

Reviewer(s)' Comments to Author:

Reviewer: 1

Comments to the Author

PLEASE NOTE THAT OUR NEW RESPONSES ARE IN UPPER CASE

I would like to once again encourage you to highlight the following more in your argument;

1) Contact rugby should not be compulsory at any level of play and this must be amended immediately at schools in the UK and Ireland. The child should have the final say regarding the sport in which they wish to participate. This could indeed lead to a smaller pool of more committed and dedicated contact rugby players filtering through into senior levels of the game and allowing other sporting codes to increase their participation numbers. WE AGREE –SCHOOL CHILDREN WHO ARE KEEN CAN PLAY COLLISION RUGBY IN THE YOUTH GAME OUTSIDE OF SCHOOL - SEE FINAL SECTION OF PAPER

2) Alternative versions of non-contact RUGBY should be made available in addition to other forms of physical activity for children to participate in. Removing rugby altogether is not the solution to making a sport that is almost 200 years old safer. SEE PAPER WE HAVE ADDED NON COLLISION VERSION TO THE 40 SPORTS

3) The RFU and their fellow rugby unions in the UK must follow the model of RugbySmart and BokSmart to develop, implement, monitor, evaluate and adapt injury prevention programmes spanning all levels of the game. It is unacceptable that these are not already well-developed in the UK and, based on promising results from New Zealand and South Africa, could make the game safer. WE AGREE BUT UNFORTUNATELY THESE PROGRAMMES HAVE NOT BEEN FULLY EVALUATED IN RESPECT OF INJURIES (SEE PAPER)

I have also responded to certain comments that you have made in your response;

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.

IS THE REFEREE SUGGESTING THAT THESE INJURIES WOULD CONTINUE AT THE SAME FREQUENCY IF THE TACKLE IS REMOVED, THIS IS A PROBLEMATIC ASSERTION AS IT IS NOT LOGICAL TO CONFLATE FREQUENCY OF PLAY WITH CONTACT ? CAN HE PROVIDE THE EVIDENCE

REVIEWER RESPONSE

There are at least three studies that report tackle-related injury rate per 1000 exposure hours in youth rugby; Palmer-Green et al., 2013; Haseler et al., 2010, and Burger et al., 2014. However, to the best of my knowledge, there are no studies assessing the propensity of tackles to cause injury i.e. number of injuries per number of events, in particular severe and catastrophic injuries. Therefore, I would suggest that this research be conducted and encouraged before making any scientifically-based claims that the tackle has the highest propensity to cause severe injury in rugby, and indeed when compared to other unique components of play in other youth sports. This sentiment reflects your statement that there is “no evidence to support the claim that a ban on tackle may also lead to unintended consequences such as an increase in the risk of injury later in competition”. Conclusions cannot be made until the evidence is available.

1. Palmer-Green DS, Stokes KA, Fuller CW, et al. Match injuries in English youth 627 academy and schools rugby union. *Am J Sports Med.* 2013;41:749–755.
2. Haseler CM, Carmont MR, England M. The epidemiology of injuries in English youth 566 community rugby union. *Br J Sports Med.* 2010;44:1093–1099.
3. Burger N, Lambert MI, Viljoen W, et al. Tackle-related injury rates and nature of 536 injuries in South African Youth Week tournament rugby union players (under-13 to 537 under-18): an observational cohort study. *BMJ Open.* 2014;4:e005556.

AUTHORS' SECOND RESPONSE

WHAT WE SAID IN OUR ORIGINAL RESPONSE WAS THAT WE WERE NOT AWARE OF STUDIES WHICH “TAKE INTO ACCOUNT EXPOSURE IN EACH PHASE OF THE GAME”. THE STUDIES PROVIDED BY THE REVIEWER GIVE TACKLE INJURY RATES PER TOTAL GAME EXPOSURE. THEY DO NOT TAKE INTO ACCOUNT, AS THE REVIEWER CORRECTLY POINTS OUT, THE AMOUNT OF TIME OR THE NUMBER OF OCCASIONS IN A GAME ACCOUNTED FOR BY EACH PHASE OF PLAY SUCH AS THE TACKLE. THEREFORE THESE RATES GIVE NO MORE INFORMATION WITH REGARDS TO WHICH PHASE OF PLAY IS MORE INJURY PRONE THAN OTHERS THAN THE PERCENTAGES ALREADY PRESENTED.

