

PLOS Science Wednesday: Hi Reddit, my name is Seena Fazel and I published a study showing that traumatic brain injury in childhood predicted later risk of adverse psychiatric outcomes in adulthood – Ask Me Anything!

PLOSScienceWednesday ¹ and r/Science AMAs¹

¹Affiliation not available

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In the United States, children play some pretty rough sports that lead to substantial head injuries, such as American football. With current helmet technology head injuries still occur. Based on your research findings, should parents reconsider allowing their children to play high contact sports that could result in head injuries?

[lawdogslawclerk](#)

It is a personal decision and you will have to weigh up the risks and benefits. Studies like ours provide some evidence of the risks but clearly the benefits of participation sports need to be considered, including physical and psychosocial ones. One possible consideration for parents to ensure that schools and sport clubs follow official guidelines for a particular sport (e.g. not re-entering the field of play if having experienced a head injury during a particular match, and checking that good refereeing standards are adhered to as many head injuries occur during foul play).

How severe does the injury have to be in order to show up in adulthood? How is severity of the injury correlated with behaviour in adulthood?

[english_major](#)

Our study followed up diagnoses of head injury that presented to primary or secondary health services, so we will have not included those injuries that were not serious enough to warrant medical attention. At the same time, we found a clear relationship between severity and poor outcomes – see table 6 in our paper that reports relative risks in those who experienced repeat head injuries. In those with recurrent head injury that was moderate-severe, the risk of receiving a disability pension was particularly high.

Do you feel research like yours has helped society reach a tipping point with regard to adolescent sports participation?

Context: Your study states:

Our third finding, on the effects of recurrent injuries, is broadly consistent with the emerging literature on the adverse consequences of sports and combat-related neurotrauma [7,9,11–14,46–49]. Although replication of this research is needed with larger samples of athletes and using research designs, such as comparisons with sibling controls, that account for confounding factors, our findings suggest that recurrent neurotrauma in any setting may be a causal risk factor for a wide range of social, cognitive, and medical adverse outcomes.

One of the implications of these findings is the importance of developing preventive interventions for early exposure to head injuries. In toddlers and preschoolers, these interventions should ideally be targeting improved parental supervision, as falling is the most common cause of TBI in this group. Prevention of sports-related concussions in older children could focus on changes to rules so that the risks of players colliding their heads with each other and with equipment (e.g., heading soccer balls or getting hit in the head by a racket, bat, or stick) [50] is reduced.

[JediLibrarian](#)

One important consideration is the absolute risks that we found in our study. This is supplementary table 3 (<http://journals.plos.org/plosmedicine/article?id=10.1371/journal.pmed.1002103#sec019>) - none of these were above 20%. So we did not find that the majority of individuals who sustained traumatic brain injuries experienced adverse outcomes. The highest absolute risk was for psychiatric outpatient contacts (20% in the head injured population until 25 years old vs. 14% in the non-head injured population).

In cases of over a decade of repeated, severe child abuse with trauma to the head, is there anything the victims can do to reduce possible effects of all the trauma? Is there anything that can be done to reverse some of the damage?

[FriedPorkCutlet](#)

I don't know the answer to this. However, more understanding of the biological mechanisms linking head injuries to these adverse outcomes can help us understand how to intervene. Our study does not do this - it is a population-based study. New research will be required to look in more detail at the underlying mechanisms.

Hello!

I wrote an undergraduate thesis after studying mild tbi using EEG. When I was writing the background and significance sections, I found a lot of research that mentioned that tbi severity is not always a super useful classification outside of the ER. Like, the average person with a severe tbi is more at risk of future problems than a person with one milder injury, but that there were many cases where even sub-concussion injuries that happened repeatedly caused worse problems than only one or two mild to moderate injuries.

Is this something you've found in your experience? How is the process of curating gold standards and NIH toolkits for the long term diagnostic impacts of head injury?

(That pun was not originally intended but I'm leaving it.)

[frontallobelove](#)

My colleague David Sharp wrote an article that presented the view that 'concussion' was not a useful

term as it assumes that it is temporary and does not lead to poor outcomes - both which are misleading assumptions (<http://pn.bmj.com/content/15/3/172.full>). Levels of severity are useful as they enable health professionals to communicate, although the term 'mild' is misleading if people think that it is similar to the lay use of mild.

