

Reviewer: 1

Comments to the Author

The manuscript made for some interesting reading. A let down for me was the use of raw data and not being able to transpose this to rates per 100,000 population. This would have embraced the message that the writers were portraying with that needed wham factor.

[RESPONSE – The rates of injury all come from individual studies of club or school rugby, they are not population rates, nor could they be easily converted to population rates.](#)

The lack of the use of the references in the appropriate places put me off this manuscript somewhat as the style of writing appeared to become personal at some stages.

[RESPONSE - We have corrected referencing as asked for. We do not agree that it is personal and would like clarification on this point.](#)

Simple things to enhance the manuscript are:

Abstract

2nd para 1st sentence: change "...risk of injury later ages." to "...rick of injury at later ages of participation."

[RESPONSE - Done](#)

2nd para 2nd sentence: Change "They claim that..." to "Tucker et al report that..."

[RESPONSE - Done](#)

2nd paragraph 3rd sentence I am presuming that "they" are in fact Tucker et al so therefore change "They fail to address..." to "Tucker et al have not addressed..." This happens throughout the manuscript on several occasions and should also be addressed and corrected.

[RESPONSE – Done and throughout](#)

Background

2nd paragraph, 2nd sentence (and elsewhere throughout the manuscript) the writers have named the article "Freitag et al" but have not put the reference besides this. Please correct this, and the other reference points where an article is specifically mentioned and has not got the reference number beside this. There are multiple of these throughout the manuscript.

[RESPONSE – All corrected](#)

8th paragraph (page 4) 4th sentence change "...248 tackle related non-injury events and found significantly higher..." to "248 tackled related non-injury events. It was identified that there was a significantly (insert p value) higher..."

[RESPONSE - Done](#)

15th paragraph (page 6) 2nd sentence Change "...over the course of a season which included 210..." to "...over the course of the season that included 210..."

[RESPONSE - Done](#)

15th paragraph 3rd sentence Change "...222 similarly aged boys from seven schools found match injury rates of..." to "...222 similarly aged boys from seven schools, reported match injury rate of..."

[RESPONSE - Done](#)

Also you may want to consider Hodgson et al (2007) For debate: Consensus injury definitions in team sports should focus on encompassing all injuries. Clinical Journal of Sports Medicine. 17: 188-191

[RESPONSE – we agree but this was not the purpose of this paper](#)

16th paragraph 1st sentence Insert the article references beside Systematic reviews not at the end of the sentence.

[RESPONSE - Done](#)

16th paragraph 3rd sentence change "25.7 injuries per thousand player hours..." to "25.7 per 1,000 player-hours..." to ensure conformity with the rest of the manuscript

[RESPONSE – Done](#)

Reviewer: 2

Comments to the Author

Dear authors

I am grateful for the opportunity to review your work. I find your argument in favour of removing the tackle from youth rugby union in the UK and Ireland extremely compelling. As an advocate of safety and injury prevention in sports participation, I believe that you truly have the health and safety of these young participants at heart. I agree that it is necessary to review and question the high incidence of injury attributed to the tackle in youth rugby, and to question what World Rugby and other international rugby unions are currently doing to make the game safer (not only at the youth level, but also at older amateur and professional levels).

However, I would like to urge you to approach this debate with an objective view of a multitude of potential solutions (including the proposal to ban the tackle), so as not to strike panic into rugby stakeholders in the UK (particularly parents), and indeed the worldwide rugby community. Such a drastic and sudden change to a fundamental skill that is key to participating in the game would certainly have far-reaching and long-term implications at all levels of the game (globally) that none of us would be able to predict.

Every potential solution requires exploration and critical review to assess its feasibility and possible effectiveness. This may only be achieved via sound, robust, scientific methods conducted by unbiased individuals with a completely objective view on the matter at hand. As with previous game-related issues, for example the scrum, substantial empirical evidence and efforts to adapt the game so as to have minimal impact on its essence are required first before the rules and regulations can be significantly adjusted.

It is possible that a compromise may be reached whereby injury rates are attenuated without completely altering the essence of rugby union, and could make the sport more exclusive to those individuals, young and old, who willingly and consciously choose to participate and accept the risks involved (as individuals in a free and modern society are allowed to do). To remove the tackle completely from the game at schoolboy level may result in the end of the game as we know it. Likewise, enforcing contact on boys who do not wish to play could result in a consistent number of injuries, including catastrophic head, neck and spinal injuries.

[RESPONSE – Thank you for your comments. The referee is giving his or her personal views and opinions which boil down to a fear that removing the tackle in the school game would change the game as we know it. Our concern is with protecting children from harmful injuries and not protecting the interested parties to the game.](#)

Page 3, lines 24-28

“The tackle is the most dangerous phase of play and where most injuries occur. Freitag et al found the percentage of injuries attributable to the tackle ranged from 39.6% to 64.0% across 11 original studies and the recent (RISUS) study of 28 Ulster schools and first XV rugby squads comprising 825 adolescent rugby players with a mean age 16.9 years found the tackle and other collision situations contributed 63.4% of injuries.”

- Please be cautious when interpreting frequency data. Reporting percentages does not provide

information regarding the actual number of injuries relative to the time spent in participation. The tackle is by far the most frequent phase of play in rugby, therefore, it would make sense that the majority of injuries would occur in this phase of play. Tackle-related propensity and injury incidence/rate data provide a more realistic view of the actual rate of injury as these calculations consider the number of events and the exposure time spent in participation respectively (this could also be used to more accurately compare the risk in the tackle versus other phases of play). Please provide studies that report these tackle injury rates as this will add thrust to your argument and will be a more logical way to compare the injury problem with other sporting codes that also report incidence rates.

[RESPONSE – We are not aware of studies which report injury rates by phase of play, including tackle, which take into account exposure in each phase of the game – could the referee provide them please if he or she is aware of such studies. Tackle is a well-established mechanism of injury.](#)

Page 3, lines 29-31

“Although tag rugby in schools could provide a safer alternative, concerns are also being raised about high numbers of fractures from children playing this form of rugby.”

