

**INDEPENDENT REVIEW OF THE WORK UNDERTAKEN BY
ASSOCIATE PROFESSOR PAUL MCCRORY
FOR OR AT THE REQUEST OF
THE AUSTRALIAN FOOTBALL LEAGUE**

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CHAPTER 1: INTRODUCTION

- 1 This report has been written by Bernard Quinn KC and Jane Lindgren of counsel, who were engaged by the Australian Football League (**AFL**) to conduct an independent review into work undertaken by Associate Professor Paul McCrory for or at the request of the AFL in relation to concussions and, in particular, their potential long-term impacts.
- 2 Professor Michael O’Sullivan, a neuroscientist and neurologist, has assisted us with the review and preparation of this report. Prof O’Sullivan is a Senior Staff Specialist in Neurology and Director of Research at the Royal Brisbane and Women’s Hospital. He is also a Professor of Translational Neuroscience and Research Group Leader at the University of Queensland Centre for Clinical Research and Affiliate Professor at the Institute of Molecular Bioscience, University of Queensland. Prof O’Sullivan has significant experience managing concussion injuries and long-term neurodegenerative diseases. In this report, we identify where our views are based on information and expert advice provided to us by Prof O’Sullivan.
- 3 The AFL appointed law firm Gordon Legal to provide assistance and support to the independent review. That assistance included collating documents, liaising with witnesses, corresponding with third parties and technological and administrative support as required.
- 4 The independent review addresses terms of reference provided by the AFL. A copy of the original terms of reference dated 11 April 2022 and slightly expanded amended terms of reference dated 12 May 2022 are included as Annexures 1 and 2 respectively. There are seven terms of reference in total which contain several sub-paragraphs. By the seventh term of reference the AFL has asked us to make recommendations arising from our review.

What prompted the review?

- 5 Associate Professor McCrory is a neurologist, general physician and sports physician with particular expertise in the area of traumatic brain injuries. He is regarded as a leading expert in sports concussion both in Australia and internationally. He has worked with various national and international professional sporting organisations.
- 6 A/Prof McCrory was a team physician for the Collingwood Football Club from 1984 until 1999. He has been involved in the AFL Doctors’ Association since 1984 and separately assisted the AFL with the management of concussion issues from about 2011 to January 2021. That involvement included providing advice to the AFL on its concussion guidelines, assisting with some of the AFL’s research projects and undertaking clinical work on referral from the AFL.
- 7 In recent times, some of A/Prof McCrory’s publicly expressed views on the potential long-term effects of repeated head impacts have attracted criticism both from members of the scientific community and other commentators. Earlier this year, there were also media reports that some of A/Prof McCrory’s published written work contained plagiarised text, which led to an opinion piece that he

wrote being retracted by the British Journal of Sports Medicine. Contemporaneously, the media also reported that A/Prof McCrory had provided an undertaking to the Medical Board of Australia and there has been some speculation and confusion as to the scope of that undertaking and as to whether it is relevant to any clinical treatment provided by A/Prof McCrory to current and retired AFL players.

- 8 In light of the various suggestions and allegations that have been made about these matters, and having regard to the association between A/Prof McCrory and the AFL over a period of years, the AFL sought to review A/Prof McCrory's work for the AFL, including by examining the status and reliability of past research activities and outcomes in which he was involved.
- 9 We also understand these developments have occurred during a period where there has been increasing public interest in the way the AFL manages concussions. That interest appears to have arisen in part from recent developments in science, the well-publicised diagnoses of three former AFL players with chronic traumatic encephalopathy (Graham Farmer, Daniel Frawley and Shane Tuck), and the apparent stagnation of the AFL's research work involving retired players, which was first publicly announced in 2014 and with which A/Prof McCrory was involved. That research project was undertaken by the AFL together with the Florey Institute of Neuroscience and Mental Health (**Florey Institute**).
- 10 The Florey Institute is a leading brain research organisation based in Melbourne which undertakes research into a range of serious diseases. The Florey Institute is regarded as a leader in imaging technology, stroke rehabilitation and epidemiological studies. A/Prof McCrory's involvement with the AFL's past player research work was through his position with the Florey Institute.

Scope of the review

- 11 As observed above, the scope of the review is defined by the terms of reference. Several of the terms of reference for this investigation appear narrow in focus, inviting enquiry into aspects of the conduct and work of one particular medical expert, being A/Prof McCrory, and his relationship with the AFL. However, for various reasons the investigation of those matters has necessarily involved review, analysis and consideration of a range of contextual issues relevant to AFL player safety, health and welfare and the measures that the AFL may be expected, or even be legally obliged, to take in respect of them. Those reasons include the nature of A/Prof McCrory's expertise, his standing as a leading expert in the brain injury field, the growing appreciation of the importance of the neuroscience of brain injury in contact sports, and the broad range of matters the AFL asked A/Prof McCrory to advise on.
- 12 Specifically, our investigation has exposed, and required consideration of, the following themes and issues:
 - (a) during the period 2011 to 2021 (being that in which A/Prof McCrory was associated with the AFL) there has been extremely rapid escalation in

stakeholder and public scrutiny of, and interest in, the incidence, prevention and appropriate management of concussion in contact sports;

