Sport Collision Injury Collective

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10 Jan 2018

To Chief Medical Officers (CMOs):

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Dear Professor Dame Sally Davies; Dr Catherine Calderwood; Dr Frank Atherton; Dr Michael McBride

Thank you for your letter dated 10 October 2017, sent on behalf of the UK CMOS by Catherine Calderwood, CMO for Scotland. We note that there is no response to the 36 questions we sent you on 13 July 2017 in our evidenced response to the opinions of your Physical Activity Exercise Group. We would appreciate a response to these questions in order to progress the science and evidence and as part of that process the purpose of this letter is to address a number of factually incorrect statements made in the press and other media by World Rugby and a neuropsychiatrist in Scotland, Alan Carson, in response to the publication of Allyson Pollock and Graham Kirkwood's opinion piece in the BMJ on 25 Sep 2017 (1). In addition we would like to draw your attention to an important peer reviewed and published response to Catherine Calderwood's BJSM article of September 2015 (2).

1. World Rugby stated that 'like was not being compared with like'

A statement put out by World Rugby and picked up by the press widely (see for example The Guardian 26 Sep 2017 (3)) sought to cast doubt on Pollock and Kirkwood's article by repeating a prior criticism that, by mixing age groups (they say 9-12 year olds with 18-20 year olds), claims made were not based on like-for-like statistics.

Firstly, this criticism was addressed previously in a response to an article by Ross Tucker and colleagues in the BJSM in July 2017 (4). In this, data used in the earlier systematic review and meta-analysis of 2015 (5), criticised by Tucker et al, were reanalysed using narrower age groups, the results of this reanalysis were also included in the evidence document we sent to you "Response to the UK CMOs Physical Activity Expert Group (PAEG)" dated 13 July 2017, see table 1 page 8. For complete clarity, we have reproduced the relevant items in table A1 below (see appendix) with clearer labelling of the age groups involved rather than using the Rugby Football Union's (RFU) confusing under 13s, 14s, 15s etc. age group categories.

Secondly, the evidence for the comparisons with other sports in Pollock and Kirkwood's opinion piece were based on three studies: a meta-analysis of youth sport concussion which does not mix 9-12 years with 18-20 years for any of the compared sports (6); and two survey based comparisons taking exposure into account, one from New Zealand (7) and the other from Australia (8) which were

for all age groups, made clear in the opinion piece. In each of these rugby is the number one sport in terms of injury rates.

Crucially, since publication of Pollock and Kirkwood's opinion piece in Sep 2017, research published in the British Journal of Sports Medicine (BJSM) written by World Rugby and RFU employees and funded researchers now concedes that the **"most effective, although extreme, method for preventing concussion would be to eliminate exposure by removing the tackle from the game."** (9)

2. Dr Alan Carson and the Scottish Media Centre

Dr Alan Carson, Edinburgh University was commissioned by the Scottish Media Centre to write a comment on Pollock and Kirkwood's opinion piece prior to publication (10), which was then used by a number of media outlets as counter argument to what had been written. Pollock and Kirkwood have since written to Dr Carson and explained why they find his submission to contain a number of factual errors (11). In particular, Carson takes issue with two of the studies cited in Pollock and Kirkwood's opinion piece.

Firstly, in referring to the large Swedish cohort study by Sariaslan et al (12), Carson's statement that the "effect all but disappears when the researchers start to control for such things as family milieu that the children were raised in" is not correct. The relative risk increases across the three models, as you would expect, by adding in true confounders. However, the most adjusted model (model III) which includes "unobserved familial confounders", measured via sibling comparisons, still yields positive associations between mild TBI and all measures (see Table 5 in Sariaslan et al (12)). To list the results: disability pension relative risk 1.36 [95% confidence interval 1.25 to 1.47]; Psychiatric visit 1.31 [1.25; 1.36]; Psychiatric hospitalisation 1.52 [1.42; 1.63]; Premature mortality 1.26 [1.02; 1.55]; Low education 1.25 [1.19; 1.31]; Welfare recipiency 1.18 [1.13; 1.23]. In other words, one or more episodes of concussion before the age of 25 years is associated with a 36% (95% CI 25% to 47%) increase in risk of receiving a disability pension; 31% increase in risk of a psychiatric outpatient visit; 52% increased risk of psychiatric hospitalisation; 26% increased risk of premature mortality; 25% increased risk of low education; and an 18% increased risk of welfare recipiency (confidence intervals as above). The increased risk for moderate to severe TBI compared to mild TBI is a dose response effect, one of the Bradford Hill criteria for establishing causality. (13)

