace office ergonomics intervention on reducing neck and shoulder complaints and sickness absence*. International Proceedings of Economics Development & Research, 42.*

Major, V. S., Klein, K. J., & Ehrhart, M. G. (2002). Work time, work interference with family, and psychological distress. *Journal of Applied Psychology, 87*(3), 427.

Mallinson, T., Cella, D., Cashy, J., & Holzner, B. (2006). Giving meaning to measure: Linking self-reported fatigue and function to performance of everyday activities. *Journal of Pain and Symptom Management, 31*(3), 229-241.

Maslach, C., & Leiter, M. P. (1997). *The truth about burnout: How organizations cause personal stress and what to do about it*. San Fransisco, CA: Jossey-Bass.

Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job burnout. *Annual Review of Psychology, 52*(1), 397-422.

Mauno, S., Kinnunen, U., & Ruokolainen, M. (2007). Job demands and resources as antecedents of work engagement: A longitudinal study. *Journal of Vocational Behavior, 7*0(1), 149-171.

McCammon, I. (2004). Heuristic traps in recreational avalanche accidents: Evidence and implications. *Avalanche News, 6*8(1), 42-50.

McDermott, H., & Munir, F. (2012). Work-related injury and ill-health among mountain instructors in the UK. *Safety Science, 5*0(4), 1104-1111. doi:10.1016/j.ssci.2011.11.014

Meijman, T., & Mulder, G. (1998). Psychological aspects of workload. In P. Drenth, & H. Thierry (Eds.), *Handbook of work and organizational psychology: Vol. 2. Work Psychology* (pp. 5-33). Hove, UK: Psychology Press.

Mohren, D., Jansen, N., & Kant, I. (2010). Need for recovery from work in relation to age: A prospective cohort study. *International Archives of Occupational and Environmental Health, 8*3(5), 553-561.

Moran-Ellis, J., Alexander, V., Cronin, A., Dickinson, M., Fielding, J., Sleney, J., & Thomas, H. (2006). Triangulation and integration: Processes, claims and implications. *Qualitative Research, 6*(1), 45-59.

Mosher, D. L., & Sirkin, M. (1984). Measuring a macho personality constellation. *Journal of Research in Personality, 18*(2), 150-163.

Nezlek, J. B. (2001). Multilevel random coefficient analyses of event-and interval-contingent data in social and personality psychology research. *Personality and Social Psychology Bulletin, 2*7(7), 771-785.

Oerlemans, W. G., & Bakker, A. B. (2014). Burnout and daily recovery: A day reconstruction study. *Journal of Occupational Health Psychology, 1*9(3), 303-314. doi:10.1037/a0036904 [doi]

O'Hare, D., Chalmers, D., Arnold, N. A., & Williams, F. (2002). Mortality and morbidity in white water rafting in new zealand. *Injury Control and Safety Promotion,* 9(3), 193-8. doi:10.1076/icsp.9.3.193.8710

Outdoor Foundation. (2013). *The active outdoor recreation report*. Retrieved from http://www.outdoorfoundation.org/research.recreation.html

Outdoor Industry Association [OIA].(2010). *Outdoor recreation participation report 2010*. Retrieved from http://www.outdoorindustry.org/research/participation.php?action=detail&research_id=193

Parent-Thirion, A. (2012). *5th European working conditions survey: Overview repor*t Publications Office of the European Union.

Patton, M. (2002). *Qualitative research and evaluation method*s (3rd ed.). California, USA: Sage Publications, Inc.

Peterson, U., Demerouti, E., Bergstroem, G., Samuelsson, M., Ake, M. A., & Nygren, A. (2008). Burnout and physical and mental health among Swedish healthcare workers*. Journal of Advanced Nursing, 6*2(1), 84-95. doi:10.1111/j.1365-2648.2007.04580.x

Philipp, R., King, C., & Hughes, A. (1992). Understanding of Weil's disease among canoeists*. British Journal of Sports Medicine, 2*6(4), 223-227.

Punnett, L., & Wegman, D. H. (2004). Work-related musculoskeletal disorders: The epidemiologic evidence and the debate*. Journal of Electromyography and Kinesiology, 1*4(1), 13-23.

Quené, H., & Van den Bergh, H. (2004). On multi-level modeling of data from repeated measures designs: A tutorial*. Speech Communication, 4*3(1), 103-121.

Raediker, B., Janßen, D., Schomann, C., & Nachreiner, F. (2006). Extended working hours and health*. Chronobiology International, 2*3(6), 1305-1316.

Rasbash, J., Charlton, C., Browne, W. J., Healy, M., & Cameron, B. (2009). *Mlwin* (Version 2.02 ed.). Centre for Multilevel Modelling, University of Bristol.

Resnick, B. (2005). Reliability and validity of the outcome expectations for exercise scale-2. *Journal of Aging and Physical Activity, 13*(4), 382-394.

Royal Yachting Association [RYA]. (2013). Watersports and leisure participation survey 2012. Retrieved from http://www.bcu.org.uk/files/Watersports%20Participation%20Survey%202012%20-%20Executive%20Summary.pdf

Ryff, C. (1989). Happiness is everything, or is it? Exploration of the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57*(6), 1069-1081.

Ryff, C., & Keyes, C. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology, 6*9(4), 719-727.

Schaufeli, W., & Bakker, A. (2004). *UWES Utrecht work engagement scale preliminary manua*l (1st ed.). Utrecht University: Occupational Health Psychology Unit.

Schaufeli, W., Salanova, M., Gonzalez-Roma, V., & Bakker, A. (2002). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies, 3*(1), 71-92.

Schaufeli, W. B., Taris, T. W., & Van Rhenen, W. (2008). Workaholism, burnout, and work engagement: Three of a kind or three different kinds of employee well-being*? Applied Psychology-an International Review-*

*Psychologie Appliquee-Revue Internationale, 5*7(2), 173-203. doi:10.1111/j.1464-0597.2007.00285.x

Schoen, R. G., & Stano, M. J. (2002). Year 2000 whitewater injury survey. *Wilderness & Environmental Medicine, 1*3(2), 119-124. doi:10.1580/1080-6032(2002)013[0119:YWIS]2.0.CO;2

Scottish Rafting Association [SRA]. (2013). Scottish rafting association individual member list. Retrieved from http://www.scottish-rafting-association.org.uk/page4.html

Shankar, S., Shanmugam, M., & Jayaraman, S. (2014). Workplace factors and prevalence of low back pain among male commercial kitchen workers. *Journal of Back and Musculoskeletal Rehabilitation,* DOI: 10.3233/BMR-140544

Shephard, R. J. (2003). Limits to the measurement of habitual physical activity by questionnaires. *British Journal of Sports Medicine, 3*7(3), 197-206.

