

Written evidence to “Concussion in sport” parliamentary enquiry, March 2021.

From Professor Allyson M Pollock and Graham Kirkwood, Population Health Sciences Institute, Newcastle University

Pollock and Kirkwood have written extensively on the topic of rugby as a collision sport and risks of injury.

Links between sport and long-term brain injury / Links between head trauma and dementia

Rugby is a high impact collision sport. Players exert extreme force in order to acquire and maintain possession of the ball. Most injuries occur during contact or collision i.e. tackle, scrum, ruck and maul. Concussion, or mild traumatic brain injury, is a routine occurrence. Repeat concussions are associated with reduced cognitive function in young adult male rugby players which can be detected over three months later following the last concussion. (1) Repeat concussion is also associated with depression, memory loss and poorer verbal fluency in later life in former American football and ice hockey players. (2-5) Evidence of a link between rugby and chronic traumatic encephalopathy (CTE) in former players is also emerging. (6-8) CTE is a progressive degenerative disease of the brain found in people with a history of repetitive brain trauma. Memory loss, confusion, impaired judgment, impulse control problems, aggression, depression typically presents in middle age, long after a player has retired and may lead eventually to dementia. CTE has been a recognised issue in boxing since the 1920s and in American football since the 1960s.

Research shows that: youth rugby has a significantly higher rate of concussion than any other contact or collision team sport (9); that girls take longer to recover from concussion than boys (10); head impacts in under 11 year olds playing rugby league are of a similar severity to those sustained by college American football players (11); a history of concussion negatively impacts on a person’s life chances across a range of social and educational measures (12); there is evidence that concussion is predictive of violent behaviour and subsequent injury in the year following the concussion in 13-14 year old Australian school children (13); head injury is associated with an increased risk of dementia and Alzheimer's disease (14).

How risks could be mitigated

Of all the phases of play the tackle is the most injurious. In England, the tackle is introduced at eight years and other collision elements (the scrum, ruck and maul) at nine years. (15) In a US surveillance

system study of high school rugby clubs, 65% of all concussions were associated with the tackle (16). The tackle is also the most common cause of concussion with tackling twice as risky as being tackled. (17, 18)

For decades the Rugby Unions have under played the role of the tackle as the main cause of injury instead focusing on the scrum. Since the evidence has started to mount, rugby researchers have been more willing to talk about the tackle as the number one cause of injuries. The logical next step would be to see rule / regulation changes around collision elements of the game, in order to encourage players to avoid the tackle. However, the evidence points to the contrary; the number of tackles taking place in professional matches is on the rise across European, National Cup and Premiership fixtures with an average of 139 tackles per team in 2017-18 compared to 102 tackles per team in 2013-14; there has also been a corresponding rise in the number of tackle-related injuries. (18)

A good example of what can be done comes from Canada. Ice-hockey is another collision sport with a high risk of injury, particularly concussion. The body check is the main legal collision element where a player deliberately makes contact with an opposing player to separate them from the ice-puck, often crashing them into the side barriers. Since banning the body check in the youngest versions of the game there has been a 67% reduction in concussions in 11 and 12 year old players (19).

The laws and rules governing the game are intended to control and regulate athletes' behaviour in relation to their conduct. A simple ban on tackles, rucks, mauls and scrums in schools' rugby would eliminate the main cause of rugby injury and concussion in school children.

Changing the rules of rugby in schools is not however a straightforward matter. Governments and education authorities have abdicated responsibility for sport safety and have little control. The responsibility for setting the rules of individual sports lies with the national sport governing body for each individual sport and within schools in the UK, versions of these rules are adopted as advised by the national sporting bodies. School children playing rugby union in England do so under a set of rules created for each age grade by the Rugby Football Union ("RFU") (15), derived from the laws established by World Rugby.