My children have had several severe concussions each. Depression is hereditary in my family. What can I do for them to possibly prevent future mental health issues?

[lamspeedy36](#)

This might be helpful - but it is about the prevention of depression generally (not specifically after a head injury): <http://www.annualreviews.org/doi/10.1146/annurev-clinpsy-033109-132040>

May I ask to which degree, in your mind, these findings may explain certain differences in behavior in the male vs female population?

From what I understand; men are consistently more prone to TBI (up to 3 times higher) than women, at the same time they don't see the doctor nearly as much as women do (also 3 times higher).

Will you investigate this issue further in the future? Would it even be possible to find a causal link between the two?

I've only read your paper's abstract, but I'm looking forward to examining the rest. And I applaud you and your colleagues for choosing PLOS for publication!

[myanonma](#)

My colleagues and first author Amir Sariaslan says: "Sex differences are interesting and worth examining closely in future studies. It is correct that males are overrepresented for TBI but the sex differences vary widely across the outcomes (e.g., much higher rates of females receiving disability pension while males are overrepresented in premature mortality). It is possible to use family-based designs, such as sibling-comparisons, to examine the moderating role of sex in these associations. Perhaps using alternative designs (e.g., self-reports) to capture those with seemingly minor injuries who avoid seeking medical treatment. As always, there are other limitations to such approaches worth highlighting (e.g., measurement error in reports/attrition in samples) etc."

Good morning Seena, thank you for the post. I had two severe concussions when I was 4-7, a handful of concussions playing football in high school and two TBI events when I was 27 and the other at 35. As an adult I lost the sense of smell and taste, 6 total cracks put in my skull, etc.. I currently am medicated for general anxiety disorder, ADD, and, if I go see a specialist, will most likely be diagnosed with Bipolar II disorder. I am currently 36 and would like to know what routine medical follow-ups you recommend and are there any symptoms I should monitor as I get older? Also, do you believe head injuries at a young age combine with family history of mental illness to complicate or increase the probability of mental health diagnoses or may the injuries be a sole cause? Thank you again!

[mrstealyomilk](#)

Can't give advice on an individual case. In terms of whether the head injury can be a sole cause, our study is consistent with a causal inference as we used unaffected siblings as comparisons (which accounts for familial effects). Also we excluded individuals with pre-existing psychiatric disorders (childhood and otherwise), and found similar findings (see table S4).

Hi Seena, Were there any commonalities in those who did not develop adverse outcomes, or anything identified as a successful treatment for childhood TBI that helped prevent those outcomes? Or would that be the next stage of the research?

[cartel](#)

In another paper from our group, we looked at suicide and death specifically and found that co-occurring psychiatric disorders and substance use disorders increased risk in those with TBIs (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4058552/> - also open access). From the abstract: "Among those with TBI, absolute rates of death were high in those with any psychiatric or substance abuse comorbidity (3.8% died prematurely) and those with solely substance abuse (6.2%) compared with those without comorbidity (0.5%)."

Underscores the importance of identifying and treating co-occurring psychiatric disorders and substance use disorders.

Does this mean I should absolutely not let my son play American football in school as a young child?

[dingdongsilver](#)

see my response to lawdogslawclerk above

I had a moderate TBI 3 years ago. I have severe, chronic anxiety and depression; memory loss; chronic headaches; confusion; vertigo; can't smell etc. Does it go away? I am 31 now. Since the brain isn't fully developed until 25, what does this affect in it's development neurologically speaking?

[Meusulus](#)

Not possible to give advice on individual cases. In general, though, if there are clear deviations from an individual's psychosocial/education trajectory after a TBI, then seeking medical advice should be considered.

What were the six medical outcomes?

I scanned the paper but didn't see it. Curious if seizures were studied. I have lately learned that greater than 50%, or something like that, of seizures/epilepsy cases result from TBI and am curious if that was one of the included outcomes.

[do_0b](#)

Its 6 medical and social outcomes - psychiatric hospitalization, psychiatric outpatient visit, premature mortality, disability pension, not completing high school education, and welfare receipt