

PLEASE NOTE RESPONSES THIS TIME AROUND ARE IN CAPITALS

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

General comments

The authors have responded to my comments, and those made by the other reviewers. In some cases they have accepted the recommendations, in some they have not, and in some the 'response' does not address the comment made. PLEASE CAN THE REVIEWER SET THESE OUT IF NOT AS STATED BELOW A number of changes to the text that were not requested by the reviewers have been made at the authors own behest. YES INDEED TO IMPROVE THE PAPER AND TO TAKE ACCOUNT OF THE CRITICISMS AND COMMENTS.

The debate regarding a tackle ban is an important one, and it is essential that the arguments put forth in support of a ban on tackles accurately represent the evidence (or lack thereof). I still have concerns that the authors are, to an extent, distorting the strength of the claims made by Tucker et al., and refuting the misrepresented version of the claim rather than the actual claim.

AUTHORS' SECOND RESPONSE

WE HAVE NOW THOROUGHLY RESTRUCTURED THE PAPER USING FULLER AND DRAWERS MODEL OF RISK MANAGEMENT IN SPORT. THIS IS THE MODEL WHICH TUCKER ET AL SAY THEY USED. WE HAVE USED DIRECT QUOTES FROM TUCKER ET AL WHEREVER POSSIBLE RATHER THAN PARAPHRASING THEM AND SET THEM OUT IN THE OPENING SECTION OF THE PAPER.

Fuller C, Drawer S. The application of risk management in sport. Sports Med 2004;34(6):349-56.

There are also places in the manuscript where it appears the authors are ignoring the available evidence because it does not support their position.

AUTHORS' SECOND RESPONSE

WE REFUTE THIS AND HAVE DEALT WITH SPECIFIC INSTANCES WHERE WE HAVE BEEN ACCUSED OF THIS BELOW. IF THERE ARE OTHERS PLEASE STATE WHAT THEY ARE.

Based on the responses to the first set of review comments, and the current content of the manuscript, it appears the position of the authors is that, regardless of the evidence, a complete ban on tackling in school rugby is the only course of action acceptable to them.

AUTHORS' SECOND RESPONSE

THIS IS NOT TRUE, WHAT WE HAVE PROVIDED IS EVIDENCE IN DEFENCE OF THE CALL TO REMOVE THE TACKLE FROM SCHOOL RUGBY BASED ON THE EVIDENCE WE ARE AWARE. THE EVIDENCE IS STRONG AND COMPELLING.

I think the paper can be strengthened considerably by focussing on the following:

1) The lack of quality injury surveillance research at the child/youth level of rugby means that the risks are not currently well established (Tucker et al. acknowledge this in their paper);

AUTHORS' SECOND RESPONSE

WE HAVE WRITTEN AND PUBLISHED REPEATEDLY ABOUT THE NEED FOR QUALITY NATIONAL INJURY SURVEILLANCE DATA, HOWEVER WE DO NOT AGREE WITH THE SECOND STATEMENT THAT THE RISKS ARE NOT CURRENTLY WELL ESTABLISHED.

THE RISKS ARE WELL ESTABLISHED, AS FRIETAG ET AL SHOW THERE ARE A WEALTH OF STUDIES ALL SHOWING THE HIGH RATE OF INJURIES IN RUGBY AND THAT MOST INJURIES OCCUR IN THE TACKLE PHASE OF THE GAME. COLLISION SPORTS INCLUDING RUGBY HAVE BEEN SHOWN TO HAVE HIGHER INJURY RATES INCLUDING CONCUSSION RATES THAN OTHER NON-COLLISION CONTACT SPORTS. (SPINKS AND MCCLURE, 2007, PFISTER ET AL., 2016) RUGBY HAS BEEN SHOWN TO HAVE HIGHER CONCUSSION RTAES THAN ANY TEAM SPORT INCLUDING OTHER COLLISION SPORTS (PFISTER ET AL., 2016).

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.

2) The above fact means that people are unable to make informed decisions about the size of the risks they are accepting when they participate in rugby. Children are recognised as being less able to comprehend and make appropriate decisions with respect to risk than adults (which is why their parents/schools are responsible for them). The current lack of quality injury surveillance information places parents, schools, and clubs in the position of putting children into situations where there is inadequate information available to properly assess the risks to which they are being exposed;

AUTHORS' SECOND RESPONSE

THE "ABOVE FACT" IS NOT A FACT, IT IS WRONG. THERE IS A LACK OF INFORMATION MADE AVAILABLE TO CHILDREN AND PARENTS BUT THIS IS NOT BECAUSE IT DOESN'T EXIST, REPEATED STUDIES SHOW OVER TIME AND ACROSS COUNTRIES ARE CONSISTENT IN SHOWING THE HIGH RISK, THIS IS WHY WE WROTE TACKLING RUGBY: WHAT EVERY PARENT SHOULD KNOW ABOUT INJURIES .

3) Compelling children to participate in an activity with risks that are indeterminate, but for which the available evidence suggests are high, is unacceptable;

AUTHORS' SECOND RESPONSE

WE AGREE THAT COMPELLING CHILDREN TO PLAY COLLISION RUGBY IS UNACCEPTABLE. THERE IS A CONTRADICTION HERE IN WHAT THE REVIEWER SAYS HOWEVER. IF THE AVAILABLE EVIDENCE SUGGESTS THAT THE RISKS ARE HIGH THEN THE RISKS ARE NOT INDETERMINATE. THE EVIDENCE POINTS TO THE RISK OF INJURY IN RUGBY BEING HIGH COMPARED TO OTHER NON-COLLISION SPORTS.

4) Providing evidence why banning the tackle would be the single most effective injury prevention intervention in school rugby given the range of possible interventions available.

AUTHORS' SECOND RESPONSE

THIS IS BASED ON THE EVIDENCE PRESENTED THAT THE TACKLE IS THE SINGLE MOST INJURIOUS PHASE OF PLAY.

5) From what is known, the tackle is the most injurious activity in rugby overall, and is responsible for over two-thirds of concussions;

AUTHORS' SECOND RESPONSE

EXACTLY

6) A cautious approach warrants a more extreme intervention than might otherwise be the case to protect the brain health of children given possible later life effects;

AUTHORS' SECOND RESPONSE

YES WE AGREE

Although the authors have already made these points in the paper or in their work elsewhere, I think making them central to the argument will create a more compelling thesis than has currently been presented. WE THINK WE HAVE DONE SO URGING A CAUTIONARY RATHER THAN A PRECAUTIONARY APPROACH. At the same time, deprecating or removing some of the arguments that have been presented as rebuttals to the points made by Tucker et al. that have been identified by the reviewers as being weak or unconvincing would, I believe, further strengthen the paper WE HAVE DONE OUR BEST IN THE REVISED VERSION TO RESTRUCTURE THE ARGUMENTS IN KEEPING WITH FULLER'S FRAMEWORK. At some points in the paper the content of the text contradicts the section title. For example, the evidence supporting the authors' position that the relative risk of rugby is high in comparison with other child and youth sports and recreational activities is presently weak due to a combination of lack of studies, lack of power of those studies that exist, and heterogeneity of data collection methods and injury definitions. The available evidence *is* equivocal, despite the authors expressing an opinion to the contrary. Although taking a position on an issue and holding it regardless of the evidence may be acceptable in political discourse, it is unacceptable for presentation in a scientific journal. Please revise the article to accurately reflect the current state of the evidence, and ensure that the rebuttal deals with the claims actually made by Tucker et al.

