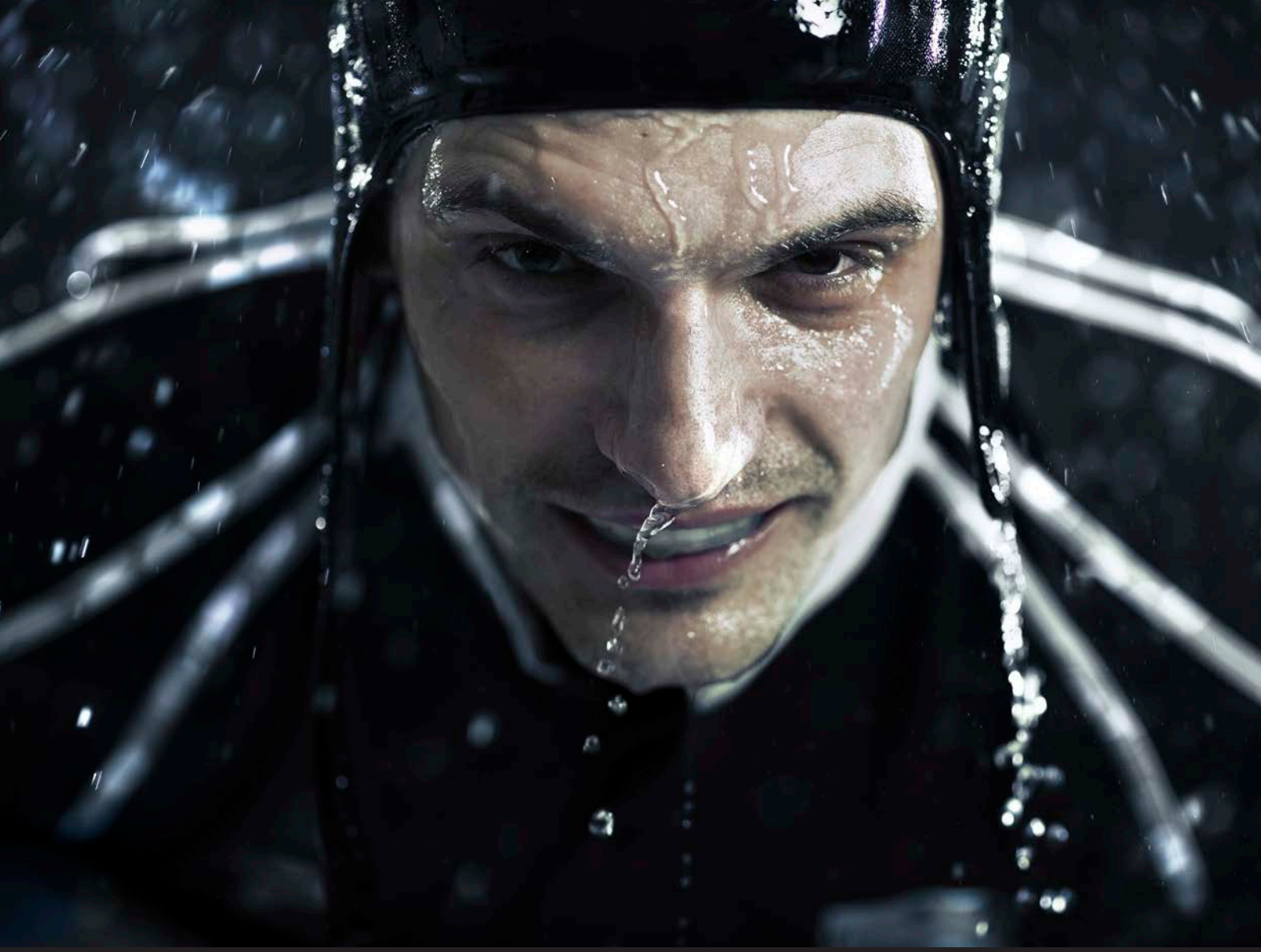

FOOTBALL, HEAD INJURIES AND THE RISK OF DEMENTIA 2016 UPDATE

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ACKNOWLEDGEMENTS

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February 2016

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ALZHEIMER'S AUSTRALIA NSW 2013 DISCUSSION PAPER

Alzheimer's Australia NSW published a discussion paper in March 2013 examining the connection between later-life cognitive impairment and dementia (primarily Chronic Traumatic Encephalopathy – CTE) in football players who suffer multiple concussive and subconcussive injuries throughout their playing career. The paper included a review of the research available in March 2013, examination of media reporting of the issue, and a number of interviews with specialists working in the area of concussion and CTE.

