Evidence in support of the call to ban the tackle and harmful contact in school rugby: a response to World Rugby

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ABSTRACT

In a paper published in *BJSM* (June 2016), World Rugby employees Ross Tucker and Martin Raftery and a third coauthor Evert Verhagen took issue with the recent call to ban tackling in school rugby in the UK and Ireland. That call (to ban tackling) was supported by a systematic review published in *BJSM*. Tucker *et al* claim that: (1) the mechanisms and risk factors for injury along with the incidence and severity of injury in youth rugby union have not been thoroughly identified or understood; (2) rugby players are at no greater risk of injury than other sports people, (3) this is particularly the case for children under 15 years and (4) removing the opportunity to learn the tackle from school pupils might increase rates of injuries. They conclude that a ban 'may be unnecessary and may also lead to unintended consequences such as an increase in the risk of injury later in participation.' Here we aim to rebut the case by Tucker *et al*. We share new research that extends the findings of our original systematic review and meta-analysis. A cautionary approach requires the removal of the tackle from school rugby as the quickest and most effective method of reducing high injury rates in youth rugby, a public health priority.

BACKGROUND

Being cautious in order to protect vulnerable people, such as children, from harm is an acknowledged policy approach.[1]

On 1 March 2016, UK and Ireland Ministers for Sport, Education and Health were sent a letter asking them to remove the tackle and other forms of harmful contact from school rugby.[2] In June 2016, two World Rugby employees Ross Tucker and Martin Raftery and a third coauthor Evert Verhagen wrote in *BJSM* that such action 'may be unnecessary and may also lead to unintended consequences such as an increase in the risk of injury later in participation'.[3]

Tucker *et al* make three key statements:

1. 'With respect to injury surveillance in Rugby Union, particularly among youth players, it must be recognised that neither the incidence nor severity of injury have been thoroughly identified and understood, and thus nor have the specific mechanisms and risk factors for injury'.
2. 'The risk of participation in Rugby Union, while warranting focus and continued efforts for primary injury prevention, does not stand out beyond that of other popular sports' and 'up to the period of adolescence (age 15 years), the risk of injury in Rugby Union is low and comparable to other major sports'.
3. Removing the tackle from school rugby may increase injuries later in life when tackling is introduced to the game by denying 'the need and opportunity to many young players to begin learning a skill set which evidence suggests is both effective (for performance) and protective later in their rugby playing careers'. They add such a ban 'may be unnecessary and may also lead to unintended consequences such as an increase in the risk of injury later in participation'.

Tucker *et al* make a number of factual errors when stating the data on risk; they also reinterpret the call for action in *school* rugby (which UK schools are responsible for under the physical education guidelines of the respective countries' Departments for Education) as a more general call for action in *youth* rugby that includes club and community rugby, which is not under the jurisdiction of the government.[4]

Fuller and Drawer's model for risk management in sport

Tucker *et al* draw on Fuller and Drawer's model for risk management in sport (see table 1)[3 5] and for this reason we use this framework to situate and address Tucker's arguments.

Risk assessment

Identification of risk factors and how these impinge on participants

> *Tucker et al argue that 'With respect to injury surveillance in Rugby Union, particularly among youth players, it must be recognised that neither the incidence nor severity of injury have been thoroughly identified and understood, and thus nor have the specific mechanisms and risk factors for injury'.*

Event-based extrinsic risk factors involving contact or collision, such as the tackle, are well-established risk factors for injury in rugby.[6–12]

Tucker *et al* acknowledge that the tackle is 'most injurious, accounting for between 50% and 70% of injuries in all forms of the game' and that 'available evidence from the community and youth setting identifies the tackle as the most injurious game event'.[3] Studies consistently and repeatedly show the tackle to be the most injurious phase of play across all age grades of children playing full contact rugby.[13 14]

Tucker's claim that 'the specific mechanisms and risk factors for injury' have not been 'thoroughly

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Table 1 Fuller and Drawer's model for risk management in sport[5]