AUTHORS' SECOND RESPONSE

WE DO NOT AGREE THAT THE EVIDENCE ON THIS IS EQUIVOCAL. WE HAVE REWRITTEN THIS SECTION AND WHAT WE HAVE WRITTEN IS AN ACCURATE PRESENTATION OF THE EVIDENCE AS IT STANDS, IT NOW READS

"A RECENT SYSTEMATIC REVIEW AND META-ANALYSIS HAS IDENTIFIED RUGBY AS HAVING A SIGNIFICANTLY HIGHER RATE OF CONCUSSION THAN ANY OTHER YOUTH CONTACT OR COLLISION TEAM SPORT. (PFISTER ET AL., 2016) TUCKER ET AL HAVE MISSTATED THE CONCLUSIONS OF SPINKS AND MCCLURE THAT FOR CHILDREN UNDER THE AGE OF 16 YEARS "NO SPORT STANDS OUT AS BEING MORE INJURIOUS THAN OTHERS". (SPINKS AND MCCLURE, 2007) WHAT SPINKS AND MCCLURE ACTUALLY WRITE IS THAT THE "HIGHEST INJURY RISK WAS RECORDED FOR ICE HOCKEY, AND THE LOWEST WAS FOR SOCCER, ALTHOUGH WIDE VARIATIONS OCCURRED BETWEEN STUDIES REPORTING THE RISK OF SOCCER INJURIES." (SPINKS AND MCCLURE, 2007) THEY DIDN'T ATTEMPT TO RANK THE OTHER SPORTS, ONE OF WHICH WAS RUGBY, AND CONCLUDE THAT "DIRECT COMPARISON OF INJURY RISK BETWEEN SPORTS REMAINS DIFFICULT BECAUSE OF VARYING DEFINITIONS OF INJURY AND HETEROGENEITY IN STUDY METHODS". (SPINKS AND MCCLURE, 2007)"

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.

To increase clarity it would be helpful if the authors re-ordered the statements in the section of the abstract entitled 'What are the findings?' to appear in the same order as they are presented in the body of the manuscript (or vice versa - as long as they are presented in the same order in the abstract and the manuscript). The wording of the 'findings', should, for consistency, match that of the section headings in the body of the manuscript.

AUTHORS' SECOND RESPONSE

THESE HAVE BEEN CHANGED TO REFLECT THE NEW STRUCTURE OF THE MANUSCRIPT.

Specific comments

"The claim that risk of injury in youth rugby is no more injury prone than any other sport is incorrect"

The sentence above should be revised to improve readability.

AUTHORS' SECOND RESPONSE

WE HAVE DONE SO IN THE REVISED MANUSCRIPT.

Background

The authors state:

*Tucker et al fail to address the key concerns which led to the call for a ban on the tackle in school rugby, namely that the risk of injuries is high and most injuries occur during the tackle phase of the game, and conflate a ban on tackling in **school** rugby (which schools are responsible for under the physical education guidelines of the Department for Education) with **youth** rugby which includes club and community rugby. 4*

I commented upon this statement in the previous review, to which the authors have responded:

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.

As I pointed out in the previous review, I believe the morbidity associated with the sport is the relevant issue, not the body that happens to be administering the sport when the injury occurred. The authors' position is equivalent to saying that it is of greater importance to prevent a shoulder dislocation to a 12 year old child in a school match than in a club match, which I find a little bewildering. While I am not insisting upon its removal, I think the authors are undermining their position somewhat, and believe that the section would be somewhat stronger (I don't see it as being a big issue either way) if they decided not to point this out.

AUTHORS' SECOND RESPONSE

WE AGREE THAT THE MORBIDITY ASSOCIATED WITH THE SPORT IS THE ISSUE AND THIS IS WHAT WE ARE ATTEMPTING TO ADDRESS. HOWEVER, TO USE FULLER AND DRAWER'S MODEL, ONCE A HIGH RISK ACTIVITY HAS BEEN IDENTIFIED, QUANTIFIED AND EVALUATED, RISK MITIGATION REQUIRES DEVELOPING AN INJURY PREVENTION APPROACH PART OF WHICH NEEDS TO BE A FOCUS ON WHO ADMINISTERS THE PARTICULAR ACTIVITY IN PARTICULAR SETTINGS. WE HAVE CHOSEN TO FOCUS ON THE SCHOOL SETTING AS THIS IS WHERE GOVERNMENT MINISTERS AND DEPARTMENTS FOR EDUCATION HAVE DIRECT RESPONSIBILITY AND A DUTY OF CARE TO THE CHILDREN BEING EDUCATED IN THEM. MOST CHILDREN HAVE NO CHOICE OVER THE SCHOOL THEY GO TO OR OVER THE SPORTS PROVIDED FOR THEM, OFTEN COMPULSORILY. THEREFORE IT IS UP TO THE RESPONSIBLE BODIES TO ENSURE THAT ACTIVITIES PROVIDED WITHIN SCHOOLS ARE SAFE. WE BELIEVE THE EVIDENCE DEMONSTRATES THAT COLLISION SPORTS SUCH AS RUGBY ARE NOT SAFE AND SHOULD NOT BE PROVIDED IN SCHOOLS. WE CHOOSE RUGBY AS THIS IS BY FAR THE SINGLE MOST PLAYED COLLISION SPORT IN UK SCHOOLS.

THE REVIEWER IS CORRECT TO SAY THAT CONCERNS OVER INJURY SHOULDN'T FINISH AT THE SCHOOL GATE. 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. 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 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.

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

Whether a given risk of injury is 'unacceptably' high depends on a range of factors, but simply stating that it is does not make it so. Is a probability of injury of 12% of missing a week's play in a season unacceptable? Is a probability that 88% of participants won't miss a week's play during a season acceptable (the same statistic turned around)? As I asked in my previous review, who gets to make that call, and on what basis?

The paper by Freitag et al. was, and remains, a valuable contribution to the knowledge base regarding injury in children and youth rugby players. Nevertheless, Tucker et al. made some valid points with respect to:

- 1) Comparing injury rates across studies using different definitions
- 2) Whether a pooled injury incidence over a large age range provides sufficient information to make appropriate injury prevention interventions at any particular level within that age range.

AUTHORS' SECOND RESPONSE

WE HAVE ANSWERED THESE POINTS IN DETAIL IN THE PAPER. SEE BELOW

a) Incompatible injury definitions

Tucker et al claim, regarding the systematic review by Freitag et al {Freitag, 2015 #466}, that for the youth game "...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". This is not correct, the analysis below suggests that for the youth game, the evidence available shows that under the time-loss definition of more than 24 hours absence from match play or training after the day of injury, the rate of injuries in the youth game may actually be higher than that calculated by Freitag et al.

