CHANGING TACKLE BEHAVIOUR

TO REDUCE HEAD-ON-HEAD IMPACT IN AMATEUR RUGBY

ANALYSIS AND GENERAL CONSIDERATIONS

IRFU MEDICAL DEPARTMENT

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1 EXECUTIVE SUMMARY

- Over 70% of all concussions occur in the tackle, with the tackler at higher risk.
- Lower tackles are safer than higher tackles.
- The greatest risk of head injury is when the tackler and ball carrier heads occupy the same space, efforts must be made to separate the heads.
- Reducing tackle height alone has limited effect on head-to-head impacts or concussion rates.
- A study in French Rugby has provided some evidence that lowering tackle height to the waist and addressing ball carrier behaviour can have a significant effect on head-to-head impacts and concussion rates.

Ball carrier behaviour and tackler height must be addressed to give the greatest reduction in head-to-head impacts and concussion rates.

2 INTRODUCTION

In light of recent findings, the IRFU is currently undergoing a consultation process on measures to improve tackle behaviours, reduce head-on-head contact and ultimately lower occurrences of head injuries (including concussion) in the amateur game.

As a part of the ongoing consultation process, the IRFU Medical Department has produced this information guide to outline the relevant research in the area of head injury and the tackle for consideration by the IRFU.

It does not cover all areas that are addressed by the IRFU in trying to minimise the risk of concussion.

We are actively reviewing and analysing all available literature and have designed this document to offer a high level overview of key areas while providing full access to more detailed resources via references and bibliography.

This document is subject to update as further research in this field becomes available. The IRFU Medical Department will continue to monitor and review all relevant literature in support of the ongoing consultation.

For additional information on the IRFU's Consultation process on measures to improve tackle behaviours, please see: https://www.irishrugby.ie/playing-the-game/tackle-behaviour-consultation/

3 INJURY RATES

Concerns over the number of injuries in rugby have resulted in the design and implementation of comprehensive rugby-specific injury surveillance systems in both the Domestic Game (amateur) and the High Performance Game (professional).

These surveillance systems continue to monitor injury trends season-on-season, highlighting the type, severity and mechanism of rugby injuries.

There is approximately:

- **2 injuries* per game in the senior men's and School's game**
- **3 injuries for every 2 games in the senior women's game**

Injury rates in the senior men's amateur game are nearly half that of the senior men's professional game.

**Injury definition = Any visible complaint that results in greater than one day absence from match or training activities (i.e. the rates given in this document are for time-loss injuries only)*

The Irish Rugby Injury Surveillance (IRIS) Project was established in 2016 to investigate injury trends in the Domestic Game in Ireland, with their national season reports published annually (1).

In the Senior men's and School's game, injury incidence rates of 49.9/1,000 player hours and 53.4/1,000 have been reported, roughly equating to two injuries per match.

There was a lower injury incidence rate found in the Senior women's game (34.2/1,000 player hours) with approximately three injuries every two matches occurring.

This is lower than what is reported across the Senior men's professional game globally (2).

In Ireland, there has been a decrease in overall rates observed since 2019, with a rate of 65/1,000 player hours reported in the 2021/22 men's season (Fig. 1).