- (b) over that same period, the understanding of the relationship between head injuries and neurodegenerative diseases, including chronic traumatic encephalopathy, has significantly evolved. There has also been rapid growth in the scientific literature on the physiological and anatomical effects of concussion both in sport and other settings;
- (c) there has been a lively debate within the international scientific community regarding the strength and reliability of the emerging evidence of a causal association between concussions and neurodegenerative diseases, and the appropriate steps that sporting organisations such as the AFL should take in light of that evidence. Unfortunately, that debate has at times been emotional and unnecessarily personal;
- (d) litigation involving sporting organisations, particularly in the United States, has led to further polarisation and concerns as to whether sporting organisations are appropriately managing concussions; and
- (e) despite the developments in neuroscience, there remain many areas of uncertainty which sporting organisations need to navigate and accommodate in developing their concussion management policies and strategies.

13 The issues referred to above have created substantial and ongoing challenges for sporting organisations such as the AFL, as well as the medical and scientific experts advising them. These challenges have included:

- (a) the need to keep abreast with the rapidly evolving scientific evidence. This includes the challenge of evaluating and appraising an escalating body of rapidly evolving literature, assimilating it into sport-related protocols and obtaining the scientific expertise required to meet this need;
- (b) the need to ascertain, from emerging evidence and conflicting interpretations in the scientific community of that evidence, the nature and extent of the short and long term risks posed to players by concussions and repeated head impacts in sport;
- (c) the need to translate the evolving and conflicting scientific evidence into workable rules and guidelines for concussion prevention, management and return to play;
- (d) the need to further the understanding of how the evidence from other sports and contexts may apply to their particular sport and to ascertain whether the response adopted by those sports may or may not be generalisable and appropriate to their own;
- (e) related to paragraph 13(d), the need to institute appropriate research programs to study the causes, effects, risks and appropriate management

strategies of concussion and longer-term neurodegenerative conditions in their particular sport;

- (f) the need to support evolving concussion prevention and management strategies and associated rule changes by parallel education campaigns aimed at players, club doctors, coaches and the broader community, so that those strategies are not defeated by a longstanding and outdated but persistent culture of trivialisation of concussion and its potential consequences in the long and short term;
- (g) the need to identify and obtain advice and assistance from a broad spectrum of independent medical and scientific experts (despite the limited number of experts in Australia), and to utilise those expert responses for the purposes described above; and
- (h) the need to ensure that the prospects of achieving the objectives referred to above are facilitated by adequate human and financial resource allocation within the sporting organisation.

Methodology

- 14 Our investigation is not a judicial process and nor does it enjoy any statutory foundation. Accordingly, we do not possess any powers to compel production of documents or the attendance of witnesses. This means that we have been reliant upon the AFL and the various other individuals and entities representing potential sources of evidence relevant to the terms of reference to voluntarily cooperate with our requests for documents and information. In general, we have encountered a high level of cooperation in this regard, with the AFL and most other potential sources of relevant information being open and cooperative in respect of access to documents and information. Where we encountered resistance to the provision of information from any individuals or entities that we felt hampered our investigations, we have referred to this in our report in relation to the affected terms of reference.
- 15 We are grateful for the extensive co-operation we received in response to our requests for documents from various parties and requests to meet with various individuals.
- 16 In summary, the review involved six work streams.
- 17 **First**, we reviewed various AFL documents relevant to the terms of reference sourced from the AFL. We received in excess of 6,500 internal AFL documents including emails, meeting minutes, memoranda to the AFL Commission and AFL Executive, and other records. Some of those documents are referred to in this report by reference to a document ID number (for example, AFL.004.001.2209). Other documents are annexed to this report. The AFL has responded to each of our document requests without objection and we have no reason to think that relevant documents have been withheld or that the body of documents provided to us by them are less than comprehensive.

- 18 **Secondly**, we interviewed 19 witnesses. Those witnesses included current and former AFL employees, external AFL advisors, club doctors and past AFL players and medical or scientific experts.
- 19 We are grateful for the participation of those individuals in this review. The names of those witnesses are set out below in alphabetical order, save for one witness who asked not to be named. Some witnesses also provided us with copies of additional documents relevant to the review.

Name	Brief description
Dr Zeeshan Arain	Former AFL club doctor and former AFL contractor (Medical Consultant).
Dr Patrick Clifton	Former AFL employee: various roles, most recently, Head of Health, Safety & Laws.
A/Prof Gavin Davis	External AFL consultant: neurosurgeon.
James Demetriou	Former AFL player.
Ian Fairley	Former AFL player.
Michael Ford	Former AFL Player and community football coach.
Dr Peter Harcourt	Former AFL Chief Medical Officer from 2006 to October 2021. Currently an AFL contractor: Medical Consultant.
Dr Philippa Inge	Current AFL contractor: Medical Consultant.
Kade Kolodjashnij	Former AFL Player.
Dr David Maddocks	External AFL consultant: lawyer and neuropsychologist.
Dr Michael Makdissi	Current AFL contractor: Chief Medical Officer since October 2021.
Stephen Meade	Current AFL employee: General Manager – Legal & Regulatory
A/Prof Alan Pearce	External neurophysiologist who worked on a research project funded by the AFL.
John Platten	Former AFL player.
Ian Prendergast	Former AFL player and former General Manager of the AFL Players' Association.
Allan Stoneham	Former AFL player.
Daniel Venables	Former AFL player.
A/Prof Catherine Wilmott	Current AFL employee: Head of Concussion Innovation & Research.
Anonymous interviewee	N/A