Subprocess	Stages of subprocess	Description
(1) Risk assessment	(1a) Identification of risk factors	Identification of risk factors and how these impinge on stakeholders (in the main participants but also including officials, spectators, the media and the public)
	(1b) Estimation of risk	Can be qualitative, for example, 'high, medium or low' risk or quantitative as probability of injury or incidence of injury, for example, in the form of injuries per 1000 player-hours of play
	(1c) Evaluation of risk	Compare risk estimates with defined standards and ascertain if participants will accept this level of risk
(2) Risk mitigation		(a) Accept risks via use of insurance or (b) identify and implement measures to control exposure to risk and consequences, whether to all athletes, the average athlete or vulnerable athletes in particular

identified and understood' in this context is puzzling. Fuller and Drawer define a risk factor as 'a condition, object or situation that may be a potential source of harm to people' whereas risk is defined as 'the probability or likelihood' that such a risk factor will lead to harm.[5] Risk factors might be situational (eg, facilities, equipment) or event based (eg, tackling) and can be either intrinsic (eg, age, physicality) or extrinsic (eg, laws of the game). From a public health perspective, it is not necessary to understand intrinsic player risk factors such as player physique or behaviour[15] when extrinsic risk factors are so clearly established.

In rugby union in England, the tackle is first introduced in the under nine game, after which it becomes a full part of the game.[4] Younger children may be at more risk of all tackle-related injuries than older children. Burger *et al* found that tournament players within the under 13 age grade had a higher probability of both all tackle-related injuries and time-loss tackle-related injuries than those in the under 18 age grade.[16] Other research has found the proportion of tackle-related injuries of all injuries consistent across age ranges for head, face and neck injuries where a high percentage of injuries attributable to the tackle is evident for all ages: under 13 (50%), under 15 (53%), under 18 (45%) and under 20 (49%).[13]

The tackle is responsible for most concussions in youth rugby, a frequent injury contributing between 2.2% and 24.6% of all youth rugby injuries.[6] A systematic review of concussion in youth rugby[7] found one study analysing concussion and phase of play: the study of 121 boys' and girls' US high school rugby clubs found that 65% of all concussions were associated with the tackle.[17] In the English adult community rugby union game, the tackle has been found to be associated with 64% of all head injuries and 74% of all concussions.[18]

Rates of match play concussion have been recorded as rising in both the professional and community adult rugby union game. In the 2014–2015 professional season in England, there were 13.4 concussions recorded per 1000 player-hours for matches up from 5.1 per 1000 player-hours in 2011–2012,[19] whereas the rate was 2.63 per 1000 player-hours in community match rugby in 2014–2015 compared with 1.37 per 1000 player-hours in 2011–2012.[18] An increasing awareness of concussion in the professional game by players, coaches, referees and medical staff is thought to explain some of the increase in rates.[19] However, according to Roberts *et al*, in the community game there is likely to be under-reporting of concussion 'through a lack of player awareness and/or unwillingness of players to report symptoms to club staff'.[18] There are no equivalent surveillance projects as yet in school or club child rugby settings. Consensus statements on concussion including definitions of concussion diagnosis and return to play guidelines date from the first consensus conference in Vienna in 2001 and most recently the fifth conference in Berlin in 2016, but there is concern over how well these guidelines are adhered to.[20 21]

Concussion can lead to long-term harms. A Swedish study of over a million individuals under the age of 26 years identified 104 290 with a prior traumatic brain injury (TBI). Compared with their unaffected siblings, those with mild TBI (concussion) were more likely to be in receipt of a disability pension or welfare payments, to have had more psychiatric inpatient admissions or outpatient visits, to die younger and to have lower educational achievement ($p<0.05$ for all).[22] A recent study of 294 paediatric sports-related concussion patients in the USA found that girls were three or four times more likely to experience postconcussive symptoms lasting >28 days than boys,[23] a particular concern given the Rugby Unions' focus on increasing the number of female rugby players.[24] Head injury more generally has also been found to be associated with an increased risk of dementia and Alzheimer's disease.[25]

Incidence and estimation of risk

Tucker et al state: i) 'neither the incidence nor severity of injury have been thoroughly identified and understood"; ii) "the risk of participation in Rugby Union, while warranting focus and continued efforts for primary injury prevention, does not stand out beyond that of other popular sports"; and this is particularly the case "up to the period of adolescence (age 15 years)" where "the risk of injury in Rugby Union is low and comparable to other major sports'.

Is it true that neither the incidence nor severity of injury has been thoroughly identified and understood?

There are no comprehensive injury surveillance systems for sports and other injuries in the UK and this needs to be rectified.[26 27] However, the high risks and rates of injury in rugby are well established and consistently high across many studies throughout the world, notwithstanding the considerable heterogeneity in study design, differences in injury definitions used and differences in magnitude of effect.

Tucker *et al* criticise the systematic review by Freitag *et al*[6] on the grounds that it overstated the level of injury risk in the youth game because (1) the time-loss definition of injury used in the men's professional game was not applied and (2) analysis combined studies with different age groups to produce pooled rates of injury. We address each of these criticisms in turn.