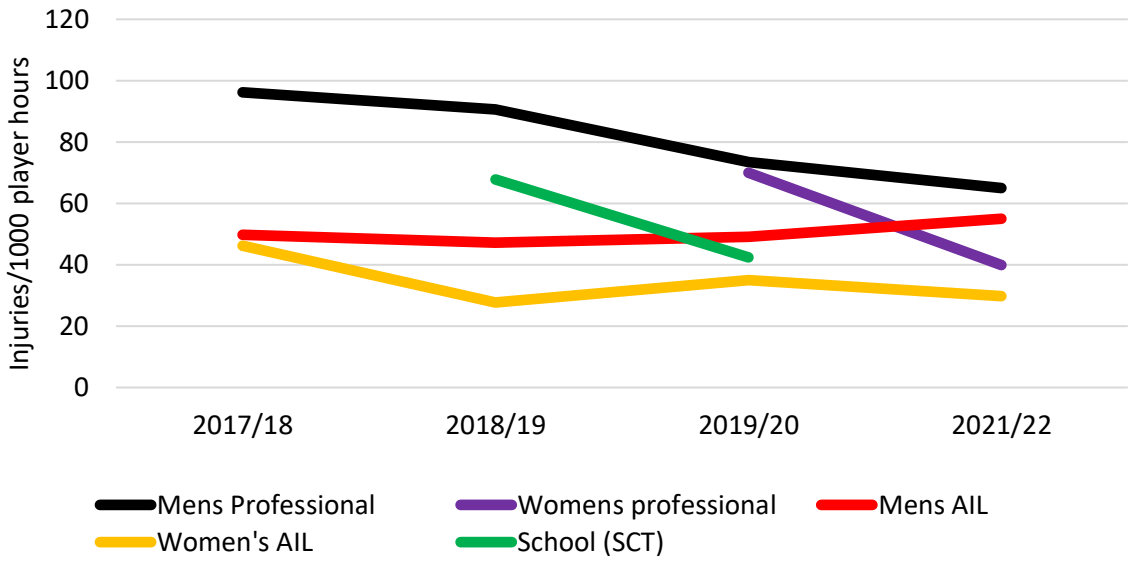

Figure 1: Overall injury incidence rates in Ireland (2017/18 season to present)

4 CONCUSSION INJURY RATES

In both the amateur and professional game the most frequently injured areas include; head and neck, shoulder, ankle and knee (1, 2). Concussion injuries continue to be the most common injury diagnosis across all groups.

Concussion injury rates in Ireland are shown in Fig. 2 from the 2017/18 season to present.

A recent study has also shown that players had a 23% greater injury risk after sustaining a concussion than before (3).

There is one concussion or suspected concussion in the amateur game approximately:

- **every 3 games in the senior men's and school's game**
- **every 6 games in the senior women's game**

Concussion injury rates in the senior men's amateur game are nearly one third that of the senior men's professional game.

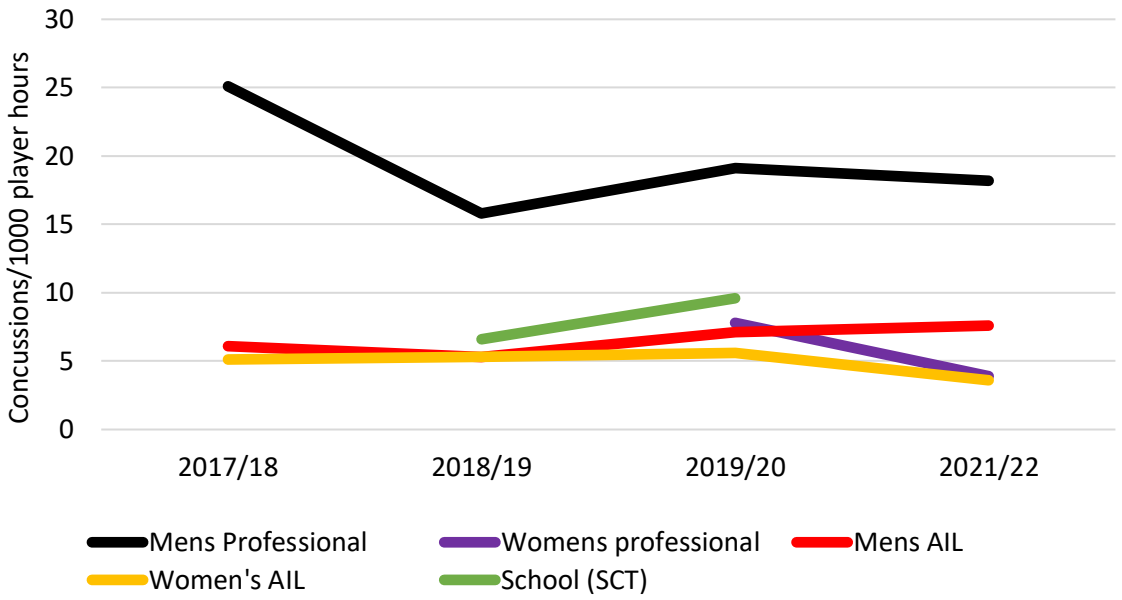

Figure 2: Concussion incidence rates in Ireland (2017/18 season to present)

5 MECHANISMS OF INJURY

The tackle event accounts for the majority of all injuries in both professional and amateur rugby and we are seeing an increase in the number of tackles per match over recent years (1, 2, 4).

When looking at overall injury rates, the risk of injury is similar between the tackler and ball carrier (1, 2, 5). However the rates of tackle injuries appear higher in the professional game compared to the amateur game (5).