The current consensus on injury definitions for rugby union, approved by the International Rugby Board Council (IRBC) - now called World Rugby - and published in 2007, defines an injury as "Any physical complaint, which was caused by a transfer of energy that exceeded the body's ability to maintain its structural and/or functional integrity, that was sustained by a player during a rugby match or rugby training, irrespective of the need for medical attention or time-loss from rugby activities. An injury that results in a player receiving medical attention is referred to as a 'medical-attention' injury and an injury that results in a player being unable to take a full part in future rugby training or match play as a 'time-loss' injury." {Fuller, 2007 #246}

Severity of injury is defined as time loss from play as the "number of days that have elapsed from the date of injury to the date of the player's return to full participation in team training and availability for match selection". Time loss is classed as slight (0–1 days), minimal (2–3 days), mild (4–7 days), moderate (8–28 days), severe (28 days), "career-ending" and "non-fatal catastrophic injuries".

Freitag et al calculated pooled incidence figures for injury risks using each of the measures described above. {Freitag, 2015 #466} Using the IRBC consensus definition of injury, i.e. all injuries "irrespective of the need for medical attention or time-loss from rugby activities", the meta-analysis of five studies calculated a rate of 26.7 (95% Confidence Interval 13.2 – 54.1) injuries per 1000 player-hours, equivalent to a 28.4% (15.2% - 49.1%) chance of a child being injured over the course of a season. A injury severity time loss definition of "at least 7 days absence from games" was used in eight studies, the pooled rate for which was 10.3 (6 – 17.7) injuries per 1000 player-hours, equivalent to a 12.1% (7.2% - 19.8%) chance of a child being injured over the course of a season.

Tucker et al take issue with Freitag et al for comparing the rate calculated under the IRBC consensus all injury definition of 26.7 (13.2 – 54.1) injuries per 1000 player-hours {Freitag, 2015 #466} with the match injury incidence figure calculated by Williams et al of 81 (63 – 105) injuries per 1000 player-hours for the professional men's game {Williams, 2013 #399}. Williams et al's figure is based on 10 studies of senior male professional rugby union and uses a time-loss definition of injury of more than 24 hours absence from match play or training after the day of injury. {Williams, 2013 #399} This definition of injury is designed for use in studies of the professional game and was originally taken from the professional men's football (soccer) setting. {Brooks, 2005 #556;Hawkins, 1999 #557}

Only two of the studies used in Freitag et al's meta-analysis use a comparable injury definition to that used by Williams et al, one by Haseler et al where data was analysed from an injury surveillance programme carried out at an English community rugby club over the course of the season that included 210 male players from Under 9 to Under 17 age grades {Haseler, 2010 #229}; and one by Palmer-Green et al which analysed data from a two-season study of 250 male youth rugby union players aged 16-18 years from 12 English Premiership academies and 222 similarly aged boys from seven schools. {Palmer-Green, 2013 #217} Combining the results from these studies in a meta-analysis gives a pooled incidence of 34.6 injuries per 1000 player-hours (95% CI 25.0 to 47.8). Therefore contrary to Tucker et al's claim, the evidence available suggests that under the time-loss definition of more than 24 hours absence from match play or training after the day of injury, the rate of injuries may actually be higher.

b) Combining ages and risk

Tucker et al claim that by combining studies across different age groups to produce pooled rates of injury, Freitag et al have overstated the injury risk in the youth game. {Freitag, 2015 #466} We have reanalysed the data using narrower age bands to show that the rates and risks are high and have not been overstated in the youth game.

Systematic reviews {Freitag, 2015 #466;McIntosh, 2005 #552;Bleakley, 2011 #409} have established that the rate of injury in rugby increases with age although not linearly. In an Australian study, McIntosh et al found head, face and neck injuries requiring a week away from games doubled from 11.8 (8.9 - 15.5) to 22.3 (18.3 to 27.1) injuries per 1000 player-hours between the under 13 and under 15 game. {McIntosh, 2010 #221} In New Zealand, Durie et al found a 25% increase in injuries resulting in attendance at an injury clinic from 20.0 to 25.7 injuries per 1000 player-hours in the under 13 game and under 15 game respectively. {Durie, 2000 #245}

We and other authors have repeatedly stated that studies of rugby injury are highly heterogeneous because of differences in: injury definitions; who diagnoses and records the injuries and their level of medical qualification and expertise; the study setting; the age of the participants; and the age grades used by the rugby playing authorities. Age therefore is just one of many factors leading to a high degree of heterogeneity making cross study comparisons difficult, although not impossible.

These limitations do not negate the validity of trying to give some sense of injury rates across youth rugby so long as any meta-analysis is presented with the above caveats. For example, Haseler et al document injury rates across all age groups as well as within age group, a common reporting method across studies. {Haseler, 2010 #229} Freitag et al acknowledged a “high degree of heterogeneity” in their paper (for example $I^2 = 98.3\%$ for the studies using a 7 days time-loss definition) and also gave 95% predicted intervals for their results to illustrate this. {Freitag, 2015 #466} Full details of each study included in the pooled incidence figure were given and study limitations were further acknowledged in the limitations section. {Freitag, 2015 #466}

Freitag et al calculated that around 12% of children engaging in a season of rugby at every school and club could expect to be injured severely enough to require at least seven days away from the game. {Freitag, 2015 #466} This rate would be lower at younger ages but even higher in the older age groups. This rate equates to between one and two children in every team playing across a season in schools and clubs across the country injured to such a severity that they can't play or train for a week.

Freitag et al carried out the meta-analysis within single injury definitions and also calculated pooled injury rates across all ages. To address Tucker et al's concern with respect to age combinations we have reanalysed the studies included in the Freitag et al meta-analysis using narrower age ranges, the results are presented in table 1 below. The few studies available which permit analysis of narrow age ranges in our reworked meta-analysis show high rates of injury in all age groups, young and old. For under 14s and younger, 18.6% (12.8%, 26.6%) were likely to be injured in a season and 9.0% (2.3%, 31.5%) severely enough to be away from play for at least a week. For the under 15s and older 25.0% (21.6%, 28.9%) were likely to be injured in a season and 19.5% (4.1%, 67.6%) severely enough to be away from play for at least a week. Thus it is well established that the rates and risks of injury are high.

Table 1

| <u>Injury Definition</u> | <u>Comparison (studies used)</u> | <u>Incidence of injury per 1000 player-hours</u> | <u>Probability of Injury Over Season</u> | <u>I- sq</u> |
|--|--|--|--|--------------|
| <u>irrespective of the need for medical attention or time-loss from rugby activities</u> | <u>All ages (1, 2, 3, 6, 9)^b</u> | <u>26.7 (13.2, 54.1)</u> | <u>28.4% (15.2%, 49.1%)</u> | |
| | <u>U14s and younger (2, 3)</u> | <u>16.5 (11.0, 24.8)</u> | <u>18.6% (12.8%, 26.6%)</u> | |
| | <u>U15s and older (2, 3)</u> | <u>23.0 (19.4, 27.2)</u> | <u>25.0% (21.6%, 28.9%)</u> | |
| | <u>U14s (2, 3)</u> | <u>16.4 (10.9, 24.9)</u> | <u>18.6% (12.7%, 26.7%)</u> | |
| | <u>U15s and U16s (2, 3)</u> | <u>21.6 (15.3, 30.5)</u> | <u>23.7% (17.4%, 31.7%)</u> | |
| <u>requiring at least 7 days absence from games</u> | <u>All ages (3, 4, 5, 7, 8, 9, 10, 11)^b</u> | <u>10.3 (6.0, 17.7)</u> | <u>12.1% (7.2%, 19.8%)</u> | |
| | <u>U14s and younger (3, 7, 11)</u> | <u>7.5 (1.9, 30.2)</u> | <u>9.0% (2.3%, 31.5%)</u> | |
| | <u>U15s and older (3, 11)</u> | <u>17.3 (3.3, 90.1)</u> | <u>19.5% (4.1%, 67.6%)</u> | |
| | <u>U14s (3, 11)</u> | <u>10.9 (1.7, 69.2)</u> | <u>12.8% (2.1%, 57.9%)</u> | |
| | <u>U15s (3, 11)</u> | <u>20.9 (3.1, 141.2)</u> | <u>23.0% (3.8%, 82.9%)</u> | |
| | <u>U16s (3, 11)</u> | <u>14.9 (3.7, 60.1)</u> | <u>17.0% (4.5%, 52.8%)</u> | |