Shimazu, A., & Schaufeli, W. B. (2009). Is workaholism good or bad for employee well-being? The distinctiveness of workaholism and work engagement among Japanese employees. *Industrial Health, 4*7(5), 495-502.

Shirom, A. (2010). In Bakker A. L., (Ed.), *Feeling energetic at work: On vigor's antecedents*. Hove; England: Psychology Press.

Siltaloppi, M., Kinnunen, U., Feldt, T., & Tolvanen, A. (2011). Identifying patterns of recovery experiences and their links to psychological outcomes

across one year. *International Archives of Occupational and Environmental Health, 8*4(8), 877-888.

SkillsActive. (2010). The outdoors survey 2009. Retrieved from http://www.skillsactive.com/assets/0000/6348/SkillsActiveTheOutdoorsSurvey2009_FINALReport_Jun2010.pdf

Sluiter, J. K. (1999). The influence of work characteristics on the need for recovery and experienced health: A study on coach drivers. *Ergonomics, 4*2(4), 573-583.

Sluiter, J. K., de Croon, E. M., Meijman, T. F., & Frings-Dresen, M. H. (2003). Need for recovery from work related fatigue and its role in the development and prediction of subjective health complaints. *Occupational and Environmental Medicine, 60 Suppl* 1, i62-70.

Snijders, T. A., & Bosker, R. J. (1994). Modeled variance in two-level models. *Sociological Methods & Research, 2*2(3), 342-363.

Sonnentag, S., Mojza, E. J., Demerouti, E., & Bakker, A. B. (2012). Reciprocal relations between recovery and work engagement: The moderating role of job stressors. *Journal of Applied Psychology, 9*7(4), 842-853.

Sonnentag, S., & Niessen, C. (2008). Staying vigorous until work is over: The role of trait vigour, day-specific work experiences and recovery. *Journal of Occupational and Organizational Psychology, 8*1(3), 435-458.

Sonnentag, S., & Zijlstra, F. R. (2006). Job characteristics and off-job activities as predictors of need for recovery, well-being, and fatigue. *Journal of Applied Psychology, 91*(2), 330-350.

Sonnentag, S. (2003). Recovery, work engagement, and proactive behaviour: A new look at the interface between non-work and work. *Journal of Applied Psychology, 88*(3), 518-528.

Sonnentag, S., & Bayer, U. (2005). Switching off mentally: Predictors and consequences of psychological detachment from work during off-job time. *Journal of Occupational Health Psychology, 10*(4), 393-414. doi:10.1037/1076-8998.10.4.393

Sonnentag, S., & Fritz, C. (2007). The recovery experience questionnaire: Development and validation of a measure for assessing recuperation and unwinding from work. *Journal of Occupational Health Psychology, 12*(3), 204-221. doi:10.1037/1076-8998.12.3.204

Sparks, K., Cooper, C., Fried, Y., & Shirom, A. (1997). The effects of hours of work on health: A meta-analytic review. *Journal of Occupational and Organizational Psychology, 70*(4), 391-408.

Sport and Recreation New Zealand [SPARC]. (2009). Sport and recreation participation levels: Findings from the 2007/08 active NZ survey. Retrieved from http://www.activenzsurvey.org.nz/Documents/Participation-Levels.pdf

Sport England. (2013). In Iain Wilson (Ed.), *RE: Research examining the work-related health of white water raft guide*s. Email: info@canoe-england.org.uk

Stöckel, T., Weigelt, M., & Krug, J. (2011). Acquisition of a complex basketball-dribbling task in school children as a function of bilateral practice order. *Research Quarterly for Exercise and Sport, 8*2(2), 188-197.

Stone, A., Kennedy-Moore, E., & Neale, J. (1995). Association between daily coping and end-of-day mood. *Health Psychology, 1*4(4), 341-349. doi:10.1037//0278-6133.14.4.341

ten Brummelhuis, L. L., & Bakker, A. B. (2012). Staying engaged during the week: The effect of off-job activities on next day work engagement. *Journal of Occupational Health Psychology, 17*(4), 445-455.

Thomas, E., Peat, G., Harris, L., Wilkie, R., & Croft, P. R. (2004). The prevalence of pain and pain interference in a general population of older adults: Cross-sectional findings from the north staffordshire osteoarthritis project (NorStOP). *Pain, 110*(1), 361-368.

Trinkoff, A. M., Le, R., Geiger-Brown, J., Lipscomb, J., & Lang, G. (2006). Longitudinal relationship of work hours, mandatory overtime, and on-call to musculoskeletal problems in nurses. *American Journal of Industrial Medicine, 49*(11), 964-971.

Tsigonia, A., Tanagra, D., Linos, A., Merekoulias, G., & Alexopoulos, E. C. (2009). Musculoskeletal disorders among cosmetologists. *International Journal of Environmental Research and Public Health, 6*(12), 2967-2979.

Tucker, P., & Rutherford, C. (2005). Moderators of the relationship between long work hours and health. *Journal of Occupational Health Psychology, 10*(4), 465-476.

