From 2010-13 our team at Bath conducted a research project funded by the International Rugby Board (IRB) which culminated in the implementation of a global trial for a new scrum engagement process at all levels for rugby union. The impact of our work is a new international law for scrum engagement, ‘crouch, bind, set’, which was introduced globally in September 2013.

Scrum injuries

Even though not many rugby injuries occur in scrums - less than 10 per cent in fact - when they do, they can be severe, making up around 40 per cent of the catastrophic injuries players experience. As opposing sides collide together in the scrum while vying for forward momentum, players experience considerable multidirectional forces. These repeated collisions may lead to both acute and longer-term degenerative injuries, such as arthritis.

Our ‘Biomechanics of the Rugby Scrum’ project was a two-phase study of teams from schoolboy level through to elite international level, which measured the forces, pressures, accelerations and movements experienced by front row forwards under different scrum engagement techniques.

Firstly, the work confirmed the considerable multidirectional forces acting on players during the initial ‘hit’ period of impact scrumming. This was followed by the testing of an alternative method of engagement - ‘crouch, bind, set’ - which, through our study, emerged as a technique that could markedly reduce peak forces during scrum engagement (about 25 per cent) without influencing the levels of sustained force during the pushing phase.

Whilst this technique was expected to improve scrum stability because of the opportunity for props to pre-bind with their opposition player prior to the engagement, the primary goal of the modification was to reduce both acute and longer-term degenerative injuries that players experience as a result of scrumming. Implemented globally in September 2013, the reaction of the rugby fraternity to the new engagement process has been resoundingly positive.

A major change to international rugby laws affecting scrums should significantly reduce long-term back injuries for players. Here Dr Grant Trewartha and Dr Keith Stokes explain how their research into biomechanics of scrum injuries and risk factor analysis of rugby injuries is influencing the game worldwide.

Continues on next page
Monitoring trends to guide injury prevention efforts

For a number of years the RFU/Bath team has been working with teams throughout rugby, with the RFU to conduct studies which monitor injury trends in rugby at a number of playing levels. These injury surveillance projects are fundamental to injury prevention efforts, as they provide the evidence upon which player welfare strategies are based. These projects also provide the means for evaluating the effectiveness of injury prevention initiatives which are being implemented.

The RFU Premiership and England injury surveillance project has been hosted at Bath since 2011 and continues to provide the most comprehensive dataset of injury patterns for professional rugby players anywhere in the world. From 2012-13 the study incorporated an additional concussion work package to understand more about return to play practices for this important and high-profile injury. In the 2013-14 season, the effect of players’ training loads and use of artificial turf pitches on the risk of injury in professional rugby players is being investigated.

The Community Rugby Injury Surveillance Project (CRISP) has been running since 2009 and has already delivered a comprehensive picture of the scale of the injury problem in this important rugby population. In recent years the data gathered has been extended to understand more about the association between functional movement and injury risk in this playing group. This work continues and the project is always looking for interested clubs (RFU levels 3-9) to come forward to participate.

The Premiership and CRISP projects have also identified the importance of reducing seizure collapse from an injury perspective, with both projects identifying higher injury incidence from collapsed rather than completed seizures.

The RFU Women’s Premiership and England injury surveillance project has also been running since 2011 to extend our knowledge of injury patterns in the women’s playing population. This is the most comprehensive study of women’s rugby in the world. This study has also considered the differences in injury profiles between 15s and 7s, having followed the England 7s squad through an intensive training period and into the 2013 World Cup 7s tournament.

A new project from 2013-14 is also taking a closer look at the role that functional movement competence - ‘physical literacy’ - has on the performance and injury profile of young rugby players aged from 15-18 years. A number of secondary schools have participated in the first year of the study which has established the population norms for physical performance and functional movement capacity across different age groups and also established the baseline injury incidence at this level.

This will be followed up in future seasons during which bespoke pre-season exercise interventions will be implemented to assess their effectiveness in reducing injury risk. Dr Grant Trewhara and Dr Keith Stokes

For more information about the Community Rugby Injury Surveillance Project please contact Dr Keith Stokes.

