



**NECK INJURY IN RUGBY UNION:
INCIDENCE, SEVERITY, AETIOLOGY AND
PREVENTION**

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Summary

A systematic review of the literature on neck injury in Rugby Union has uncovered variations in the definition of sports injury and the design of studies which has resulted in our current limited understanding on this subject. There is a paucity of data on the severity of sports injuries and little analytical data to confirm any causal relationship between risk factors and neck injury in Rugby Union. Therefore a prospective cohort study was undertaken to analyse the incidence, severity, aetiology and type of neck injury in amateur men's Rugby Union. In 31140 hours of play (12860 hours of match time and 18280 hours of training) 90 participants ($n = 262$) sustained neck injury (8 were recurrent). The incidence rate of neck injury was 2.9 injuries/ 1000 player-hours (95% CI: 2.3, 3.6). Sixty-nine point three percent of neck injuries were minor, 17% mild, 6.8% moderate and 6.8% severe. Neck compression was the most frequent mechanism of injury and was found to be weakly associated with severity ($P = 0.073$). Cervical facet injury was the most frequent type of neck injury diagnosis. There was a significant relationship between the incidence of neck injury and pain reported during pre-season screening. A weak association was found between the incidence of neck injury and the players' age, stage of career and previous neck injury. A weak association between the severity of injury and the amount of time spent on pre-season preparation was also present. Based on these findings preventative strategies have been proposed and recommendations for future studies stated.

Candidate's statement of originality

I hereby declare that this submission is my own work and that, to the best of my knowledge, it contains no material previously published nor written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or other institute of higher learning, except where due acknowledgment is made in the thesis. Any contribution made to the research by others, with whom I have worked at Macquarie University or elsewhere, is explicitly acknowledged in the thesis.

I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic expression is acknowledged.

The research presented in this thesis was approved by Macquarie University Ethics Review Committee, reference number: HE24FEB2006-M04460 on 11 April 2006.

Signed _____

Michael Steven Swain (Student Id: 30651468)

Date _____

Supervisor's statement

As supervisors of Michael Steven Swain's masters work, we certify that we consider his thesis "Neck injury in Rugby Union: incidence, severity, aetiology and prevention" to be suitable for examination.

Associate Professor Henry P. Pollard

Department of Chiropractic, Faculty of Science

Macquarie University

Date: _____

Associate Professor Rodney Bonello

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Date: _____

Doctor Stephney Whillier

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Date: _____

Publications and presentations

Much of the work presented in this thesis has been published, drafted for publication or presented in the following forums:

Publications

Incidence and Severity of Neck Injuries in Rugby Union: A Systematic Review.

Swain MS, Lystad RP, Pollard HP, Bonello R. *Journal of Science and Medicine in Sport*. 2010; article *in press*

Swain MS, Pollard HP, Bonello R. Incidence, Severity, Aetiology and Type of Neck Injuries in Men's Amateur Rugby Union: A Prospective Cohort Study. *Chiropractic and Osteopathy*. 2010;**18**.

Article in review for publication

Risk Factors for neck injury in men's amateur Rugby Union: a prospective cohort study. **Swain MS**, Pollard HP, Bonello R. Whillier S. *Sports Medicine, Arthroscopy, Rehabilitation, Therapy and Technology*. 2010; *in review*

Presentations

Cervical injuries in rugby union: Incidence severity, aetiology and prevention: A prospective cohort study, a presentation of methodology. **Swain MS**, Bonello R, Pollard H. 2006 Conference on Chiropractic Research. Chicago, Illinois, United States of America - 15-16 September, 2006.

The Epidemiology of Neck Injuries in Non-Elite Rugby Union: A Prospective Cohort Study. **Swain MS**, Pollard HP, Bonello R. Chiropractic and Osteopathic College of Australasia's 8th Biennial Conference. Sydney, Australia - 20-22 November 2009.

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I acknowledge the players, coaches and managers of Lindfield Rugby Club and Northern Suburbs Rugby Club for their willing participation in this project. These individuals share my passion for Rugby Union and desire for a safe game.

I acknowledge Amanda Turner, sports physiotherapist, for her work in data collection. Amanda epitomises professionalism in sports injury management and contributed her wealth of knowledge and experience to the data collection process. Thank you Amanda.

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Most importantly I would like to acknowledge my beautiful wife Tamaryn. You inspire me on a daily basis to be a better man. You have experienced the trials and tribulations of this candidature with me. Thank you in advance for your support in my future research endeavours.