(1) Would applying the time-loss definition used in the professional game change the findings of the Freitag review[6]?

Tucker *et al* claim that '… if the definition of injury was brought in line with the time-loss definition (>24 hours absence from match play or training after the day of injury) that has been adopted by the majority of well-established injury surveillance studies in the professional game, then the reported injury incidence in the youth Rugby playing cohort would be lower'. We reanalysed the evidence for the youth game, using a time-loss definition of >24 hours absence from match play or training after the day of injury and show an even higher rate of injuries in the youth game than those calculated in the earlier paper by Freitag *et al*. Our analysis is detailed below.

Freitag *et al* used the injury definitions for rugby union approved by the council of the International Rugby Board (IRB) in 2007

(now called World Rugby)[28] to calculate two pooled incidence figures for match injuries. The first rate was for injuries sustained by the youth player during a match 'irrespective of the need for medical attention or time-loss from rugby activities' from five studies of 26.7 (95% confidence interval (CI) 13.2 to 54.1) injuries per 1000 player-hours, equivalent to a 28.4% (95% CI 15.2% to 49.1%) risk of a child being injured over the course of a season; the other rate measured severity under the time-loss definition of 'a player being unable to take a full part in future rugby training or match play' for at least 7 days from eight studies of 10.3 (95% CI 6.0 to 17.7) injuries per 1000 player-hours, equivalent to a 12.1% (95% CI 7.2% to 19.8%) risk of a child being injured over the course of a season.

Tucker *et al* criticise Freitag *et al* for comparing the rate calculated under the IRB all injury definition of 26.7 (95% CI 13.2 to 54.1) injuries per 1000 player-hours with the match injury incidence figure calculated by Williams *et al* of 81 (95% CI 63 to 105) injuries per 1000 player-hours for professional men's rugby union[12] under the time-loss definition of injury of >24 hours absence from match play or training after the day of injury.[12]

Tucker *et al* claim that if Freitag *et al* had applied Williams *et al*'s definition of injury for professional players then the rate calculated would have been lower. We have recalculated a new pooled incidence rate based on the >24 hours definition for the studies used by Freitag *et al*. Two studies used in Freitag *et al*'s meta-analysis use a comparable injury definition to that used by Williams *et al*, one by Haseler *et al* where data were analysed from an injury surveillance programme carried out at an English community rugby club over the course of the season that included 210 male players from under 9 (child will have ninth birthday during the academic year) to under 17 age grades[29]; and one by Palmer-Green *et al* which analysed data from a two-season study of 250 male youth rugby union players aged 16–18 years from 12 English Premiership academies and 222 similarly aged boys from seven senior school rugby union teams.[14] Combining the results from these two studies in a meta-analysis gives a pooled incidence of 34.6 injuries per 1000 player-hours (95% CI 25.0 to 47.8). The time-loss definition of >24 hours absence from match play or training after the day of injury gives a higher rate of injury than that calculated for all injuries irrespective of medical attention or time loss from play. The injury rates may be higher because the studies may have included players at a higher level.[14] Our reanalysis shows that the rate of injuries has not been overstated using the original definition.

(2) Did combining ages overstate injury risk?

Tucker *et al* claim that combining studies across different age groups to produce pooled rates of injury overstates the injury risk in the youth game.[6] We have reanalysed the data using narrower age bands to show that the rates and risks are high across all ages in youth and have not been overstated in the youth game.

The rate of injury in youth rugby increases with age although not linearly.[6 8 30] An Australian study found head, face and neck injuries requiring a week away from games doubled from 11.8 (95% CI 8.9 to 15.5) to 22.3 (95% CI 18.3 to 27.1) injuries per 1000 player-hours between the under 13 and under 15 game[13] and in New Zealand a 25% increase in injuries resulting in attendance at an injury clinic, from 20.0 to 25.7 injuries per 1000 player-hours, has been found between the under 13 game and under 15 game.[31]