- The fractures referred to in this study focus on the hand only, and this does not provide information on the other types of injury associated with this form of the game. I would suggest removing this sentence from the manuscript as it does not add value.

[RESPONSE – Removed](#)

- Besides the mention of tag rugby, you have not provided any alternatives to tackle rugby in this manuscript or in the Sport Collision Injury Collective open letter. As obvious as this may sound, this should be mentioned in this manuscript.

[RESPONSE – This is not the purpose of our review, other alternatives in the school game could include physical activity, dance, swimming or athletics!](#)

Page 3, lines 34-35

“Concussion is a frequent injury in rugby, contributing between 2.2% and 24.6% of all injuries, the majority of which occur in the tackle.”

- I agree that concussion is a concern and that no concussion should be taken lightly. However, it is possible and likely that the incidence of concussion will increase gradually as rugby stakeholders (including players and parents) and medical professionals become more aware of and sensitive to the potential dangers of these injuries. Thus reporting rates may also increase. Please mention this in the manuscript.

[RESPONSE – The referee has highlighted the recognised problem of underreporting of concussion. As reporting improves with better recognition then concussion incidence will rise and the true risks and](#)

dangers inherent in the game will then become apparent. A paragraph on this has been added with data from the professional and community game surveillance projects in England. It is interesting that while it may be true that part of the explanation for a rise in incidence of concussion in the professional game is thought to be better recognition and reporting, this is not thought to be the case in the community game where it is though concussion continues to be under-reported. There are no equivalent surveillance projects as yet in the school or club child rugby settings.

Page 3, 38-39

“A Swedish study of over a million individuals under the age of 26 years identified 104290 with a prior traumatic brain injury (TBI).”

- This study used a cohort of individuals who were not rugby players.

RESPONSE – have changed to a general discussion of concussion

Please provide information regarding the short- and long-term outcomes of youth rugby players who sustained concussions (regardless of mechanism) to direct your argument. You must note that there may be several other confounding risk factors contributing to the symptoms and time-course of these concussions, and indeed their long-term health outcomes. The referenced study noted that they could not completely control for congenital factors as the siblings who were used as controls were not identical twins. In addition to this, research has shown that gender, physiological stress, pre-existing mental illness, alcohol consumption, narcotics and performance-enhancing drugs may all influence the nature of concussion symptoms and long-term outcomes (1-3).

RESPONSE – all studies have limitations but this is an important population study of over a million individuals and can not easily be dismissed. We agree it would be interesting to ascertain whether there are short and long term studies of outcome but that was not the purpose of our review of Tucker’s paper. The referee might be interested in the very underpowered study of retired rugby players which was misreported in the press (<http://jinnp.bmj.com/content/early/2016/10/05/jinnp-2016-314279>) and another study that is in progress (<http://www.qmul.ac.uk/media/news/items/smd/177745.html>).

Page 3, line 56, and page 4, lines 3-4

“They provide no evidence to suggest that introducing the tackle at a younger age improves tackling later in life or reduces injuries and published studies do not support their claim.”

- I agree that the technical nuances between body-checking in ice hockey and tackling in rugby are quite obvious. Body-checking in ice hockey appears to be more uncontrolled, aggressive and dangerous. Comparisons between these two skills should be approached with caution, although it is not entirely impossible that a similar effect could be evident if the tackle is removed. However, as this is the only available evidence, you should suggest that it is the responsibility of World Rugby to prove this scientifically to substantiate this hypothesis i.e. there have been no previous comparisons between youth rugby players introduced to tackling at a later age versus players who have started playing contact rugby at a younger age. This may be key to determining whether or not it is worthwhile changing the rules and regulation of the game to remove tackling at the youth level.

RESPONSE – have added in the reference and a statement on the ice-hockey study. The cautionary principle should apply for children – the risk of injury is well established at all ages, we should not be experimenting with the tackle but rather removing it until it’s reintroduction can be shown to be safe.

- Please include scientific evidence to substantiate your claim that it is not necessary for rugby players (or any athletes) to learn a fundamental skill, such as tackling, at a young age and that it can be introduced at a later age (please also be aware that tackling contact is unlike other sport-specific skills that may be introduced at a later age with minimal risk).

RESPONSE – our response to this is that it is inappropriate to conduct trials of rugby tackling on children when it is known that it is the number one risk factor in injury

- Please also provide the age at which you propose introducing tackle contact in rugby along with scientific evidence to substantiate the age that has been selected.

RESPONSE – we propose that the tackle is completely removed from the school setting.

Page 4, lines 14-16

“Tucker et al do not mention the data that shows that many children who participate in rugby at school stop participating in the sport, when leaving traditional compulsory education, or at 18 years when they leave sixth form or college.”

- From my understanding from this manuscript and from the Sport Collision Injury Collective open letter it appears that it is compulsory for boys at certain schools in the UK to partake in contact rugby from an early age (age 11 onwards). This is unacceptable. This should be a key driving point for your argument – to remove compulsory participation in tackle rugby at the youth level. The children should have a choice to participate in other activities if they are not inclined to playing contact sport. Please add this to the manuscript.

RESPONSE - We agree, a section to this effect has been added.

- You have not suggested a viable alternative to contact/tackle rugby. Please add this to the manuscript with referenced details regarding these alternatives (see previous comment referring to Page 3, lines 29-31).

RESPONSE –The school curriculum offers 42 different sports and physical activities – other alternatives can be offered.

Page 4, lines 37-40

“In the highly competitive terrain of sport, players may prioritize performance at the expense of safety, both players own attitudes and those of their coaches prioritise tackle technique for performance over tackle technique for injury prevention with players willing to sacrifice their own as well as their opponents’ safety.”