Secondly, Carson refers to the systematic review and meta-analysis by Li et al (14) and says that the fact they found "no association between definitive brain injuries i.e. where there was loss of consciousness and subsequent dementia" is "much more suggestive of confounding than a true biological effect". In fact, the authors of the review listed confounding due to residual or unmeasured factors as the last in a list of possible explanations for the lack of association between loss of consciousness and dementia. The primary explanation was a limited number of studies with low statistical power in each of the head injury with loss of consciousness and without loss of consciousness subgroups. Other explanations included recall bias; survivor bias; and reverse causation. See table 1 below for full list:

Table 1: List of reasons given by Li et al why they found “no association between definitive brain injuries i.e. where there was loss of consciousness and subsequent dementia” given in order

Primary explanation	“most included studies did not distinguish head injury with and without LOC . Thus, there were very limited studies in the head injury with LOC or without LOC subgroup, making the results of subgroup low of statistical power”
Alternative explanation 1	“head injuries without LOC would be susceptible to greater recall bias, and if that were so, one might observe a greater risk for AD among head injured persons without than those with LOC”
Alternative explanation 2	“there may be a survivor bias, where people with history of more severe head injury who later enrolled in studies or survived into old age were the best able to recover from those injuries”
Alternative explanation 3	“the idea of the early pre clinical minor motor features of dementia leading to falls and minor head injury seems a much more probable explanation for our findings.”
Alternative explanation 4	“residual or unmeasured confounding factors, such as alcohol consumption, misuse prescribed opiates, and other psychiatric illnesses such as depression may also contribute to this anomalous result”

3. **Conflation of rugby with physical activity**

Once again, numerous commentators have diverted discussion of concerns with the tackle and other harmful elements of contact within the sport of rugby within schools to concerns around physical inactivity and obesity more broadly. While physical inactivity and obesity is a concern, it is not appropriate to conflate these issues. The RISUS study in Northern Ireland established that 49% of injuries required in excess of 28 days away from play, therefore contributing to physical inactivity. (15) There is currently no data to suggest that parental worries surrounding concussion would reduce physical activity, as suggested in Calderwood et al.’s opinion piece in the British Journal of Sports Medicine (2, 16). Of course, parents may remove their children from collision sports through concerns of injury and particularly concussion, but this does not equate to them removing them from sport or physical activity more broadly (17).

We note that, once again, instead of proper debate, uninformed and inaccurate responses by Rugby Union and others are being used to confuse parents, children and the wider public on the dangers of collision rugby played in schools. The health of our children must come first.

We sincerely hope you will review the evidence in our submissions which underpins our call for removal of tackle and other forms of harmful collision in the school game and look forward to a speedy response to 36 questions.

Yours sincerely,

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Appendix

Table A1: Risk of injury in youth rugby using narrow age ranges

Injury Definition	Comparison (studies used) [a]	Effect Size	Probability of Injury Over Season	I-squared	Estimated Predictive Interval [b]
irrespective of the need for medical attention or time-loss from rugby activities	6-18 years (18-22) [c]	26.7 (13.2, 54.1)	28.4% (15.2%, 49.1%)	99.6%	(1.65, 433.26)
	11 - 13 years (19, 20)	16.5 (11.0, 24.8)	18.6% (12.8%, 26.6%)	82.6%	N/A
	14 – 18 years (19, 20)	23.0 (19.4, 27.2)	25.0% (21.6%, 28.9%)	46.2%	N/A
requiring at least 7 days absence from games	6-19 years (20, 22-28) [c]	10.3 (6.0, 17.7)	12.1% (7.2%, 19.8%)	98.3%	(1.49, 70.82)
	9-13 years (20, 25, 28)	7.5 (1.9, 30.2)	9.0% (2.3%, 31.5%)	94.2%	(0, $3.35x10^8$)
	14-16 years (20, 28)	17.3 (3.3, 90.1)	19.5% (4.1%, 67.6%)	97.6%	N/A

a – "A player's age grade is determined by their age at midnight on 31st August at the beginning of each Season and that age grade applies for the whole Season" (http://www.englandrugby.com/mm/Document/General/General/01/31/97/52/RFURegulation152016-2017_English.pdf)

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

c – as calculated in Freitag et al 2015 meta-analysis (5)

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