Implications for youth sport

Children are an under-researched group. Rugby is played in many schools throughout the UK and is being rolled out to both state and private schools. In England, in 2013, almost half of state secondary

schools (1,500 out of 3,281) played competitive rugby with plans to increase this number by 750 by 2019. (20) In a recent sample survey of state-funded secondary schools that deliver contact Rugby Union as part of the boys' physical education curriculum, rugby union was the sport most likely to be made compulsory and was a compulsory activity in 91% of the 229 schools that delivered full contact rugby. (21)

Despite the fact that a large proportion of state schools offer rugby, data on actual numbers of injuries sustained through rugby in a season are not collected routinely. The first ever Youth Rugby Injury Surveillance Project Season Report 2017-18 has now been published. Using data collected from 19 English schools (15 private and four state) and from children aged 12 to 17 years, the incidence of match injuries where players were prevented from play or training for seven days or more was 21.2 per 1000 player-hours (17); this compares to that in the professional adult game in the same season of 63 per 1000 player-hours (18).

Concussions were highest for the under 18s at 8.7/1000 player-hours with under 13s recording 6 per 1000 player hours and under 15s, 5.9 per 1000 player-hours. Most injuries including concussions happened in the tackle and 23% of concussed players returned to play in less than 23 days, the minimum medical timeframe specified for under-19 players; six percent returned within seven days.

Funding for further scientific research

It is striking that in the UK there is almost no independent research into rugby injuries, research is almost exclusively funded by the rugby unions.

The main funding for rugby research are World Rugby and the Rugby Football Unions (RFUs) - who make the Laws in defence of the tackle in school rugby. Critics of the injuries incurred in the sport do not receive funding and there is no government funding for research into the sport or indeed into injuries and harms resulting from sport. It is seen as a private matter.

Some major academic journals also close down the debate by delaying publication and restricting access to their articles. Their censorship is based on ability to pay. The use of free to view open access creates another bias. The rugby unions, like the pharmaceutical companies, pay large amounts to journals for reprints of their articles and so the bias is perpetuated. This is a hidden form of sponsorship.

The role of national governing bodies and major sporting organisations in ensuring member clubs receive up to date medical advice and promote good practice

We have written to the Chief Medical Officers (CMOs) of the four countries of the UK on the following dates: [01 March 2016](#); [13 July 2017](#); and [10 January 2018](#); outlining our concerns and the growing evidence of serious harms from tackle in youth rugby. Their current stated position was set out by then Scottish CMO Catherine Calderwood on behalf of the four CMOs on 10 October 2017 and is that “As a group we continue to support the position set out in my article in the British Journal of Sports Medicine in September 2015 - that it is important for schools and community groups to develop and implement strong concussion management policy.” (22, 23) In other words, no primary preventative approach to reducing the numbers of concussion has been adopted; the focus remains only on how to deal with them when they have already occurred. This is after the harms have occurred. We have yet to receive any detailed response to the 36 questions we raised in July 2017 (<https://www.sportcic.com/resources/SCIC%20questions%20to%20UK%20CMOs%20re%20rugby%20injury%2013July2017.pdf>). Our most recent letter dated [10 January 2018](#) is unanswered. The CMOs of the four countries of the UK have yet to address the serious issues of injuries and concussion from tackle sustained during rugby in the children and youth game (24)

REFERENCES

1. Gardner A, Shores EA, Batchelor J. Reduced processing speed in rugby union players reporting three or more previous concussions. Archives of clinical neuropsychology : the official journal of the National Academy of Neuropsychologists. 2010;25(3):174-81.
2. Guskiewicz KM, Marshall SW, Bailes J, McCrea M, Harding HP, Jr., Matthews A, et al. Recurrent concussion and risk of depression in retired professional football players. Medicine and science in sports and exercise. 2007;39(6):903-9.
3. Guskiewicz KM, Marshall SW, Bailes J, McCrea M, Cantu RC, Randolph C, et al. Association between recurrent concussion and late-life cognitive impairment in retired professional football players. Neurosurgery. 2005;57(4):719-26; discussion -26.
4. De Beaumont L, Theoret H, Mongeon D, Messier J, Leclerc S, Tremblay S, et al. Brain function decline in healthy retired athletes who sustained their last sports concussion in early adulthood. Brain : a journal of neurology. 2009;132(Pt 3):695-708.
5. Tremblay S, De Beaumont L, Henry LC, Boulanger Y, Evans AC, Bourgouin P, et al. Sports concussions and aging: a neuroimaging investigation. Cereb Cortex. 2013;23(5):1159-66.
6. Gardner A, Iverson GL, McCrory P. Chronic traumatic encephalopathy in sport: a systematic review. British journal of sports medicine. 2014;48(2):84-90.
7. Rugby 'linked to early onset dementia'. BBC News. 03 August 2013. Available from: <http://www.bbc.co.uk/news/uk-scotland-23545796>.
8. Lawton G. Rugby players warned of long-term brain injury risks. New Scientist. 12 March 2014.
9. Pfister T, Pfister K, Hagel B, Ghali WA, Ronksley PE. The incidence of concussion in youth sports: a systematic review and meta-analysis. British journal of sports medicine. 2016;50(5):292-7.