IT IS SETTING THE BAR TOO IMPOSSIBLY HIGH TO ASK FOR AN ANALYSIS OF INJURY RATES IN THE DIFFERENT UNIQUE COMPONENTS OF OTHER SPORTS WILL PREVENT ANY POLICY STATEMENTS BEING MADE IN RESPECT OF INJURY TO CHILDREN IN RUGBY. WHAT WE ARE SAYING IS THAT THE EVIDENCE SHOWS THAT THE TACKLE IS THE CAUSE OF MOST INJURIES DURING GAMES AND THE COLLISION PHASE OF THE GAME RESULTS IN HARMS , THIS IS CLEAR FROM ALL THE ACCUMULATED EVIDENCE.

WE HAVE READ THE TWO ADDITIONAL HELPFUL REFERENCES FROM THE REVIEWER. THESE CONFIRM OUR POSITION AND ADD TO THE ALREADY STRONG EVIDENCE BASE ON COLLISION AND TACKLE.

1. Fuller CW, Brooks JH, Cancea RJ, Hall J, Kemp SP. Contact events in rugby union and their propensity to cause injury. *Br J Sports Med.* 2007;41:862-7.
2. Quarrie KL, Hopkins WG. Tackle injuries in professional rugby union. *Am J Sports Med.* 2008;36(9):1705-16.

THE FIRST PAPER BY FULLER ET AL ANALYSES DATA FROM TWO SEASONS OF PROFESSIONAL ENGLISH RUGBY UNION AND FOUND COLLISIONS HAD THE HIGHEST RATE OF INJURIES PER 1000 EVENTS 10.5 (95% CI 7.6–14.6), THE SECOND HIGHEST INJURY CAUSING EVENT WAS SCRUM 8.1 (6.2–10.6) FOLLOWED BY TACKLE 6.1 (5.5–6.8). THE EVENT WITH THE HIGHEST NUMBER OF INJURIES ATTRIBUTED TO IT WAS TACKLE, 313/497 INJURIES (63%) FOLLOWED BY RUCK 65 (13%) AND SCRUM 54 (11%).

THE SECOND STUDY BY QUARRIE ET AL ANALYSED DATA FROM ALL NEW ZEALAND PROFESSIONAL MATCHES BETWEEN 2003 AND 2005. THEY ONLY LOOKED AT TACKLES AND COMPARED VARIOUS CHARACTERISTICS OF THE TACKLE IN ITS PROPENSITY TO INJURY.

AS QUARRIE ET AL SAY “THE TACKLE IS THE MOST DANGEROUS FACET OF PLAY IN RUGBY UNION”. REMOVING THE TACKLE FROM SCHOOL RUGBY IS PART OF WHAT WE EXPECT IS REQUIRED IN MAKING SCHOOL RUGBY A NON-COLLISION SPORT, THEREFORE REDUCING THE RISK OF COLLISIONS AS WELL.

- 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, HOWEVER WE AGREE other alternatives in the school game could include physical activity, dance, swimming or athletics AND TAG OR NON CONTACT RUGBY AND WE HAVE MENTIONED THIS IN OUR PAPER

REVIEWER RESPONSE

I am aware that there are several alternative sporting codes to participating in rugby. I want to know what school children who actually want to play rugby, specifically, will do i.e. what alternative forms of rugby exist that could pose as a viable solution?? THAT IS FOR THE GOVERNMENT TO DECIDE – WE HAVE MENTIONED NON COLLISION SPORT. The child should have the final decision whether or not to participate in contact rugby (this is in the child’s best interests) THIS IS NOT THE CASE IN SCHOOLS WHERE THE SCHOOLS HAVE A DUTY OF CARE. You cannot possibly decide for all children and parents AGREE. This is equivalent controlling if a child wishes to play in a tree or ride their bicycle, where they are also at risk of injury- SCHOOL ACTIVITIES ARE DIFFERENT AS SCHOOL IS IN LOCUS PARENTI. You will also need to control for youth boxing where the aim of the sport is to purposefully concuss your opponent (whereas concussion is an unfortunate, unintentional consequence from participating in rugby). SEE BELOW