Van der Hulst, M., Van Veldhoven, M., & Beckers, D. (2006). Overtime and need for recovery in relation to job demands and job control. *Journal of Occupational Health, 48*(1), 11-19.

van der Starre, Robine E, Coffeng, J. K., Hendriksen, I. J., van Mechelen, W., & Boot, C. R. (2013). Associations between overweight, obesity, health measures and need for recovery in office employees: A cross-sectional analysis. *BMC Public Health, 13*(1), 1207-1215.

van Hooff, M. L. M., Geurts, S. A. E., Beckers, D. G. J., & Kompier, M. A. J. (2011). Daily recovery from work: The role of activities, effort and pleasure. *Work and Stress, 25*(1), 55-74. doi:10.1080/02678373.2011.570941

van Hooff, M. L. M., Geurts, S. A. E., Kompier, M. A. J., & Taris, T. W. (2007). Workdays, in-between workdays and the weekend: A diary study on effort and recovery. *International Archives of Occupational and Environmental Health, 80*(7), 599-613. doi:10.1007/s00420-007-0172-5

van Horn, J., Taris, T., Schaufeli, W., & Schreurs, P. (2004). The structure of occupational well-being: A study among dutch teachers. *Journal of Occupational and Organizational Psychology, 77*(3), 365-375.

Van Yperen, N. W., & Hagedoorn, M. (2003). Do high job demands increase intrinsic motivation or fatigue or both? The role of job control and job social support. *Academy of Management Journal, 46*(3), 339-348.

Veldhoven, M. V., & Broersen, S. (2003). Measurement quality and validity of the "need for recovery scale". *Occupational and Environmental Medicine, 6*0(Suppl 1), 3-9. doi:10.1136/oem.60.suppl_1.i3

Walbridge, C., & Singleton, M. (2005). Safety code of American whitewater. Retrieved from http://www.americanwhitewater.org/content/Wiki/safety:start

Warr, P. (1994). A conceptual framework for the study of work and mental health. *Work and Stress, 8*(2), 84-97.

Wassinger, C. A., Myers, J. B., Sell, T. C., Oyama, S., Rubenstein, E. N., & Lephart, S. M. (2011). Scapulohumeral kinematic assessment of the forward kayak stroke in experienced whitewater kayakers. *Sports Biomechanics, 10*(2), 98-109. doi:10.1080/14763141.2011.569563

Weiss, E. A. (1991). Whitewater medicine. *Journal of Wilderness Medicine, 2*(3), 245-252. doi:10.1580/0953-9859-2.3.245

Whisman, S. A., & Hollenhorst, S. J. (1999). Injuries in commercial whitewater rafting. *Clinical Journal of Sport Medicine, 9*(1), 18-23. doi:10.1097/00042752-199901000-00004

Wittmann, L. (2000). Kayaking is safer than you might think (really!). *American Whitewater,* 100-101.

Woods, K., Bishop, P., & Jones, E. (2007). Warm-up and stretching in prevention of muscular injury. *Sports Medicine, 37*(12), 1089-1099.

World Health Organization. (1948). WHO definition of health. *Constitution of the World Health Organization as Adopted by the International Health Conference, New York, 19-22 June, 1946; Signed on 22 July 1946 by the Representatives of 61 States (Official Records of the World Health Organization, no. 2, p. 100) and Entered into Force on 7 April 1948.*

Wright, K. B. (2005). Researching internet-based populations: Advantages and disadvantages of online survey research, online questionnaire authoring software packages, and web survey services. *Journal of Computer-Mediated Communication, 10*(3) doi:10.1111/j.1083-6101.2005.tb00259.x

Wu, S., He, L., Li, J., Wang, J., & Wang, S. (2012). Visual display terminal use increases the prevalence and risk of work-related musculoskeletal disorders among Chinese office workers: A cross-sectional study. *Journal of Occupational Health, 54*(1), 34-43.

Zijlstra, F. R., & Sonnentag, S. (2006). After work is done: Psychological perspectives on recovery from work. *European Journal of Work and Organizational Psychology, 15*(2), 129-138.

Appendix 1: Study 1 Information Sheet

Participant Number.....

Scoping work-related health in those who lead white water paddle sport activities in the UK.

What does our research involve?

This study has been designed to explore and investigate how health is managed by those who lead activities in the outdoor white water paddle sport industry within the UK. Specifically we are looking for Qualified Raft Guides, aged 18-65 years old, to discuss their health and how their work, as a raft guide, has influenced it.

How can you get involved?

We are conducting interviews which should take no longer than 30 minutes. These can be conducted at a convenient location for you, or over the telephone. In the interview we will ask questions about the work that you do and how you manage your health. As part of the interview, you will be asked to complete a short questionnaire about work and well-being and musculoskeletal complaints. The interview will be recorded using a digital Dictaphone. The data will be transcribed for analysis.
Participation is entirely voluntary and you are free to withdraw from the study at any time without consequences.

How will we use the data collected?

All information collected will be anonymous and confidential and stored securely at Loughborough University, in accordance with the Data Protection Act 1998.
Overall the data will be used to improve advice and guidelines.
Your participation would be much appreciated, as this is one of the first studies to explore the work related health in the outdoor white water sports industry.

Please keep this information sheet for your records.