- More recent research (also in a South African cohort) has shown there have been significant

improvements in player attitude and behaviour towards practicing safe tackle technique since the introduction of the BokSmart injury prevention programme (4). Please will you mention that there is a possibility that the introduction and enforcement of educational injury prevention programmes such as RugbySmart in New Zealand and BokSmart in South Africa may be a possible solution to reducing the incidence of tackle-related injuries. Indeed, there has been a significant decrease in the incidence of catastrophic injuries in youth rugby players in South Africa since the introduction of the BokSmart programme (5). This is evidence that educational programmes may significantly reduce the incidence of severe injuries without significantly altering the fundamentals of the game.

[RESPONSE – sentence added on these two studies. A review of injury prevention strategies found that there was little evidence that any of them reduced the risk of injury from tackle as few had evaluated impact on injuries \(<http://www.bmj.com/content/350/bmj.h1587>\).](#)

- I am also aware that one of the authors of the current study recently stated that the UK and Ireland have limited outreach via an injury prevention programme other than the online HEADCASE programme and that this programme and others are not compulsory and have yet to be evaluated (6). However, I am aware of the RugbySafe programme. I would direct more energy towards emphasising that the RFU and World Rugby should ensure that the UK follows the example of New Zealand and South Africa and should grow and develop the RugbySafe programme, and that this programme must formally evaluated. Continued injury surveillance is also required at the youth level. This is a vital component of your argument and needs to be included.

[RESPONSE – again until the evaluations have been carried out we cant urge implementation - see above](#)

Page 4, lines 48-49

“They state that poor or inappropriate tackle technique is a risk factor in rugby injuries, citing two articles on proficiency rather than technique as evidence.”

- These studies did assess technique as part of the analyses. These studies assessed the players’ proficiency in executing correct tackle technique. Please correct this in the manuscript.

[RESPONSE – as above re inappropriateness of trials of tackling in children](#)

Page 4, lines 53-55

“They found no evidence of association between tackle proficiency and concussion. Indeed the average proficiency score, indicating better technique, was higher for the tackles involving injury than for those which didn’t.”

- While you are correct in stating that the overall scores for injured tacklers was higher, there were individual technical criteria that had a moderate effect towards a non-injury outcome. The same was true for tacklers and ball-carriers. Please either include this in the manuscript or remove this section.

[RESPONSE – this section has been removed.](#)

Page 5, line 6

“There is little evidence to support the claim that technique could lower high injury rates.”

- You have highlighted two studies in the previous section assessing the potential influence of technique on the risk of injury. While this is only preliminary evidence, it is evidence nonetheless and it is the first of its kind in youth rugby union. Please remove the above sentence as it contradicts the previous section where you provided the evidence.

[RESPONSE – section has been removed and replaced with discussion of inappropriateness of trials of tackling in children](#)

Page 5, lines 6-8

“Tucker et al misstate the conclusions of McIntosh et al and wrongly infer that lower injury rates in younger players are due to tackle technique.”

- I agree with you in making this statement. Although this study was well-powered, it did not assess the discrete details of tackle technique between the different levels of play that were included in the analysis. There may be a variety of factors contributing to the higher incidence of tackle-related injuries at the older levels of play.

Page 5, lines 15-16

“The only association with technique was when a player was tackled by two players simultaneously as opposed to being tackled by a single tackler.”

- Could this not perhaps be an area where the laws of the game could be adjusted to make the tackle safer? This is evidence that double or 'gang' tackles are more dangerous, and this could be relatively simple to regulate via effective officiating. Please add this to the manuscript.

[RESPONSE – yes this should be done, we don't think we need to add anything more than what we have already stated.](#)

Page 6, lines 17-21

“There is therefore no evidence to support Tucker et al's statement 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”.

- You correctly define and describe the consensus agreement on reporting injuries in rugby union. However, the evidence you provide appears to reaffirm Tucker et al's argument that, when applying the definition of a time-loss injury resulting absence from sport or other activities for longer than 24 hours, the incidence is far greater at the senior professional level (81 injuries per 1000 hours; Williams et al., 2013) in comparison to the incidence reported in Freitag et al's review (24 injuries per 1000 hours – Haseler et al., and 47 injuries per 1000 hours – Palmer-Green et al. Therefore, this section requires substantial revisions.

[RESPONSE – We don't think so. Firstly, it is a widely accepted finding that injuries are higher in the professional game than in the amateur games. The criticism levelled at us was that we used the](#)

[figure of 26.7 injuries per 1000 player-hours, calculated under the consensus all injury definition to compare with a rate calculated from the professional game under the >24 hours away from play injury definition.](#)

[What we have shown is that even if we adopted the same injury definition to that used in the Williams et al professional game systematic review and meta-analysis of >24 hours away from play, the figures we obtain from the two available studies plus the one additional study are 24, 47, 35 and 29 injuries per 1000 player-hours. There is therefore no evidence to support Tucker et al's assertion 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."](#)

Page 7, lines 12-14

"In a systematic review of 12-18 year olds, Bleakley et al found the risk of injury in rugby union to be higher than other sports."

- You have previously just stated that "direct comparison of rates of injury between sports is problematic due to study heterogeneity."

[RESPONSE – The previous statement was out of context and has been revised.](#)

Therefore, how does the reference to the above sentence/study add value to your argument? This seems slightly contradictory.

Please amend this by either removing this section or by stating that study heterogeneity may be an issue in the study by Bleakley et al.

[RESPONSE – has been corrected in line with above](#)

Page 7, lines 14-15

"And for 16-45 year olds, rugby has the highest rate of all injuries and serious injuries of any of the main popular sports in England and Wales."

- I am unsure how referencing this study adds to your argument? This research included a very broad age group and included a majority of adult players. I would suggest that this is removed.

[RESPONSE - removed](#)

Page 7, lines 21-23

"Our analysis of data from Oxfordshire hospital emergency departments from Jan 2012 to Mar 2014 shows that for 10 to 19 year old males, after football, rugby union followed by rugby league are the most common causes of attendance for sport injury (see table 2)."