- 20 The AFL co-operated with our requests to interview various individuals associated with it.
- 21 We requested an interview with A/Prof McCrory, but he declined. A/Prof McCrory has, however, provided responses to our written questions which we refer to in this report.
- 22 **Thirdly**, we engaged in detailed correspondence with various third parties during the review to obtain further relevant information. That correspondence is explained below and includes correspondence with A/Prof McCrory, the Florey Institute, the Australian Health Practitioner Regulatory Authority (**Ahpra**) and the British Journal of Sports Medicine. Gordon Legal sent correspondence to each of those parties on our behalf.
- 23 **Fourthly**, and as explained further below, Gordon Legal has also assisted us to review A/Prof McCrory's numerous journal articles and other written work to

check for instances of plagiarism. A/Prof McCrory has authored over 400 publications either as a sole author or co-author.

- 24 **Fifthly**, we obtained and reviewed medical and scientific literature related to concussion, sports-related head injury and impact and associated neurodegenerative conditions and consulted closely with Professor O’Sullivan in respect of the relevant medical and scientific issues (including in relation to research ethics) in order to ensure that we understood them.
- 25 **Sixthly**, we drafted the report and offered an opportunity to those persons and entities potentially adversely affected by the report to review and comment upon those parts that may affect them.
- 26 A pre-release copy of this report was provided to the AFL. The AFL responded with comments, and we have taken those comments into account when preparing this final version.
- 27 Pre-release copies of chapters 3 to 8 and an extract from this chapter were provided to A/Prof McCrory for consideration and comment. We have received a response from A/Prof McCrory and have taken his comments into account when preparing this final version.
- 28 Pre-release copies of chapters 7 and 8 and an extract from chapter 9 were provided to the Florey Institute for consideration and comment. We have received a response from the Florey Institute and have taken its comments into account when preparing this final version.

Forensic Issues and Standard of Proof

- 29 The nature of the review has generally been inquisitorial rather than adversarial. It will be observed that the terms of reference require us to make findings about certain matters. In making those findings, we have considered the evidence that we have obtained through the processes set out in the previous section. We have attempted to weigh various strands of evidence relevant to particular issues and make any necessary findings to the civil standard – that is, on the balance of probabilities. However, we wish to record five matters relevant to our consideration of the evidence available to us.
 - (a) **First**, we did not have the benefit of the same “testing” of relevant contentious evidence, as we would have in an adversarial process involving cross-examination by interested opposing parties. Our own “testing” of witnesses was necessarily of a different nature to that which may be taken by an opposing party seeking to establish a particular factual finding. It involved inquiry and close scrutiny of uncertain, ambiguous or inconsistent matters without the objective of establishing any particular forensic position.
 - (b) **Secondly**, we took into account the fact that some of the events that we heard oral evidence about occurred many years ago and memories about those events may have been imperfect. This does not mean that we accepted uncritically the contents of contemporaneous documentary evidence. However, we were more cautious in our approach to

retrospective explanations by witnesses about events to which contemporaneous documents related.

- (c) **Thirdly**, when we considered the evidence offered by individuals we interviewed, we kept in mind any personal, professional or other interest or allegiance they may have that may have affected their accounts.
- (d) **Fourthly**, when it was not necessary, in order to respond to the terms of reference, to reach a concluded view about a particular matter on which there appeared to be conflicting factual accounts or recollections, we generally attempted to set out the different possible conclusions without making a finding as to which was preferable.
- (e) **Fifthly**, we considered the available evidence, and made necessary findings, having regard to the seriousness of the implications of the finding for the person the subject of it and its affect upon them and their reputation personally and professionally. The approach was similar to that which would be achieved by application of the principle in *Briginshaw v Briginshaw* (1938) 60 CLR 336 in an adversarial context.

Independence

- 30 Counsel and Prof O’Sullivan were paid by the AFL to undertake this review. We consider the mere fact of payment does not detract from our and Prof O’Sullivan’s independence. No attempt was made to influence the manner in which the review was conducted, the documents and information which we sought or had access to, or the views that we formed in relation to any issue.
- 31 We have no previous relationship or affiliation with the AFL, A/Prof McCrory, or any of the individuals interviewed as part of this review which we consider could compromise our independence.
- 32 Similarly, Prof O’Sullivan has no previous relationship or affiliation with the AFL, A/Prof McCrory or any of the individuals interviewed which could compromise his ability to provide neutral opinions on medical issues for the purposes of this review. Further, Prof O’Sullivan has not been commissioned or paid by the AFL or any other sporting body to provide advice. Prof O’Sullivan’s research to date has also received no financial or other support from AFL or any other sporting organisation. His current research in brain injury is supported by the National Health and Medical Research Council and is unrelated to sport.