a - this is only possible where there are more than two studies

b – as calculated in Freitag et al 2015 meta-analysis {Freitag, 2015 #466}

1 - {Davidson, 1978 #237}, 2 - {Davidson, 1987 #236}, 3 - {Durie, 2000 #245}, 4 - {Fuller, 2011 #233}, 5 - {Haseler, 2010 #229}, 6 - {Junge, 2004 #226}, 7 - {Nathan, 1983 #219}, 8 - {Nicol, 2011 #200}, 9 - {Pringle, 1998 #216}, 10 - {Roux, 1987 #215}, 11 - {Sparks, 1985 #212}

In the section on ‘Injury definitions’, the authors are attempting to refute the claim by Tucker et al. that Freitag et al. made an inappropriate comparison by comparing rates derived from studies using an ‘all injuries’ definition for childrens/youth rugby with a ‘missed >=24 hours’ definition for professional players. Tucker et al. claim that if, instead of comparing rates from an ‘all injury’ definition with rates derived from a ‘missed >=24 hours’ definition the definitions were brought into line, the difference between the rates would be greater. The authors deny this claim. Other things being equal, Tucker et al.’s logic is correct here. Comparing rates from a more inclusive definition with a less inclusive definition would show less of a difference in rates than a comparison between the studies than if the less inclusive definition were used for both. If, in the studies reported by Freitag et al. that used the ‘all injuries’ definition all those injuries that were ‘missed zero to 24 hours’ play were excluded, the observed difference in rates between childrens’/youth rugby and professional rugby would have been bigger, which I believe was the point Tucker et al. were attempting to make.

AUTHORS’ SECOND RESPONSE

THIS MAY APPEAR TO BE LOGICAL BUT AS WE HAVE DEMONSTRATED IS NOT BORNE OUT BY THE FACTS. WE IDENTIFIED TWO STUDIES FROM THE FREITAG PAPER WHICH HAD A COMPARABLE INJURY DEFINITION TO THAT USED BY THE WILLIAMS PAPER AND HAVE META-ANALYSED THEIR RESULTS. IN FACT THE RATE IS HIGHER THAN THAT USED BY FREITAG IN THE COMPARISON UNDER QUESTION.

The authors are denying this fact based on bringing in data from a study that was not included in the review by Freitag et al. The data from the RISUS project by Archbold et al., showed a rate of missed play injuries of 29.1 injuries per 1000 player hours. The authors have not, for some reason, also included data from a paper by Collins et al., which showed a rate of 11.4 injuries per 1000 player hours using a missed ≥ 24 hours of play definition, despite the facts that I drew their attention to this information in the previous review and that they are aware of the work by Collins et al. because it was referenced in the paper by Freitag et al. Why was this data not included in the new comparison (nor, for that matter, in the new Table 1)?

AUTHORS' SECOND RESPONSE

WE HAVE ONLY USED STUDIES IN THE REWORKED META-ANALYSIS WHERE THE INJURY RATE WAS GIVEN IN PLAYER-HOURS, AS WAS THE CASE IN THE ORIGINAL FREITAG REVIEW. NEITHER FREITAG ET AL OR OURSELVES IN THIS UPDATED META-ANALYSIS ATTEMPT TO CONVERT RATES OF INJURY IN STUDIES WHERE THEY WERE GIVEN IN THE FORM OTHER THAN PER PLAYER-HOURS.

WE APPRECIATE THAT BLEAKLEY ET AL CONVERTED THE RATE FROM THE COLLINS STUDY, THIS WAS NOT DONE BY FREITAG ET AL IN EITHER THE CASE OF COLLINS OR ANY OTHER PAPER WHICH GAVE RATES PER ATHLETIC EXPOSURE. IT IS NOT CLEAR HOW BLEAKLEY ET AL CONVERTED THIS RATE AND WHETHER THEY COMBINED PRACTICE AND MATCH INJURIES IN A SINGLE CALCULATION. FREITAG ET AL CALCULATED POOLED INJURY RATES FOR MATCH INJURIES USING A CONSERVATIVE ESTIMATE OF A GAME DURATION OF 50 MINUTES IN THEIR CALCULATIONS. IF A MATCH DURATION OF 50 MINUTES WERE ASSUMED THEN WE CALCULATE A MATCH RATE OF INJURIES FROM THE COLLINS STUDY OF $488 \text{ INJURIES} / (50 \text{ MINS} \times 32014 \text{ EXPOSURES}) = 18.3 \text{ INJURIES PER } 1000 \text{ PLAYER-HOURS}$, HIGHER THAN THAT QUOTED BY BLEAKLEY. WE COULD NOT BE EXPECTED TO INCORPORATE THIS RATE FROM A STUDY WHICH HAS BEEN THROUGH AN UNDEFINED PROCESS IN A SECOND PAPER, WHEN WE DON'T KNOW ANY DETAILS OF THE CALCULATIONS OR METHODS.

WE HAVE INCLUDED THE RISUS STUDY AS A FURTHER EXAMPLE AS IT DOES GIVE THE RATE OF INJURIES IN PLAYER-HOURS.

The column labelled 'Effect Size' in the new Table 1 seems to be reporting rates of injuries per 1000 hours of play. Normally an effect size statistic is a comparison of some type between groups.

AUTHORS' SECOND RESPONSE

YES, THANKS FOR SPOTTING THIS, HAS BEEN RELABELLED AS "INCIDENCE OF INJURY PER 1000 PLAYER-HOURS".

The rate reported by the authors for studies using an injury definition of 'at least seven days absence from games', for which the pooled rate was 10.3 (95% CL 6 to 17.7). In my view the best comparison for the authors to make would be with the rate reported by Williams et al. for injuries meeting the same severity criteria. Williams et al. reported that the rate of injuries requiring absence from play

for 8-28 days was 28 per 1000 player hours (25-31), and for injuries requiring absence from play of greater than 28 days was 15 per 1000 player hours (13-17). I have directly approached the corresponding author of the meta-analysis (Williams), and given the weightings used in the metaanalysis, the rate of injuries requiring absence for greater than seven days was 46.2 (90% CI 43.6 to 48.9), (which is slightly higher than the straight sum of the two rates). The relative rate based on that comparison is around 4.5. I advise the authors to remove the new Table 1. Based on the available evidence, it is clear that the rates of injury among professional players are substantially higher than those among children/youth players.