- This is interesting data. However, rugby union is a collision sport. Football, trampoline and basketball are not collision sports. Naturally, the incidence of injury will be higher in rugby union. It

would be more accurate to include exposure time and injury incidence for the injuries across these sports (see my previous comment referring to Page 3, lines 24-28). It would also be more useful to compare this data against other youth collision sports e.g. rugby league, ice hockey and American Football.

[RESPONSE – yes it would be useful , unfortunately these are not available, our statement is factually correct, that these are the main reasons for attendance at A&E.](#)

- A more recent report than the ‘Taking Part 2013/14 Annual Child Report’ is required. In addition to this, the report categorises 5-a-side football into the ‘football’ category, and categorises Rugby League, Union, touch rugby or new image rugby into the ‘rugby’ category. It would be more clear if absolute number for participants in 11-a-side football and 15-a-side rugby union were added to the injury data that you present (as your argument is specifically against tackling in rugby union and not the other rugby codes). You do not have the information to infer that there are significantly more injuries relative to the number of youth rugby union players versus the number of injuries to youth football players. For example, at the 11-15 year old level (where the majority of football and rugby union injuries occurred), 49,9% of all participants were engaged in ‘football’ (including 5-a-side) and only 16,9% were participants in ‘rugby’ (including League, Union, touch rugby or new image rugby). Hypothetically, it is possible that the 49,9% was split evenly between 11-a-side and 5-a-side football, and that 15% of ‘rugby’ participants were 15-a-side rugby union players i.e. less than double the number of 11-a-side football players versus 15-a-side rugby union players. Therefore, this does not support the injury data that shows there are twice the number of football injuries in comparison to rugby union. However, this too cannot be confirmed as the data is not available.

[RESPONSE – Could the referee show us a more recent report than Taking Part- we are not aware of any.](#)

- The ‘Taking Part 2013/14 Annual Child Report’ uses a ‘sport in the last 4 weeks’ definition. Could the seasonal variations in sports participation not skew this data, for example fewer participants in rugby at the time of the data collection?

[RESPONSE – yes indeed it may well do- but we don't have access to that data](#)

- Please highlight the limitations mentioned above in your manuscript.

[RESPONSE – statement added](#)

Page 8, lines 9-11

“All the evidence available supports the view that World Rugby and Ministers and Chief Medical Officers should immediately adopt the precautionary principle and remove the tackle from school rugby and it should not be reintroduced until it can be shown to be safe to do so.”

- This is a very bold statement. The evidence is equivocal and both sides of the argument have valid comments. Please reword this sentence.

[RESPONSE – We don't think the evidence is equivocal. The rates of injury found in rugby are high in the school game and the most frequent cause of injury is the tackle. Chief Medical Officers of the UK](#)

[and Ireland have a duty to protect children and to act on the evidence by taking a cautious approach to remove the tackle from school rugby.](#)

Key comments

- Please consider providing other viable alternative solutions in addition banning the tackle, for example;
 - o Weight-banding to remove the effects of size mismatch in growing and developing youth athletes (implemented in Australia)
 - o Implementation of robust, strict and evaluated educational injury prevention programmes
 - o Robust assessments of tackle technique from a young age and removal from play if insufficient
 - o Longitudinal research comparing injury rates in contact versus non-contact rugby
 - o Longitudinal research assessing effect of age at which tackle is introduced on injury incidence
 - o Continued longitudinal injury surveillance on rugby injuries in youth rugby and detailed assessment of these injuries to identify key risk factors and mechanisms
- Please provide all viable alternatives to tackle rugby – [see above- the current curriculum has 40 alternatives to contact rugby for physical activity](#)
- Please provide the proposed age at which you believe the tackle should be introduced in rugby, and please provide scientific evidence to substantiate this age selection- [no age for children attending school](#)
- A key driving point for your argument should be to remove compulsory participation in tackle rugby at the youth level – [one of two key points and we have made it](#)
- Please consider directing more thrust of your argument towards the establishment of a structured injury prevention programme in UK- [we have done so in several articles](#)

[RESPONSE – the above comments would make for an excellent article and we have argued for these in other articles but this goes beyond the remit of our article and is a research programme in its own right.](#)

References

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2. MCCRORY, P, MEEUWISSE, W, AUBRY, M, ET AL. Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012. Br. J. Sports. Med. 47:250–258. 2013.
3. MCKEE, A.C., DANESHVAR, D.H., ALVAREZ, V.E., ET AL. The neuropathology of sport. Acta. Neuropathol. 127:29–51. 2014.
4. BROWN, J.C., GARDNER-LUBBE, S, LAMBERT, M.I., ET AL. The BokSmart intervention programme is associated with improvements in injury prevention behaviours of rugby union players: an ecological cross-sectional study. Inj. Prev. 21:173-178. 2015.
5. BROWN, J.C., VERHAGEN, E, KNOL, D, ET AL. The effectiveness of the nationwide BokSmart rugby injury prevention program on catastrophic injury rates. Scand. J. Med. Sci. Sports. 26:221-225. 2016.

6. WHITE, A, GAMBLE, T, BATTEN, J. Safety in youth rugby: education is not the answer to the concussion crisis. (http://blogs.bmj.com/bjism/2016/09/19/safety-youth-rugby-education-not-answer-concussion-crisis/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A%20bjism%2Fblogs%20%28Latest%20from%20British%20Journal%20of%20Sports%20Medicine%20blogs%29&g=w_bjism_blogs_tab). First accessed: 22 October 2016.

Reviewer: 3

Evidence in support of the ban to tackle in school rugby. A response to World Rugby
General comments

The authors have written an article responding to points made in a paper by Tucker, Raftery and Verhaghen [1], who in turn were responding to a call to ban tackles made in an open letter from the lead author of the current article (along with many others). I agree with some, but not all, of the claims the authors are making. I will address what I believe to be the major issues with interpretation regarding the evidence. I have concerns that in some places in the article the authors appear to be responding to, and rebutting, claims that Tucker et al. did not actually make.