AUTHORS’ SECOND RESPONSE

WE TAKE THE VIEW THAT WORLD RUGBY, THE RUGBY FOOTBALL UNIONS (RFUS) AND THE DEPARTMENTS FOR EDUCATION IN THE UK COUNTRIES MUST DESIGN A SAFE FORM OF RUGBY WHICH CAN BE PLAYED IN SCHOOLS. THERE ARE CLEARLY ISSUES WITH ALL COLLISION SPORTS, THE REVIEWER CITES BOXING AS ONE, WE AGREE WITH HER / HIS CONCERNS; HOWEVER THE FOCUS OF OUR WORK IS ON RUGBY. THIS IS BECAUSE RUGBY UNION AND RUGBY LEAGUE ARE BY FAR THE TWO MOST FREQUENTLY PLAYED COLLISION SPORTS IN UK SCHOOLS.

IT IS OUR VIEW THAT THERE IS NO NEED FOR COLLISION SPORTS TO BE PLAYED IN SCHOOLS GIVEN THEIR HIGHER RISK OF INJURY THAN OTHER CONTACT SPORTS. (SPINKS AND MCCLURE, 2007, PFISTER ET AL., 2016) WE UNDERSTAND CONCERNS AROUND PHYSICAL ACTIVITY AND OBESITY, HOWEVER THERE ARE A WHOLE RANGE OF OTHER SPORTING ACTIVITIES AND PHYSICAL ACTIVITIES THAT CAN BE UNDERTAKEN WITH MUCH LOWER RISKS OF INJURY. IF THE RESPONSIBLE BODIES CAN MAKE RUGBY INTO A NON-COLLISION FORM OF THE GAME WITH COMPARABLE RATES OF INJURY TO OTHER CONTACT SPORTS THEN IT CAN TAKE ITS PLACE WITH THE OTHER CONTACT SPORTS IN PART OF THE PHYSICAL EDUCATION OFFER IN SCHOOLS. STATE BODIES HAVE A DUTY OF CARE TO CHILDREN, THEY MUST DECIDE WHICH ACTIVITIES ARE SAFE TO BE OFFERED TO CHILDREN TO PARTICIPATE IN AT SCHOOL AND THEY SHOULD TAKE THE CAUTIONARY APPROACH. CHILDREN DO NOT HAVE THE FINAL SAY IN SCHOOL IN RESPECT OF DANGEROUS ACTIVITIES AS SCHOOLS HAVE A SPECIAL DUTY OF CARE.

PFISTER, T., PFISTER, K., HAGEL, B., GHALI, W. A. & RONKSLEY, P. E. 2016. The incidence of concussion in youth sports: a systematic review and meta-analysis. Br J Sports Med, 50, 292-7.

SPINKS, A. B. & MCCLURE, R. J. 2007. Quantifying the risk of sports injury: a systematic review of activity-specific rates for children under 16 years of age. Br J Sports Med, 41, 548-57; discussion 557.

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 – THANKS YOU FOR THE AGREEMENT AND THE reference WHICH WE HAVE ADDED ALONG WITH 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 UNLESS AND until it’s reintroduction can be shown to be safe.

REVIEWER RESPONSE

You have stated later in your response that the tackle should not be introduced at all. In addition, there is no evidence to prove that it safer to introduce contact at a later age. You hypothesize that it may be safer to be introduced after the school playing level. There is every possibility that it may actually be more dangerous, but once again this first needs to be proved or disproved before radical changes are made to the game.

AUTHORS’ SECOND RESPONSE

WE HAVE REMOVED ALL REFERENCES TO REINTRODUCING THE TACKLE TO SCHOOL RUGBY. THE FOCUS OF THIS PAPER IS ON WHAT MEASURES CAN BE TAKEN NOW TO MAKE RUGBY ACCEPTABLY SAFE IN SCHOOLS.