In this current paper and the 2013 version, Alzheimer's Australia NSW has used the term 'football' to describe the four main football codes popular in Australia – rugby league (National Rugby League - NRL), rugby union (Australian Rugby Union - ARU), 'Aussie rules' (Australian Football League - AFL) and soccer (Football Federation Australia - FFA).

WHAT DID THIS PREVIOUS PAPER REVEAL?

Research into a type of dementia linked to repetitive brain trauma including concussive or subconcussive blows to the head has developed. This type of dementia is a neurodegenerative disease which involves a build-up of the toxic tau protein and the progressive death of brain cells[i]. Known as Chronic Traumatic Encephalopathy (CTE), it was first noticed in boxers and described as being 'punch drunk' in 1928. Punch drunk was later termed 'dementia pugilistica', literally meaning 'dementia of a fighter'. In the 1960s the condition was renamed CTE. In recent years, awareness of CTE has increased as it has become associated with sports such as American football, hockey, soccer and wrestling[ii].

The onset of CTE is often in midlife - years or decades after recovery from the initial effects of concussive or subconcussive brain trauma. Symptoms identified by some researchers include: poor concentration, or attention and memory loss as well as disorientation, dizziness and headaches. People with CTE can experience irritability, outbursts of violent or aggressive behaviour, confusion and speech abnormalities. Some research also shows a higher frequency of suicide, drug overdose and depressive disorders during this stage for people with CTE compared to the general population. As the disease progresses there is a greater loss of motor functioning[iii].

CTE may be misdiagnosed as Alzheimer's disease or fronto temporal dementia (FTD) which share similar presenting clinical symptoms. Clinical diagnosis is difficult due to a lack of consensus on diagnostic criteria. The only way to definitively diagnose CTE is through post-mortem neuropathological autopsy and there is no evidence-based pharmacological treatment available for CTE[iv].

Football players may sustain concussive or subconcussive injuries throughout their playing career, with research suggesting this may increase their risk of developing CTE. The relationship between concussions and traumatic brain injuries (TBIs) sustained in football and dementia is complex.

Symptoms of concussion include: inability to remember the cause of the injury or events that occurred immediately before or up to 24 hours after it happened; confusion and disorientation; difficulty remembering new information; headache; dizziness; blurry vision; nausea and vomiting; ringing in the ears; trouble speaking coherently; and, changes in emotions or sleep patterns. Symptoms often appear at the time of the

injury or soon after, yet sometimes they do not develop for days or weeks. Symptoms are usually temporary and clear up within hours, days or weeks, but they can last months or longer. Cognitive changes are among the most common, longest-lasting and most disabling symptoms that can result directly from concussions. The ability to learn and remember new information, the capacity to pay attention, organise thoughts, plan and make sound judgements can be affected[v].

It is important to establish that not everyone who has experienced concussion will develop CTE. In addition, we don't know what the other factors are that make some people more susceptible than others (e.g. genetics).

> *"Most people agree that repeated head trauma cannot be good for you… We can't ignore the current data and pretend we are immune here in Australia but we need to conduct sound research of our own before we can draw conclusions."*
>
> Dr Andrew Gardner, Co-Director, Sport Concussion Clinic, Hunter New England Local Health District[vi].
>
> *"We don't yet know whether the risk is 1 in 10,000; 1 in a million; or 1 in 10 million. We also suspect that there are genetic factors that make some people more susceptible to CTE. The first one that comes to mind is called APOE4 and is known to be linked to Alzheimer's and to poor outcome from head trauma."*
>
> Professor Sam Gandy, Professor of Neurology and Psychiatry (Dual Primaries); Mount Sinai Chair in Alzheimer's Disease Research; Director, Center for Cognitive Health and NFL Neurological Care; Associate Director, Mount Sinai Alzheimer's Disease Research Center[vii].

