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Sport Structured Brain Trauma is Child Abuse

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ABSTRACT

This article first summarizes research regarding the relationship between sports that intentionally structure multiple types of brain trauma into their practice, such as rugby and boxing, and the range of negative health outcomes that flow from participation in such sports. The resultant brain injuries are described as 'now' and 'later' diseases, being those that affect the child immediately and then across their lifetime. After highlighting how these sports can permanently injure children, it examines this harm in relation to existing British laws and policies concerning child abuse. The conclusion drawn is that neither children nor adults on their behalf are legally able to give informed consent for participation, and that impact sport organisations effectively groom children into sustaining and accepting brain trauma. Adults providing brain-traumatizing versions of these sports are thus described as being complicit in a form of child abuse that we term brain abuse. The contradictions in existing sports policy are highlighted, where policy describes that children are to be protected from harm, and yet the very practice of such sports creates harm by design. Implications of the argument are that children should be prohibited from partaking in impact sports.

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Concussion; Sport; Child abuse; Rugby; Contact sport

Evidence of Harm

This paper sits within a context of increasing cultural concern over what many consider concussion sports, and their relationship to chronic and traumatic brain injuries (TBI). It is authored by a collective of scholars vested in following the science, and making policy recommendations, in order to protect children's brains. The author membership includes two sociologists of sport and two sport psychologists, one of whom, Gary Turner, holds 13 world titles in combat sports.

We recognize that not all concussion sports are the same: combat sports have brain trauma as a desired aim of the sport through inducing loss of consciousness or incapacitation, while brain trauma that occurs in rugby is an undesirable consequence but

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nonetheless one that results from the structure of the game. However, undesirable consequences are not the same as unanticipated consequences (de Zwart 2015). Four hundred-meter runners are assigned a lane, if one accidentally ventures outside that lane resulting in the tripping of another runner and resultant brain injury, this is an accident. When structural components of the game dictate the collision of bodies, it cannot be called an accident when harm occurs.

We avoid calling sports such as rugby and boxing concussion sports and instead opt to call them 'impact' sports because brain injury can occur at very low levels of impact (Nauman, Talavage, and Auerbach 2020) and, commonly, without giving rise to the objective signs and subjective symptoms known as concussion (Peek, Elliott, and Gardner 2020). Throughout this article, a large focus is placed on rugby and boxing as these are salient sports to the British context examined, particularly as contact rugby is still delivered in the compulsory Physical Education curriculum (White et al. 2022). However, the argument is not restricted to these sports and applies to all impact sports in which brain trauma occurs by design.

For clarity of definition, traumatic brain injury (TBI) is a neurological event; concussion is a neurological syndrome; persistent post-concussion symptoms are a neurological sequelae; and Chronic Traumatic Encephalopathy and other resultant later life pathologies are neurodegenerative diseases (Wojnarowicz et al. 2017). To simplify further, we utilize two heuristic categories to explicate this damage to the brain: *Now brain injuries* and *later brain diseases*.

Now Brain Injuries: are injuries that occur at levels of force colloquially known as concussive. These injuries may be with or without symptoms. This category includes symptoms that can last weeks to years, known as post-concussion syndrome. This category also includes potentially deadly brain bleeds and second impact syndrome. Now injuries occur traumatically but can also be life-long and life-ending.

Later Brain Diseases: are diseases caused by repeated traumatic brain injuries, yet they also occur through repetitive impacts that fall below what might normally give rise to concussive symptoms. Colloquially, these are known (even if imprecisely) as sub-concussive or sub-clinical impacts and occur as part of the daily operation of heading the ball in football/soccer, tackling in rugby, or being struck in the head in fight sports. Later brain diseases are related to cognitive and neurological damage sustained over time.

Now Injuries

Impact sports produce a wide range of traumatic and chronic injuries (West et al. 2021). Some of these injuries are salient, like musculo-skeletal injuries, and others less-known, like increased risk of cardiac arrest after collision (Hosomi et al. 2022). These are sometimes life-ending and life-debilitating injuries. They are important to understand and *could* fit within the scope of our analysis of impact sports as child abuse. However, this paper is concerned with a more recently understood category of injury: brain injuries.

TBI is often understood as being either mild (mTBI), moderate or severe, although identification as to what constitutes which is more objective at the extreme ends of brain trauma, it becomes more subjective in the middle (Wojnarowicz et al. 2017). Colloquially, they are known as concussion, which is when the objective signs and subjectively

experienced symptoms become manifest. These ‘now injuries’ are universally understood as events that require immediate removal from play, medical examination, and a considerable amount of recovery before one can return to play (Patricios et al. 2023).

Today, we recognize that no concussive hit to the head is benign. The emerging consensus amongst scholars of brain trauma is that ‘knocks to the head’ result in mild to severe brain injury, and every hit harms as it contributes to a volume of damage that can result in later diseases (Nauman, Talavage, and Auerbach 2020). So while accidental and infrequent mild brain injuries may not give cause for serious alarm, it is the intentional, frequent, structural and sustained nature of damage that is a concern. Everyone can have an accident, but we cannot plan to have hundreds of accidents or fail to protect children from hundreds of foreseen accidents.