- 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 TACKLE IS THE MAJOR risk factor FOR injury

REVIEWER RESPONSE

You highlight the need for scientific evidence in the guidance of a change in policy but seem opposed to the scientific method for providing this evidence. Injury surveillance and video analysis studies in youth rugby are

not unethical. However, they are limited in number and more detailed studies are required before changes can be enforced. WE AGREE THAT MORE STUDIES ARE ALWAYS USEFUL BUT WE DO NOT NEED MORE STUDIES FOR A CAUTIONARY APPROACH TO BE TAKEN TO THE GAME.

AUTHORS' SECOND RESPONSE

WE RESTATE OUR POSITION.

1 – RUGBY IS A COLLISION SPORT WITH A HIGH RATE OF INJURY

2 – THE TACKLE IS THE SINGLE LARGEST CONTRIBUTOR TO THIS HIGH RATE OF INJURY

3 – THERE IS NO NEED FOR CHILDREN TO BE EXPOSED TO THIS HIGH RISK OF INJURY IN ORDER TO BE PHYSICALLY ACTIVE

4 – THEREFORE RUGBY IN SCHOOLS SHOULD BE MADE INTO A NON-COLLISION SPORT

- 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.

REVIEWER RESPONSE

Please state clearly when exactly you suggest that the contact rugby is introduced. You do not mention this in any of your content.

AUTHORS' SECOND RESPONSE

WE PROPOSE THAT THE TACKLE IS REMOVED FROM SCHOOL RUGBY, CHANGING IT FROM A COLLISION SPORT TO A NON-COLLISION CONTACT SPORT. THE RULES SET WITHIN THE NON-SCHOOL YOUTH GAME WILL PRESUMABLY BE SET BY WORLD RUGBY AND THE RESPONSIBLE RFUS AS THEY ARE AT THE MOMENT. THE QUESTION OF GOVERNANCE AND INJURY SURVEILLANCE IN THESE SETTINGS IS AN IMPORTANT ONE AND ONE FOR THE RFUS TO ANSWER. WE DO NOT SPECIFY AN AGE WHEN TACKLING CAN BE INTRODUCED; WE ARE INTERESTED IN REMOVING TACKLING FROM ONE PARTICULAR SETTING, SCHOOLS, FOR ALL AGES. HOWEVER THE RFUS DO NEED TO CONSIDER WHETHER THEIR CURRENT POLICY OF INTRODUCING TACKLING FROM THE AGE OF EIGHT YEARS IS SAFE. IT HAS BEEN SHOWN IN NEW ZEALAND FOR EXAMPLE THAT THE HEAD IMPACTS SUSTAINED BY 11 YEAR OLD RUGBY LEAGUE PLAYERS ARE OF A COMPARABLE MAGNITUDE TO THOSE SUSTAINED BY COLLEGE AMERICAN FOOTBALLERS. (KING ET AL., 2016)

KING, D., HUME, P., GISSANE, C. & CLARK, T. 2016. Head impacts in a junior rugby league team measured with a wireless head impact sensor: an exploratory analysis. J Neurosurg Pediatr, 1-11.

- 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.

REVIEWER RESPONSE

Once again, I am aware of alternatives forms of physical activity and I would encourage children to participate in a wide variety of these sports. However, is touch or 'tag' rugby not an alternative for players who appreciate the aspects of the game of rugby without contact? WE HAVE ADDED IN NON COLLISION FORMS OF THE GAME TO THE PAPER.

AUTHORS' SECOND RESPONSE

AGAIN WE TAKE THE VIEW THAT IT IS UP TO WORLD RUGBY, THE RFUS AND THE DEPARTMENTS FOR EDUCATION IN THE UK COUNTRIES TO DESIGN A SAFE FORM OF RUGBY WHICH CAN BE PLAYED IN SCHOOLS. WE DO NOT BELIEVE THAT RUGBY IN ITS CURRENT COLLISION SPORT FORM WITH ITS HIGH RATE OF INJURIES IS AN APPROPRIATE SPORT FOR CHILDREN TO BE OFFERED OR COMPELLED TO PLAY WHEN THEY HAVE NO CHOICE BUT TO BE IN SCHOOL IN THE FIRST PLACE.