Alzheimer's Australia NSW believes that the association between concussions and other head injuries sustained in football and the development of dementia is sufficiently concerning for steps to be taken to protect players. We must ensure that the likelihood and impact of risk events is reduced to protect players' current welfare and future well-being. Potential risk events include:

- Accidental head clashes
- Poor tackling techniques (including shoulder charges)
- Striking
- Falls
- Heading the ball

Many of these risk events are accidental in nature, making it difficult to change the games' rules to entirely remove risks. Protective soft headgear is often seen as a way of reducing a players' risk of head injury. However, according to international experts on concussion in sports, there is no clinical evidence that the protective equipment currently available will prevent concussion. Headgear and mouthguards are not effective at preventing concussions or head injuries as they do not stop the brain from moving around inside the skull which is what causes concussion[viii].

Proper management of concussions when they do occur is therefore critical to protect players' current and future wellbeing. The foundation of concussion management is physical and cognitive rest until symptoms resolve and then a graded program of exertion prior to medical clearance and return-to-play[ix].

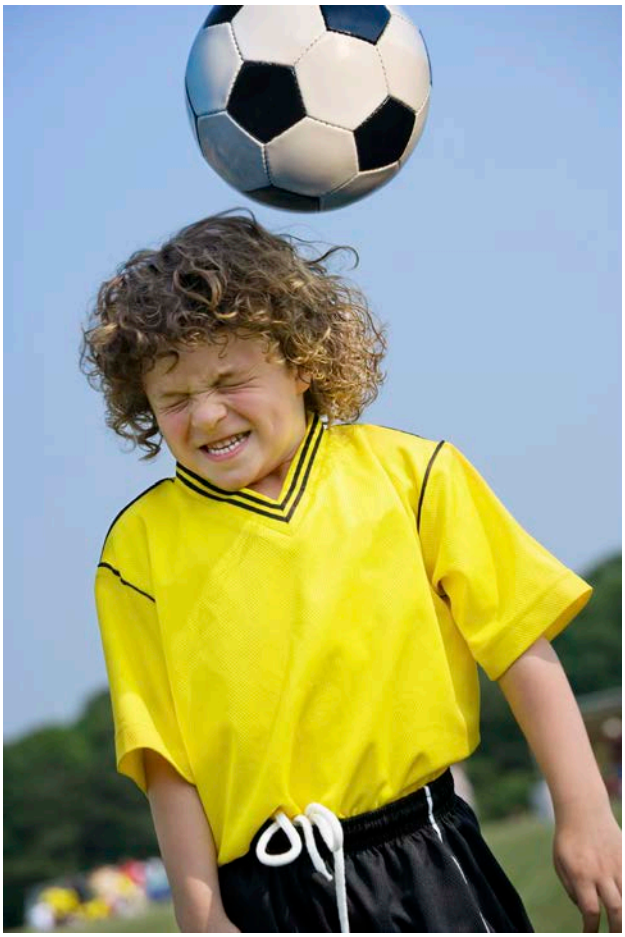
When we published the first paper in 2013, the four football codes in Australia each had expressed concerns about the welfare of their players and had developed concussion management guidelines which adhered to international guidelines. Some codes have separate guidelines for professional and community level players, whilst others have guidelines that apply to all players. In addition, each code has different guidelines for children or junior players.

Proper management of concussion is an important issue for junior players. The human brain is not fully developed until early adulthood. The prefrontal cortex is one of the last regions to develop. This brain region is responsible for cognitive analysis and abstract thought, and the moderation of behaviour in social situations[x]. Head injuries to a young developing brain therefore have the potential to result in significant damage. The Sports Concussion Assessment Test (SCAT) now has the Child SCAT3 specifically for young children aged between 5 and 12[xi].

Although concussion management guidelines were in place for all codes, it was and remains difficult to ascertain to what extent these are enforced, at both elite and community levels. Instances of guidelines being flouted in professional games, with players suspected of concussion remaining on or returning to the field, were identified at the time of writing.

> *"With player welfare becoming increasingly paramount, the NRL introduced guidelines this season that if a player shows signs of concussion he must be replaced and can't return until he's cleared by the club's medical officer. Yet Ryan Hoffman was knocked into Disneyland after attempting a tackle early in the win over South Sydney and was seen staggering around for a couple of minutes but stayed on the field. The back-rower scored a try a few minutes later and won the man-of-the-match award. You can't blame Craig Bellamy [coach] for wanting his best players on the field but if there's a rule in place it must be enforced for all matches, regardless of whether they are trials, regular season games, finals or representative fixtures."*

Example of the flouting of concussion guidelines in the NRL as reported by Yahoo Sports in 2012[xii]



WHY THE NEED FOR AN UPDATED DISCUSSION PAPER?