These ‘now injuries’ thus call into question the practice of intentionally exposing children to both the inevitability of occurrence through combat sports, as well as the high likelihood of occurrence through participation in other impact sports. We highlight that these ‘now injuries’ are varied, sometimes resulting in permanent disability, or death; however, they are also capable of producing later debilitating diseases.

Later Diseases

While impact sport has consequences for later diseases related to mobility, osteological and other diseases, long-term damage to the brain has recently gained cultural prevalence (Matthews et al. 2023; White et al. 2020) and should be considered a public health crisis (Bachynski 2019). This concerns the long-term consequences of both singular and repeated head trauma and its impact on risk of neurodegenerative disease that we call *later diseases*.

In addition to suffering from several emotional, cognitive, and other signs and symptoms of ‘now’ brain injuries, across varying degrees of severity and varying degrees of time, a child receiving a single concussion that leads to hospitalization is more likely to have adverse life outcomes across a wide range of markers, including adult mortality, psychiatric morbidity, and social outcomes (Sariaslan et al. 2016). Three mTBIs among rugby players produce significant long-term cognitive deficits in memory, processing speed, and attention (Lennon et al. 2023). There are then issues concerning sub-concussive (sub mTBI) impacts that come as a regular occurrence in impact sports, principally with the disease Chronic Traumatic Encephalopathy (CTE).

CTE is a form of dementia that onsets much earlier than Alzheimer’s disease and manifests almost exclusively among cohorts with a history of repeated head impacts, namely impact sport athletes and soldiers (McKee 2020). But this is not the only form of neurodegeneration associated with repeated exposure to sub-concussive, repetitive, impacts. Progressive brain atrophy (Bernick et al. 2020) together with other forms of dementia, ALS, Parkinson’s and other conditions (Delic et al. 2020) are also linked to impact sports.

There is no longer respectable academic debate about whether CTE exists and there is no longer respectable academic debate about brain trauma as a cause of CTE (Nowinski et al. 2022). Dose-response research examining the brains of 266 deceased American football players, all men who played football for varying lengths of time, shows the odds of developing CTE increase 30% every year, doubling every 2.6 years, and increasing by

>10-fold every 9 years (Alosco et al. 2018). Similarly, in a convenience sample of former Rugby Union players, Stewart et al. (2023) found CTE was present in 21 of 31 (68%) brains examined, with the majority (13/21; 62%) having played at amateur level alone. They conclude that risk of CTE was directly associated with the length of rugby playing career, due to the total volume of head impact exposure.

Similar research comes from the ongoing Professional Fighters Brain Health Study (Bernick et al. 2013): a prospective study with professional combat sport athletes, demonstrating brain atrophy and worsening cognitive abilities over time. These effects of neurodegeneration are in a dose-response to the number of hits, their frequency, and their magnitude. Most germane to our argument, is that the study demonstrates that the younger first exposure occurs, the worse the neurodegenerative effects demonstrated (Bryant et al. 2020).

There does remain illegitimate doubt about a causal relationship among a decreasing group of scholars. They tend to be scholars funded by sporting organizational bodies (Piggin et al. 2022) and they exist in density within the Concussion in Sport Research Group (CISG), whose former leader has been exposed for multiple counts of academic misconduct (Macdonald et al. 2022). Thus, the commercial interests of this group should be examined with the same suspicion as academics who were historically funded by the tobacco industry (Belson 2022).

Our paper is not, however, concerned with debating the merits of those who remain skeptical that impact sports cause CTE. This is for two reasons. First, our paper stands on its own even if there were only ‘now injuries’. Second, in October of 2022, the world’s largest biomedical research agency—the American Institutes of National Health (NIH)—declared there is a cause-and-effect relationship between repeated subconcussive impacts and CTE. This proclamation brings the NIH into alignment with the US Centers for Disease Control and Prevention, which stated in 2019 (CDC 2019, p. 1): ‘The research to date suggests that CTE is caused in part by repeated traumatic brain injuries, including concussions, and repeated hits to the head, called subconcussive head impacts’. Supporting this position, researchers using nine criteria of the Bradford Hill Criteria, the same criteria that show a causal link between smoking and lung cancer, showed that CTE is caused by repeated hits to the head, and that this is the only known cause (Nowinski et al. 2022).

Comorbidities for Children

Children are susceptible to both ‘now injuries’ and ‘later diseases’ related to impact sports. The potential harm to a child occurs in the damage that is sustained to their brain, which is then compounded by the long-term risk of impact on development, learning and progression through life. In other words, if two players cease playing rugby aged 30, the player who began playing aged 8 will have 10 years more exposure to brain trauma than the player who began the game aged 18.

Immediately following just a few head impacts, balance and coordination are adversely affected. Decreases in cognitive capability, memory, and the ability to learn also manifest—even in the absence of subjectively experienced symptoms (Broglio et al. 2017). Cognitive processing issues might give rise to impaired learning, memory issues, mood

disorders, as well as a greater likelihood of a growing concern towards the earlier and more rapid development of 'later diseases' (Alosco et al. 2020; NSPCC 2020).