Report structure and guide to findings

- 33 Many of the issues discussed in this report involve neuroscience – a technical and complex area of science. To assist the reader, in **chapter 2** we have set out some definitions of key medical terms and concepts referred to in this report. We have also set out in summary form, the current scientific understanding of various issues relating to concussion management and neurodegenerative diseases, and key areas of ongoing uncertainty that scientists are currently investigating.

- 34 The purpose of **chapter 2** is to provide a neutral view on the state of the current science which can be used to have informed discussions about the various public health issues that arise from this review. We have observed a tendency in media reporting to oversimplify the science in a way that impedes rather than improves the quality of public debate about how best to manage concussion injuries. We have also observed emotive and polarised public discussion and hope further polarisation of views can be avoided if there is more balanced reporting and enhanced public understanding about the state of the current science.
- 35 The report then canvasses each term of reference in turn.
- 36 **Chapter 3** discusses the first term of reference, which is concerned with the work undertaken by A/Prof McCrory for the AFL over time.
- 37 **Chapter 4** discusses the second term of reference, regarding the allegations of plagiarism made against A/Prof McCrory. As mentioned above, there have been media reports about this issue. The instances of plagiarism that we have identified, which are detailed in this report, are limited and, in our view, they do not affect or taint the work that A/Prof McCrory has undertaken for the AFL or the substantive findings in the works authored or co-authored by A/Prof McCrory relating to concussion and/or neurodegenerative diseases.
- 38 **Chapter 5** discusses the third term of reference, regarding A/Prof McCrory's undertaking to the Medical Board of Australia not to perform specific neurophysiological procedures. As discussed below, before A/Prof McCrory provided the undertaking, new training accreditation requirements were introduced for neurologists wishing to undertake particular neurophysiological procedures on patients. A/Prof McCrory elected to give the undertaking not to perform those particular procedures rather than complete the further training. That election is not unusual or necessarily suggestive of impropriety. We are informed by Prof O'Sullivan that many neurologists do not perform those neurophysiological procedures and instead refer patients to other medical practitioners to perform those procedures. Further, the undertaking was in respect of procedures that were by their nature unlikely to have any association with treatment for concussion, head impact or related neurodegenerative disease in AFL players or anyone else.
- 39 **Chapter 6** discusses the fourth term of reference, regarding the circumstances in which A/Prof McCrory has provided clinical treatment to current and former AFL and AFLW players. Chapter 6 does not descend into a discussion of any particular players or clubs and the term of reference did not require this.
- 40 **Chapter 7** discusses all research projects participated in by A/Prof McCrory and the AFL in relation to the risk of brain injuries to players of Australian football. Two particular projects are discussed. The first project was a pilot study. The second project was launched in 2014 and involved retired AFL players.
- 41 **Chapter 7** largely focusses on the latter – the retired player project. The project was funded, overseen and managed by the AFL. The project started with an online screening survey which was completed by approximately 550 retired AFL players. Based on the survey results, individuals were identified for further

assessment and then invited to participate in further research and receive clinical treatment paid for by the AFL. The research imaging was undertaken by the Florey Institute and the clinical treatment was provided by a network of medical practitioners, one of whom was A/Prof McCrory. Some retired players were also invited to participate in separate cross-sectional research programs.

- 42 In our view the project was under-funded and under-resourced from the outset. It suffered from a lack of stewardship and coordination. There was accordingly no clear plan for how the project would be rolled-out and implemented, and how it may simultaneously accommodate clinical and research objectives. Consequently, there were no clear guidelines, processes and communication strategies to ensure that participants were not confused about what tests or procedures related to clinical treatment as opposed to being purely for research purposes. Many participants had disappointed expectations of medical advice and follow-up from tests that were for research rather than clinical purposes.
- 43 Although there have been attempts in recent years to rectify some of the problems with the project, as at the date of this report there is no published research explaining the results of the research imaging undertaken on retired AFL players. Some clinical assistance has been provided to participants who were flagged as requiring further treatment. While some of that assistance was provided in a timely way, other assistance was not. Some of the delay involved tardiness by A/Prof McCrory in reporting back to the AFL. However, there were also delays by the AFL in reporting results and advice from medical practitioners back to patients. This appears to us to have been a function of poor planning and governance and under-resourcing rather than being attributable to inaction by individual officers within the AFL, who were attempting to manage the project with limited time and resources.
- 44 **Chapter 8** discusses the relationship between A/Prof McCrory and the AFL over time. In that chapter we describe the informal nature of the relationship. In our view, A/Prof McCrory was neither an employee nor contractor of the AFL. He assisted from time to time as part of the AFL's Concussion Working Group by providing advice on various issues from 2011 to January 2021. A/Prof McCrory was also involved in setting up and assisting with the 2014 research project mentioned above. It appears to us that the relationship between the AFL and A/Prof McCrory in respect of these projects was able to take on the outward appearance of a consultancy or advisory service notwithstanding the absence of formal retainers by reason of a combination of mutual interest in the subject matter of concussion in sport, the deference of the AFL to A/Prof McCrory as a world leader in concussion research, and the existence of close professional relationships between A/Prof McCrory and AFL medical personnel as part of what was and remains a relatively small network of medical professionals with expertise in sports-related concussion.
- 45 **Chapter 9** sets out specific recommendations for the AFL in light of the issues we have identified during our review. The recommendations fall into four categories.
- 46 **First**, structural, governance and resourcing recommendations – concerning the need to have a better resourced and more accountable advisory team on brain