Since the publication of our paper in March 2013, public awareness of the potential long-term effects of concussions and mild traumatic brain injuries sustained in sport, especially different types of football, has continually increased. There is a growing understanding of the link between blows to the head experienced in football and other contact sports, such as boxing, and the potential for increased risk of dementia in later life.

The football codes' administrative bodies and team officials have an obligation to provide a safe work environment for their players. Reckless and negligent behaviour, such as not ensuring that concussion management guidelines are adhered to could leave them legally exposed should players develop later life cognitive impairments and a causative relationship can be established between neurological damage and playing. The potential legal implications and costs for Australian codes have been highlighted and quantified by the US$765 million class action settled by the NFL and ex-players.

WHAT CHANGES HAVE HAPPENED SINCE 2013?

The picture in relation to clinical research into CTE and concussion has become more complex as more researchers examine the issue from different lenses. It remains an area in need of further research, particularly to understand why some players are more likely to experience concussion, and why some players who experienced concussion develop CTE while others do not. It is a complex issue, and a risk-averse approach to player health and welfare is prudent at this time.

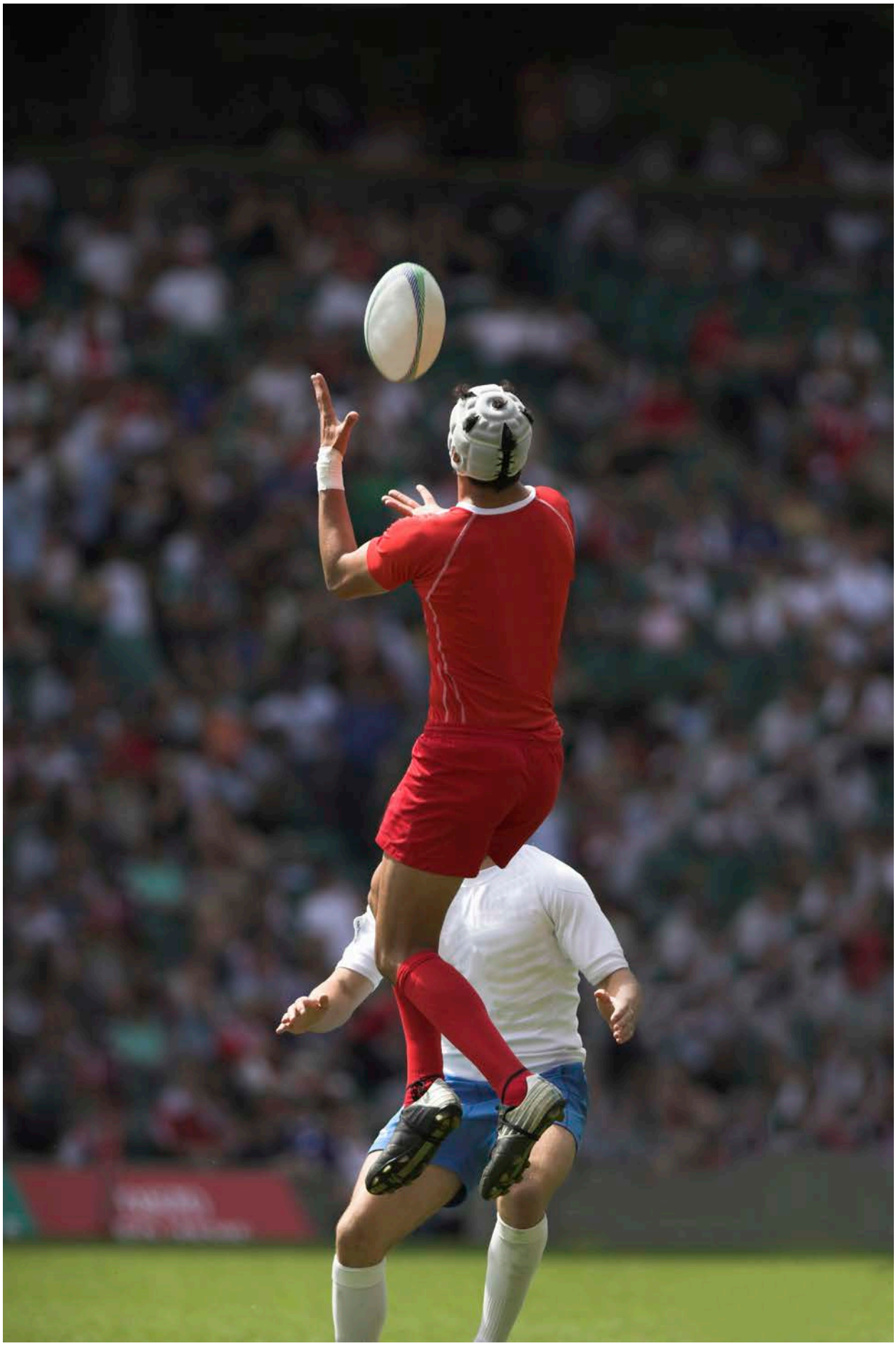
Overall, improvements have been made by the football codes including rule changes and more obvious enforcement of concussion guidelines. There is also increased public awareness of the issue and discussion within codes, especially NRL, ARU and AFL, where the incidence of concussion are much higher than for soccer.