These comorbidities are important because impact sports are 1) played by large numbers of children (Strandbu et al. 2017) and 2) played mostly by children. The statistical under-representation of sport among adults is attributable to sport existing upon a decreasing opportunity structure, and thus a decreasing participation capacity framework (Magrath, Cleland, and Anderson 2020). For this, and other reasons, there is a progressive rate of dropouts for children, particularly among team sport athletes, beginning age 12 and increasing onwards. Conversely, there are increasing rates of participation for non-competitive forms of sports and physical activity during adolescence (Back et al. 2022). Adults are also turning away from organized club sport and adopting informal sport practices (Neal et al. 2023). Thus, numerically speaking, sport is a child's endeavor. However, there is a professional element to sport. And it is in this, capitalistic entertainment aspect which drives the enterprise more generally (Coakley 2021).

Sport Grooming

There are multiple purposes of children's sport that we simplify into two not mutually exclusive categories: 1) the fun, health, and social development model; and 2) the grooming model.

The fun, health and social development model of sport is the salient and dominant reason for joining sport for children. Here, youth sport exists within the cultural imagination of being a fun way to exercise, while also serving as a vessel for teaching teamwork, dedication, and resilience. The outcome of the fun model is academically debatable (Anderson and White 2018; Whitehead, Telfer, and Lambert 2013) but whatever those immediate outcomes, the perceived benefits are alluring for parents who view sport as a transformative vessel (Back et al. 2022).

Given this category of *perceived* benefits to children, we highlight that brain trauma does not promote and indeed detracts from fun, health and social objectives. There are no physical or cognitive benefits to taking an impact or multiple impacts to the head. Tackle versions of rugby or American football might be fun, but there are no proven health benefits compared to non-contact versions, as there are no proven cognitive performance benefits to being struck in the head. There does not exist a single piece of empirical data to suggest that tackle versions of sport better promote social or physical benefits of sport over non-contact versions. Indeed, the opposite is true: Of 198 studies examining rugby and non-contact rugby, the non-contact game was found to provide a wide range of physical and mental wellbeing benefits, while contact rugby provides less robust findings (Griffin et al. 2021).

If the purpose of youth sport is to promote physical, psychological and social health, inhibiting cognitive, emotional, or physical health through brain trauma is thus counter-productive to the stated or implied objectives. Given that non-contact or non-collision versions of these sports exist, it is reasonable to restrict the risk of collision/contact versions until adulthood (Findler 2015).

The fact that many sport organizations do not restrict children reminds us that youth sport is not independent of corporate bodies who profit from professional sport. Oppositely, youth sports are the feeder system for the profit version. Thus, the moment

children enter almost any sport, they enter a system that is designed to identify talent and promote that talent toward professional levels of play, where they are commodified. This is the grooming model of sport (Anderson and White 2018), or what many call the Talent Identification Model.

Children who show talent in sport are showered with praise. If talented enough, or if lacking diversity of engagement in other activities, some children are socially groomed to see themselves as a future elite athlete (Way 2023). Idolizing adult athletes, receiving lavish praise, they are vulnerable to sport organization messaging about their futures as elite athletes (Magrath 2017). Indeed, such a model is even seen in Physical Education, whereby much learning is delivered through PE-as-sport-techniques and PE thus relies on competitive sport (Kirk 2012), with it being structured as a space to identify 'talented' sporting children. In England, for example, the national curriculum for compulsory PE states that it should 'inspire all pupils to succeed and *excel in competitive sport* and other physically demanding activities' (Department for Education 2013, our emphasis).

This is a problematic version of sport that exists as an early career training ground for a high stakes gamble of 'making it' as a professional athlete. This dream is often sold to children and parents without reference to the reality of the miniscule percentage of people that pass through such a system to become a professional athlete. Yet, youth sport often resembles the same activities that professional athlete experience, albeit sometimes with less hours of work per week devoted to the organizing body.

Thus, it seems evident from the start that the first set of characteristics, health and fun, can be achieved from non-contact versions of sport. The second, that of sport grooming, can only partially be fulfilled if the professional version is contact. Hence, the authorization of the collision of children is to privilege the culture and history of a sport, whilst vetting the future capacities of a potential professional player, sacrificing the purpose of putting these children into sport in the first place.

For example, the hegemonic image of rugby is that it includes tackling, just as the hegemonic image of boxing includes blows to the head. It is this professional sporting version that makes children want to play the impact versions (Anderson and White 2018). It is the hegemony which makes the discussion of child brain abuse in this context uncomfortable for many as it contests the hegemonic version of these sports. This is an important aspect to the argument: children are culturally persuaded to favor impact over non-impact versions of sport.

Implausibility of Informed Consent

This section argues that neither children, parents nor schools can consent to children's participation in impact sports. To show this, we: 1) cast doubt onto the concept of adults making informed consent, 2) before illustrating why they cannot then consent on children's behalf, then 3) we explain why schools cannot consent (and compel) children into impact sports, and 4) demonstrate that children cannot consent, also.