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 – THANK YOU FOR THESE – WE HAVE added A SENTENCE 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>).

REVIEWER RESPONSE

The review you refer does allude to some of the success achieved via the RugbySmart programme but does not highlight the need for similar programmes across the nations within the UK. In addition, the Boksmart injury prevention programme showed that, although very rare, the majority of catastrophic injuries occur in the tackle and scrum. They have subsequently shown that these injuries have significantly decreased in the youth level of the game since the programme was implemented. To my understanding, this is evidence of the positive effects that a long-standing, well-run programme can have on injury incidence, particularly injuries that are associated with the greatest burden and cost. Perhaps other programmes are not effective due to poor implementation or due to lack of behavioural change as they have not been action for long enough?

AUTHORS' SECOND RESPONSE

THIS MAY WELL BE THE CASE BUT THE RESEARCH SHOWING A REDUCTION IN INJURIES HAS NOT BEEN PUBLISHED TO OUR KNOWLEDGE

• 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 be 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 – WE AGREE WITH THE NEED FOR INJURY SURVEILLANCE AND THAT RUGBYSAFE IS INTERESTING. HOWEVER UNTIL THE EVALUATIONS HAVE BEEN CARRIED OUT IT IS DIFFICULT TO MAKE THE CASE FOR THEIR IMPLEMENTATION – ALTHOUGH THIS WOULD SEEM A PRACTICAL THING TO DO SEE ABOVE

REVIEWER RESPONSE

I agree. So you should be advocating and encouraging studies to implement and evaluate programmes like this in the UK and Ireland. Until such a point, you cannot prove or disprove the lack of effect that these programmes have.

AUTHORS' SECOND RESPONSE

SENTENCE ADDED "THERE IS A NEED FOR PROPER EVALUATION OF INJURY PREVENTION PROGRAMS SUCH AS THE SECONDARY CONCUSSION PREVENTION SCHEME HEADCASE, IN THE UK AND IRELAND."

WE HAVE ALSO ADDED IN A REFERENCE TO THE NEWLY PUBLISHED SYSTEMATIC REVIEW BY FRAAS ET AL WHICH HAS FOUND LITTLE EVIDENCE FOR THESE PROGRAMS WITH RESPECT TO CONCUSSION PREVENTION OR EDUCATION.

"IN A SYSTEMATIC REVIEW, FRAAS ET AL CONCLUDED THAT DESPITE THEIR BEING SEVERAL CONCUSSION EDUCATION AND PREVENTION PROGRAMMES IN EXISTENCE ACROSS VARIOUS COUNTRY RUGBY UNIONS, THERE WAS LITTLE EVIDENCE AVAILABLE TO SUPPORT THEIR EFFECTIVENESS."

FRAAS, M. R. & BURCHIEL, J. 2016. A systematic review of education programmes to prevent concussion in rugby union. Eur J Sport Sci, 16, 1212-8.

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

REVIEWER RESPONSE

You have removed this completely from your manuscript although this is encouraging scientific evidence that optimising technique may reduce the risk of injury???. In addition: page 9 line 49-52; "We are concerned that Tucker et al in moving the debate away from removing the harms i.e. tackle are distracting and confusing the reader with a detailed analysis of the merits of different tackle techniques and proficiency in order to preserve the established risks and harms in the Laws of the game."