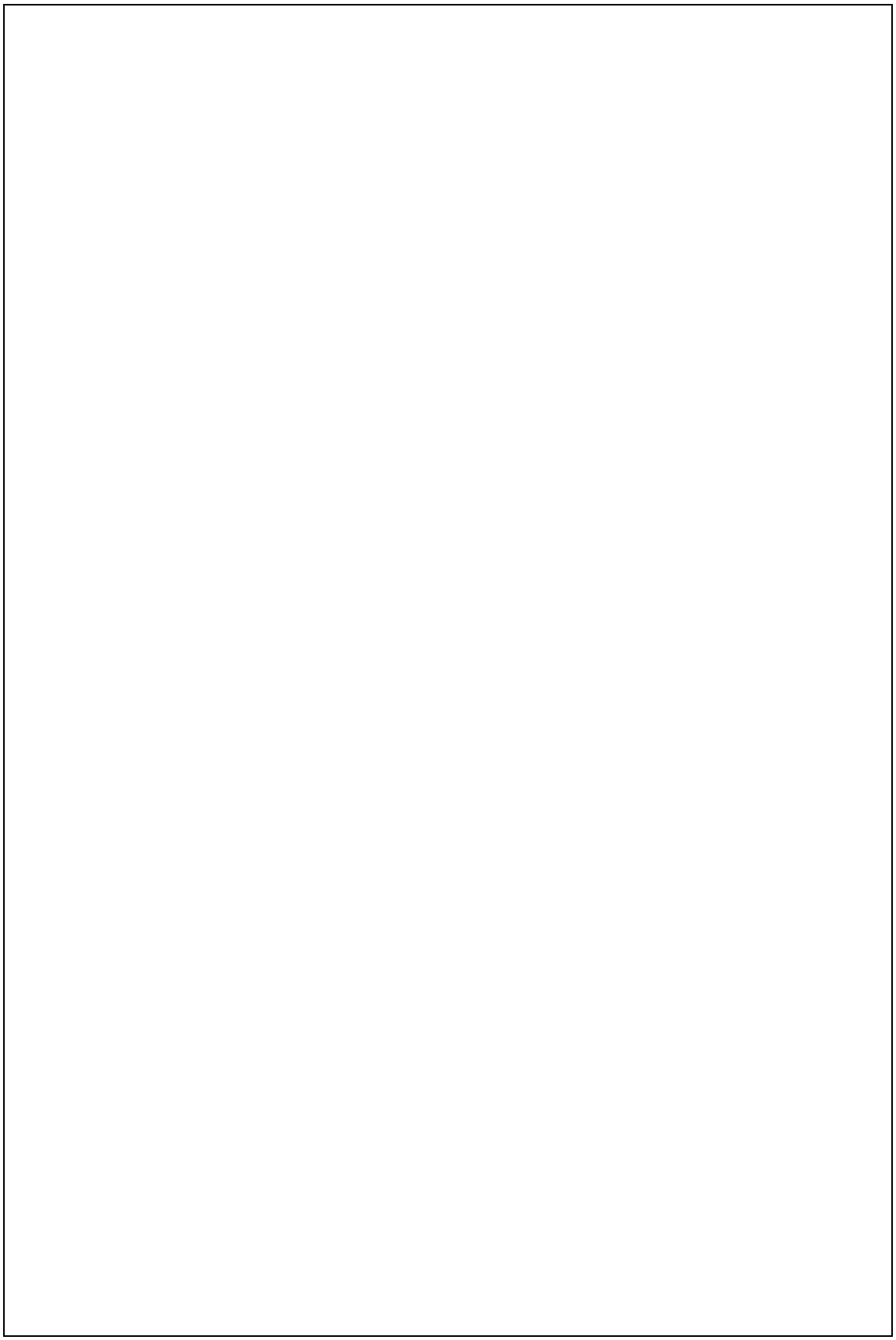
If you have any questions or are interested in participating, please contact the Researcher or his Supervisors:

Iain Wilson	**Dr Hilary McDermott**	**Dr Fehmidah Munir**
(Researcher)	(Supervisor)	(Supervisor)
(I.S.Wilson@lboro.ac.uk)	(H.J.McDermott@lboro.ac.uk)	(F.Munir@lboro.ac.uk)
01509 223083	01509 223098	01509 228228

WORK & HEALTH RESEARCH CENTRE

Loughborough University

Appendix 2: Nordic Musculoskeletal Questionnaire



Appendix 3: Images of a raft guide demonstrating guiding on both the left (image a) and on the right (image b). Raft guides who do both are said to guide bilaterally.

a)

b)

Appendix 4: Study 2 Information Sheet

Work-Related Health of White Water Raft Guides in the UK

About our research

Health and Safety Regulations are in place to protect those who participate in outdoor adventure activities. However, there is limited focus on the health and well-being of employees working in this industry.

The extent to which work-related injury is a problem in the white water industry is currently unknown. This survey has been designed to assess the prevalence of work-related injuries sustained through white water raft guiding and also to identify possible factors related to these injuries.

What does our research involve?

We are inviting Qualified Raft Guides, aged 18-65 years old, to complete this survey, which should take no longer than 20 minutes of your time.
We are collecting data at three time points to assess work-related health throughout a working summer season in the UK. If you decide to complete this questionnaire, we will need you to complete this survey again in July and in October.
The survey will ask questions about you; your work and qualifications; your preparation for work; your equipment; your health; your work and well-being; your recovery from work; and finally any injuries you have sustained.
Participation is entirely voluntary and you are free to withdraw from the study at any time without consequences.

How will we use the data collected?

All information collected will be confidential and stored securely at Loughborough University, in accordance with the Data Protection Act 1998.
Overall the data will be used to improve advice and guidelines.
Your participation would be much appreciated, as this is one of the first studies to explore the work related health in the outdoor white water sports industry.

How do I benefit from taking part?

After you have completed the this survey, you will receive a summary of the findings and …..
If you have any questions or are interested in participating, please contact the Researcher or his Supervisors:

Iain Wilson	**Dr Hilary McDermott**	**Dr Fehmidah Munir**
(Researcher)	(Supervisor)	(Supervisor)
(I.S.Wilson@lboro.ac.uk)	(H.J.McDermott@lboro.ac.uk)	(F.Munir@lboro.ac.uk)
01509 223083	01509 223098	01509 228228

WORK & HEALTH RESEARCH CENTRE

Loughborough University

Appendix 5: Prize Draw Flier

CHANCE TO WIN!!

COMPLETE THE FINAL SURVEY AND BE ENTERED INTO A PRIZE DRAW TO WIN A:

PEAK UK 15M BULLBAG THROW LINE!!

- UNIQUE DESIGN
- BOUYANT FOAM INSERT
- 9mm ROPE WITH >500kg BREAKING STRENGTH
- MORE INFO AT: www.peakuk.com

WINNER WILL BE SELECTED AT RANDOM IN OCTOBER. PRIZE WILL BE SENT TO UK ADDRESSES ONLY.

IAIN WILSON
WORK AND HEALTH RESEARCH CENTRE
LOUGHBOROUGH UNIVERSITY
LEICESTERSHIRE
LE11 3TU
I.S.Wilson@lboro.ac.uk

Appendix 6: Online Survey – Information Sheet and Consent Form

1. Work-Related Health of White Water Raft Guides in the UK

This survey will take approximately 15 minutes to complete.

The purpose of this survey is to assess the prevalence of work-related injuries sustained through white water raft guiding. It will also be used to identify possible risk factors related to these injuries.The data will be used to improve advice and guidelines.

We are collecting data at three time points: March/April, July and October. This is to assess work-related health throughout a working summer season in the UK. If you decide to complete this questionnaire, we will need you to complete this survey again in July and in October.