injury issues to avoid some of the problems which arose from having an informal Concussion Working Group which met on an intermittent basis. We understand the AFL has already taken significant steps to implement a formal structure with more advisors and greater accountability.

- 47 **Secondly**, research program recommendations – concerning the AFL’s plans for future research on concussions and neurodegenerative diseases. At this stage, the AFL is supporting several research projects in relation to diagnosing and treating acute and subacute concussions in the short term. While there is a general plan to invest in research regarding longer-term neurodegenerative diseases it seems to us there is no clear program or strategy at this stage or specific goals the AFL intends to achieve from that research.
- 48 **Thirdly**, clinical program recommendations – concerning the AFL’s plans to continue offering clinical treatment to retired AFL players who are assessed as requiring further treatment. Although the connection between repeated head impacts and longer-term neurodegenerative diseases is unclear and subject to ongoing research, we think the AFL’s commitment to providing a clinical program is important and have included some recommendations to help avoid the problems encountered during the retired player project.
- 49 **Fourthly**, some further general recommendations based on various other matters that we have observed during our review.
- 50 In this report we have referenced documents using the Australian Guide to Legal Citation (4th edition, 2018), save for scientific and medical journal articles and editorials. For those documents we have used the American Medical Association 11th Edition Style.

CHAPTER 2: RELEVANT CONTEXTUAL MATTERS

- 51 In this chapter we provide an overview of the relevant scientific context, and concepts, including definitions of key scientific terms referred to in this report, research methodologies for concussions and neurodegenerative illnesses, and areas that are subject to ongoing research by the scientific and medical community.
- 52 We also summarise the key international guidance on sports-related concussion management which has informed the AFL's concussion management strategies and the AFL's current guidelines on concussion management.
- 53 Prof O'Sullivan has reviewed the explanations in this chapter and cross-referenced them with current literature to ensure they are as current as possible at the date of this report and are based on reputable scientific literature.
- 54 The focus of this inquiry has been adult neurology as A/Prof McCrory is an adult neurologist. Paediatric neurology, a sub-discipline of neurology, has accordingly not been our primary focus. Having said that, we observe there are unique questions about concussion risks encountered by junior players during earlier stages of brain development that require specific attention by sports organisations such as the AFL.¹
- 55 We also observe that concussion risks between men and women may differ and there is emerging science on that issue which is briefly mentioned in this chapter as well as **chapter 9**.
- 56 This chapter has seven sections, as follows:
- (a) key scientific terms used in this report;
 - (b) research methods used to investigate brain injuries;
 - (c) under-reporting of concussions and symptoms;
 - (d) areas of ongoing uncertainty in sport-related brain injury;
 - (e) consensus statements on concussions in sport;
 - (f) the AFL's current concussion guidelines; and
 - (g) concussion panels.

¹ Kaukas L, Holmes JL, Rahimi F, Collins-Praino L, Corrigan F. Injury during adolescence leads to sex-specific executive function deficits in adulthood in a pre-clinical model of mild traumatic brain injury. *Behav Brain Res.* 2021;402; Mulligan T, Barker-Collo S, Gibson K, Jones K. You only get one brain. Adult reflections on acute and ongoing symptom experiences after traumatic brain injury in adolescence. *Brain Inj.* 2021;35(10):1308-1315; and Chapman SB, McKinnon L. Discussion of Developmental Plasticity: Factors Affecting Cognitive Outcome after Pediatric Traumatic Brain Injury. *J Commun Disord.* 2000;33(4):333-344. doi:10.1016/S0021-9924(00)00029-0.

Key scientific terms used in this report

- 57 In this section we discuss the following terms: concussion, sub-concussive impacts, neurodegenerative diseases, chronic traumatic encephalopathy, post-concussive syndrome and traumatic encephalopathy syndrome.