AlHashmi and Matthews (2022) demonstrate how problematic and false knowledge about concussion and brain injuries circulates in sporting subcultures and that athletes primarily privilege these myths and misconceptions in order to remain focused on maintaining and enhancing sport performance. This is to say that they thus sacrifice mental and physical health for the sake of sport performance. Matthews (2021) argues

that boxers, and by extension other athletes, know little about the medium- to long-term consequences of living with brain injuries. And that, when this lack of understanding is connected with subcultural pressures to focus on performance instead of health, the 'informedness' of consent might well become an empirical and logical impossibility (see Channon and Matthews 2021 for a more detailed discussion). Even if one can be fully informed, adults are legally prohibited from engaging in some behaviors that the government deems too dangerous for them: from driving without a seat belt to illicit drug use.

There is thus precedence for the prohibition of even informed adults' abilities to engage in dangerous activities. While there is a debate to be had about whether informed adults should be able to legally partake in heroin use or drive without a seatbelt, this position would not apply to children because, even when illicit activities are permitted by law, it recognizes a difference between adults and children.

This is to say that adults sometimes cannot consent to children's participation in grossly dangerous activities. Consider sexual activity, which is perfectly legal for consenting adults. Sex has known health risks and benefits, but adults cannot consent to children engaging in this behavior. Thus, parents are not capable of consenting to child participation in sex. Indeed, custodial sentences await any adult who is complicit in promoting sex among those who have yet to reach the age of 16.

Germane to this article, if adults cannot understand the complex neuropathology of brain trauma to provide even their own informed consent, they should not be permitted to make such consent for their children. Even if adults are capable of understanding the complex neuropathology of 'now' and 'later' brain injuries, this does not mean they should be permitted to provide such consent for their children. There is, in fact, a very long list of activities that adults cannot consent to on behalf of their children. Parents cannot consent for their children to vote, work a full-time job, drop out of education, take out a loan, marry, buy alcohol or tobacco products, partake in consensual sex, gamble, drive a car, fight in war, or engage in a host of other financial and contractual issues before the age of 16/18 in western countries.

This then brings us to the question of children making informed consent themselves to engage in high-risk sporting activities. On this question, legal principles of consent have largely seen children unable to consent to many hazardous, or irreversible activities, such as those listed above. The ostensible reason is the inability to conceptualize risk appropriately.

We do not think it necessary to detail how prepubescent children are incapable of understanding neuroscience. We thus do not think any serious person would make an argument that a young child can understand dose response research related to this neurochemistry as to make an informed consent as to the risks of participation.

We ask readers to consider this position in relation to sex. If one agrees that an 8-year-old cannot consent to sex; their parents or school cannot consent to their engagement in sexual activity, the same logic holds true that parents, schools or children themselves should not be able to consent to unnecessary physical activity that can cause a lifetime of psychological harm. Sometimes children need to be protected from even their own guardians. This is something we further examine in subsequent pages of this article.

We now turn to the question of adolescents, which contest the definition of 'child'. Here, we note that the nature of adolescence itself drives thrill seeking behavior, and this happens before the slow maturation of the cognitive-control

system that regulates such risky impulses. This combines with activation of the socio-emotional network, overall presenting a diminished ability to exercise control (Albert, Chein, and Steinberg 2013). Thorpe (2014) describes a foundational incapacity for adolescents to act ‘appropriately’ when faced with physical harm, a lack of capacity to comprehend even obvious risks. Therefore, in no way can informed consent be reasonably assured for adolescents. Again, there can be no removal of duty of care, and that includes the duty of care of parents.

It is for these reasons that British law curtails the activities of adolescents to prevent demonstrable psychological or physical harm, regardless of parental perspective (The Law Commission 1995). Notably, just as we highlighted with children, teenagers before the age of majority are also not legally permitted to: vote, work a full-time job, drop out of education, take out a loan, marry, buy alcohol or tobacco products, partake in consensual sex, gamble, drive a car, fight in war, or engage in a host of other financial and contractual issues. The prima fascia reasoning behind the collection of these prohibitions concerns their lacking the cognitive capacity to make duly informed decisions (Albert, Chein, and Steinberg 2013).

We do not engage here with complex theories of when human development, on average, means that people can make complex decisions regarding their behaviors and futures. That is a salient question and will most certainly depend on the individual. Instead, we simply rely upon the United Nations (1990) definition as one being a child until one reaches the age of 18. Salient to this discussion, however, is that a child is deemed to have the capacity and competency to consent to *benefit* if they meet certain criteria at 16. They can consent to sex and medical treatment. Even if a child is under the age of 16, they can consent to medical treatment or contraception if they meet Gillick competency within the Fraser Guidelines (Cornock 2007; Griffith 2016). Gillick competency is often confused with Fraser Guidelines, yet they are not the same thing (Parekh 2007). Gillick competence refers to testing a child’s ability to give consent, whereas the Fraser Guidelines refer to specific guidance for a health-care professional to provide specific treatment to a child (Cornock 2007). Consent to *benefit* should not be conflated with consent to *harm*, however.

