

# The need to tackle concussion in Australian football codes

A call for systematic and comprehensive investigation into the long-term effects of football-related head trauma

Postmortem evidence of chronic traumatic encephalopathy (CTE) in the brains of American National Football League players who suffered concussions while playing have intensified concerns about the risks of concussion in sport.<sup>1</sup> Concussions are frequently sustained by amateur and professional players of Australia's three most popular football codes (Australian football, rugby league, and rugby union) and, to a lesser extent, other contact sports such as soccer. This raises major concerns about possible long-term neurological damage,<sup>2-4</sup> cognitive impairment and mental health problems<sup>5</sup> in players of these sports.

## A hidden problem

CTE is a degenerative brain disease caused by repeated head trauma and characterised by the neural deposition of injury-related tau proteins.<sup>1</sup> CTE produces symptoms similar to those of early-onset dementia, along with behavioural and cognitive impairment. The cumulative effects of chronic and subtle brain injuries resulting in CTE can currently only be observed postmortem.

CTE is usually linked to a history of "concussion", but tauopathies have also been found in postmortem examination of the brains of young footballers who did not report such a history,<sup>6</sup> and only a minority of athletes who suffer a concussion appear to develop CTE.<sup>7</sup> Genetic and other risk factors (eg, age, multiple concussions, drug misuse) may place some athletes at greater risk.<sup>7</sup> The extent to which milder degrees of head trauma (or "subconcussions") are implicated in neurodegeneration remains to be elucidated. Footballers with a history of multiple concussions appear to be more likely to experience severe neuropathological symptoms, including memory impairment and depression.<sup>5,8</sup>

Our understanding of the precise neuropsychological effects of concussion has been limited by methodological variability in the selection of cohorts for study, the precision and nature of the neuropsychological tests used to measure impairment, and a reliance on self-report rather than more objective medical reports of head injuries. There is an urgent need to investigate the cumulative effects of head traumas over longer periods using methods that track an athlete's playing history and record head injuries in standardised ways to allow valid comparisons across cohorts. For instance, in the United States, Mayo Clinic now offers a baseline concussion

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testing program at no cost to high school athletes in Arizona and Minnesota.<sup>9</sup>

The implementation of such research in Australia would require the cooperation of the three major football codes to obtain sufficient numbers of footballers to provide meaningful results about the sequelae of head injuries. Such cooperation need not exclude collaborations with other contact sports that may involve a risk of head trauma, such as soccer. This research may raise uncomfortable questions about how head injuries are managed, but it is crucial for the football codes to facilitate such research to ensure the safety and future welfare of their players.

## Guidelines on return to play after concussion

In the meantime, there are prudent steps that football codes can take to make their sports safer for amateur and professional athletes. The Zurich consensus statement on concussion in sport<sup>10</sup> and a position statement from the American Academy of Neurology<sup>11</sup> both recommend that athletes suspected of suffering a concussion should be removed from the game, assessed by a physician, and not permitted to return while they are still suffering the effects of concussion. It is now unlawful in several US states (eg, Arizona<sup>12</sup>) for a concussed athlete under 18 years of age to be permitted to return to play until he or she has been cleared by a licensed medical health care provider.

The Australian Football League (AFL) adopted a return-to-play guideline at the beginning of the 2011 season that excludes concussed players from continuing to play in the same match.<sup>13</sup> The enactment of this rule highlighted the lack of similar policies to reduce concussion and secondary head trauma in professional rugby league and rugby union in Australia, although the International Rugby Board has since adopted the recommendations of the Zurich consensus statement.<sup>10</sup> The National Rugby League should also make this a priority.