The revised concussion rules for the NRL, ARU and AFL attempt to minimise subjectivity in medical staff judgements by instituting mandatory 'non-return to field' if a player exhibits any of the following signs:

- Loss of consciousness
- Falling to the ground without taking protective action
- Seizure
- Memory impairment
- Balance disturbance (ataxia)

This is a positive development that assists medical staff to make a decision in what can sometimes be a difficult-to-diagnose situation. Medical staff are also being supported by use of the updated SCAT3 which contains improved wording, includes a neck examination, a modified balance examination and some background health questions the person conducting the assessment must ask the athlete[xiii]. These developments should result in fewer players being able to hide these signs from staff, thereby remaining on the field of play and placing themselves at greater risk of increased injury/damage.

The policies of the FFA, ARU, NRL and AFL all changed between 2014 and 2015 with the non-return inclusion, backed up by a clearer requirement for clearance by a medical professional and emphasis on player welfare ("If in doubt sit them out")[xiv]. Importantly, the governing bodies took a stronger line on enforcement of the changed rules. For example, in 2015 the NRL fined the Parramatta Eels for not following its revised concussion protocol properly[xv].



Pleasingly, the attitude and tone of football commentators and former players has markedly changed over the three years since publication of the previous paper by Alzheimer's Australia NSW. Instead of suggestions that the lawmakers will "have them playing tiddlywinks", there is now praise for adherence to concussion guidelines, respect for the medical professionals who are charged with looking after the immediate and longer-term welfare of the concussed player, and criticism when the guidelines are obviously flaunted. This is important for changing public perceptions of the risks involved, elevating the importance of the issue, and combating inaccurate perceptions that the players are 'weak' or 'soft' if they leave the field following a potential concussion.

> *"...it's important the next generation of players do not have to suffer the brain injuries that I have."*
>
> Mario Fenech, former rugby league player[xvi]

Since 2012, clubs such as the Newcastle Knights have formed relationships with medical researchers and a neuropsychologist at the Hunter Medical Research Institute and Hunter New England Mental Health Service. The involvement of these professionals has supported Knights player James McManus who experienced three concussions in 2015 – the final one of which occurred on 25th July and, at the time of writing, saw him miss the remainder of the 2015 season and possibly sit out the 2016 season. Importantly, both the CEO and coach of the Knights have voiced their public support for the medical professionals and the player's welfare[xvii] symbolically shifting the tone away from ''wearing your concussion as a badge of honour''[xviii] to one where the health of the player is paramount.

> *''I know they're taking it really seriously, so whatever they think is the best thing for James, we'll go down that path."*[xix]
>
> Matt Gidley, CEO Newcastle Knights
>
> *''As you learn as you get older, footy is a wonderful game, but there is a lot more to life ahead of you. I think his health is the No.1 priority for himself and the club at the moment.''*[xx]
>
> Nathan Brown, Coach Newcastle Knights

The ARU Concussion Guidance document states, "rest is the cornerstone of concussion management" and the duration of this rest period is "until all symptoms and signs of concussion have disappeared"[xxi].