Finally, schools often fail to ask for consent when they choose to have children engage in impact rugby. Researchers found that impact rugby was compulsory in 91% ($n = 208$ of 229) of state-funded English secondary schools randomly sampled that delivered rugby as part of the boys’ physical education curriculum and 54% ($n = 82$ of 151) of state-funded secondary schools that delivered contact rugby as part of the girls’ physical education curriculum (White et al. 2022). Schools should not be permitted to either force children to play collision rugby against their will, nor should they be permitted to offer it as structuring brain trauma into a sport is antithetical to education.

We know that supporters of impact sports will examine our proposition of prohibition through a radical framework, not because the logic is flawed, but because it counters a taken-for-granted, hegemonic position that all sport is good. This relates to the ‘Great Sport Myth’ proposed by Coakley (2015), whereby sport is seen as inherently pure and good. The result is a reluctance to critically examine sport for its shortcomings. Indeed, even critical scholars of sport may suggest our position to be radical and refute it based on libertarian principles. To this, we reiterate that our position applies only to children. Intentionally exposing children to repeated brain trauma has no place in physical education or organized sport.

Medicolegal Positions

British Law

The criminal legal position in the United Kingdom (UK) is that no child can consent to harm, and no adult can consent to harm on their behalf (The Law Commission 1995). In the UK, a child is protected from harm through a legislative framework, with a child being defined as being under the age of 18 (Department of Education 2010; NSPCC 2020; United Nations 1990). The policy also states that allowing a child to receive harm is ‘child abuse’, with sport receiving no exception in this respect (CPSU 2019; NSPCC 2020).

Further to the above, the UK Government commissioned an inquiry into concussion in sport (Digital Culture Media and Sport Committee 2021) which highlights health and safety legislation that requires stakeholders in sport, at all levels of stakeholder and sporting level, to respond to TBI risk, such that *prevention*, mitigation, and management of TBI are undertaken.

The germane legislation is the Health and Safety at Work Act, and the Management of Health and Safety at Work Regulations 1999, which also require written policy, define responsibilities that stakeholders must provide reasonable care to not just employees, self-employed, or even volunteers but all persons who may be affected by the stakeholder practices—and this includes participants in sport.

United Nations Convention on the Rights of the Child

The United Nations Convention on the Rights of the Child (UNCRC) is an international and widely supported human rights treaty with 195 state signatories, including the UK. The convention consists of 54 articles, with the focus being on the best interests of the child (United Nations 1990). The rights fall into four broad categories: ‘rights to survival, protection, development, and participation’ (Limber and Flekkoy 1995, 4).

Whilst the UNCRC does not specifically mention sport, David (2005) outlines how the majority of the articles are directly relevant to sport. Moreover, Lang (2022, 43) details the numerous ways in which sport falls short when evaluated against the UNCRC such as ‘early specialization, intensive training, the valorization of athletes who train through injury, shouting as a way of enacting control’. This is not an exhaustive list, and there is a long list of harms in sport which violate the UNCRC. We argue that the convention is a justifiable framework for prohibiting impact sports for children (United Nations 1990) because Article 19 spells out that the state has a duty to protect children, even from their own parents.

ARTICLE 1 (definition of a child) The rights set out in the United Nations Convention on the Rights of the Child (UNCRC) apply to everyone under the age of 18.

ARTICLE 19 (protection from violence, abuse and neglect). The state must do all it can to protect children from violence, abuse, neglect, bad treatment or exploitation by their parents or anyone else who looks after them.

The Precautionary Principle

Jonas (1984 [1979]) has described a philosophical idea that if there are reasonable scientific grounds for identifying that a new product or process may not be safe, it should be withheld until the purveyors of the product or process can evidence that the risks are small and are outweighed by the benefits. If the dangers are considered serious enough, then the principle may require us to withdraw the products or impose a ban or a moratorium on further use.

Yet this approach has been entirely dismissed by the leading organization of sport scholars that take research monies from sport organizations, the Concussion in Sport Group (Casper and Finkel 2022). The criticism includes that many CISG members have close relationships with sports organizations, presenting the potential for corporate entanglement, and therefore present potential conflicts of interest that may influence the consensus. Despite this bias, it is this group that organized sporting bodies take concussion advice from. This is a case of the fox guarding the hen house.

In order to maintain a pro-sport perspective, not only must this group ignore the precautionary principle but they must both cast doubt onto the relationship between head trauma and CTE by ignoring evidence that counters their bias. Evidencing this, there are notable exclusions from the signatories, namely those who show causation with head injuries and CTE (McKee 2020; McKee et al. 2023). The membership of the CISG also does not include a range of other experts essential to the subject, lacking frontline trauma surgeons, education and learning experts, epidemiologists, sociologists and more—including the voices of the very participants in sport themselves (Casper et al. 2021). Finally, the members of the CISG remain within limited fields and do not contain the depth of expertise to fully understand the complexity of concussion management in the context of sporting practice. Yet, collectively, the CISG are vested in asking detractors to prove that their product is dangerous; without evidencing that their product is safe.