In our work, we have acknowledged that studies of rugby injury are highly heterogeneous because of differences in injury definitions, who diagnoses and records the injuries and their level of medical qualification and expertise, study setting, age of participants and age grades used by the rugby playing authorities. Age is therefore just one of many factors leading to a high degree of heterogeneity making cross-study comparisons difficult, but not impossible. These limitations do not negate the validity of trying to give some sense of injury rates across youth rugby so long as any meta-analysis is presented with the above caveats. Injury rates are high, and the issue is around magnitude, that is, how high. Many studies give injury rates across broad as well as narrow age ranges in youth rugby.[17 29 32–36] Freitag *et al* acknowledged a 'high degree of heterogeneity' in their paper and also gave 95% estimated predictive intervals for their results to estimate the uncertainty in predicting the true effects in future studies with characteristics drawn from the heterogeneous studies explored in the meta-analysis.[6] Full details of each study included in the pooled incidence figure were given and study limitations were further acknowledged in the limitations section.[6]

Additionally, under-reporting of some injuries, particularly concussion, is an issue[36] as is changing conduct of youth rugby in terms of rules and player behaviour. Children and coaches may mirror the evolution of the professional game in terms of increasing physicality and rates of injury.[37–40] These issues should be taken into account when combining studies from different eras or attempting to generalise their findings.

Freitag *et al* carried out the meta-analysis across all ages within single injury definitions. To address Tucker's concern with respect to age combinations, we have reanalysed the studies included in the Freitag *et al* meta-analysis using narrower age ranges; the results are presented in table 2. The few studies available which permit analysis of narrow age ranges in our reworked meta-analysis show high rates of injury in all age groups, young and old. For under 14s and younger, 18.6% (95% CI 12.8% to 26.6%) were likely to be injured in a season and 9.0% (95% CI 2.3% to 31.5%) severely enough to be away from play for at least a week. For the under 15s and older, 25.0% (95% CI 21.6% to 28.9%) were likely to be injured in a season and 19.5% (95% CI 4.1% to 67.6%) severely enough to be away from play for at least a week. Notwithstanding study heterogeneity and wide estimated predictive intervals where available along with variation in estimates, it is clear that the rates and risks of injury are high across the age ranges in youth rugby and that the risk of injury has not been overstated.

Does the risk of participation in rugby union stand out beyond that of other popular sports and is the risk of injury in rugby union low and comparable to other major sports?

Medical experts working for the Rugby Football Union (RFU) state that 'rugby union has a relatively high risk of injury compared with other team sports', and that 'there is a growing body of literature showing that injury incidence in rugby union is similar to that of other full contact sports such as rugby league, American football and Australian Rules Football'.[41] In collision sports, which the RFU terms full contact sports, 'athletes purposely hit or collide with each other or with inanimate objects (including the ground) with great force'.[42] Rugby union and rugby league are the most frequently played collision sports in UK schools[43] and many schools make rugby compulsory.[44] Our focus is on what can be done by schools and responsible state bodies to reduce the risk of injury in rugby.

Tucker *et al* incorrectly report the results of a between-sport comparison in children aged 6–15 years by Pringle *et al*,[35] claiming netball had the highest rate of injuries. Tucker *et al* confuse the injury rate for rugby league with that for netball; the correct figures are 24.5, 15.5 and 13.0 injuries per 1000 player-hours for rugby league, rugby union and netball, respectively.[35]

Table 2 Risk of injury in youth rugby using narrow age ranges

Injury definition	Comparison (studies used)	Incidence of injury per 1000 player-hours (95% CI)	Probability of injury over season (95% CI)	I^2 (%)	Estimated predictive interval* (95% CI)
Irrespective of the need for medical attention or time loss from rugby activities	All ages 32–34[31–33 35 66] †	26.7 (13.2 to 54.1)	28.4% (15.2% to 49.1%)	99.6	(1.65 to 433.26)
	U14s and younger[31 66]	16.5 (11.0 to 24.8)	18.6% (12.8% to 26.6%)	82.6	not applicable (N/A)
	U15s and older[31 66]	23.0 (19.4 to 27.2)	25.0% (21.6% to 28.9%)	46.2	N/A
	U14s[31 66]	16.4 (10.9 to 24.9)	18.6% (12.7% to 26.7%)	79.6	N/A
	U15s and U16s[31 66]	21.6 (15.3 to 30.5)	23.7% (17.4% to 31.7%)	81.0	N/A
Requiring at least 7 days absence from games	All ages[29 31 34–36 67–69]†	10.3 (6.0 to 17.7)	12.1% (7.2% to 19.8%)	98.3	(1.49 to 70.82)
	U14s and younger[31 68 69]	7.5 (1.9 to 30.2)	9.0% (2.3% to 31.5%)	94.2	(0 to 3.35×10^{8})
	U15s and older[31 69]	17.3 (3.3 to 90.1)	19.5% (4.1% to 67.6%)	97.6	N/A
	U14s[31 69]	10.9 (1.7 to 69.2)	12.8% (2.1% to 57.9%)	94.3	N/A
	U15s[31 69]	20.9 (3.1 to 141.2)	23.0% (3.8% to 82.9%)	96.4	N/A
	U16s[31 69]	14.9 (3.7 to 60.1)	17.0% (4.5% to 52.8%)	92.1	N/A