The tackle event accounts for the majority of all injuries in both amateur and professional rugby.

Over 70% of all concussions occur in the tackle with the tackler at higher risk.

Looking specifically at concussion injuries, the majority of concussions occur in the tackle event, with the tackler at a significantly higher risk than the ball carrier (Appendix A, 6).

Lower tackles are safer than higher tackles.

Relative risk of tackles where the tacklers head is above the shoulder is more than 4 times greater than when it is below that line.

4. 1 Professional Game Data:

World Rugby Head Injury Assessment (HIA) rate is 4.3 times greater when a tackle occurs at or above the lower level of the armpit (shoulder) (Fig 3).

Similarly, when looking at the U20 World Cups, senior professional men's and women's rugby and amateur (UK community) rugby, all studies show that lower tackles are safer than higher tackles.

Simply put, you want the tackler's head away from the ball carrier's head and shoulders (6).

Figure 3: Rate of head impact events (HIAs) above and below line of sternum (World Rugby).

6	TACKLE HEIGHT

Laboratory and World Rugby studies have shown there is:	
GREEN ZONE:	Belly area (between torso and waist) - head injury risk is lowest.
ORANGE ZONE	Waist down to the ground - a moderate head injury risk.
RED ZONE:	Head and shoulder - highest risk of head injury.

Head to head contact creates the greatest risk of a head injury event, for both the tackler and the ball carrier (6, 7). This is followed by the elbow, knee and hip. In contrast, the upper leg and upper body are on the safer end of the spectrum (Fig. 4).

Figure 4: Propensity for a Head Injury Assessment (HIA) in professional rugby

Tackle height strongly effects the head movements (whiplash) experienced by the ball carrier, with more head and neck movement seen when tackled at the upper trunk compared to the lower trunk (8).

In addition, contact at the upper trunk of the ball carrier resulted in more HIAs (head impacts) for the tackler (9).

Tackling below the torso (belly area) may therefore reduce head impact risk for both the ball carrier and tackler.

Laboratory studies have also shown that ball carriers use two main movement strategies when being tackled; 1) increase their stability by bending forward during an upper trunk tackle or 2) offloading the ball/evading the tackle (staying more upright) during a lower trunk tackle (10).

Risk of head injury is GREATER when:

- **Both tackler and ball carrier are upright**
- **The tackler is upright**

Risk of head injury is LOWER when:

- **The tackler is bent and the ball carrier is upright**

The GREATEST RISK is when the heads occupy the same space

5. 1 Body Position:

Body position of both the ball carrier and tackler must be considered. Overall, HIA risk is 32% higher when the tackler is upright compared to bent and 17% higher when the ball carrier is bent (6, 7).

This means that upright players increase risk for both the tackler and ball carrier.

Head contacts above the line of the sternum (above waist height) increases the risk of head impacts.

The tackler is also at risk of a head impact when the ball carrier fends into contact, however fewer ball carrier characteristics that result in a head impact have been identified, compared to tackler characteristics (8, 9).

7 RISK REDUCTION TRIALS

Reducing tackle height alone had a limited, if any, effect on concussion rates.

One study in France which combined lowered tackle height and ball carrier behaviours produced a significant reduction in head impacts .

6.1 French Amateur Rugby Trial (11)

French Amateur Rugby Trial

Tackle height lowered to WAIST, prohibited ball carrier dip into tackle and double tackling.

- **63% REDUCTION in head-to-head contacts**
- **30% REDUCTION in blue cards by referee (clear concussions)**

Head impacts, high tackles and number of tackles were compared over two seasons, following a change to tackle behaviours in the second season.

Tackle behaviour was addressed in three key areas:

1. Tackle height lowered to the line of the waist;
2. Ball carrier prohibited from dropping height and charging head forward and;
3. Double tackles prohibited.

The number of tackles remained the same in both seasons, however the number of high tackles fell from 18% to 13% in the second season.

There was also a reduction in head impacts (head to head contacts), from 9.5 per match to 3.5 per match.

The concussion rate, measured as blue cards issued by referees for clear concussions, dropped by almost 30% (12).

Key stakeholders in the amateur game were engaged in the process, and when surveyed 60% felt the trial brought more safety to the game.

In addition, 80% found the game to be more fluid and developed new skills, however 35% felt that there were too many penalties.