Specific comments

Background

Page 3. Lines 14-18. "...and conflate a ban on tackling in school rugby (which schools are responsible for under the physical education guidelines of the Department of Education) with youth rugby which includes club and community rugby.3"

What is the rationale for calling for a ban on tackles in school rugby, but not in youth rugby (which includes club and community rugby)? Isn't the morbidity associated with the sport the relevant issue with respect to a tackle ban, rather than which organisation happens to be administering the sport when the injury occurred? A dislocated shoulder as a result of a tackle carries the same pain to the child, and the same social and health care costs regardless of whether the game occurred in a school, community or club match doesn't it?

[RESPONSE –We agree, however the government has jurisdiction over schools and there is a duty of care in schools, so that is where we need to begin. World Rugby sets the laws of the game, laws which are translated into the school game. If the government were to remove the tackle in school rugby World Rugby would need to justify to parents and players why it was safe to retain the tackle in the club game.](#)

The claim that removing the tackle in the child game is unnecessary contradicted by evidence

The points made in the first paragraph are a reiteration that the tackle is the most dangerous phase of play, and is where most rugby injuries occur. I cannot see anywhere within the piece by Tucker et al. [1] that they claim otherwise.

Tucker et al. state that there is a lack of quality information available upon which to make 'realistic and effective decisions to reduce injury risk', and that 'emerging surveillance in the community and youth game will enable a more sophisticated and targeted approach to risk reduction than a blanket removal of contact as proposed'. [1] They acknowledge that research evidence has consistently identified the fact that the tackle is the element of rugby that is associated with the greatest risk of injury.

[RESPONSE – we have stated that Tucker et al accept that the tackle is the most injurious phase of play. This being the case the logical next step would be to remove it surely? We disagree with Tucker's statement above - the risks are clear enough and the cautionary principle should be applied – delay means more children being injured year on year – we submit that Tucker et al are putting the interests of the game before the child](#)

Page 3. Lines 38-46. This paper should give anyone involved in contact sport pause for thought, and will hopefully act as an accelerant for renewed efforts for injury prevention across a range of activities, which may, or may not, include removing the tackle, or modifying it so that the energy transfer and risk of concussion, in rugby is significantly lowered.

The claim that a ban on tackle ‘may also lead to unintended consequences such as an increase in the risk of injury later in participation’ is not supported by research [Note single quote at the beginning of the quote and double at the end]

[RESPONSE - corrected](#)

Absence of evidence of an effect, and absence of an effect, are not synonymous. I agree that Tucker et al. [1] ‘have not provided research evidence that introducing the tackle at a younger age improves tackling technique in later life or reduces injuries.’ While they suggest that it may have that effect, they qualify their suggestion by stating: “Currently, the impact that removing the tackle at an early age may have on the injury risk later in the participation cycle is unknown.” [1] Given that a ban on the tackle is yet to be implemented, there cannot be research supporting the statement that a tackle ban ‘may also lead to unintended consequences such as an increase in the risk of injury later in participation’, because any such research would necessarily have to be undertaken subsequent to the introduction of a tackle ban, and evidence from it would take some time to accumulate.

[RESPONSE - The referee agrees with our point.](#)

There is plenty of evidence, however, indicating that practicing technique in any skill leads to increased proficiency at the skill being practiced. People don’t, for example, become concert pianists, brain surgeons, or professional athletes in a sport without putting in a very large amount of practice. Why would the authors expect that people who practice tackle techniques would not improve their proficiency at that skill?

[RESPONSE – our response to this is that it is inappropriate to conduct trials of rugby tackling on children when it is known that it is the number one risk factor in injury .](#)

The risk associated with tackles is closely related to the amount of energy transferred in the collision between players’ bodies. Adults typically transfer greater amounts of energy in tackles than children, who are generally smaller and slower than adults. The average amount of energy transferred per tackle is likely to increase year by year as children develop and become bigger and faster. It is my belief that this is probably why most studies indicate increasing injury rates in rugby with age. If a person who had not learned how to tackle was suddenly required to tackle adults I imagine they would be at relatively high risk of injury, partly because getting the body into the correct orientation to effectively make a tackle is a learned skill.

[RESPONSE – This is a comment and needs no response. The referee might be interested in the very high rates of injury in the RISUS study of elite school boy players where tackling would have been considered a learned skill. \(<http://bjsm.bmj.com/content/early/2015/12/23/bjsports-2015-095491.abstract>\)](#)

Page 4, lines 6-12.

Sentence one is referring to the age of players when the tackle is introduced in rugby in England. Is this the case for both rugby union and rugby league? You should probably clarify when you are talking about rugby union, rugby league, or both throughout the paper.

[RESPONSE – this refers to rugby union and has been made clear in the text](#)

I think the authors should note that sentence two is referring to a study from Australia, and sentence three to a study from South Africa. At present it can be read that the situation in England is still being discussed in sentences two and three. Although the statistics presented in sentences two and three are correct as far as they go, the following should be noted:

The percentages of head, neck and face injuries sustained by the various groups are not greatly different given the uncertainty in the samples (which, although they were not presented, can easily be estimated).

[RESPONSE – agree, inference taken out](#)

The reported rate of missed match injuries among under 20, under 18, and under 15 players (around 22.4 per thousand player-hours) was substantially higher than that among under 13 year old players (11.8 injuries per 1000 player-hours). This means that, at least in this study, the under 13 players sustained many fewer head, face and neck injuries per unit of exposure than those playing in the higher grades even though the distribution of injuries across the body appeared to be similar.

Although you refer to these rates later in the manuscript, it is somewhat misleading to report only the percentages here without indicating the difference in the rates, because people won't necessarily connect the two citations to the same work.

[RESPONSE agree as above](#)

Although the study by Burger et al. is interesting, they (Burger et al.) acknowledge that the findings are limited by a lack of statistical power. Burger et al. stated "Ongoing injury surveillance is necessary before these injury trends may be interpreted with confidence." The pattern reported in the majority of research publications examining injury epidemiology in children's and youth rugby is that the injury risks tend to increase with increasing age.