This your personal opinion. Tucker et al attempt to encourage the accruing of scientific data to make evidence-based changes to the game. [THIS IS THE REFEREE'S PERSONAL OPINION.](#)

AUTHORS' SECOND RESPONSE

IT IS OUR OPINION THAT THIS IS NOT THE DIRECTION OF TRAVEL WE SHOULD BE GOING IN. THERE MAY WELL BE TECHNIQUE AND PROFICIENCY ISSUES WHICH WOULD ASSIST IN THE REDUCTION OF RATES OF INJURIES. HOWEVER AS WE HAVE STATED WE BELIEVE IT UNETHICAL TO EXPERIMENT ON CHILDREN WHEN YOU KNOW THERE IS AN EVIDENT HARM THEY ARE BEING EXPOSED TO WHICH IS DISPROPORTIONATE TO ANY BENEFITS RECEIVED BY THE INTERVENTION OVER AND ABOVE OTHER SIMILAR INTERVENTIONS (EG. OTHER NON-COLLISION SPORTS OR PHYSICAL ACTIVITIES).

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

REVIEWER RESPONSE

As I have previously stated, injury surveillance and studying tackle types in youth rugby match situations is not unethical and should be encouraged. Only with this evidence can substantial changes be made to the game.

AUTHORS' SECOND RESPONSE

INJURY SURVEILLANCE IS VITAL, WE AGREE. TUCKER ET AL STATE THAT THERE ARE NO STUDIES ON TACKLE TECHNIQUE OR PROFICIENCY IN THE YOUTH GAME. IT IS OUR VIEW THAT GIVEN THE AVAILABLE KNOWLEDGE OF THE HIGH RISK OF INJURY IN RUGBY AND ITS ASSOCIATION WITH THE TACKLE, SUCH STUDIES WOULD BE UNLIKELY TO ETHICALLY APPROVED FOR CHILDREN. THESE TRIALS COULD BE CONDUCTED IN THE ADULT GAME WITH CONSENTING ADULTS.

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."

REVIEWER RESPONSE

You have applied the same definition of injury to the Williams et al meta-analysis and have proved that the rate of time-loss injury is almost twice that in the professional game versus youth rugby cohorts. Objectively, this is evidence to support Tucker et al's claim and does not support your claim.

AUTHORS' SECOND RESPONSE

WHAT TUCKER ET AL SAY IS

"IT SHOULD BE NOTED 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. THE DIFFERENCE BETWEEN THE INCIDENCE REPORTED IN THE YOUTH AND SENIOR PROFESSIONAL COHORTS WOULD THEREFORE BE LARGER."

THE ISSUE IS NOT THAT THE RATE OF INJURIES IS HIGHER IN THE PROFESSIONAL GAME THAN IN THE YOUTH GAME, NO-ONE DISPUTES THAT. TUCKER ET AL'S CLAIM WAS THAT IF FREITAG ET AL ADOPTED THE >24 HOURS DEFINITION THEN THE RATE THAT FREITAG ET AL CALCULATED WOULD BE MUCH LOWER, WHICH WE HAVE SHOULD TO NOT BE THE CASE.

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.

REVIEWER RESPONSE

You could once again use your energy to encourage research in this area before radical changes are

conducted. THIS IS AD HOMINEM ATTACK – IT IS NOT FOR THE REVIEWER TO SAY WHAT WE SHOULD BE DOING.

AUTHORS' SECOND RESPONSE

WE DON'T AGREE THAT REMOVING THE TACKLE IS RADICAL FROM THE SCHOOL GAME IS RADICAL. WE DO AGREE THAT THERE IS A NEED FOR GOOD INJURY SURVEILLANCE DATA AND STUDIES SUCH AS THOSE OUTLINED ABOVE BUT THAT DOES NOT INVALIDATE THE EVIDENCE TO DATE AND OUR CONCLUSIONS. AS THE REVIEWER AGREES, DUE TO ITS NATURE AS A COLLISION SPORT, RUGBY HAS HIGHER RATES OF INJURY THAN OTHER NON-COLLISION CONTACT SPORTS. WE THINK THE CAUTIONARY PRINCIPAL NEEDS TO BE APPLIED IN THIS CASE.

- 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.

REVIEWER RESPONSE

No I cannot. Please respond to the remaining details of the above comment.