The survey will ask questions about you; your work and qualifications; your preparation for work; your equipment; your health; your work and well-being; your recovery from work; any injuries you have sustained; personality characteristics and finally the outcomes of the physical aspects of the work.

All information collected will be confidential and stored securely at Loughborough University in accordance with the Data Protection Act 1998.

Your participation would be much appreciated, as this is one of the first studies to assess the work related health in the outdoor white water sports industry.

After you have completed the this survey, you will receive a summary of the findings.

If you have any questions about this survey please contact:

Iain Wilson: e: I.S.Wilson@lboro.ac.uk t: 01509 223083
Supervisors: Dr Hilary McDermott and Fehmidah Munir

Thank you for your time.

I understand that participation in this study is completely voluntary and that I am not obliged to take part. I understand that I have the right to withdraw from this study at any time without incurring penalty. I understand that any details which could be used to identify me will be separated from my response to the survey questions. I understand that all the information I provide is private and confidential.
Please tick to show that you agree to participate in this research:

☐ I agree

Appendix 7: Online Survey – Demographic and Qualification Questions

This section is concerned with details about yourself

	Male	Female
Sex		

Age in Years	

Height in cm OR feet and inches	
cm	
Feet	
inches	

Weight in kg OR stone and pounds	
kg	
Stone	
Pounds	

What is your highest raft guide qualification? (Please select 1 answer)		
Level 1 Raft Guide		
Level 2 Raft Guide		
Level 3 Trip Leader		
Level 4 Raft Coach		
Level 5 Senior Raft Coach		
Other		
If 'Other', please state:		

Appendix 8: Online Survey – Details of Work and Preparation for Work

This section is concerned with your employment.

	How would you describe your current employment status? (Please select 1 answer)	
	Full Time	
	Part Time	
	Freelance	
	Other	
	If 'Other', please state:	

	In the past four weeks, how many total hours did you work as a white-water raft guide? (Include any overtime)
	Hours

	In the past four weeks, how many total hours did you work in a physically active job (e.g., Mountain Leader, Canoe Instructor, Personal Trainer etc.)? (Include any overtime)
	Hours

	In the past four weeks, how many total hours did you work in a non-physically active job (e.g., Office Work, Studying, etc.)? (Include any overtime)
	Hours

	In the past four weeks, how many total hours did you participate in physically active leisure activities (e.g., Cycling, Running, Canoeing/Kayaking, etc.)?
	Hours

What grade water do you currently work on as a raft guide? (Select all that apply)				
Grade 1	Grade 2	Grade 3	Grade 4	Grade 5

	For your current work, do you guide on natural rivers or man-made courses?
	I always guide on a natural river
	I mostly guide on a natural river but sometimes guide on a man-made course
	I guide on natural rivers and man-made courses equally
	I mostly guide on a man-made course but sometimes guide on a natural river
	I always guide on man-made courses

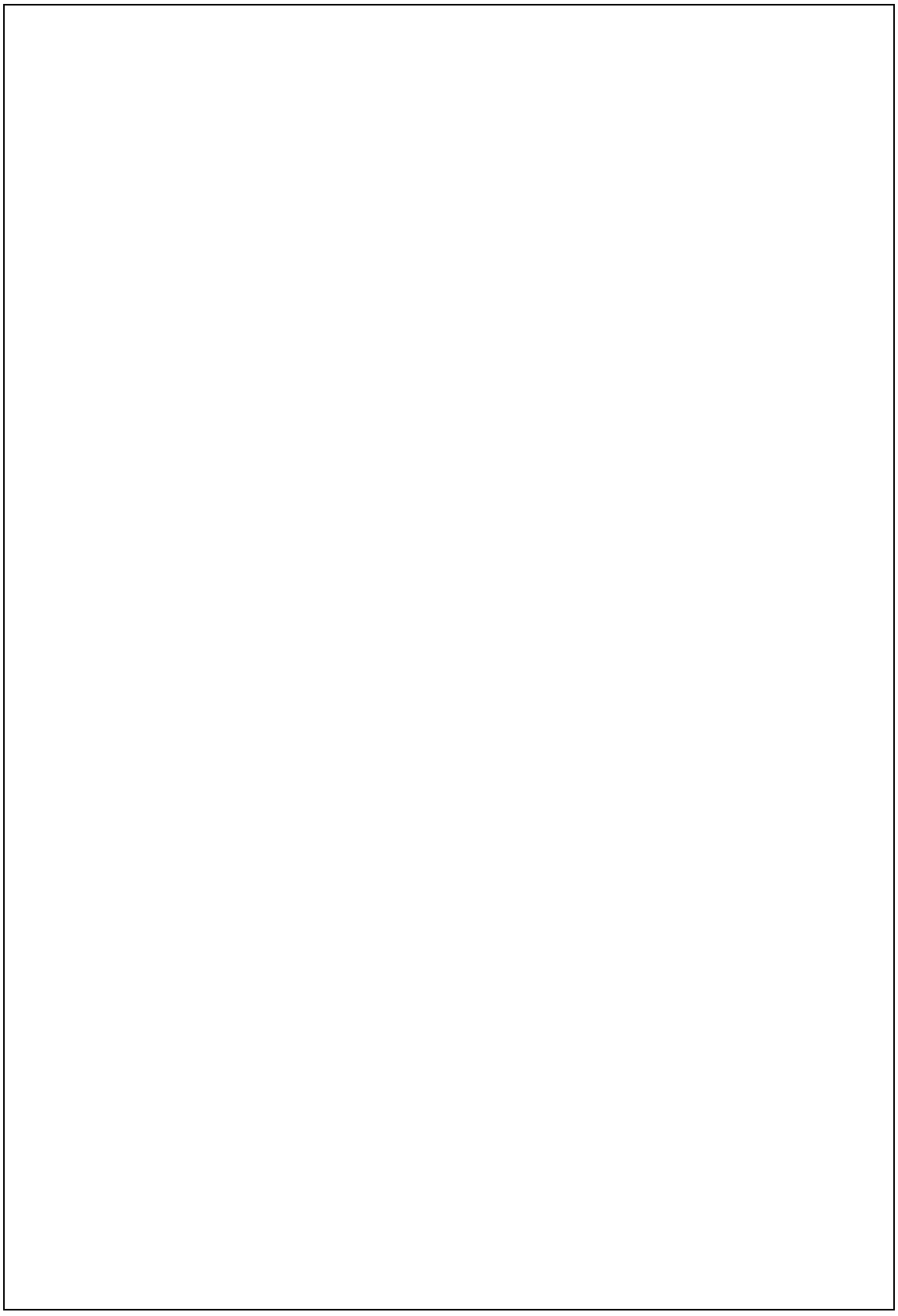
	Please indicate which of these statements is most appropriate to describe the side which you guide on?	
	I always guide on my left	
	I mostly guide on my left but sometimes guide on my right	
	I guide on left and right equally	
	I mostly guide on my right but sometimes guide on my left	
	I always guide on my right	