If concussion rules are to succeed, they must be enforceable and consistently applied in ways that are resistant to manipulation. Their effects should also be evaluated after implementation. Team physicians play a vital role in the enforcement of the AFL's concussion rule, although this has highlighted important questions about how concussion is best diagnosed and managed under match conditions. These questions include which tests are most useful (eg, brief neuropsychological tools such as the SCAT2 [Sport Concussion Assessment Tool 2] or advanced imaging techniques such as functional magnetic resonance imaging or diffusion imaging) and who is most qualified to diagnose and manage concussed players (eg, general practitioners, neurologists, neuropsychologists).<sup>10</sup> The rule also requires management of potential conflicts of interest

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and coercive pressures that may be experienced by coaches, players and medical officers in diagnosing and managing concussion.<sup>14</sup> Assessment by health professionals who are not employed by clubs would alleviate suspicion that diagnoses may be influenced by the interests of clubs.

Well designed studies could determine whether a mandatory “sit-out” period after concussion reduces the risk of long-term harm. The International Rugby Board recommends that concussed players who are not treated by a medical officer take a 3-week break from playing, but this guideline is not easily enforced, and compliance appears to be low.<sup>15</sup> Such measures may also be unpopular with teams, players and fans. Physicians must also be vigilant against acts that may potentially undermine a concussion rule — for example, players underreporting head injuries to avoid exclusion from matches.

### Enforcing rules against deliberate contact to the head

Deliberate contact with the head is a frequent infringement in football that may be deterred with harsher penalties. For example, slinging tackles resulting in the attacking player’s head making contact with the ground, even if unintentional, could be treated more severely by the AFL Tribunal. Deterring this type of tackle may help protect the attacking player, and encourage coaches and players to devise different tackling methods to stay within the rules.

In rugby league and rugby union, it is often the player making a tackle who suffers a concussion. Coaches may point to poor tackling technique, but there is a need for more systematic investigation of who is most likely to suffer a “defensive concussion” and why. A better understanding of the number and causes of defensive concussions could help to shape rule modifications (eg, interchange rules) and training practices that would reduce the risk of them occurring. This is another area for collaboration between researchers, physicians and those inside the game.

### Headgear

Novel technologies are being used in the helmets of American football players to detect and prevent concussions by measuring the impact force of sustained blows.<sup>16</sup> However, very few footballers in the three Australian codes wear padded headgear. It is tempting to make such usage mandatory, but some studies have found no difference in concussion rates between players with and without headgear.<sup>17</sup> The reasons for this are unclear, because of methodological limitations of the studies and because the quality and safety of padded headgear are rarely tested against any agreed standard.

A further complication is the possibility of risk compensation — that is, wearing headgear might encourage players to adopt a more dangerous style of play. One study found that schoolboys playing rugby union

felt more confident and tackled harder when wearing headgear.<sup>18</sup> This has also been observed in American football, where headgear has evolved from padded leather into hard crash helmets that allow the head to become a weapon rather than a body part to be protected.<sup>6</sup>

### Young athletes

Reducing the risk of concussive and subconcussive impacts is even more critical at the non-professional level, where there is a large population of vulnerable young players to whom a significant duty of care is owed.<sup>6</sup> Most reported cases of second-impact syndrome (when a brain that has not healed from a previous injury suffers an additional trauma) that led to death or severe disability have occurred in young athletes.<sup>19</sup> Yet most amateur teams do not have qualified health professionals or other staff who are trained to detect and assess concussion. At this level of sport, many concussions likely go unrecognised and incorrectly managed.<sup>20,21</sup> However, if players and sporting organisations at the elite level change their approach to head injury and concussion, it is hoped that those at amateur levels will do likewise.

### Conclusions

Australia’s football codes need to attend to the cumulative effects of years of chronic or subtle brain injuries among their players at the elite and amateur levels. There is a medical and ethical imperative for all football codes to minimise the risks of head injuries and concussion among players. An essential step will be cooperation between researchers, physicians and the football codes in commissioning large-scale prospective studies of head injuries among elite and younger players. In the interim, all contact sports should adopt and evaluate the effects of precautionary policies that require concussed players to leave the field.

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