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.

THE ADDITIONAL RESULT FROM THE REVIEWER FROM WILLIAMS ET AL IS INTERESTING BUT OBVIOUSLY WE CAN'T USE THIS INFORMATION IN THE PAPER IN THIS FORM. AND AS THE REVIEWER POINTS OUT THE RATE FROM WILLIAMS ET AL FOR INJURIES OF A SEVERITY SUCH THAT 7 DAYS PLAY WAS MISSED WAS NOT AVAILABLE IN THE ORIGINAL WILLIAMS ET AL PAPER.

THE POINT OF TABLE 1 IS TO SHOW THE RATES OF INJURIES FOR SMALL AGE GROUPS, NOT TO TACKLE THE >24 HOURS INJURY DEFINITION ISSUE, THIS IS DEALT WITH SEPARATELY, (SEE BELOW)

The authors have now attempted to make a comparison with those studies in Freitag et al. that do use a 'missed >24 hours of play' definition with the studies in the Williams et al. paper that use the same definition. - The authors identify only two papers in Freitag et al. that use such a definition (although there were at least three - see note about Collins et al. above). Because of the limited number of studies, the confidence limits are very wide, and I don't think this is of particular value in supporting the authors' position on this issue, because it comes back to the point raised by Tucker et al. that

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

AUTHORS' SECOND RESPONSE

THE FACT THAT THE CONFIDENCE INTERVALS ARE WIDE STRENGTHENS OUR ARGUMENT FOR USING ALL STUDIES ACROSS ALL AGES TO TRY AND GIVE A SENSE OF THE RATE OF INJURIES DUE TO RUGBY. THE REVIEWER IS CONFUSING TWO ARGUMENTS HERE HOWEVER. WE HAVE REWORKED THE META-ANALYSIS TO SHOW THAT THE RATE OF INJURIES IS HIGH FOR ALL AGES. SEPARATELY WE HAVE META-ANALYSED THE

STUDIES USING A 24 HR DEFINITION OF INJURY AND SHOWN THAT THE RATE FROM THESE IS ACTUALLY HIGHER THAN THE RATE FOR ALL INJURIES IRRESPECTIVE OF TIME LOSS OR MEDICAL ATTENTION, CONTRARY TO WHAT TUCKER ET AL EXPECTED TO BE THE CASE.

Comparisons of injury rates across studies that used different definitions of injury should be avoided for the obvious reason that like is not being compared with like, and I think the authors should change the focus of their argument from attempting to justify the comparison used in Freitag et al., to a reiteration that there remains considerable uncertainty about the true rates of injury to child and youth rugby players, which means that people will struggle to make informed decisions about the risks involved with participation.

AUTHORS' SECOND RESPONSE

FREITAG ET AL SET OUT CLEARLY THAT THEY DID NOT COMBINE STUDIES ACROSS INJURY DEFINITIONS.

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

Beyond the fact that the authors appear to be perpetuating the confusion about whether they are calling for a ban on the tackle in schools rugby or youth rugby in general by referring to the ‘child game’ rather than ‘school rugby’, Tucker et al. did not claim that removing the tackle in the child game ‘was’ (or ‘is’) unnecessary, that said it ‘*may be unnecessary*’ given the considerable uncertainty around the state of the evidence regarding injury risk and severity in rugby, and the lack of data available to allow proper comparisons of the risks inherent in rugby with those of other activities. The authors need to ensure that they refute the claims actually made by Tucker et al., rather than refuting a stronger claim that was not made.

AUTHORS' SECOND RESPONSE

WE HAVE CHANGED THE REFERENCES TO CHILD RUGBY TO SCHOOL RUGBY TO BE CONSISTENT.

In their response to my comment, the authors state:

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

Tucker et al. seem to be calling for better evidence upon which to make decisions, to put in appropriate risk management options that are commensurate with the degree of risk at various levels of the sport. This does not imply they are calling for ‘trials’. Observational (injury surveillance) studies, which is something the authors have repeatedly called for, can yield information about the relative risks of activities while not placing players at higher risk than they already face.

WE QUESTION THE FEASIBILITY OF OBSERVATIONAL TRIALS. AS THE REVIEWER WILL BE AWARE, THE RFU “AGE GRADE RUGBY” GUIDANCE SAY TACKLING SHOULD BE INTRODUCED FROM THE AGE OF EIGHT YEARS ON. IS THE REVIEWER AWARE OF SCHOOLS WHERE THIS GUIDANCE IS NOT ADHERED TO, I.E. TOUCH OR TAG RUGBY CONTINUES BEYOND THE AGE OF EIGHT, SURELY SUCH SCHOOLS WOULD BE REQUIRED IN ORDER TO MAKE AN OBSERVATIONAL STUDY POSSIBLE.

While Tucker

et al. caution that a tackle ban may have unintended consequences if introduced, and that there may be a range of possible modifications to the sport that change the risks associated with the tackle, they have not, at least as far as I can see, ruled out a ban on tackles a priori.

WE SEE THIS AS MAKING A CASE FOR CLUSTER RANDOMISED CONTROLLED TRIALS IN SCHOOLS, SOMETHING WHICH WE VIEW AS BEING UNETHICAL AS THE HARMS ARE CLEARLY ESTABLISHED. AS STATED ABOVE WE DO NOT SEE OBSERVATIONAL STUDIES BEING VIABLE IN THIS SITUATION EITHER WITHOUT CONSENT. WE THINK WE SHOULD BE ALLOWED TO STATE OUR OPINION ON THIS AND IF PUBLISHED THIS CAN BE CHALLENGED IN PUBLIC VIA THE JOURNALS MECHANISMS.

Identifying the riskiest area of an activity is an important step in managing the risks associated with the activity. It does not necessarily follow, however, that once the riskiest element(s) of the activity are identified that eliminating them (or eliminating the activity altogether) is the most logical or reasonable step to take. There exist structured methods for evaluating and dealing with risks in sport; for example Fuller's publications on risk management in sport, and the 'E's of injury prevention (engineering, enforcement, education, economics) provide guidance as to the range of options available to dealing with specific risks.

WE HAVE ENDED WITH FULLER AND DRAWER'S FRAMEWORK WHICH ENCOMPASSES THE FINAL STAGE OF RISK MANAGEMENT NAMELY, RISK MITIGATION. CHILDREN ARE A VULNERABLE GROUP AND REQUIRE URGENT ATTENTION TO PREVENTION. THE OPTIONS SET OUT BY THE REVIEWER ARE COSTLY AND CHILDREN CANT WAIT FOR THESE TO BE IMPLEMENTED AND EVALUATED.

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Whether or not eliminating the 'riskiest' element entirely in any given activity is the most appropriate step to take depends on a range of factors, including, but not necessarily limited to:

- a) The range of options available for managing the risk. In some cases this *will* entail eliminating the risk entirely, in other cases it won't;
- b) Whether, and to what extent, risk management practices are already in place and being adhered to;

WE AGREE BUT ARE NOT AWARE OF ANY MONITORING OF THESE OR PUBLICATION OF RESULTS OF SUCH MONITORING IF IT EXISTS.