	What warming-up exercises do you complete? (Tick all that apply)				
	Increase Heart Rate		Stretch Arms		Stretch Neck
	Stretch Shoulders		Stretch Ankles		Stretch Upper Back
	Stretch Sides		Stretch Thighs		Stretch Outside Legs
	Stretch Lower Back		Stretch Groin/Hip		Stretch Wrists
	Stretch Chest		Stretch Hamstring		None

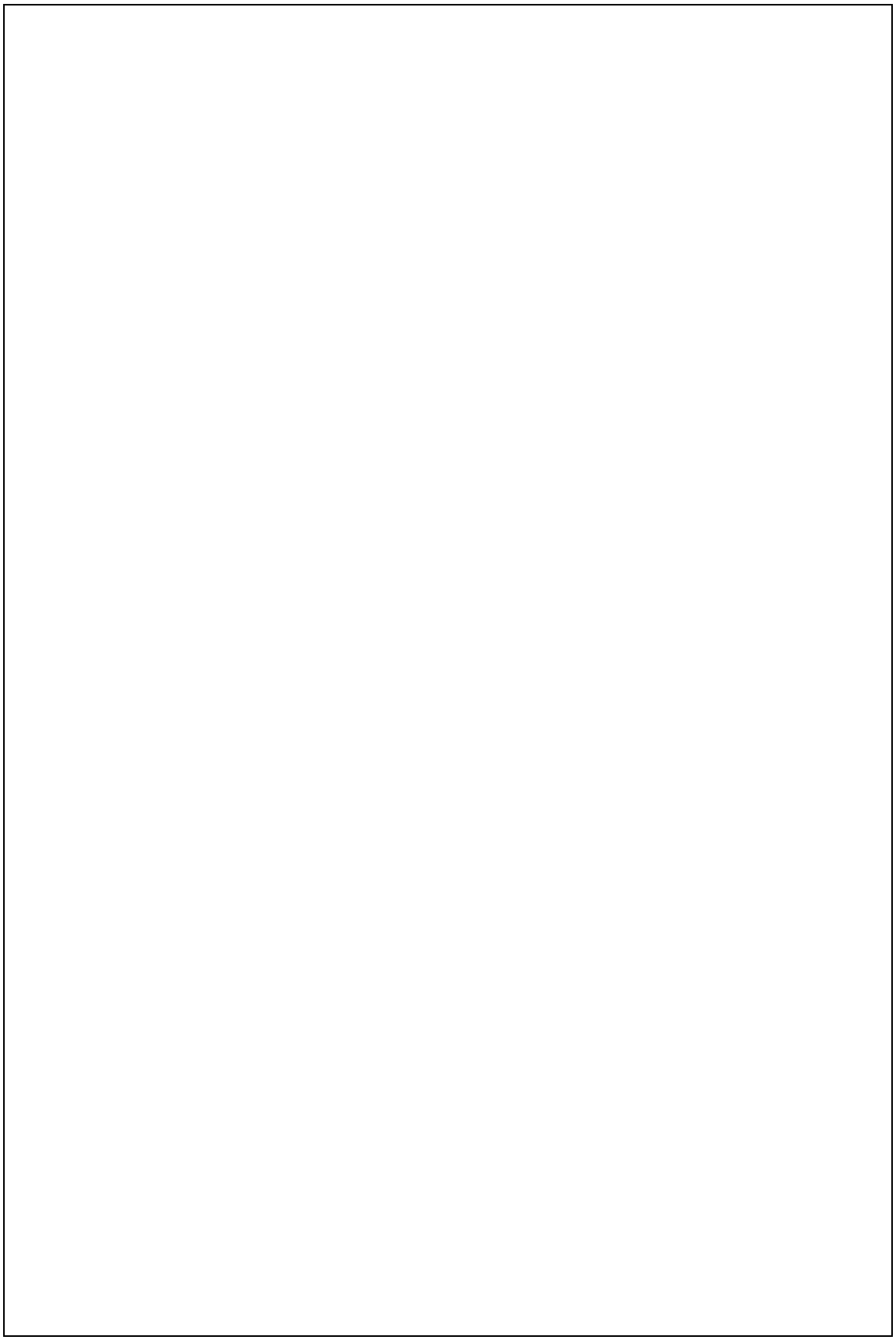
	On average, how many minutes do you spend per day warming-up before starting work as a raft guide?	
	Minutes	

Think back to when you have received training as a raft guide. In your training, were you informed about the benefits of warming-up before work?	
Yes	No