[RESPONSE - Agree](#)

Page 4 lines 16-17. 'Many' is a vague term for inclusion in a scientific manuscript, and I think the information in the paper to which the authors are referring (Ref 15, Lee, Garraway, Hepburn et al) could equally be used to support the argument that the most common reasons provided by Under 20 players for ceasing play were for reasons other than rugby injury. Fifty seven players aged under 20 provided 70 reasons for stopping play. 19% of the reasons (13 of the 70 reasons given) were for rugby injury; 81% of the reasons given were for motives other than rugby injuries.

[RESPONSE – have replaced "many" with actual percentages](#)

Table 1.

I am unclear what the percentages reported are percentages of. Are they, for example, indicating that 0.55% of people in England above the age of 14 play rugby once per week? Please clarify. Is it not the case that 'many' children who participate in sport stop when leaving school, regardless of the sport? Are the drop-offs in participation for the rugby codes inordinately high compared to other sports? If they are not, I think the authors should consider whether they have provided a particularly persuasive argument on this point.

[Removed this as the percentages are so small as to not really add anything](#)

Overall, I don't believe the authors have provided a strong rebuttal to the point raised by Tucker et al. with respect to potential unintended consequences of a ban on tackles in rugby. I find the arguments put forth by Tucker et al. [1] on this point plausible (although not necessarily compelling), and the argument raised against it (that there is a lack of supporting research that such unintended consequences would occur) is not actually addressing the claim made by Tucker et al., who did not say that there was supporting research in the first place.

[RESPONSE - Tucker is not being logical- exactly what are these unintended consequences from the perspective of school children rather than the potential damage to the professional game?](#)

The claim that improving tackle technique and proficiency will reduce injury rates is not supported by evidence

In my opinion, this is the weakest section of the paper, for two reasons.

Firstly, because some of the information presented directly contradicts the heading, and secondly, because the fact that different types of tackles (and hence the different techniques employed) carry different levels of risk is well established. Evidence that different types of tackles/different techniques carry different levels of risk in rugby has been provided in multiple studies [2-6]. The fact that some tackle techniques are riskier than others is recognised within the rules of rugby - 'spear tackles', and 'head-high tackles' are considered dangerous play, and are not permitted. It is self-apparent that a player who places their head in front of the ball carrier's knees when effecting a tackle is at higher risk of receiving a concussion than a player who places their head behind the ball carrier's hips. The acceptance that certain types of tackle techniques carry higher risks than others also underpins much of the coaching/injury prevention resources that have been produced. Material regarding tackle technique plays a central part in RugbySmart, BokSmart, RugbyReady and similar programmes designed to educate coaches, players and referees about how to teach, perform, and regulate tackle techniques that minimise the risk for players.

The second sentence of the section states: "They [Tucker et al.] state that poor or inappropriate tackle technique is a risk factor in rugby injuries, citing two articles on proficiency rather than technique as evidence. 18 19 " It unclear to me why the authors are drawing a distinction between 'proficiency' and 'technique'. 'Proficiency', in the context of the cited work, was a measure of how well the given tackle technique was performed. Burger et al. refer to 'technique proficiency scores'. Paper 19 was a study examining tackle technique and proficiency, and it found: Higher overall mean and criterion-specific tackle-related technique scores were associated with a non-injury outcome.

The ability to perform well during tackle events may decrease the risk of injury and may manifest in superior performance. In the conclusion of the paper it states: Players had higher mean tackle and ball-carry technique proficiency scores during their non-injury events in comparison to the events where they were injured.

[RESPONSE –The facts are that the risks of injury are high and that most injuries occur in the tackle. We are calling on the government to remove tackle form school rugby as children should not be exposed to the unnecessary risks. Our response to this is that it is inappropriate to conduct trials of rugby tackling on children when it is known that it is the number one risk factor in injury](#)

Having a greater overall technical proficiency and the ability to fulfil specific technical criteria were associated with a non-injury outcome. In fact, the authors acknowledge these findings [Page 4 lines 55-59; Page 5 lines 3 & 4]. I do not understand the authors' assertion in the heading of the section that improving tackle technique and proficiency will reduce injury rates is not supported by evidence given that the information they are citing provides [at least some] evidence that it does!

[RESPONSE – as above](#)

The authors are, however, correct on some of the points they are making with respect to reference 18. Tucker et al. [1] made the following statement: "It has also been documented that poor or inappropriate tackle technique is more likely to be observed in tackles leading to head injuries 40 " This statement should have been limited to make it clear that: 1) The study cited (reference 40 in Tucker et al.) [7] was so under-powered that any conclusions drawn from it needed to be very tentative indeed 2) While there were certain elements of technique that appeared to decrease the risk of head injury (e.g. head placement on the correct side of the ball carrier), the overall metric of tackle 'proficiency' that they used did not show differences between head injury and nonhead injury tackles My opinion is that with a sample of four tackles associated with injury, and 15 associated with noninjury, the paper should have been presented as a 'description of methods', rather than as a presentation of findings of risks associated with tackle techniques.

Tucker et al. [1] are correct in stating that McIntosh et al. found that younger players were significantly less likely to be injured in the tackle than older players. [3] The younger players did make significantly more passive shoulder tackles, and fewer active shoulder tackles, than senior players. [3] It should be noted, however, that McIntosh et al.'s study was also underpowered, and that their own conclusion regarding the differences in risks between tackle types was a misinterpretation. McIntosh et al. stated

"No specific tackle technique was observed to be associated with a significantly increased risk of game injury." [3]

The key word in this sentence is 'significantly'. The odds ratio for passive shoulder tackles was 1.3 (compared to active shoulder tackles which was standardised to a reference of 1.0), and that for ankle taps was 2.24. McIntosh et al. have conflated lack of statistical significance with lack of effect, and incorrectly inferred that there were no differences in risk across the tackle techniques. There were differences in injury rate across the various tackle types, but these didn't reach statistical significance due to a lack of study power. In other words, they observed some differences, but the strength of the evidence they presented for these differences was relatively weak, because the

power of the study to detect effects was limited by the sample size. Part of the issue with these studies is that tackle injuries are (relatively) rare on a per tackle/tackle event basis, and that some types of tackle are much more common in the sport than others. To obtain sufficient statistical power to make statements about clear differences in risk between various types of tackles requires large numbers of tackles to be evaluated. In a much larger study (i.e. over 13 times as many tackle events evaluated than in the study of McIntosh) of tackle injuries and the risks associated with various tackle types (albeit at the professional level of the sport),