In this regard, CISG is applying a Kehoe Paradigm in respect to unsettled elements of the science in respect to TBI, particularly the long-term neurodegeneration and neurodegenerative diseases. The Kehoe Paradigm posits that something is considered harmless until there is proven harm (Nriagu 1998), and such an approach provides a misrepresentative position, where absence of evidence of risk equals evidence of the absence of risk. In fact, at the time of writing, the Rugby Football Union in the UK, has, once-again, changed tackle height in an on-going effort to hope that there is some way that two bodies can collide without producing injurious forces to the brain (spoiler alert: there is not). To put this another way: the RFU, alongside other rugby bodies, cannot demonstrate their own product's safety, and thus, under the precautionary principle, should justifiably be prohibited: either to children alone or to both children and adults.

The precautionary principle does not require industry to provide absolute proof that something new is safe. That would be an impossible demand. However, the constant shifting of rugby tackle heights certainly indicates that they cannot prove safety.

The precautionary principle simply places the burden of proof onto sport organizing bodies, in a reasonable way. It is up to the purveyors of impact sports to demonstrate, beyond reasonable doubt, that their product is safe for the public, and not the other way around. They cannot, however, because it is not. Faced with being unable to prove that

their products are safe, many major impact sport industries now formally recognize a link between brain collisions and permanent brain damage from concussion.

Contradictions in Existing Sporting Policies

Many organizing bodies of impact sports postulate what child abuse is, definitions that are consistent with the application of sport to children within their organizations. For example, the England Rugby Safeguarding Children Policy (2023) first declares that children are those aged under 18 before declaring that ‘all children are entitled to feel safe and protected from any form of abuse ...’. before writing:

Physical abuse may involve hitting, shaking, throwing, poisoning, burning or scalding, drowning, suffocating, or otherwise causing physical harm to a child. Physical abuse may also be caused when a parent or carer fabricates the symptoms of, or deliberately induces, illness in a child.

Examples of physical abuse in sport include extreme physical punishments; forcing a child into training and competition that exceeds the capacity of his or her immature and growing body or limitations of a disability.

Taking together the literature presented throughout this article on the known physical harms of impact sports, England Rugby’s own safeguarding policy outlines that permitting children to play contact rugby is child abuse. One cannot be complicit in allowing young bodies and brains to collide into each other and call this a ‘safe’ environment. Such collisions induce physical harm and increase the risk of neurodegenerative diseases and thus is child abuse by England Rugby’s own definition.

If we turn to boxing, England Boxing also hold a contradictory position on hitting children. They state:

It is never acceptable to physically assault a child or young person.

Physical assault occurs where someone physically hurts or injures are child or young person. This can occur in a number of ways including hitting, shaking, throwing, burning, biting and giving alcohol, drugs or poisons.

The over-riding principle is that any behaviour that threatens the welfare of a child or young person is prohibited and requires reporting and possible action. The participation of children and young people in the sport of boxing should be enjoyable and safe. Any behaviour that affects these goals amounts to a safeguarding issue.

With this juxtaposition that it is a physical assault to hit a child outside the ropes, but boxing inside, England Boxing clearly demonstrates the principles of ‘work as imagined’ and ‘work as done’ (Hoc and Leplat 1983) being in conflict. These are the words of a sport that both condones and facilitates one child hitting another in the head yet that action is contrary to their own safeguarding policy.

Safeguarding in Martial Arts already has no hitting a child in the head as best practice (CPSU 2019; NSPCC 2019; Safeguarding Code in Martial Arts 2020). To date, however, no case law could be discovered in this respect. Should a child receive harm during combat sport practice through being hit in the head, there is likely to be a clear duty of care and the stakeholder in charge of that practice may be open to litigation.

However, even with these existing policies in the UK and similar existing in many countries, harm to children is still apparent. Combat sports still persist in allowing children to strike each other in the head as a desired aim, and recent safeguarding and duty of care failures are identifiable (Whyte 2022). Hence, an independent government report found that safeguarding and duty of care to children requires improvements (Grey-Thompson 2017).

At the core of these same policies, prohibiting the hitting of children while simultaneously promoting hitting, is social context. Cultural perception is that tackling a student during a math lesson is abuse but tackling a student in PE is sport; striking a child outside the ring is abuse, but striking a child inside the ring is boxing. Important to remember, however, is that the brain does not care for social context, and the neurological damage from head impacts is the same across contexts. Intentionally structuring sport to result in impact to the brain is to *intentionally* subject a child's brain to be hit. This is why we call it child brain abuse.

Child brain abuse can also be implicated with neglect. All child protection policies for these sports draw attention to neglect as a form of child abuse. The RFU's policy states, 'Somebody may abuse or neglect a child by inflicting harm, or by failing to act to prevent harm'. Given that children playing rugby are at risk of both 'now injuries' and 'later diseases' (a fact that the organizing body acknowledges), *failing to act to prevent this harm* is, therefore, by their own definition, negligent at best, and may be willful child abuse at worst.

Delay, Deny, Deceive, Ignore

While the organizing bodies of impact sport can no longer deny the seriousness of 'now injuries', many appear to remain engaged in known strategies of resisting change in practices and culture, through denial, delaying, deceiving, and ignoring evidence of harm, all contrary to the growing social awareness of later injuries.