Perhaps the greatest remaining area of concern is the attitude of existing players on the field, or who have just been removed from the field by medical staff, who do not want to leave the field and/or publicly criticise those people charged with looking after their welfare when their own decision-making ability is compromised.

> *"The player's instinct is always that they are fit enough to play on because of their desire to serve the team"*[xxii]
>
> Chris Dutton, Sports Reporter, Fairfax
>
> *"Players will invariably take risks. It's up to clubs and governing bodies to temper that attitude."*[xxiii]
>
> Darren Kane, Sports Lawyer

This desire to 'serve the team' may actually do more harm to themselves and, due to their impaired cognitive state, may result in poor decision making that has a negative effect on the team's performance. It is an understandable viewpoint of players, who are highly motivated and team-oriented, have trained for years to reach the pinnacle of their game, and invariably love the game that they play and want to maximise their involvement.

CONCLUSION

With the connection between concussion, TBI, CTE and dementia, Alzheimer's Australia NSW would ideally like to have no players experience concussion in their playing careers. As this is unlikely as it is an ever-present risk in contact sports, the successes the four major football codes have had in reducing the likelihood of player concussion through rules changes is supported and they are to be congratulated.

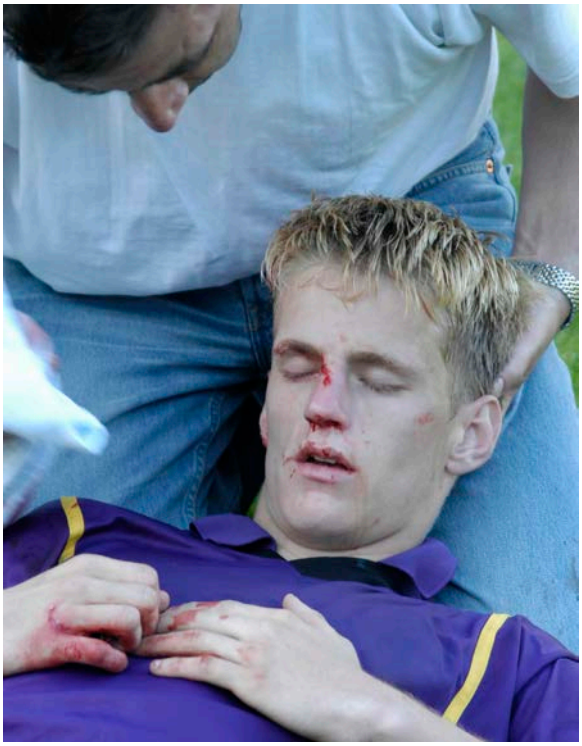
The seriousness with which all codes are responding to concussion within their game and the increased focus on player welfare by recognising it, removing players from the game, enforcing stand down and rest periods, and involving medical practitioners as independent decision makers, is to be encouraged. The leadership on attitudinal change shown by the codes has been reinforced by ex-players who have seen some of their team mates experience serious health issues such as CTE. The words of prominent former players such as Mario Fenech, who does not want players today to face the same problems he is dealing with, are a clarion call on this issue.

Further research is needed within Australian settings to understand the complexities surrounding who does and does not experience concussion and subsequent later life CTE. In addition, more research into rest and recovery periods is warranted as decisions over this rely on professional judgement and discretion rather than clinical evidence at this stage.

Player attitudes to medical professionals and coaches, who are required to follow guidelines and protect the welfare of those very players, is an area that needs addressing. Further education on the topic for current players and meeting ex-players with CTE would highlight the risks and consequences of not heeding the rules that have been put in place based on the latest available clinical research and consensus reached by sporting administrators.

WHAT STILL NEEDS TO HAPPEN?

1. Research in Australia, particularly to understand the complexity of incidence of CTE and why some players are more prone to concussion and CTE than others.
2. Policies for each of the four major codes continue to reflect international consensus statements on concussion and use of latest SCAT as the body of research improves in coming years.
3. Enforcement of the codes policies occurs with stronger punishments and disincentives for clubs, coaches and officials who breach the policies. Children's sport is particularly vulnerable to breaches without televised coverage and less likelihood of there being qualified health professionals in attendance at all fixtures.
4. Continuing education and awareness for players of the potential risks of playing with concussion or returning to play prior to medical clearance being given.



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