~~we agree but~~

~~no monitoring~~

- c) The product of the incidence and severity of harms associated with the activity (100 injuries costing £1000 carries the same cost to insurers/the public health system as 1 injury costing £100,000);

WE AGREE WITH THE SUM, HOWEVER CHILDREN'S HEALTH AND WELL-BEING SHOULD NOT BE REDUCED TO POUNDS SHILLINGS AND PENCE. ~~we agreee~~

- d) The size of the population at risk (large populations involved in relatively low risk activities can cause a greater public health issue than small populations involved in relatively high risk activities);

COLLISION RUGBY, LARGELY AS A RESULT OF THE TACKLE, IS NOT A LOW RISK ACTIVITY AS WE HAVE SHOWN, IT IS A HIGH-RISK ACTIVITY WHICH TAKES PLACE IN A LARGE AT RISK POPULATION.

e) Whether the incidence and severity of harms is disproportionately high compared to other activities;

IT IS CERTAINLY TRUE THAT RUGBY HAS A HIGHER RATE OF CONCUSSION THAN ANY OTHER TEAM SPORT

f) The social setting within which the activity occurs and whether the action causing injury falls inside or outside the laws of the land/laws of the sport;

THE ACTION CAUSING INJURY FALLS WITHIN THE LAWS SET BY THE RFU WHICH ARE ADOPTED INTO THE SCHOOL CURRICULUM. ULTIMATELY RESPONSIBILITY FOR ENSURING SAFETY IN SCHOOL LIES WITH THE DEPARTMENTS FOR EDUCATION IN THE COUNTRIES OF THE UK.

g) The benefits associated with the activity (social, physical, emotional etc.);

THIS DISCUSSION IS BEYOND THE SCOPE OF THIS RESPONSE TO TUCKER ET AL, HOWEVER IT IS SOMETHING WE HAVE ADDRESSED ELSEWHERE, SEE [HTTP://BJSM.BMJ.COM/CONTENT/EARLY/2016/04/19/BJSPTS-2016-096220](http://bjsm.bmj.com/content/early/2016/04/19/bjsports-2016-096220)

h) Whether the risks are well-understood and have been communicated to participants, so that they can make informed decisions about participating;

WE WOULD AGREE THAT IT IS UNLIKELY THAT THIS IS BEING DONE ADEQUATELY, HOWEVER THE RESPONSIBLE BODIES NEED TO ENSURE THAT EVEN IF CHILDREN ARE GIVEN A CHOICE OVER PARTICIPATION IN ACTIVITIES IN SCHOOLS, THE CHOICES OFFERED NEED TO BE SAFE, WE ARE ARGUING THAT COLLISION RUGBY IS NOT A SAFE OPTION.

i) The competency of the participant to make an informed decision (children are typically less able to appraise the risks in any given activity, and are reliant upon adults to make decisions that have their best interests at heart).

THIS SHOULD BE CONSIDERED, WE AGREE

The authors have made some of these points in the paper, but I would encourage them to demonstrate that they have considered the range of options available, and made the call to ban the tackle in light of them. **I think that the authors need to provide a convincing argument about why, given the range of injury prevention actions that could or have been taken to reduce the risks of injury to children playing rugby, banning the tackle outright across all levels of school rugby is the most reasonable course of action.**

AUTHORS' SECOND RESPONSE

WE BELIEVE THAT WE HAVE SHOWN THAT GIVEN THE AVAILABLE EVIDENCE, URGENT ACTION IS REQUIRED. WE DO NOT SEE HOW A RESEARCH PROGRAM USING CHILDREN AS PARTICIPANTS IN RANDOMISED CONTROLLED TRIALS ON TACKLE TECHNIQUE COULD POSSIBLY BE ETHICAL GIVEN THE HIGH RISK OF INJURY WHICH IS KNOWN. WE THEREFORE BELIEVE THAT WHAT WE ARE PROPOSING, THAT THE TACKLE AND OTHER HARMFUL FORMS OF CONTACT IN COLLISION RUGBY BE REMOVED IN SCHOOLS, IS A REASONABLE COURSE OF

ACTION. THERE IS NO NEED FOR COLLISION SPORTS WITH THEIR INHERENT RISK OF INJURY TO BE PLAYED IN SCHOOLS. THERE IS NO EVIDENCE THAT RUGBY OR ANY OTHER COLLISION SPORT HAS BENEFITS OVER AND ABOVE OTHER NON-COLLISION CONTACT SPORTS OR NON-SPORT PHYSICAL ACTIVITIES.

Football (soccer) is a much more popular sport in the United Kingdom than is rugby, and the authors have provided evidence that, at least in the Oxfordshire catchment, football is responsible for over twice as many emergency department attendances as rugby union and almost seven times as many as rugby league. In terms of a public health issue, football is placing a substantially larger burden on the available health resources in that area than is rugby. This could largely be eliminated by banning all physical contact between players in football, along with banning heading of the ball. What is the position of the authors on this? It is relevant because the authors have included the information from the Oxfordshire catchment in the paper and the call to ban the tackle is predicated upon the injuries associated with rugby tackles being a public health issue.

AUTHORS' SECOND RESPONSE

WE DON'T KNOW THE INJURY MECHANISMS OF INJURY IN FOOTBALL, WE HAVEN'T CARRIED OUT ANY RESEARCH ON THIS. AS THE REVIEWER SAYS FOOTBALL IS A MUCH MORE POPULAR SPORT, HENCE THE HIGHER NUMBERS OF INJURIES. IF WE TAKE JUST CONCUSSION, RUGBY HAS THE HIGHEST RISK OF CONCUSSION OUT OF ANY SPORT INCLUDING OTHER COLLISION SPORTS. (PFISTER ET AL., 2016) IF WE LOOK AT ALL INJURIES, SOCCER HAS THE LOWEST RATE OF INJURIES OUT OF ANY SPORT. (SPINKS AND MCCLURE, 2007)

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.

The authors have included the following:

“The claim that a ban on tackle will lead to an increase in the risk of injury later in participation is not supported by current research which shows that injury risk increases with age.”

The statement in the abstract differs from that in the body of the paper, which is:

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 participation”

AUTHORS' SECOND RESPONSE

THIS STATEMENT ALONG WITH THE OTHER HEADINGS HAVE BEEN REMOVED AS THE STRUCTURE OF THE PAPER HAS SIGNIFICANTLY CHANGED.

As per my comment in the previous review, the authors should be cautious about using absolute terms such as ‘no evidence’. The authors have added new content in the section, which provides at least some evidence that modifying the ability of participants to engage in contact at a younger age may alter their risk of injury later. This is not rugby-specific, but nor is it ‘no evidence’.