Highlighting deflection tactics, the narrative has been reversed with many sporting organizations placing the responsibility on researchers to prove harm to children, rather than the sport organizations to prove safety and evidence the benefits of sport structured brain trauma for children. Many detractors also engage in deflection through the false equivalence of risk to other activities. For example, the first line on the England Rugby (2023a) 'Concussion Prevention' public information page, as of October 2023, states, 'Concussion occurs every day in the street, on school playgrounds and in the workplace'. Attempting to equate the risks of participating in rugby with 'everyday' activities, such as crossing the street, is an uncritical, unacademic and unevidenced argument regularly used by purveyors of the sport.

Highlighting denial, Pop Warner, the largest American children's American football provider, wrote on their website (January 2023):

Warner's independent medical advisory committee of neurosurgeons, sports medicine physicians, pediatricians and scientists has led us to implement the most stringent player safety rules in the game. Our efforts to keep kids safer are driven by objective data. While opponents point to research that claims youth football can lead to CTE, the truth is no conclusive proof exists. Many of the nation's leading medical researchers point out that there is no proven connection between

youth football and CTE.(1)(2) As parents, players, coaches and administrators, we need to know more and we encourage more advanced, unbiased research into this issue.

While this was recently removed after critical questioning by the Concussion Legacy Foundation, it remains on a subsidiary site. The point is that Pop Warner, which serve 425,000 children, denied a causal link with two references: one a 2018 opinion piece and the second a defunct link. Given the lack of updated material to reflect the National Institutes of Health statement of casualty, this appears to be intentional deceit.

The website for World Rugby (2023, 2023b) does not do much better, coaching brain health in a basic tutorial of all factors that contribute to brain health:

World Rugby is working hard to improve measures directed towards prevention, research, education and practice around the particular risk factor of brain injury. As a community, we work hard to prevent unnecessary head impacts.

There is thus tacit admittance that the sport causes brain injury, but their website also deflects. Notably, they have not ruled children out of tackle rugby to prevent, 'unnecessary head impacts'. Logically then, World Rugby assume brain injury for children is 'necessary' yet provide no supporting evidence to why. Moreover, note in their paragraph below the claim that one should manage anxiety and eat well for good brain health but fails to mention that one should avoid concussion to avoid poor mental health.

Physical things like checking your hearing, blood sugar and blood pressure, eating well, while getting regular exercise are all good for your brain. Making sure you manage your mental health, avoiding stress, managing anxiety and depression, while avoiding social isolation are all similarly important.

Examining the English Football Association's website, as of January 2023, there is an omission of the topic of 'later' brain diseases. There is no mention of CTE on their website, despite research showing its over-representation among retired Association football players (Mez et al. 2020).

In the face of growing evidence of harm and cultural shifts, these framing tactics (Piggin et al. 2022) must now be challenged, and those involved with sport, including the wider academic community, should be considered negligent and complicit in the abuse of children if they fail to 'act to prevent' this harm.

This tactic can, however, be avoided through prohibition of children to partake in impact sports in the first place.

Prohibition Has Precedence

It may be tempting to think that organized sport should be exempt from prohibitions related to sport because there is, ostensibly, some health benefit from sporting participation, alongside demonstrable harm. This argument is firstly diminished on the account that there are equivalent sports on offer that remove the structure of intentional impact: rugby has tag, flag and ripper versions; football can be played without heading the ball at all; and combat sports do not need to land punches to the head or even the body to be scored. It is only culture, tradition and emotion that

drives sport evangelists' belief that such intentional impacts are 'necessary' for children in these sports.

Secondly, there is a history of prohibiting children from sporting danger. The Football Association in England determines that one cannot head the ball in practice until aged 12, the same age in which USA Hockey permits checking. Olympic divers need to be 14 and Olympic gymnasts 16. Most gym memberships prohibit children from lifting weights until they are 16. UK Athletics prohibits children from partaking in half-marathons until 17, and marathons until 18. There are also restrictions by the governing bodies of impact sports. One cannot play adult rugby union until 17, while the NHL and NASCAR are 18, the NBA 19, and the NFL 20.

The list of prohibitions above is not exhaustive, but it shows that sporting bodies recognize that children, and even young adults, need to be protected from the harms of sports in ways they determine adults do not. Our argument that children should be prohibited from impact sports thus fits in line with a larger body of sporting practice that seeks to protect children from the dangers of various sports: There is significant precedence.

The Ineffectiveness of Safety Measures

A common strategy to bely concern over brain health is mitigation through safety measures: usually helmets or gloves. Such safety measures fail. Sometimes they exacerbate the problem.

Helmets worn in American football do not protect one from brain trauma (Sone et al. 2017). They prevent fractures but fail to stop the brain from moving within the skull. In fact, there is no evidence to support the use of personal protective equipment in the prevention of traumatic brain injuries in any sport. They may even increase damage via risk compensation as athletes take increased risk due to a sense of increased protection (Thompson et al. 2001). Thus, they hit harder. Hardwicke et al. (2022) show most competitive cyclists hold the false belief that helmets protect from concussive injuries and thus they fail to seek medical care for head injuries, even when crashing and cracking their helmet. To them, a cracked helmet means the helmet 'did its job'. The introduction of safety equipment, therefore, may increase the harm to athletes in respect to concussion.