Grant Trewhara

Grant is a Senior Lecturer in Biomechanics in the Department for Health at the University of Bath. His research focuses on the bio-mechanics of injury prevention and injury mechanisms.

Within sport this mainly relates to rugby union and endurance running, within an exercise/health context this mainly relates to trip recovery and fall prevention. His research area also includes human movement patterns during high-risk actions, either directly or through modelling approaches, to develop an understanding of the loads placed on the human body and investigate whether technique, equipment or training interventions can modify these loads to reduce the risk of injury.

Where appropriate he incorporates other methodologies, such as epidemiological research, to inform the evidence-base for interventions.

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Keith Stokes

Keith is a Senior Lecturer in Exercise Physiology in the Department for Health at the University of Bath. His research interests include the science of rugby, muscle metabolism and function and exercise endocrinology, which focuses on how to apply smarter training to improve performance in elite sport. He has worked on major rugby research projects with the Rugby Football Union, RFU for Women, Premiership Rugby, and the International Rugby Board.

Further developments

The research knowledge gained from the project is now being utilised in a new collaborative research project involving the Rugby Science at Bath (Rsbath) team, linking up with the Centre for Orthopaedic Rehabilitation Biomechanics at Bath, to investigate in more detail the biomechanical loading and injury mechanisms which occur in the cervical spine region during rugby activities.

This research study, funded by the Rugby Football Union (RFU), Injured Players Foundation (IPF), focuses on improving our understanding of the magnitude of forces that the necks of rugby players are subjected to, with a view to identifying ways in which these forces can be mitigated. This project is using an exciting blend of research methods, including trials on players, impact testing of cadaveric specimens, and computer modelling techniques.

Functional movement and fitness testing of youth rugby players

Keith Stokes

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REFERENCES:

Inside Rugby - View from the Top

BASEM Today spoke to Dr Simon Kemp, Chief Medical Officer for the Rugby Football Union, to find out more about some of the injury challenges faced in the modern game and how university research can help organisations like the RFU protect player welfare.

“The major focus at all levels of the game currently is concussion. The RFU has had a comprehensive approach to concussion management in place for some time but this has been developed significantly over the past 12 months across the professional, development and age-group games.

Across the development game, the RFU has been raising awareness of this issue since it launched the ‘Use Your Head’ campaign in 1996, in partnership with NHS Direct. Through this, 50,000 posters and advice cards were distributed to clubs, schools, universities and colleges.

In 2013 a new initiative, ‘HEADCASE’, was launched in conjunction with brain injury campaigners and leading neurologists with 220,000 awareness cards being distributed to clubs across England involved in the game this season. The RFU has made it mandatory for all level one and two rugby coaches to pass the ‘Rugby Ready’ Course which includes guidance on preventing concussion. There have been 230,000 participants since 2008. Over recent years, information on concussion has been given increasing prominence.

“The risk of injury will never be completely absent in rugby union but our understanding and perception of risk needs to be carefully balanced against the recognised positive health consequences of playing rugby union.”

Simon Kemp, RFU

A key challenge facing the game will be the development of injury prevention and injury treatment approaches across all levels of the game that are based on a detailed understanding of risk but acknowledge the unique nature of rugby union – namely that it is a game for all shapes and sizes where a contest for possession is paramount. Communicating the subtleties of risk is not easy in a world where messages are increasingly effective when they are short and might be 140 characters or less. Welfare interventions need to be tailored to the game. The recent change in the scrum engagement sequence is a good example of the value that science can add when addressing specific questions posed by the game.

There remains a huge demand for medical support at all levels of the game. The easiest way for practitioners to enhance player welfare is to get involved in the game. This requires the practitioner to be appropriately skilled in pre-hospital sports immediate care and to have an understanding of the game but it’s typically hugely rewarding.

The International Rugby Board (IRB) player welfare website - http://www.irbplayerwelfare.com/

The IRB rugby science network - http://www.irbscicenetswork.com/


Since 2011, the University of Bath has also played a critical role in the development of policy in this area by conducting the Professional Rugby Injury Surveillance Project, which surveys injury risk across the Premiership and Senior England teams. This study has tracked the incidence, severity and risk factors for all rugby injuries across the professional game since 2002.