6.2 South African Amateur Rugby Trial (13)

South African Amateur Rugby Trial
Tackle height lowered to ARMPIT.
Downward trend in injuries but NO change in concussion rates

Overall injury incidence rates and concussion injury incidence rates were compared after lowering the legal tackle height from the line of the shoulder to the lined of the armpit in a University rugby group.

While no statistically significant differences in injury or concussion rates were found between the two seasons, there was a 30% decrease in concussion rates which may still be clinically relevant.

6.3 UK Professional Rugby Trial (14)

UK Professional Rugby Trial
Tackle height lowered to ARMPIT.
Upward trend in injuries but NO change in concussion rates

Concussion injury incidence rates were compared after lowering the legal tackle height from the line of the shoulder to the lined of the armpit in the Senior men's professional game, and found no significant differences.

There was a non-significant upward trend following the change in tackle height but this may be due to poor buy-in, engagement and compliance with stakeholders prior to the trial.

6.4 UK Amateur Rugby Trial (not yet published)

UK Amateur Rugby Trial
Tackle height lowered to ARMPIT.
NO change in concussion rates

The RFU and Bath University are currently investigating the effect of lowering tackle height to the line of the armpit in all age-group community rugby on concussion injury risk.

Preliminary reports during the 2021/22 season show no significant change in concussion injury risk (15).

8 GENERAL CONSIDERATIONS

Coach and player knowledge of injury risk during the tackle and the importance of proper technique does not necessarily translate into tackle training or tackle training proficiency.

Engaging with key stakeholders across the game to ensure buy-in and compliance is important

Tackle height alone may not result in significant changes to head injury risk, the behaviours around the tackle situation must be addressed.

Studies have shown that while a sample of youth coaches were aware of the injury risk during the tackle and the importance of proper tackle technique, this did not translate to their tackle training sessions (5).

Similarly, even when players have high awareness around the importance of both tackler and ball carrier technique to reduce tackle-related injuries and win the tackle contest, their awareness of safe and effective techniques did not relate to their tackle proficiency during training drills (16).

The tackle height trial in the UK professional game (14), highlights the importance of engaging with key stakeholders across the game to ensure buy-in and compliance.

It was theorised that stakeholders (players, coaches and referees) were not engaged effectively or successfully prior to the trial beginning and may have attributed to the upward trend in concussion rates following the change in tackle height.

Education has often been highlighted as a key method of reducing injuries, however despite repeated initiatives to develop concussion education and prevention programmes there is little evidence to support such strategies.

Therefore, other solutions and avenues need to be explored (5, 16).

09 GLOSSARY

Injury Definition;
Any physical compliant that results in greater than 1 day absence from match or training activities (i.e. the rates given in this document are for time loss injuries only).

Match Injury Rate;
Data is presented as the number of injuries per 1,000 player hours of match exposure (1,000 player hours equates to 25 games of rugby)

Match Injury Rate (IR) calculation;

$$\text{Injury Rate} = \frac{\text{Number of match injuries}}{\text{Number of Matches x Number of players (30) x match duration (1.33hrs)}} \times 1{,}000$$

Recognise & Remove;
The process within the amateur game by which a player with a suspicion of concussion is removed from the field of play. Thus IRIS rate is for confirmed and suspected concussions.

Head Injury Assessment (HIA);
The process within the professional game by which a player is removed from the field of play to determine if there is a suspicion of concussion.

Blue Card;
In some countries where the referee considers that a player has a suspected or clear concussion he/ she shows a blue card to indicate removal form the field of play under the recognise and remove process.

10 APPENDICES

IRIS Clubs Raw Data On Mechanism of Concussion Injuries		
Mechanism	n	%*
Tackling	198	50.4
Being tackled	96	24.4
Ruck	45	11.5
Unknown	24	6.1
Accidental collision	15	3.8
Other	4	1.0
Maul	3	0.8
Scrum	3	0.8
Lineout	3	0.8
Aerial Duel	2	0.5
**adds to 100% without 1 d.p. rounding*		

IRIS Schools Raw Data On Mechanism Of Concussion Injuries		
Mechanism	n	%*
Tackling	38	53.5
Being Tackled	14	19.7
Ruck	12	16.9
Unknown	3	4.2
Accidental Collision	2	2.8
Other	1	1.4
Maul		
Scrum	1	1.4
Lineout		
Aerial Duel		
**adds to 100% without 1 d.p. rounding*		

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