[RESPONSE – this section has been rewritten, we do think Tucker et al use two separate results from this McIntosh paper to infer the techniques used at younger ages are the reasons for the lower tackle related injury rates. In fact McIntosh et al find no direct link between different techniques and risk of injury.](#)

Quarrie and Hopkins [5] found clear differences in risk associated with differences in tackle type. Although the rate of injuries resulting in unavailability for selection per tackle was low (in the order of 2-3 per 1000 times tackled for ball carriers, and 1.5 per thousand tackles attempted for tacklers), the collection of data on a large number of tackle events (i.e. ball carriers being tackled; 84494), mean that sufficient information on low frequency tackles was collected to be able to show statistically robust evidence of differences in risk associated with different tackle types. For example, ball carriers were at much higher risk when they were tackled around the head and neck than when tackles were lower on the body; both players were at higher risk when respective running speeds (and thus the amount of energy transferred in the tackle) was higher. Fuller et al., [4] in a somewhat smaller scale study, also found clear differences in risk associated with different tackle types in professional rugby; high speed going into the tackle and tackles to the head/neck region were also identified as risk factors in their study.

[RESPONSE – the referee says that different tackle types may result in different rates and risks of injury- we are arguing for the removal of all tackle and the reintroduction of tackle only when it can be shown to be safe, this would require a study of different tackle types. For school children the risks should be removed and the study could be conducted in over 18s.](#)

The claim that the rate and risk of injury in youth rugby is overstated and is not unacceptably high is not correct.

The arguments provided by the authors in this section do not address the issue raised by Tucker et al. that a blanket approach to risk management (for example, a tackle ban for all ages at school rugby) may be inappropriate when the risks differ substantially across cohorts of participants.

[RESPONSE – our ban is for removal of tackle in all school children regardless of age until it can be shown to be safe](#)

a) Injury definitions

Page 5. Lines 56-58. Taking issue with a comparison of injury rates based on different injury definitions seems like a reasonable thing to do to me. In my opinion the comparison made in Freitag et al. [8] between the injury rate reported by Williams et al. of 81 match injuries per 1000 player

hours for injuries requiring at least one day's absence with all injuries 'irrespective of the need for medical attention or time-loss from rugby activities' was, as Tucker et al. have indicated in their opinion piece, inappropriate because different things were being counted as injuries. It is unclear to me as to whether the authors are actually attempting to rebut Tucker et al.'s claim here. Do the authors disagree with the claim made by Tucker et al., or not? If not, on what grounds is the claim being rebutted?

[RESPONSE – Our rebuttal was because Tucker was inferring that the rate would be much lower if we used the >24 hours definition. We show this not to be the case. Firstly, it is a widely accepted finding that injuries are higher in the professional game than in the amateur games. The criticism levelled at us was that we used the figure of 26.7 injuries per 1000 player-hours, calculated under the consensus all injury definition to compare with a rate calculated from the professional game under the >24 hours away from play injury definition. What we have shown is that even if we adopted the same injury definition to that used in the Williams et al professional game systematic review and meta-analysis of >24 hours away from play, the figures we obtain from the two available studies plus the one additional study are 24, 47, 35 and 29 injuries per 1000 player-hours. There is therefore no evidence to support Tucker et al's assertion 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."](#)

Page 6 Lines 6-7. What is the relevance of this sentence?

[RESPONSE – to put this measure in context](#)

Page 6 line 10. Typo: 'Haseler', not 'Hasler'.

[RESPONSE – done](#)

Page 6. Lines 17-21. "There is therefore no evidence to support...."

Didn't Collins et al. [9, 10] report a rate of 11.4 injuries per 1000 hours of play for injuries requiring at least one day's absence from rugby? [Bleakely et al., in their review, converted the rate reported in Collins from athletic exposures (matches) to hours [9]]. This would appear to contradict the statement you are making here. I would be careful about making absolute statements regarding evidence (e.g. 'no evidence'). Perhaps 'no evidence of which we are aware' would be better.

[RESPONSE – changed](#)

b) Combining ages and risk

Page 6. Lines 27-33. I agree that the weight of evidence indicates that the rate of injury in rugby tends to increase with age.

Page 6. Lines 33-35. The authors state "Lower injury rates at these younger ages may be more to do with body mass, strength and speed than any technique or deficiency issues", with a reference to a

paper by McIntosh et al. [11] Lower rates at younger ages may well be more to do with body mass, strength and speed, but McIntosh et al. did not rule out the fact that skill/technique were also potential risk factors:

Risk factors that could be studied in future would focus on skill acquisition, development and execution, physical maturation, anatomical features, player and game 'speed' in youth rugby.

I note that McIntosh et al. also commented upon the level of risk in rugby: Overall, injury rates for young players (U13 and U15) are lower than in the adult and professional levels of rugby and the sport is not as 'dangerous' as may be perceived by some parents; perceptions that might arise via professional rugby.

Page 6. Lines 37-42. I agree with this statement, and would point out that it concurs with, rather than rebuts, the statements made by Tucker et al. [1]

[RESPONSE – We can all agree on this, however the difference in opinion centres on whether you can still perform a meta-analysis on rugby studies or not, we and other authors think so, Tucker et al appear to think not.](#)

Page 6. Lines 43-51. These are all good points.

Page 7. Lines 53-58. The probability of injury for children circles back to the issue raised by Tucker et al. in their introductory section: 'what constitutes an acceptable level of risk for the sport'. The authors are obviously of the view that the rates of injury for children in rugby are 'unacceptable'. Who determines that if 12% of children are injured to the extent they are away from the game for at least seven days it represents an 'unacceptable' burden of injury?