Concussion

- 58 Concussion is a form of traumatic brain injury. The use of the term “concussion” has changed over time as scientists better understand how the brain works. We are informed by Prof O’Sullivan that, historically, concussion was intended as a term to label brain dysfunction in the absence of a structural injury to the brain. However, this was in the pre-imaging era² when the notion of structural injury was limited to laceration or visible bruising of the brain (contusion). Nowadays, the term is generally applied to a spectrum of traumatic brain injuries ranging from functional disturbance in a structurally normal brain to structural injuries that are not evident on currently available clinical brain scans (but may be apparent with research imaging techniques or by examination of the brain post-mortem).
- 59 Common symptoms after a concussion include headache, dizziness, sleep disturbance, cognitive impairments, fatigue, irritability, anxiety and depression.³ Loss of consciousness is not a prerequisite. The most common impairments include “impairments in the domains of awareness, processing speed, memory, attention and executive function”.⁴
- 60 The scientific literature occasionally distinguishes between a concussion in the acute stage (that is, a recently sustained concussion) and the sub-acute stage (after the acute phase but still proximate to the date of injury). We refer to that distinction in this report from time to time.
- 61 The term “concussion” is not without controversy, with some commentators viewing it as unhelpful because it can be used in a way that downplays the potential severity of the injury. However, it remains in widespread use in and outside of sport and for that reason we use it in the report while urging appropriate caution as to the generality and imprecision with which it is often used.

Sub-concussive impacts

- 62 The term “sub-concussive impacts” or “sub-concussive hits” is also discussed in the scientific literature. This refers to impacts either to a person’s head or body which are below the threshold to “cause or elicit any signs of a concussion”⁵. However, it is possible that repetitive sub-concussive impacts may lead to longer-term adverse effects on the brain. It has been said that additional research on

² We are informed by Prof O’Sullivan that CT scanning was introduced in the 1970s and MRI entered widespread medical use in the 1990s.

³ Sharp DJ, Jenkins PO. Concussion is confusing us all. *Pract Neurol*. 2015;15(3):172-186. doi:10.1136/practneurol-2015-001087.

⁴ Ibid, page 178.

⁵ Johnson B, Neuberger T, Gay M, Hallett M, Slobounov S. Effects of subconcussive head trauma on the default mode network of the brain. *J Neurotrauma*. 2014;31(23):1907-1913. doi:10.1089/neu.2014.3415.

sub-concussive impacts is required to better understand potential long-term effects.⁶ In this regard, there may prove to be little distinction between concussions and repetitive sub-concussive impacts, with the long-term effects of both still imperfectly understood.

Neurodegenerative diseases

- 63 These diseases involve degeneration of the nervous system, in particular, degeneration in the brain. Prof O’Sullivan referred us to the following commonly cited definition:⁷

Neurodegenerative diseases are incurable and debilitating conditions that result in progressive degeneration and / or death of nerve cells. This causes problems with movement (called ataxias), or mental functioning (called dementias).

- 64 Examples of neurodegenerative diseases include Alzheimer’s disease and other forms of dementia such as frontotemporal lobar degeneration, corticobasal degeneration, Pick’s disease and chronic traumatic encephalopathy (referred to below), Parkinson’s disease, Motor Neuron Disease and Huntington’s disease.

Chronic traumatic encephalopathy

- 65 Chronic traumatic encephalopathy (**CTE**) is a form of dementia. It is also a pathological entity, that is, a disease defined by the appearance of brain tissue examined under a microscope. At this stage, it can only be definitively diagnosed post-mortem by examining the brain during an autopsy.⁸ The clinical, imaging and other diagnostic features that could be used to diagnose CTE during life remain unclear but research in this area continues and there are some indications that diagnoses during life may be possible in the future.

- 66 Below is a definition of CTE from a recent scientific journal article. The definition refers to the “pathophysiology of CTE”, which means the changes in the brain that give rise to CTE. In summary, the definition refers to “tau” (an important protein found within neurons in the brain) which is released from the neurons and accumulates in different areas of the brain. Higher concentrations of structurally altered tau in particular regions of the brain correlate with greater neurocognitive dysfunction and, in severe cases, a CTE diagnosis.

- 67 The definition states:⁹

The pathophysiology of CTE is complex and we must begin with the classical finding of CTE. The pathognomonic findings of CTE include abnormal perivascular accumulation of tau in an irregular pattern at the depths of the sulci of the frontal, temporal, or parietal cortices. But where does this tau come from? Tau is a microtubule-associated protein present in the neuron....

⁶ Johnson B, Neuberger T, Gay M, Hallett M, Slobounov S (n 5).

⁷ ‘What is neurodegenerative disease?’ *JPND (EU Joint Programme – Neurodegenerative Disease Research)*, (Web Page) <<https://www.neurodegenerationresearch.eu/what/>>.

⁸ Willer BS, Haider MN, Wilber C, Esopenko C, Turner M, Leddy J. Long-Term Neurocognitive, Mental Health Consequences of Contact Sports. *Clin Sports Med*. 2021;40(1):173-186. doi:10.1016/j.csm.2020.08.012, page 174.

⁹ Ibid.