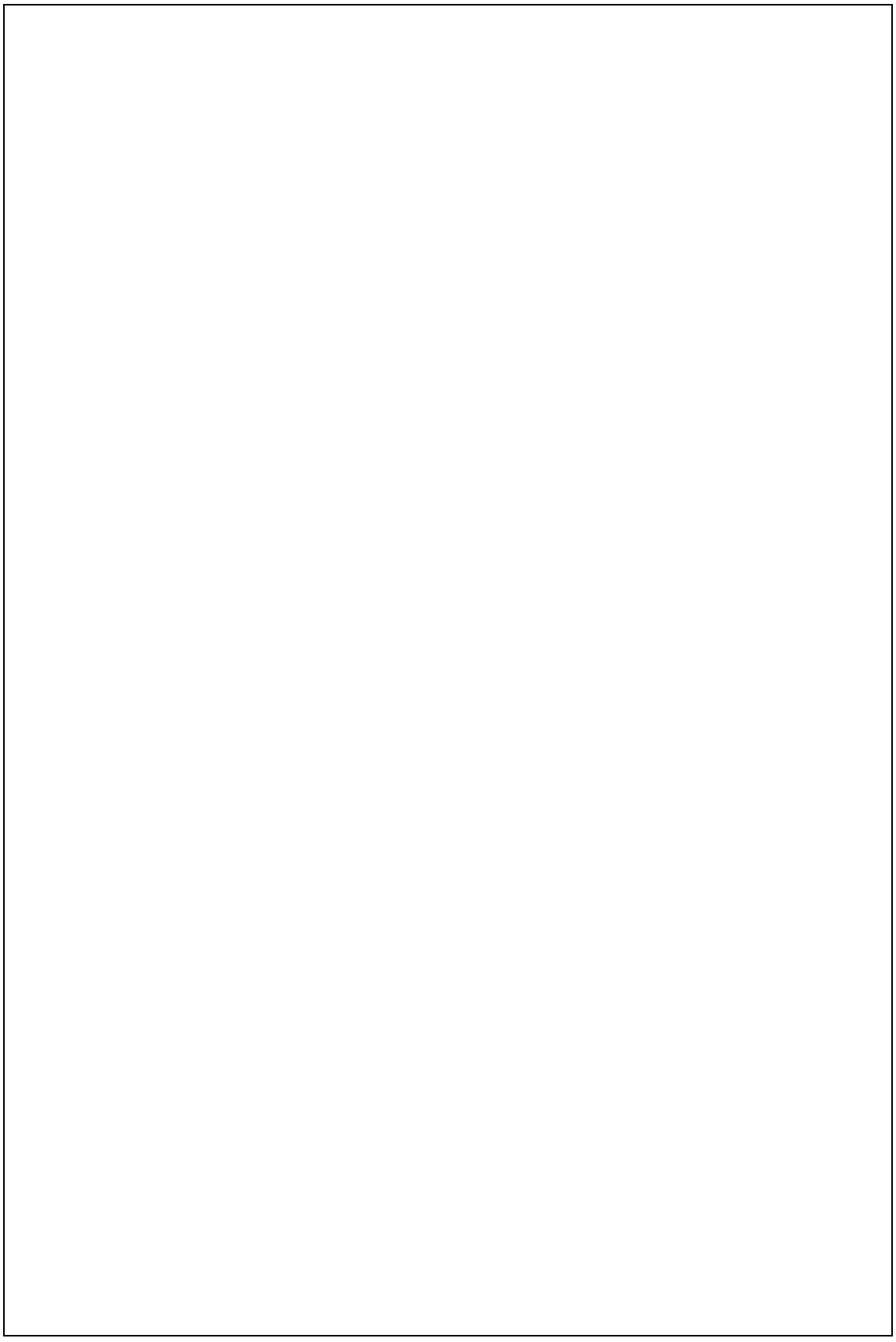
Appendix 9: Utrecht Work Engagement Scale



Appendix 10: Need for Recovery Scale



Appendix 11: Nordic Musculoskeletal Questionnaire – Chronic MSCs



Appendix 12: Nordic Musculoskeletal Questionnaire – Acute MSCs

Appendix 13: Survey Questions on Equipment Used at Work

Please indicate how often you perform any form of safety check on the equipment listed below for your own use as a raft guide. Some employers may provide this equipment for you whereas if you work freelance, you may have to use your own equipment.

How often do you use equipment provided by your employer(s)?				
Never	Rarely	Sometimes	Often	Always

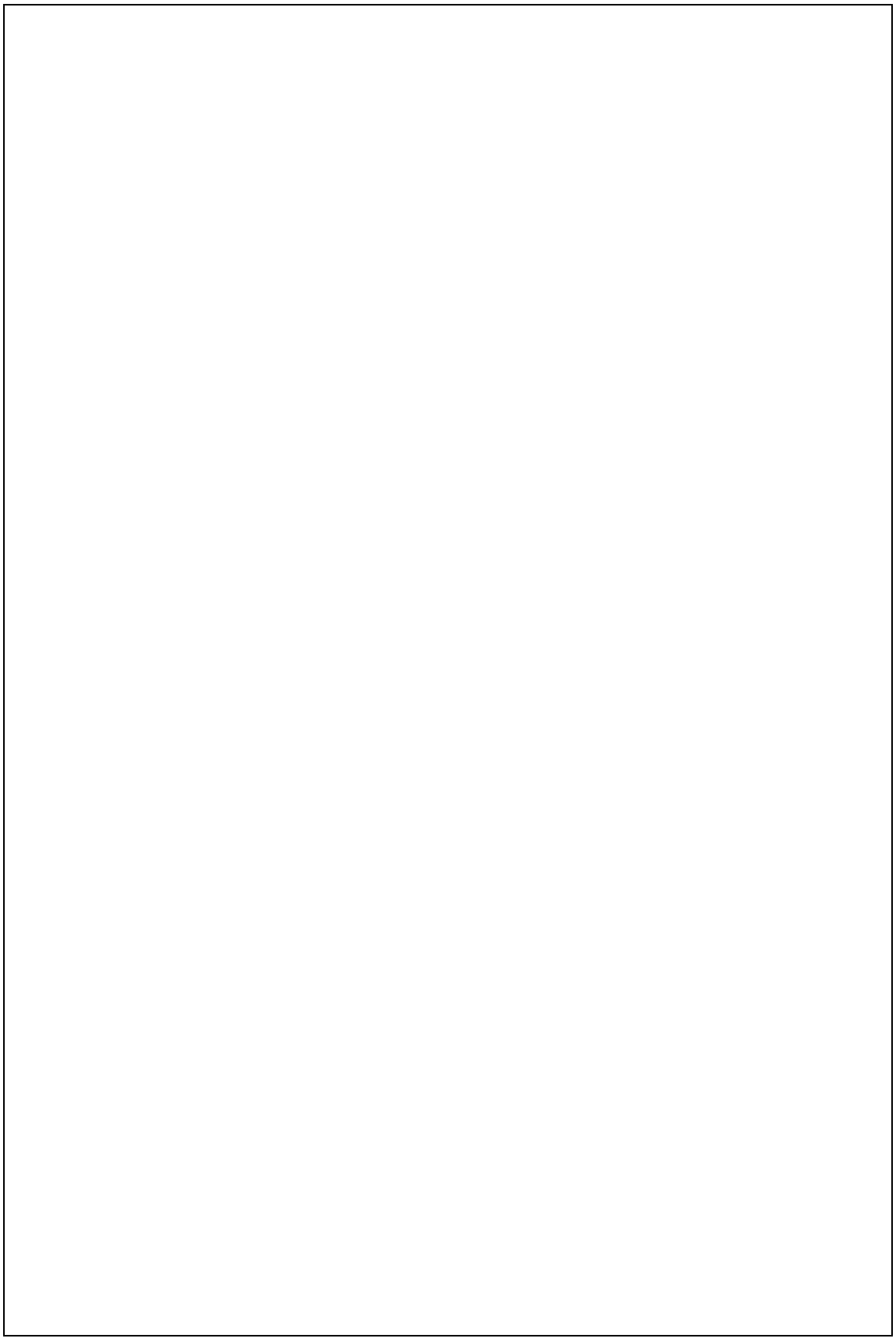
Please answer all of the following questions. If you do not use the piece of equipment in your work, indicate in the "Don't Use" column.