*This is only possible where there are more than two studies; 'where the true effects are to be expected for 95% of similar (exchangeable) studies that might be conducted in the future'.[70]
†As calculated in Freitag et al meta-analysis:[6]

We refer Tucker *et al* to two systematic reviews which conclude that collision sports have higher rates of injury than other sports. Pfister *et al* identified rugby as having a significantly higher rate of concussion than any other youth (under 18s) contact or collision team sport.[45] Spinks and McClure identified ice hockey, another collision sport, as having the highest rate of injury of any sport in children under the age of 16 years, despite varying definitions of injury, heterogeneity in study methods and a wide range of injury rates.[46] Also, Bleakley *et al*, in their systematic review of rugby union injuries in children aged 12–18 years, cite evidence in the discussion that the risk of injury in rugby union in children aged 12–18 years is higher than other sports including football (soccer) and basketball and that the prevalence of severe injury in adolescent rugby players was lower than or comparable to high school American football, football and wrestling athletes.[8] Spinks and McClure also found football (soccer) to have the lowest rate of injuries.[46]

Taking all these results together, it is difficult to see how Tucker *et al* arrive at the conclusion that the risk of participation in rugby union doesn't stand out beyond that of other popular sports. Our conclusion, in line with other commentators, and confirmed by the evidence, is that rugby, along with other collision sports, has a high risk of injury compared with other non-collision contact sports and a higher risk of concussion than any team sport, either collision or non-collision.[41 45 47–50] Rugby is by far the most played collision sport in UK schools; therefore, any public health approach to lower the high rates of sport injury in children needs to look seriously at rugby and how to reduce that rate of injuries, including concussion.

Risk mitigation

Tucker et al argue that removing the tackle from school rugby may increase injuries later in life when tackling is introduced to the game by denying 'the need and opportunity to many young players to begin learning a skill set which evidence suggests is both effective (for performance) and protective later in their rugby playing careers". They add such a ban "may be unnecessary and may also lead to unintended consequences such as an increase in the risk of injury later in participation'.

Will removing the tackle from school rugby lead to an increased risk of injury later in participation?

Tucker *et al* misreport the findings of McIntosh *et al* as attributing tackle technique to lower injury rates in younger players.[51] McIntosh *et al* found that younger (under 15 years) players were more likely to use a passive shoulder tackle whereas older players were more likely to use an active shoulder tackle; but separately they found a significantly lower risk of tackle game injury in younger players than elite players. They conclude, however, that no specific tackle technique was associated with a significantly increased risk of injury. They analysed a total of 6618 tackle events, of which 81 resulted in injury, and found no statistical evidence of any difference in the odds of receiving an injury during an active shoulder tackle compared with any one of passive shoulder tackle, jersey tackle, ankle tap or smother ($p>0.05$ for each); the only association with technique was an increased risk of injury when a player was tackled by two players simultaneously as opposed to being tackled by a single tackler.[51] Tucker *et al* cite a small study by Hendricks *et al* which found weak evidence of an association between tackler proficiency and likelihood of concussion.[49] Burger *et al* did find evidence that improved tackle technique on the part of both the ball carrier and the tackler was associated with reduced risk of injury.[48] Speed going into the tackle and force of impact[47] as well as tackle height[52] also have an impact on injury.

A review of injury prevention strategies found little evidence that any had reduced the risk of injury from tackle as few had evaluated impact on injuries.[53] In a systematic review, Fraas *et al* concluded that despite there being several concussion education and prevention programmes across various country Rugby Unions, there is little evidence to support their effectiveness.[54] The South African BokSmart programme may influence player's attitudes and may be associated with a reduction in catastrophic injury at the junior level.[55 56] There is a need for proper evaluation of injury prevention programmes such as the secondary concussion prevention scheme HEADCASE, in the UK and Ireland.

