

I first became interested in rugby injuries in 2002, when my 14-year old son broke his cheekbone during a game, leaving him unconscious. It wasn't his first injury. The previous year he had broken his leg in a tackle but the school said he'd be safer if he came out of the A (firsts) team and we all gave in. We only learned later that a child who has sustained an injury in rugby is more at risk of an injury. When I arrived at the hospital, the surgeon said it was the type of injury that commonly occurred in car crashes, when someone goes through a windscreen. I inquired of my son's headmaster if such injuries were common. He said monitoring was the responsibility of the Scottish Rugby Union so I wrote to the SRU and was invited to a meeting at Murrayfield. There I learned that no mechanisms were in place to collect comprehensive statistics on injuries from schools and clubs. As I am by training a public health physician, I decided to carry out my own study of rugby injuries at my son's school. I discovered that over a five-year period, in a cohort of 76 boys, 28 had sustained injuries, and 12 had been injured twice or more. More worryingly for those who played rugby throughout school more than 90% sustained a serious injury. I asked to present my findings to the parents' association and was told I couldn't. The headmaster – who perhaps thought I was planning to sue the school over my son's injury (I wasn't) – met me reluctantly with a phalanx of staff, saying he would prefer if a lawyer was present. When I asked to audit the injury book, they told me it was lost.

I got in touch with the Scottish Chief Medical Officer, and persuaded him to collaborate with me on a study of injuries over the second half of a single season in six Scottish schools, in the end one refused to participate. Our main aim was to show how easily an injury monitoring system could be put in place and to show its effectiveness we published the injury rates we found. Using World Rugby's own Board's definitions of injury and severity of injury, we recorded 37 injuries among 470 boys over 193 games. Twenty of these resulted in a trip to hospital accident and emergency departments. This was equivalent to 10.8 injuries per 1000 hours. The SRU, which collected no data, wrote to my employer, Edinburgh University, to complain about my comments on my study 'which had caused significant damage to the standing and reputation of the game in Scotland'. The Principal's reply emphasized 'the long history the University had in engaging with rugby and the long and positive working relationship with the Scottish Rugby Union' but did not mention injuries or concerns about injuries.

The striking thing about our study that the injury rate we recorded was, if anything, lower than that found in larger-scale medical studies of rugby injuries. The SRU could have pointed to it as a sign that the game was safer than critics claim, or simply a problem of only recording injuries in the second half of a season. But rugby is used to being treated as a case apart. In most UK schools, comprehensive risk assessments are compulsory for seemingly innocuous activities, but even in state schools rugby injuries aren't systematically counted as rugby injuries and there is poor recording and collection of injuries in sport. Some of these injuries are horrific. Michael Carter, a paediatric neurosurgeon in Bristol and a rugby parent himself, recently wrote an editorial in the British Medical Journal in which he described hours spent 'picking skull fragments out of the contused frontal lobes of a teenage rugby player'. Over Christmas I

received two letters, one from the mother of a 15-year-old boy who dislocated his hip and fractured his pelvis in a rugby game, another from a woman whose son had to have brain surgery after a blood clot. Carter and three neurosurgical colleagues counted two deaths over the last decade, 20 children's rugby injuries requiring brain surgery, four or five serious spinal fractures and several depressed skull fractures, with varying degrees of associated brain injury. There were in addition lots of cases of spinal injuries and concussions. No other school sport bore comparison with it. Defenders of rugby will say that most injuries are not serious. This is not so. Fractures, dislocations, torn ligaments, and dental and maxillofacial injuries and concussions are considered run-of-the-mill. Moreover, there is increasing evidence about the long-term effects of the most common injury, concussion. The *BMJ* Editor in Chief, Dr Fiona Godlee, wrote in January 2015 "let's call the current state of monitoring and prevention of rugby injury in schools what it is: a scandal. It needs urgent remedy before more children and their families suffer the consequences of collective neglect." The *BMJ* poll of doctors this month confirmed that 72% felt the game should be made safer.