The claim that 'risk of injury in youth rugby is no more injury prone than any other sport is incorrect [This is a clumsy sentence, I suggest redrafting. Also, the quotation mark at the end is missing at the moment]

[RESPONSE - reworded](#)

Page 7 Lines 8-11. The authors are correct in stating that Tucker et al. misstated the conclusions of Spinks and McClure [12]

Page 7. Lines 12-14. I think both the authors and Tucker et al. acknowledge that comparisons of injury rates across sports are difficult for a range of reasons. Bleakley et al. reference the work of Collins et al., who concluded: "While caution should be used when comparing injury rates across studies, in the United States, high school rugby appears to have a lower injury rate than ice hockey, higher injury rates than basketball and soccer, and similar injury rates to football and wrestling". They also state "with the exception of Collins et al, 19 the prevalence of severe injuries in adolescent rugby players in the current evidence base 21,24,29,30 was lower than or comparable with data from high school football (8.6%47 to 11.2%51), soccer (10.4%),51 and wrestling (14.8%)51 athletes."

Spinks and McClure also state:

Policy implications

The risk of physical activity-related injury must be considered within the context of the substantial benefits that children gain through participation in sports and activities.

[RESPONSE – to our knowledge there are no studies showing the unique benefits of rugby or more specifically rugby with tackle, over and above other forms of physical activity.](#)

In general, the overall injury risk may be considered to be quite low compared with the opportunities for improving physical, psychological and mental health that many activities offer

[RESPONSE - what is the evidence that full contact sports offer more benefits and fewer harms than physical activity.](#)

At some point, however, questions will be asked about sports and activities for which a higher injury risk is consistently demonstrated. Discouraging children from participation in such activities is undesirable.

[RESPONSE - which is why we are arguing for a law modification.](#)

However, anxious parents may not permit children to participate if they believe their safety is compromised. Modification of rules for younger players is one approach that has met with previous success in reducing injuries in some sports

[RESPONSE - this is what we are arguing for by removing tackle](#)

Such approaches are being explored for many activities and coupled with improvements in coaching techniques, equipment safety and maintenance of playing fields may improve the safety of childhood sports and activity without reducing the associated enjoyment and health benefits.

[RESPONSE - where is the evidence for this statement? These are the authors \(Spinks and McClure\) subjective opinions and not relevant to the Tucker paper.](#)

Given these observations, and the current content of the manuscript, I think the authors should directly address the following point made by Tucker et al. [1]: “However the available evidence, when considering these challenges, [of injury definition, measurement of exposure time, and accurate diagnosis] suggests that the risk of injury in Rugby Union is not disproportionately high in children and that around 15 years of age appears to be when the incidence of injury in contact and collision sports increases in comparison to non-contact sports.”

[RESPONSE – We have addressed this point in our article.](#)

Page 7. Lines 15-17. “Rugby Football Union employed medical experts agree that ‘rugby union has a relatively high risk of injury compared with other team sports’

[RESPONSE ...where team sports are non full contact.](#)

I think the authors have selected part of a quote to suit their purpose. The full quote reads: “As a result, rugby union has a relatively high risk of injury compared with other team sports, but there is a growing body of literature showing that injury incidence in rugby union^{1–8} is similar to that of other full contact sports such as rugby league,⁹ American football¹⁰ and Australian Rules Football.¹¹

[RESPONSE - our comparison is with non contact team sports. We are not advocating that children switch to other contact sports](#)

Page 7. Lines 21-60. In the absence of participation rates I am not convinced that this information provides strong support for the argument the authors are making. The fact that the most common age for rugby union and rugby league players attending emergency departments in Oxfordshire is 14 years old may or may not simply be a function of participant numbers.

[RESPONSE – We state that we don't have participation rates. It is a fact that the two codes of rugby accounted for the second and third most frequent cause of attendance of 10-19 year old boys turning up at A&E in Oxfordshire](#)

Conclusion

Page 8. Lines 9-12. “All the evidence available supports the view....” Again, I would be careful with absolute statements with respect to evidence. From my reading of the issues, it seems that both parties to the argument agree that:

- 1) The tackle is the riskiest part of rugby/responsible for the major part of the injury burden associated with the sport(s) [rugby union and rugby league]
- 2) Rugby injury rates tend to increase with age
- 3) Removing the tackle in schools’ rugby would markedly reduce the risk of injury

[RESPONSE – we don't think Tucker et al agree with us on this point.](#)

- 4) There remains a lack of high quality information regarding the relative risks associated with different children’s sports and recreational activities

[RESPONSE ... because exposure data and injury definitions vary but this is not a reason to remove the tackle.](#)

The parties differ, however, in their views as to whether the risks associated with rugby participation for school children are ‘unacceptably high’, and whether the tackle should, in fact, be banned

[RESPONSE ...in school rugby.](#)

The authors, and the signatories to the open letter are obviously of the view that the risks associated with tackles in rugby are unacceptably high (although not yet well defined), and that, given the lack of quality injury surveillance systems in the United Kingdom and corresponding lack of quality evidence about the size of the risks, the precautionary principle should apply and that tackles should be banned in school rugby.

The authors of the piece representing World Rugby's perspective seem to be of the view that while there remain large gaps in the evidence base, the risks associated with rugby participation do not seem to be inordinately high compared to other childhood sports/activities. It seems that although they appear to accept that the risks associated with the tackle need to be addressed, they do not believe that the application of the precautionary principle necessarily requires the introduction of a tackle ban, rather, that there is a range of potential risk management strategies available up to and including the removal of the tackle, and that the interventions selected should be proportionate to the risk, targeted to particular age cohorts and acceptable to the various stakeholder groups. My question to both parties is, 'whose norms determine what constitutes unacceptable risk' in any given activity, and why?

[RESPONSE - It is not a question of norms rather that the duty of government is to protect children from injury.](#)

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