Tau is a fundamental component in the brain, because it is responsible for maintaining neuronal integrity and axoplasmic transport. Recent animal research has shown that **traumatic brain injuries can cause shearing of microtubules, releasing tau into the extracellular space that subsequently undergoes hyperphosphorylation and deposits in the cortex. The hyperphosphorylated tau is unable to perform its normal function and the brain does not have a system of removing excess tau. Tau begins to accumulate and can even form widespread plaques in severe cases. This can cause direct and indirect effects on the surrounding tissues, which can lead to further neurodegeneration.** Higher concentrations of tau correlate with greater neurocognitive dysfunction in severe cases of CTE; however, the presence of tau on histochemical assessment is not specific to a history of repetitive head trauma or playing sports. Rather, it is more suggestive of neurodegeneration than healthy aging. [citations omitted, emphasis added]

- 68 There are four stages of CTE which increase in severity from stage I to stage IV. The seminal scientific journal article in relation to the classification of CTE stages was published in 2013 by a group of 23 authors, the lead author being Dr Ann McKee (**2013 article**).¹⁰
- 69 The stages are defined by the level of accumulation of tau in the brain, including the location of that accumulation. The clinical symptoms also generally increase in severity from stage I to stage IV, however, there can be variation in symptoms at each stage. As explained below, research into the various CTE stages is ongoing.
- 70 To assist with understanding the different stages, we set out below the summaries of clinical symptoms observed in the individuals the subject of the 2013 article:

[Stage I]

Family interview and medical record review were available in six of the seven subjects with stage I CTE. One subject was asymptomatic. Four of the six reported headache and loss of attention and concentration, three reported short-term memory difficulties, aggressive tendencies and depression and two reported executive dysfunction and explosivity. Two subjects were diagnosed with post-traumatic stress disorder...

[Stage II]

Eleven of the 14 individuals with stage II CTE were symptomatic; common presenting symptoms were depression or mood swings, headaches and short-term memory loss. Three subjects presented with symptoms of MND [Motor Neuron Disease]. Symptoms in stage II subjects included depression or mood lability, explosivity, loss of attention and concentration, short-term memory loss and headache. Less common symptoms included executive dysfunction, impulsivity, suicidality and language difficulties...

[Stage III]

Family interview and medical record review were available for 12 subjects with stage III CTE; one individual was asymptomatic (Case 68). The most common presenting symptoms were memory loss, executive dysfunction, explosivity and difficulty with attention and concentration. Other symptoms frequently found in stage III subjects were depression or mood swings, visuospatial difficulties and aggression. Less common symptoms included impulsivity, apathy, headaches and suicidality. Seventy-five per cent

¹⁰ McKee AC, Stein TD, Nowinski CJ, et al. The Spectrum of Disease in Chronic Traumatic Encephalopathy. *Brain*. 2013;136(1):43-64. doi: 10.1093/brain/aws307.

of subjects were considered cognitively impaired. Two subjects developed symptoms of MND after the onset of cognitive or behavioural abnormalities, another developed cognitive changes after the onset of MND...

[Stage IV]

Family interview and medical record review were available on 13 subjects with stage IV CTE; all were symptomatic. Executive dysfunction and memory loss were the most common symptoms at onset, and all developed severe memory loss with dementia during their course. Most subjects also showed profound loss of attention and concentration, executive dysfunction, language difficulties, explosivity, aggressive tendencies, paranoia, depression, gait and visuospatial difficulties. Less common symptoms were impulsivity, dysarthria and parkinsonism; 31% were suicidal at some point in their course. Two of the 13 subjects developed symptoms of MND years after developing cognitive and behavioural abnormalities.

- 71 Much of the polarisation in the scientific community regarding the management of concussions relates to the discussion of CTE. For example, there are different views on whether conclusions about the prevalence of CTE are appropriately supported by research and whether the conclusions drawn are fair having regard to the way that data has been collected. The following extract describes that polarisation in more detail:¹¹

There have been no systematic studies on CTE published to date, and current understanding of the disease is based on a selection of case series. These series have been heavily covered by the media, with headlines such as “CTE found in 99% of studied brains from deceased NFL players” [20] catching the attention of many readers worldwide. However, the studies on which these articles are based have been primarily limited to populations of contact sports players, many of which reported symptoms resembling CTE presentation prior to death. The results of these series primarily reflect contact sports players with a clinical history and is therefore not representative of the general population or even contact sports players as a whole. The media coverage on CTE is therefore misleading.

As CTE can only be diagnosed postmortem, studies on CTE have all been based on autopsy series. These studies are limited in that they cannot inform on new incidences of disease or prevalence of the disease outside of the study population. In other words, true epidemiological data on CTE does not yet exist.

A longitudinal population study on CTE could advise on these issues of prevalence and incidence; however, the diagnostic criteria established [3] does not include any clear clinical diagnostic criteria, so a population-based study is not yet possible.

The confounds of brain donation programs must also be considered when evaluating postmortem case studies. Generally, patients and next-of-kin are more likely to participate in brain donation programs if they display symptoms of the disease than if they were not [21], commonly referred to as “referral bias”. It has also been reported that families of athletes who died by suicide are disproportionately more likely to participate in CTE brain donation programs [21]. The clinical information on these donated brains rely on retrospective interviews with next-of-kin for case history, including playing time, number of concussions, symptoms, and substance abuse among other factors. Clinical analysis is therefore based on information which could be significantly influenced by recall bias. This is insufficient for creating robust clinical diagnostic criteria for CTE in living patients. The

¹¹ Schwab N, Hazrati L-N. Assessing the limitations and biases in the current understanding of chronic traumatic encephalopathy. *J Alzheimers Dis*. 2018;64(4):1067-1076. doi:10.3233/JAD-180373.

design of CTE case series studies is therefore fundamentally flawed by referral and recall biases and cannot answer epidemiological questions.