Rugby is a high impact collision sport in which players have to exert extreme force in order to acquire and maintain possession of the ball. Most injuries occur during contact or collision ie the tackle and the scrum. Concussion, or traumatic brain injury, is a routine occurrence. A link has been found between repeat concussions and mild cognitive impairment in young adult male rugby players. This can be picked up as early as three months after the last concussion. Repeat concussions also seem to be associated with depression, memory loss and poorer verbal fluency diagnosed in later life among former American football and ice hockey players. Researchers are also starting to find evidence of a link between repeat concussions and chronic traumatic encephalopathy (CTE). CTE is progressive degenerative disease of the brain found in people with a history of repetitive brain trauma. The degeneration can bring with it memory loss, confusion, impaired judgment, impulse control problems, aggression, depression, and, eventually, dementia. It typically presents in middle age, long after a player has retired. CTE has been an issue in boxing since the 1920s and in American football since the 1960s. Last year, America's National Football League reached a \$765 million settlement over concussion-related brain injuries among its 18,000 retired players, agreeing to compensate victims, pay for medical exams and underwrite research. The settlement was a result of concealing the harms of injuries from players. This tactic is also used by tobacco industry and the pharmaceutical industry and has resulted in punitive fines and settlements. In 2013 the first case was confirmed in a retired rugby player who died of complications of severe CTE with dementia at age 77. Until recently, World Rugby used to insist that players with concussion came off the pitch and not play for a week, a period already reduced from three weeks under an earlier rule. But all that changed in 2012 when a new protocol for dealing with head injuries was introduced called the Pitch-Side Concussion Assessment (PSCA), colloquially known as the five-minute rule. When it is suspected that a player is concussed, he is assessed for symptoms (can he stand up straight?), asked a series of questions like the ones in drink-driving cases (where are we? What's the score?)

One failed question or four balance errors and the player is removed from the game. Otherwise he can go back on after five minutes. Barry O'Driscoll, himself a former Ireland international player, resigned from World Rugby's medical committee in protest at the introduction of the new system. "There is no test that you can do in five minutes that will show that a player is not concussed", he said. He told *The Guardian* he fears World Rugby and the national rugby unions will face lawsuits from players who were unaware of the risks they were taking, just like the National Football League in the USA. He also criticised the new categories of concussion that are being invoked on the pitchside namely, probable and suspected concussions, where players with suspected concussions are allowed to play on. It is simply not possible to differentiate between a probable and a suspected concussion. The decision to decrease the period before a player returns to play from three weeks to six days using a graduated return to play is grounded in no strong evidence and coincides conveniently with the period between weekly matches.

Rugby is a business. This year's Rugby World Cup is expected to bring nearly £1bn to the UK economy. With two and a half million players, England accounts for 30 per cent of the world's rugby union players in the world, of whom an estimated 1.2 million are children. Announcing the coalition government's New Youth Sports Strategy, Jeremy Hunt promised £135m to support sports in UK Schools. 'We will work with sports such as Football, Cricket, Rugby Union, Rugby League and Tennis to establish at least 6,000 partnerships between schools and local sports clubs by 2017. The government hopes to put 1,300 links in place between schools and rugby union organizations and a further 1,000 with rugby league. It has done so without looking at the evidence on harms and injuries. Article 19 of the UN Convention on the Rights of the Child, to which the UK government is party, decrees that "States Parties shall take all appropriate legislative, administrative, social and educational measures to protect the child from all forms of physical or mental violence, injury or abuse, neglect or negligent treatment, maltreatment or exploitation, including sexual abuse, while in the care of parent(s), legal guardian(s) or any other person who has the care of the child." Given the growing evidence on rugby injuries, the UK government too could find itself at the wrong end of legal actions.

This might be what it takes to get proper monitoring in place. New Zealand is the only country in the world to have a comprehensive national dataset of rugby injuries, collected since April 1974 by the government's Accident Compensation Corporation. The ACC has a statutory duty to prevent injury, which it means it must monitor injuries and work on prevention strategies with relevant parties. The New Zealand provides financial compensation and support to anyone who suffers an injury irrespective of proof of blame and citizenship. To ensure that legal responsibility for rugby injuries remains with the state, rugby officials have to report any injury to the head or neck that happens on their watch, or any injury requiring hospital admission or an absence from play of eight weeks or more. Since 2001, the ACC has required all coaches and referees to take a compulsory injury prevention course called RugbySmart, to teach them about the most common causes of injury, to show them how to assess the condition and health of a player before he goes on to the pitch, and to give them the skills

to keep players safe and healthy on the pitch. In the first four years of the programme, injuries to the neck and spine decreased by 23 per cent and knee injuries by 16 per cent. Nothing of comparable sophistication exists in the UK and rugby's governing bodies in this country are highly resistant to the introduction of comprehensive monitoring and UK lawyers to no fault compensation schemes. The rugby unions have rushed out many initiatives but none have been evaluated. Many, perhaps most, of the serious injuries in rugby, are avoidable and preventable. But prevention requires radical changes to the Laws of the game and taking out the collision element for children, namely the tackle. World Rugby determines the Laws of the game but their interests are in the professional game and business. Children have little or no representation in the national rugby unions either, their welfare and interests are not paramount. By allowing the sport's own governing bodies to decide what if any information to collect and to determine the Laws of the Game for children, the UK government has abdicated its responsibilities to children under the UN Convention and exposed itself to potentially costly legal actions in the future.