Exemplifying the idea of risk compensation in the sport of rugby, research shows that those wearing standard headgear had a 14% higher risk of injury (Mcintosh et al. 2009). When high school American football players' don helmets with G-force sensors, they even try to see who can register a bigger hit (Conidi 2015).

Changing Cultural Sentiment

No helmet, impact sensor, neck-strengthening exercise, neuromuscular training in warm-ups or tackle-height change will save children's brains from the repercussions of collision. There is no science coming to save the day for impact sports. The structure of many sports is squarely at odds with brain health.

The question thus becomes: how do we change the sports to protect children from the adults who provide these health-denigrating products? How do we stop adults from falsely signaling the health virtues of these sports for children?

The answer is that laws, rules, and policies around impact sports need to either be enforced or established. However, given legal change normally follows social change, we need culture to change its understanding of these sports. Fortunately, this is something that is rapidly occurring (Parry et al. 2022). It may be one reason why the Active Lives Survey shows that despite population growth, the numbers of 16+ who play Rugby Union Football are rapidly diminishing, having fallen from 259,600 in 2016 to 196,900 in 2022.

Failed Rebuttals

There are no arguments for exposing child to sport structured brain trauma that are housed within a health promotion or health acquisition framework. Thus, when proponents of impact sports argue for children's participation under a health framework, it is the running and movement which brings exercise benefits, not the collisions. There are numerous ways children can participate in sport and exercise without structured brain trauma.

This then leads proponents of impact sports to advocate for them over non-impact versions on two grounds: 1) they are fun and 2) because failing to groom children to adult versions of the game will fail to educate them how to 'safely' take hits or develop 'tackle technique' as adults.

We have already addressed the issue of fun, suggesting that fun alone is no reason for children to engage in dangerous activities. Second, there is no research showing that tackle rugby is more fun than touch. It may be hegemonic, but this is not a valid measure of fun.

The grooming argument is then negated by the facts that sport has a tremendous childhood dropout rate after puberty, so removing impact from youth sport would protect the majority compared to the minority who matriculate to professional sport. It is then the responsibility of sport bodies to inform 18-year-olds of the damage and to teach them how to take impact before they are engaged in games that feature tackling or hitting.

Final Considerations

There are no evidenced psychological, social, or physical health benefits of partaking in impact sports compared to their non-impact versions. There are, however, clear and present dangers to children's brains resulting from participation in them; games in which children cannot provide truly informed consent; and games for which there exists no mitigating safety gear. Impact sports should thus be examined through the same framework of other child protective laws around sex, drugs, and financial matters, taking consent out of parental or school's locus.

Concepts of child abuse are normally categorized into known domains of physical, emotional, sexual and neglect. We add a hybrid category, 'child brain abuse', because it takes physical abuse to create both short- and long-term emotional damage, alongside cognitive detriments, a variety of motor-neuron diseases, and early mortality. There is also abuse by neglect of impact sport providers to protect children from this unnecessary harm.

We thus take existing legal and policy frameworks and expand the cultural conceptions to include child brain abuse as a fifth form of child abuse. If an adult facilitates children smoking, we call it child abuse; if an adult facilitates sexual activity with or between children, we call it child abuse; if an adult slaps, hits, or shakes a child, we call it child abuse; if an adult facilitates children being hit in rugby or boxing, we should all call it child abuse.

We find jurisprudence in British law and United Nations convention. We find support from the moral concept of the precautionary principle. We have even shown that many impact sport organizations themselves define the act of hitting or shaking a child as abuse. Given that there is considerable precedence for prohibiting children's participation in multiple other sporting events, even until ages even beyond that of majority, adding impact sports to the prohibition list until the age of majority has precedence.

The degree to which one commits child brain abuse is outside the scope of this paper, but nonetheless deserves attention, as there is a difference between knowing about now and later diseases and ignorance of the dangers. One might be worthy of prosecution because it contains intent, while the other might not as it is conducted out of ignorance. There are also questions about degrees concerning child brain abuse. Like all prohibitions, there will be an abundance of unintended consequences, slippery slope scenarios, and moral implications to the enforcement of existing prohibitions or promotion of new prohibitions concerning impact sports as child brain abuse. However, such complexities should not stop us from placing a child's brain before the continuance of a sport.

With this article, we thus hope to influence a change in cultural sympathies by educating readers but also by invoking stigma against those who proffer impact sports for children—behavior change does not emanate from education alone.

Detractors of our 'impact sport as child brain abuse supposition' will fail to counter our hypothesis with biomedical research and will thus attempt to dismiss us as morons, wusses, or anti-sport. The argument will likely be conflated with a reactionary 'why not ban all sport' and that people should have individual liberty to partake in dangerous activities. To this we reiterate that the argument applies only to children and only to the elements of impact sports in which brain trauma exists by design, such as a rugby tackle. Our argument may be called preposterous. There will likely be attempts to dismiss us by suggesting that we aim to wrap children in cotton wool. There may be attempts to discredit us, but truth is on our side. Hence, detractors may call us what you will, but we call the very fact that this article is published in a sport journal, progress to protect children from abuse.

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