

## **Tackle and scrum should be banned in school rugby**

Allyson M Pollock and Graham Kirkwood, Institute of Health and Society, Newcastle University

Dr Alan Carson, Reader in Neuropsychiatry, University of Edinburgh, Clinical Lead National Managed Clinical Network for Acquired Brain Injury.

Conflicts of interest- I went to rugby playing school and really didn't like the game, and rowed instead, but many close friends did and there was little doubt that they enjoyed the physical aspect of the sport.

In this article Pollock and Kirkwood argue that the tackle and other forms of contact should be removed from school rugby. There can be no argument that rugby is a contact sport and that by removing contact one would reduce the rate of injury. Some will feel that this is a good thing and worthy of such a ban others may be less sure and concerned that it makes childhood overly 'sterile'. My own personal view tends towards the latter but this is a matter of personal opinion.

I am however concerned by some of the science offered here. It is clear the article is concerned about concussion and the risk concussions poses- I think these are misunderstood, perhaps as neither author is from a neuroscience background.

The case for concussion causing any form of problem to children or adults is far from proven. The scientific evidence is unequivocal that participants in professional contact sports, in particular the NFL, are twice as likely to live longer than others from similar backgrounds.

[Could you tell us what research this is please?](#)

In other words there is no doubt sport and exercise is good for you and that effect is far more important in terms of all cause mortality than any increase in risk of neurodegeneration. One can of course get the exercise benefits without the risk of contact and as the author suggest cycling may be an alternative, although whether results from a the calm of New Zealand map onto inner city Britain is highly questionable. But perhaps more relevantly would the majority of children be as willing to engage. As kid I used to regularly cycle as means of building cardiovascular fitness for rowing- my friends all thought it was weird! The health crisis facing Britain's children is not concussion but obesity and lack of exercise. Public health clinicians should think very carefully before calling for measures that may cut participation in sport

The interpretation of the scientific literature on whether concussion causes longer term problems is complex as it is very prone to confounding as there are multiple risks for problems down the line and it is far from clear that concussion is the cause.

## Of the studies cited

1. “a history of concussion is associated with a lowering of a person’s life chances across a range of social and educational measures including receipt of disability pension, psychiatric inpatient admissions or outpatient visits, premature mortality, low educational achievement, and receipt of state welfare payments”- this well conducted Swedish cohort study is not nearly as clear as the authors make it out to be. Severe brain injuries undoubtedly cause such problems but when one looks at the data in this study on mild brain injury the effect all but disappears when the researchers start to control for such things as family milieu that the children were raised in- the alternate hypothesis is that impulsive children who make injudicious decisions are more prone to getting concussion and it is there personality that makes them prone to troubles in adult life.

Carson is referring to the study by Sarialsan et al (1). 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). 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 reciprocity 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 reciprocity (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. (2)

2. “head injury is associated with an increased risk of any dementia, adding to existing evidence that head injury may lead to neurodegenerative diseases”- this study requires careful consideration. What it found was that there was no association between definitive brain injuries ie where there was loss of consciousness and subsequent dementia (which is in keeping with the literature) whereas they found a weak association with knocks to the head in which the brain may or may not have been affected. This finding is obviously much more suggestive of confounding than a true biological effect

Carson is referring to the systematic review and meta-analysis by Li et al. (3) Confounding due to residual or unmeasured factors was the least likely explanation for the lack of association between loss of consciousness and subsequent dementia proposed by the authors. The primary explanation was limited studies with low statistical power. Other explanations included recall bias; survivor bias; and reverse causation. See below for full list:

1. "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"
2. "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"
3. "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"
4. "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."
5. "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"

The problems with concussion research and its complexity are discussed in detail in <http://jnnp.bmj.com/content/early/2017/03/10/jnnp-2016-315510>

My opinion would therefore be that it is legitimate to argue against rugby on grounds that children should not be put at risk of any injury, if that is your view, but not to use a poorly understood neuroscience argument to do so.

1. Sariaslan A, Sharp DJ, D'Onofrio BM, Larsson H, Fazel S. Long-Term Outcomes Associated with Traumatic Brain Injury in Childhood and Adolescence: A Nationwide Swedish Cohort Study of a Wide Range of Medical and Social Outcomes. *PLoS medicine*. 2016;13(8):e1002103.
2. Hill AB. The Environment and Disease: Association or Causation? *Proceedings of the Royal Society of Medicine*. 1965;58:295-300.
3. Li Y, Li Y, Li X, Zhang S, Zhao J, Zhu X, et al. Head Injury as a Risk Factor for Dementia and Alzheimer's Disease: A Systematic Review and Meta-Analysis of 32 Observational Studies. *PloS one*. 2017;12(1):e0169650.