Tucker *et al* state that the impact 'removing the tackle at an early age may have on injury risk later in the participation cycle is unknown'. A recent systematic review and meta-analysis from Canada found that rule changes disallowing body checking in Pee Wee (11 and 12 year old) ice hockey, where a player deliberately makes contact with an opposing player to separate them from the ice puck, has led to a 67% reduction, incidence rate ratio 0.33 (95% CI 0.25 to 0.45), in concussion risk.[57] The evidence for other strategies to reduce concussion risk in sport including protective equipment (helmets, headgear and mouthguards), training and fair play rules is either weak or conflicting.[57] Tucker

et al refer to a large Canadian study on ice hockey involving nearly 2000 players aged 13–14 years which found that those previously exposed to 'body checking' had a reduced risk of injury requiring 7 days of time loss, although this was only borderline significant, incidence rate ratio 0.67 (95% CI 0.46 to 0.99).[58] There was however no evidence of any association found between prior experience of body checking and injury overall, concussion overall or concussion resulting in >10 days of time loss.[58] There are no studies from rugby which have analysed the effect of age of introduction of tackle on injury rates.

The numbers of children going on to play rugby 'reduce dramatically' at 18 years.[59] Therefore, perfecting tackle technique for the long term is of little benefit. A survey conducted in a Scottish Borders rugby playing district among keen club players found that 19% of the reasons given by under 20 players for stopping playing were connected to rugby injury and a further 20% were connected to disillusionment with the game.[60] There is no evidence that removing the tackle will have a negative impact on children who go on to play adult rugby.

Moreover, a training audit conducted in October 2015 in 24 Oxfordshire Rugby Football Schools Union-affiliated schools found that only 39% of current physical education (PE) teachers had any rugby coaching qualifications and only 32% had completed a concussion education module (for state schools this was 14%, nine state schools had no teacher with concussion training).[61] Similarly, even in targeted schools for the RFU as part of the All Schools initiative, 31% of schools had received no coaching development training.[62]

Grappling with the merits of different tackle techniques and proficiency will not address the established risks and harms of the tackle in the laws of the game as they apply to school children.

CONCLUSION

Under the United Nations Convention on the Rights of the Child (Article 19), governments have a duty to protect children from risks of injury: '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 …'.[63] As a party to the Convention, the UK must ensure the safety of children.

A 2015 survey of predominantly private schools in England showed that 77% of the 116 schools responding made rugby a compulsory sport.[44] The Children's Commissioner for Wales, Sally Holland, states that in her view children should be given a choice of sport and no individual sport should be made compulsory.[64] Sport is part of the national curriculum in England, Scotland, Wales and Northern Ireland; however, the ministers have not made clear whether individual sports can be made compulsory at the individual school level. Children need to be given a choice of physical activity in school and their choices should be respected. The government should take steps to end compulsion and to outlaw dangerous elements of collision sports in children as it does for other school-based activities. It should ensure there is monitoring of all sports injuries in schools and in children. Government should commission a survey of all schools to ascertain what choice children actually have. Alternatives to collision rugby include a non-collision version such as tag rugby and many of the 40 sports listed as physical activities in the school curriculum for England.

Tucker *et al* provide no evidence which requires us to change our position on removing the tackle from school rugby. To echo Fuller and Drawer, we are proposing a 'compromise approach'.[5] Rather than arguing for the entire rule structure of rugby union and rugby league to be changed, this compromise approach recognises children as a definable 'vulnerable group of athletes' with 'unique risks' and proposes 'specific measures' as a way of lessening the risk of injury in this group, at least where they are in a controllable environment, while at school. The call to remove the tackle and other harmful forms of contact from school rugby would reduce and mitigate the risk of injury in the vulnerable group of participants identified, school children.[5]

All the evidence available on injury in rugby shows the high risks of injury and that the tackle is where most injuries occur. Chief medical officers should advise ministers of this evidence and World Rugby and ministers should immediately take a cautionary approach to protect children from avoidable harms by removing the tackle from school rugby.

What are the findings?

- The main mechanism and risk factor for injury in youth rugby union is the tackle; this has been clearly identified and is well understood.
- The incidence and severity of injury in youth rugby union is clearly established.
- Youth rugby has a higher rate of concussion than any youth team sport including other collision sports.
- There is no evidence that removing the tackle in school rugby could adversely affect players at senior levels.

How might it impact on clinical practice in the future?

- Doctors have voiced concerns over the high rate of injuries in youth rugby. In two polls carried out by the *British Medical Journal* in 2015, 65% of doctors thought the rules of rugby should change to reduce the risk of concussion and 72% thought school rugby should be made safer.[65]
- Chief Medical Officers for the UK and Ireland have a duty to protect children and to act on the evidence by advising the UK government to take a cautionary approach and to remove the tackle from school rugby.

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