Responsibilities and tasks

The chief investigator

The role and responsibilities of the chief investigator constituted the largest proportion of duties in this study. The chief investigator guided by the supervisors conceived the study and was responsible for participant recruitment (which includes initial contact with participation Rugby Union clubs and Rugby Union player recruitment). The baseline measurements (conducting the questionnaire and physical examination) were the responsibility of the chief investigator. The chief investigator developed the physical examination procedures with a colleague prior to their implementation, collected the primary data from all training and game sessions and was responsible for performing the manual spreadsheet data entry. A secondary data collector was recruited, trained and monitored by the chief investigator. The chief investigator compiled the completed injury report forms and manually entered the neck injury data. The chief investigator was responsible for correspondence with the statistical expert which involved communicating the primary and secondary objectives of the study and communicating the research questions which were to be answered. The chief investigator is responsible for storage of collected data and for submitting papers for journal publication and was the primary writer of this thesis. The chief investigator provided feedback to participants in the form of a results manuscript. The chief investigator was responsible for quality assurance through compliance with protocol, problem identification, distribution and maintenance of material. The chief investigator did not receive monetary reward for responsibilities and tasks in this study.

The primary supervisor

The role and responsibility of the primary supervisor was to oversee the conduct of the research project and provide troubleshooting for problems that may have arisen. The primary supervisor contributed to the conception of the research project and evaluated the rigour of the methodological construct. The primary supervisor monitored study progress in the context of the primary and secondary objectives. The primary supervisor was the overseer of results dissemination and edited the results manuscripts and thesis. The primary supervisor monitored project quality assurance. The primary supervisor did not receive monetary reward for responsibilities and tasks in this study.

The secondary supervisor

The role and responsibility of the secondary supervisor was to troubleshoot problems that may have arisen. The secondary supervisor contributed to the conception of the research project and evaluated the rigour of the methodological construct. The secondary supervisor was responsible for ethical issues considered in this project. The secondary supervisor edited the results manuscripts and thesis. The secondary supervisor did not receive monetary reward for responsibilities and tasks in this study.

The tertiary supervisor

The role and responsibility of the tertiary supervisor was to critique all parts of this thesis. The tertiary supervisor contributed to the editing of this thesis. The tertiary supervisor did not receive monetary reward for responsibilities and tasks in this study.

The secondary data collector

The role of the secondary data collector was to collect neck injury data from Northern Suburbs Rugby Union Club over the 2006 and 2007 rugby union seasons (observation period) period. The secondary data collector received an honorarium of \$2 000.00 for assistance in data collection over this period.

The statistician

The statistician provided advice on statistical methodology. The statistician reviewed the correctness of the statistical analysis of collected data.

Resources

A research budget of \$10 000.00 was available from the Department of Chiropractic's higher research degree fund at Macquarie University. No other sources of funding were requested. Of the \$10 000.00 budget, \$8 565.00 was utilised on directly gathering and interpreting data in this study protocol. The remainder was designated to presentation and publication of results and thesis.

Preface

This thesis is organised into six chapters written so that each chapter is able to be read independently. Each chapter focuses on a specific component of the research process. Chapters prepared or accepted for publication contain their own reference list. Appendices that have been prepared or accepted for publication in the form of online supplementary material are included at the end of the thesis. Ethical approval was gained from the Human Research Ethics Committee of Macquarie University for the study prior to commencement. The thesis organisation is as follows:

Chapter 1: The *Introduction*, in which the topic of this thesis is established as relevant to the disciplines of public health and epidemiology. A brief overview of the sports injury problem and prevention of sports injury is provided. In this chapter the thesis research aims are stated.

Chapter 2, *Literature review*, consists of a rigorous review and summary of the literature on the topic. This chapter identifies all prospectively reported incidence and severity data in the literature on neck injury in Rugby Union. It highlights proposed risk factors for Rugby Union neck injury and where possible comments on the level of evidence of supportive data.

Chapter 3, *Methodology*, provides research objectives and questions as well as the protocol for a sports injury surveillance study employed to obtain the results section of this thesis.

Chapter 4, *Results*, this section presents the findings of a two year prospective cohort study with the primary purpose of identifying epidemiological particulars of neck injury in Rugby Union. The data is presented in the format of two manuscripts for journal publication.

Chapter 5, *Discussion*, summarises the key findings and considers all findings in the context of previously published work. It identifies and discusses study limitations. Further consideration is given to the strength of the available evidence as well as the implications the results of the study have to our current understanding neck injury in Rugby Union. Recommendations on methodological construct and direction of future research are offered. The chapter concludes with the implications this study has for future research on neck injuries in Rugby Union. Preventative strategies based on the study findings are proposed to reduce neck injury in men's amateur Rugby Union.

Chapter 6, *Conclusion*, the thesis concludes with the principal findings and practical implications of the thesis.