How often do you check your PERSONALLY OWNED equipment before use?						
	Don’t Use	Never	Rarely	Sometimes	Often	Always
Helmet						
Buoyancy Aid						
Throw Line						
River Knife						
Flip Line						
Mechanical Advantage Equipment						
Footwear						
First Aid Kit						

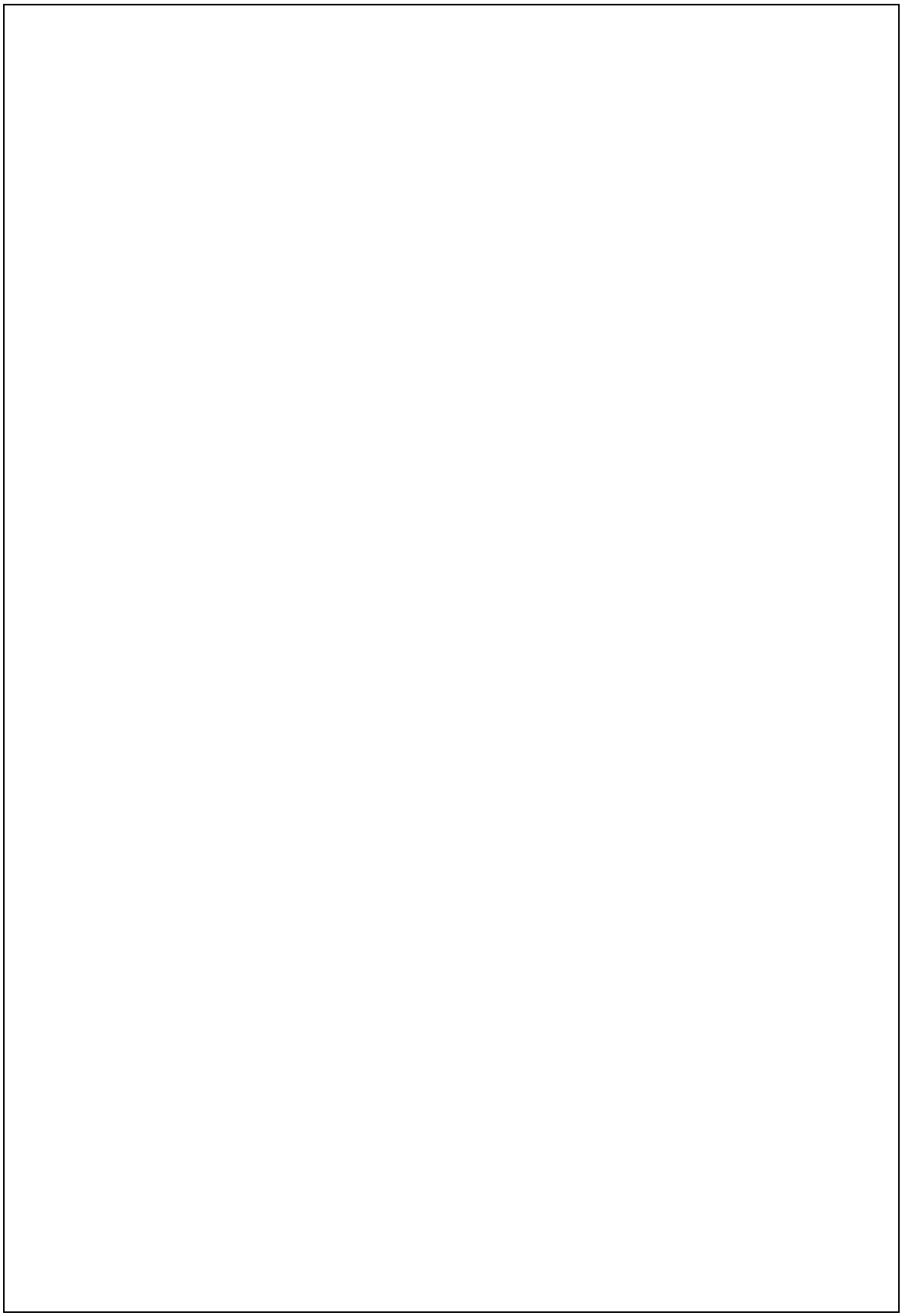
Please answer all of the following questions. If your employer does not provide the piece of equipment or you do not use the piece of equipment in your work, indicate in the "Don't Use" column.

How often do you check your EMPLOYER PROVIDED equipment before use?						
	Don’t Use	Never	Rarely	Sometimes	Often	Always
Helmet						
Buoyancy Aid						
Throw Line						
River Knife						
Flip Line						
Mechanical Advantage Equipment						
Footwear						
First Aid Kit						

Appendix 14: Survey Questions on Macho Identity



Appendix 145: Survey Questions on Outcome Expectations from White-Water Rafting



Appendix 156: Workstyle Short Form