AUTHORS' SECOND RESPONSE

WE HAD STATED THAT THERE ARE LIMITATIONS WITH THE TAKING PART STUDY. ALL WE WERE TRYING TO SHOW HERE IS THE RELATIVE POPULARITY OF RUGBY COMPARED TO OTHER SPORTS. THIS IS INTERESTING GIVEN THE HIGH NUMBER OF INJURY RELATED EMERGENCY DEPARTMENT ATTENDANCES FOR BOTH RUGBY UNION AND RUGBY LEAGUE COMPARED TO OTHER SPORTS. WE HAVE MADE NO CLAIMS AND WE HAVE MADE CLEAR THE LACK OF PARTICIPATION DATA.

DUE TO SPACE CONSIDERATIONS HOWEVER THIS SECTION HAS BEEN REMOVED, THE EVIDENCE FROM THE FIELD BASED STUDIES IS STRONG ENOUGH TO CARRY THE ARGUMENT. WE WOULD BE HAPPY TO REINSERT IT IF THE EDITOR WISHES.

“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. WE ARE URGING A cautionary approach to remove the tackle from school rugby.

REVIEWER RESPONSE

I would suggest rewording this paragraph as follows (or similar); “There is evidence to show that the tackle is a high risk aspect of rugby union, including at the youth level. World Rugby and Ministers and Chief Medical Officers should immediately adopt the precautionary principle and remove compulsory participation in contact rugby at schools in the UK and Ireland. They must also ensure the implementation of robust injury surveillance and injury prevention strategies to mitigate this risk as much as possible, and, if these efforts prove to be unsuccessful in alleviating this risk, it may be necessary to consider removing contact rugby from schools.”

AUTHORS' SECOND RESPONSE

THE TACKLE IS NOT MERELY “A HIGH RISK ASPECT”, IT THE MOST HIGH RISK ASPECT LEADING TO THE MAJORITY OF INJURIES INCLUDING HEAD INJURY AND CONCUSSION. IT IS NOT ENOUGH TO SIMPLY GIVE CHILDREN IN SCHOOL CHOICE OVER AN ACTIVITY WHICH HAS BEEN SHOWN TO BE UNACCEPTABLY DANGEROUS. THE EVIDENCE SHOWS THAT RUGBY IN ITS CURRENT FORM IS NOT SAFE TO BE OFFERED IN ANY SCHOOL. AUTHORITIES HAVE A DUTY OF CARE AND MUST ENSURE THAT ACTIVITIES GIVEN TO CHILDREN IN SCHOOL EITHER AS A CHOICE OR BY COMPULSION ARE SAFE. OBVIOUSLY THERE IS A RISK IN EVERYTHING WE DO, HOWEVER THE HIGH RISK OF INJURY INHERENT IN COLLISION SPORTS MAKES THEM NOT SUITED FOR SCHOOLS.

Key comments : THE FOLLOWING IS WORTHY BUT IT REALLY IS UP TO WRU TO PROVE THAT THE FOLLOWING MEASURES WILL PREVENT INJURY AND HARM AND TO FUND THE RESEARCH PROGRAMMES BELOW

- 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 POINT HAS BEEN MADE REPEATEDLY BY THE REFEREE - SEE ARTICLE – WE ARE CONCERNED WITH SCHOOL RUGBY.
- 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 [in fact](#) a research programme in its own right.

REVIEWER RESPONSE

This could indeed form part of a research programme to substantiate your argument. The evidence is lacking or unavailable. Therefore, this should be implemented before removing the tackle from youth rugby and alternative, non-contact forms of the game should be made available to children who wish to participate in rugby specifically.

AUTHORS' SECOND RESPONSE

AGAIN WE WOULDN'T DISAGREE WITH THIS, THIS IS HOWEVER NOT THE PURPOSE OF THE ARTICLE WE HAVE WRITTEN.

Reviewer: 2

Comments to the Author
Please refer to the attached file.

Editor(s)' Comments to Author:

Associate Editor

Comments to the Author:

Thank you for resubmitting this manuscript. Unfortunately both reviewers and the editorial team have found your responses to the initial concerns raised inadequate. Please carefully respond to ALL issues raised by the reviewers before resubmitting a new version of the manuscript. Each of the points raised by the reviewers requires a more detailed response. Should these fail to be addressed the manuscript will not be accepted for publication.