10. Miller JH, Gill C, Kuhn EN, Rocque BG, Menendez JY, O'Neill JA, et al. Predictors of delayed recovery following pediatric sports-related concussion: a case-control study. *Journal of neurosurgery Pediatrics*. 2016;17(4):491-6.
11. King D, Hume P, Gissane C, Clark T. Head impacts in a junior rugby league team measured with a wireless head impact sensor: an exploratory analysis. *Journal of neurosurgery Pediatrics*. 2016:1-11.
12. Sariaslan A, Sharp DJ, D'Onofrio BM, Larsson H, Fazel S. Long-Term Outcomes Associated with Traumatic Brain Injury in Childhood and Adolescence: A Nationwide Swedish Cohort Study of a Wide Range of Medical and Social Outcomes. *PLoS medicine*. 2016;13(8):e1002103.
13. Buckley L, Chapman RL. Associations between self-reported concussion with later violence injury among Australian early adolescents. *J Public Health (Oxf)*. 2017;39(1):52-7.
14. Li Y, Li Y, Li X, Zhang S, Zhao J, Zhu X, et al. Head Injury as a Risk Factor for Dementia and Alzheimer's Disease: A Systematic Review and Meta-Analysis of 32 Observational Studies. *PloS one*. 2017;12(1):e0169650.
15. England Rugby. RFU Regulations. 2019-20. Available from: <https://www.englandrugby.com/governance/rules-and-regulations/regulations>.
16. Collins CL, Micheli LJ, Yard EE, Comstock RD. Injuries sustained by high school rugby players in the United States, 2005-2006. *Archives of pediatrics & adolescent medicine*. 2008;162(1):49-54.
17. Youth Rugby Injury Surveillance Project (YRISP) Steering Group. Youth Rugby Injury Surveillance Project Season Report 2017-18. Available from: <https://www.englandrugby.com/participation/playing/player-welfare-rugby-safe/rugbysafe-research>.
18. England Professional Rugby Injury Surveillance Project Steering Group. England Professional Rugby Injury Surveillance Project 2017-2018 Season Report. Available from: <https://www.englandrugby.com/participation/playing/player-welfare-rugby-safe/rugbysafe-research>.
19. Emery CA, Black AM, Kolstad A, Martinez G, Nettel-Aguirre A, Engebretsen L, et al. What strategies can be used to effectively reduce the risk of concussion in sport? A systematic review. *British journal of sports medicine*. 2017;51(12):978-84.
20. Education Committee. Written evidence submitted by the Rugby Football Union. April 2013. Available from: <https://publications.parliament.uk/pa/cm201314/cmselect/cmeduc/164/164vw27.htm>.
21. White A, Batten J, Anderson E, Magrath R, Piggitt J, Millward P, et al. Imposing compulsory, high-risk rugby on school children: an analysis of English state-funded secondary schools (under review). *British journal of sports medicine*.
22. Calderwood C. Chief Medical Officer's Correspondence. CMO Scotland letter to Allyson Pollock - October 2017.pdf. . Available from: <https://www.sportcic.com/chief-medical-officers-correspondence.php>.
23. Calderwood C, Murray AD, Stewart W. Turning people into couch potatoes is not the cure for sports concussion. *British journal of sports medicine*. 2016;50(4):200-1.
24. Sport Collision Injury Collective. Chief Medical Officer's Correspondence. SCIC questions to UK CMOs re rugby injury 13July2017.pdf. . Available from: <https://www.sportcic.com/chief-medical-officers-correspondence.php>.