AUTHORS' SECOND RESPONSE

THIS REALLY CAN ONLY BE DESCRIBED, IF WE ARE BEING GENEROUS, AS WEAK EVIDENCE. THIS STUDY TUCKER ET AL CITE IS FROM A DIFFERENT SPORT, ICE HOCKEY, AND INVOLVED A LARGE COHORT OF NEARLY 2000 PLAYERS AGED 13-14 YEARS, BUT ONLY FOUND ONE BORDERLINE SIGNIFICANT RESULT, THAT THOSE PREVIOUSLY EXPOSED TO "BODY CHECKING" HAD A REDUCED RISK OF INJURY REQUIRING SEVEN DAYS OF TIME LOSS WHEN BODY CHECKING WAS INTRODUCED FOR ALL PLAYERS, INCIDENCE RATE RATIO (0.67; 95%CI 0.46 TO 0.99). THEY ALSO FOUND NO EVIDENCE OF ANY ASSOCIATION BETWEEN PRIOR EXPERIENCE OF BODY CHECKING AND INJURY OVERALL, CONCUSSION OVERALL OR CONCUSSION RESULTING IN MORE THAN 10 DAYS OF TIME LOSS

The authors are correct that there is not research that indicates whether a ban on tackles will lead to an increase in the risk of injury later in participation in rugby. As noted in the previous review, such evidence does not, and cannot exist at present, and Tucker et al. explicitly stated that the true effect of such an intervention was unknown - they did not claim that evidence about what would happen if a tackle ban were enacted existed.

AUTHORS' SECOND RESPONSE

SEE PREVIOUS COMMENT

The authors are also correct in stating that current research shows that injury risk increases with age. The fact that injury risk increases with age anyway is a red-herring in this argument. Tucker et al. identify that there is a progressive increase in injury rates with age in their paper. What they were arguing was that a ban *may* increase the injury rate at the higher levels of participation *beyond* what it currently is. The phrasing in the headings above implies that Tucker et al. have provided evidence to support their claim, and that the rebuttal by the authors is showing that such evidence does not exist. This is misleading, and the authors need to modify the heading to reflect the actual statements made by Tucker et al. and the state of the evidence.

AUTHORS' SECOND RESPONSE

AS ABOVE, THE ONLY EVIDENCE THEY PROVIDE IS INADEQUATE TO DELAY OR FRUSTRATE INJURY PREVENTION.

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

I identified in my previous review that there existed evidence that different tackle types carried different levels of risk, and what that evidence was. I also indicated that the evidence the authors were citing by Hendriks et al. directly contradicted the statement they were making in the heading. The response of the authors has been to remove the reference to the work by Hendriks et al, provide no reference to the work by others (Quarrie and Hopkins; Fuller et al.) that showed different types of tackles carried different levels of risk, and retain the heading. *Ignoring* the evidence that contradicts the heading when the authors know of its existence is, to my mind, scientifically unacceptable.

AUTHORS' SECOND RESPONSE

WE CHOOSE NOT TO GO DOWN THIS ROAD, WE THINK IT IS A DIVERSION AND AS WE EXPLAIN ABOVE WE HAVE COME TO THE CONCLUSION THAT THE LOGIC OF THIS APPROACH WOULD BE RCTS WITH CHILDREN AS GUINEA PIGS WHICH IN OUR OPINION WOULD BE UNETHICAL.

As I previously pointed out, there were differences in risks by tackle type noted in the paper by McIntosh et al. While these did not reach a significance level of $p < 0.05$, that does not mean there was 'no statistical evidence'. The odds ratio of being injured from an ankle tap compared to a shoulder tackle (the reference) was 2.24 (0.65 - 7.66). This is telling us that, while there remains considerable uncertainty about the true size and direction of the effect, it is much more likely that ankle taps carry higher risk of injuries compared to shoulder tackles than vice versa. Evidence from data doesn't magically become 'statistical evidence' once it passes the $p = 0.05$ threshold. I would draw the authors' attention to the following:

<http://amstat.tandfonline.com/doi/full/10.1080/00031305.2016.1154108?scroll=top&needAccess=true>

AUTHORS' SECOND RESPONSE

AS WE EXPLAIN ABOVE THIS IS NOT A ROAD WE CHOOSE TO GO DOWN. THE REVIEWER MAKES THIS POINT AND HAS GIVEN US A LINK TO AN ARTICLE ON P-VALUES. IT MAY WELL BE THE CASE THAT WITH A LARGER SAMPLE SIZE THE RESULT WOULD REACH SIGNIFICANCE AND IN THE SAME DIRECTION AND OF A SIMILAR MAGNITUDE BUT THAT REMAINS TO BE SEEN. NOWHERE IN THE ARTICLE THE REVIEWER REFERS US TO DOES IT SAY THAT A CONFIDENCE INTERVAL SUCH AS THIS ONE SHOULD BE INTERPRETED IN ANY WAY OTHER THAN AS NON-SIGNIFICANT UNDER THE 95% CONFIDENCE INTERVAL STANDARD.

There *is* statistical evidence, but it is weak because the study was not sufficiently powered to show the effect sufficiently clearly for it to reach a p-value of less than 0.05.

AUTHORS' SECOND RESPONSE

THE AUTHORS OF THE STUDY SET THEIR STATISTICAL SIGNIFICANCE LEVEL AT 5%. IF THEY HAD SET IT AT 10% THEN WHAT THE REVIEWER SAYS MAY HAVE BEEN CORRECT, HOWEVER THEY DIDN'T. WE ASSUME THAT THE AUTHORS MADE AN A PRIORI DECISION TO SET THE CHANCE OF TYPE 1 ERRORS AT 5% FOR A REASON.

In their response to my comments the authors state:

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 from 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

At no point as far as I can tell, did Tucker et al. call for 'trials' of different types of rugby tackling to be conducted on children. It is not the 'natural conclusion' that a cluster randomised control trial is needed to establish the risk associated with different tackle types. If further research were to be done, it would need to be observational (as much of that conducted on rugby in general has been to date, whether for children or adults), because the ethical issues associated with conducting trials that may place certain groups of children at higher than baseline risk are well understood.

I believe that the case the authors are making would be strengthened by removing this section, and the references in the paper to it, entirely.

THE REFEREE RAISES INTERESTING QUESTIONS IN OUR MINDS AS TO WHETHER GIVEN THE STATE OF KNOWLEDGE IT WOULD BE ETHICAL TO CONDUCT TRIALS WHEN THE ROLE OF THE TACKLE IN INJURY IS WELL ESTABLISHED.

The claim that “the risk of participation in Rugby Union...does not stand out beyond that of other popular sports” is incorrect.

At present, I am not convinced that there is good evidence to suggest that the risk of participation in rugby stands out beyond that of other popular sports. The fact is that there needs to be much better evidence about the relative risks of different activities before strong claims can be made about which sports are particularly dangerous for children and adolescents.

In two instances in the first paragraph of this section, the authors provide misleading statements about what other researchers have claimed.

The authors state:

In a systematic review of 12-18 year olds, Bleakley et al found evidence that the risk of injury in rugby union was higher than other sports including football (soccer) and basketball. 13

But it is misleading not to include what Bleakley et al. went on to say:

It is also useful to consider the risk of severe injuries across adolescent sports. In one of the included studies,²³ compared with age-matched soccer players, rugby players sustained more fractures, dislocations, and concussions ($P < .05$), injuries resulting in 8- to 21-day absences ($P < .05$), and career-ending injuries ($n = 3$ in rugby, $n = 0$ in soccer). However, 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.

AUTHORS' SECOND RESPONSE

APART FROM SOCCER, THE OTHER SPORTS CITED BY BLEAKLEY AND REPRODUCED ABOVE, HIGH SCHOOL FOOTBALL (AMERICAN FOOTBALL) AND WRESTLING ARE BOTH COLLISION SPORTS. RUGBY IS ONE OF ONLY A HANDFUL OF COLLISION SPORTS WHICH EXIST AND ALL APPEAR TO HAVE HIGH RATES OF INJURY. THE COMPARISON WITH SOCCER AND SEVERE INJURY IS INTERESTING BUT DOESN'T ALTER OUR BASIC PREMISE THAT RUGBY, AS A COLLISION SPORT, CARRIES A HIGH RISK OF INJURY.

WE HAVE REMOVED BLEAKLEY FROM THIS SECTION AS THE SECTION ON BETWEEN SPORT COMPARISONS IS NOT PART OF THEIR SYSTEMATIC REVIEW AND THEY ONLY BASE THEIR OBSERVATIONS ON A RANDOM SELECTION OF STUDIES. WE HAVE RELIED ON THE TWO SYSTEMATIC REVIEWS WE ARE AWARE OF ON THIS TOPIC, SPINKS AND MCCLURE AND PFISTER, TO MAKE OBSERVATIONS ON THIS ISSUE. WHAT IS CLEAR FROM PFISTER IS THAT RUGBY HAS A HIGHER RATE OF CONCUSSION THAN ANY OTHER TEAM SPORT. SPINKS AND MCCLURE ONLY IDENTIFY ICE-HOCKEY AS HAVING A HIGHER RATE OF INJURY THAN OTHER SPORTS, IT IS INTERESTING THAT THIS IS ALSO A COLLISION SPORT. THEY DON'T DO ANY META-ANALYSIS AND DON'T RANK OTHER SPORTS, APART FROM FOOTBALL WHICH THEY SAY HAS THE LOWEST RATE OF INJURIES.

Collins stated:

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.

These statements appear to contradict the claim the authors are making in the heading.

AUTHORS' SECOND RESPONSE

THIS IS ENTIRELY CONSISTENT WITH WHAT ARE SAYING THROUGHOUT, THAT COLLISION SPORTS (E.G. RUGBY, ICE-HOCKEY, AMERICAN FOOTBALL AND WRESTLING) HAVE HIGHER RATES OF INJURY THAN NON-COLLISION CONTACT SPORTS (E.G. BASKETBALL AND SOCCER)

The authors have also opted to ignore the work by Pringle and McNair cited by Tucker et al. that indicated higher rates of incidence for young netballers in New Zealand than rugby players.

AUTHORS' SECOND RESPONSE

THIS IS A WORRYING ERROR ON THE PART OF TUCKER. IT MAKES US WONDER ABOUT THE PEER REVIEW PROCESS TUCKER ET AL WENT THROUGH. PRINGLE AND MCNAIR ACTUALLY FOUND NETBALL HAD A LOWER RATE OF INJURIES THAN EITHER RUGBY UNION OR RUGBY LEAGUE, THE FIGURES WERE 13, 15.5 AND 24.5 INJURIES PER 1000 PLAYER-HOURS FOR THE THREE SPORTS RESPECTIVELY. TUCKER ET AL HAVE SWAPPED AROUND THE RATES FOR NETBALL AND RUGBY LEAGUE. THE REVIEWER OF THE TUCKER PAPER DOES NOT APPEAR TO HAVE NOTICED THIS.

IT IS TRUE THAT THERE WAS A HIGHER PROPORTION OF INJURIES REQUIRING A WEEK AWAY FROM PLAY IN NETBALL THAN RUGBY UNION IN THIS PARTICULAR STUDY, BUT RUGBY LEAGUE STILL HAD THE HIGHEST PROPORTION OF THESE INJURIES OF THE THREE SPORTS.

WE HAVE NOT OPTED TO IGNORE THIS WORK, IT WAS INCLUDED IN THE ORIGINAL FREITAG ET AL SYSTEMATIC REVIEW. THE REVIEWER IS TRYING TO BUILD A CASE THAT WE ARE BEING SELECTIVE IN OUR EVIDENCE WHICH IS SIMPLY INCORRECT.

WE HAVE WRITTEN "TUCKER ET AL INCORRECTLY REPORT THE RESULTS OF A BETWEEN SPORT COMPARISON IN 5-15 YEAR OLDS OF THE TWO CODES OF RUGBY WITH NETBALL. THEY SAY THAT NETBALL HAD THE HIGHEST RATE OF INJURY 24.5 INJURIES PER 1000 PLAYER-HOURS COMPARED TO 15.5 AND 13.0 PER 1000 PLAYER-HOURS FOR RUGBY UNION AND RUGBY LEAGUE RESPECTIVELY. THE CORRECT FIGURES ARE 24.5 PER 1000 PLAYER-HOURS FOR RUGBY LEAGUE, NETBALL HAS THE LOWEST RATE OF INJURY AT 13.0 INJURIES PER 1000 PLAYER-HOURS.(PRINGLE, 1998)"

I took issue with the authors for the following quote in the previous review. They have chosen to retain it. Rugby Football Union employed medical experts agree that "rugby union has a relatively high risk of injury compared with other team sports". 45

As I pointed out, the full quote was:

"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 union¹⁻⁸ is similar to that of other full contact sports such as rugby league,⁹ American football¹⁰ and Australian Rules Football

AUTHORS' SECOND RESPONSE

THESE DATA ARE NOT A SURPRISE AS THESE ARE ALL COLLISION SPORTS, RUGBY IS THE NUMBER ONE COLLISION SPORT IN SCHOOLS.

WE HAVE NOW WRITTEN 'MEDICAL EXPERTS WORKING FOR THE RUGBY FOOTBALL UNION STATE THAT "RUGBY UNION HAS A RELATIVELY HIGH RISK OF INJURY COMPARED WITH OTHER TEAM SPORTS" BUT GO ON TO SAY THAT "THERE IS A GROWING BODY OF LITERATURE SHOWING THAT INJURY INCIDENCE IN RUGBY UNION IS SIMILAR TO THAT OF OTHER FULL CONTACT SPORTS SUCH AS RUGBY LEAGUE, AMERICAN FOOTBALL AND AUSTRALIAN RULES FOOTBALL" {ROBERTS, 2013 #568} TO THAT LIST WE WOULD ADD ICE-HOCKEY AND

POINT OUT THAT THE ISSUE HERE IS THAT THERE IS A HIGHER RISK OF INJURY IN COLLISION SPORTS, WHICH THEY TERM FULL CONTACT SPORTS, SUCH AS RUGBY UNION, RUGBY LEAGUE, AMERICAN FOOTBALL, AUSTRALIAN RULES FOOTBALL AND ICE-HOCKEY THAN OTHER NON-COLLISION CONTACT SPORTS. THE ISSUE WITH RUGBY IS THAT IT IS BY FAR THE MOST FREQUENTLY PLAYED COLLISION SPORT IN UK SCHOOLS.'

To which the authors have made the following response:

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

In my view, it is unacceptable to truncate a quote so that it materially changes the meaning of the statement made by the original authors. Please remove the quote, or include it in its entirety.

AUTHORS' SECOND RESPONSE

WE HAVE PUT IN THE FULL QUOTE AND DEVELOPED THE CONTEXT AS ABOVE..