A lack of proper controls and specificity is also an issue in the study of CTE microscopic pathology. Several large case studies of CTE have failed to acknowledge literature implicating the presence of sporadic tau in aging, but otherwise healthy, brains [22].

- 72 We note that this article was published in 2018 and referred to the main issues of contention in the scientific literature at that time. Of course, the state of the science, and thus the debate, has moved on since then, demonstrating the rapidity of evolving learning in this area which we comment upon earlier. For example, subsequent research has discussed ways that selection bias issues can potentially be accounted for.¹² It is not the purpose of this review to arrive at any conclusion as to the actual prevalence of CTE. The point is simply that the debate about the prevalence of CTE remains polarised, creating difficult choices for sporting organisations.
- 73 Prof O’Sullivan agrees that the above is a balanced summary of the state of the science regarding CTE. He has also observed that the uncertainties associated with linking CTE to symptoms during life (that is, the difficulty of establishing causal association given potential confounding factors and the lack of epidemiological studies) has led to increased polarisation of opinion between members of the scientific community. In neurodegenerative diseases more broadly, the low accuracy of diagnosis during life provides an opportunity for different viewpoints, which can become increasingly polarised, including through the effect of confirmation bias on clinical diagnosis. This problem is exacerbated by the fact that a clinical syndrome can map onto a number of distinct pathological (post-mortem) diagnoses, and vice versa. The cost and difficulty of performing large-scale comprehensive studies mean that this type of data is often not available to support clinical diagnosis until late in the evolution of a field of research.

Post-concussion syndrome and traumatic encephalopathy syndrome

- 74 In simple terms, “post-concussion syndrome” (**PCS**), refers to concussion symptoms that persist beyond normal recovery periods. The Concussion Legacy Foundation, a research organisation in Boston, describes PCS as follows on their website:¹³

Post-Concussion Syndrome, or PCS, is the persistence of concussion symptoms beyond the normal course of recovery. The majority of concussion symptoms will resolve within about two weeks. In cases where symptoms last longer than one or two months, doctors may diagnose Post-Concussion Syndrome. Patients with PCS can experience

¹² Mez J, Daneshvar DH, Abdolmohammadi B, et al. Duration of American Football Play and Chronic Traumatic Encephalopathy. *Ann Neurol*. 2020;87(1):116-131. doi:10.1002/ana.25611; and

LeClair J, Weuve J, Fox MP, et al. Relationship Between Level of American Football Playing and Diagnosis of Chronic Traumatic Encephalopathy in a Selection Bias Analysis. *Am J Epidemiol*. 2022;191(8):1429-1443. doi:10.1093/aje/kwac075.

¹³ ‘What is PCS?’ *Concussion Legacy Foundation* (Web Page) <<https://concussionfoundation.org/PCS-resources/what-is-PCS>>.

concussion-like symptoms at rest or in response to too much physical or cognitive activity, often forcing them to withdraw from their usual physical, professional, and social lives.

- 75 Traumatic Encephalopathy Syndrome (**TES**) is a separate concept which can potentially overlap with a PCS diagnosis. TES has been described as the in-life condition which indicates a person is suffering from CTE. However, there is some uncertainty at present as to what constitutes TES and the current definition is broad enough to capture PCS in some instances. TES has been described as follows:¹⁴

CTE is the neuropathologic determination of disease confirmed at autopsy, whereas traumatic encephalopathy syndrome (TES) represents the clinical symptoms, including behavioral, cognitive, and psychological complaints, in individuals who have experienced repetitive head trauma. More work is needed to define the clinical diagnostic criteria for TES because recent work indicated that approximately 50% of a sample of men with clinical depression met the research criteria for TES.

¹⁴ Willer BS, Haider MN, Wilber C, Esopenko C, Turner M, Leddy J (n 8).

Methods used to investigate brain injuries

- 76 In this section we explain five types of methods that are currently used to investigate concussions and neurodegenerative diseases in individuals which are referred to in subsequent chapters of this report. Those methods are surveys, imaging, neuropsychological testing, fluid biomarkers and transcranial magnetic stimulation.

Surveys

- 77 Surveys are typically employed to help screen individuals who might be suffering from concussions or longer-term neurodegenerative diseases.

Imaging

- 78 In hospital or other clinical settings, individuals with a history of head injury or symptoms of neurodegenerative disease may be assessed with either a Computed Tomography (**CT**) or Magnetic Resonance Imaging (**MRI**) brain scan.
- 79 In addition to the types of MRI scan available in typical clinical practice, a number of advanced MRI methods exist which are commonly used in research.
- 80 Scientific evidence suggests that advanced MRI methods are more sensitive to some of the sequelae (indicators) of brain injury than standard clinical MRI. Standard MRIs can only detect some structural changes to the brain whereas advanced MRI methods are more sensitive to structural alterations. This includes detection of microstructural changes (“diffusion MRI”) as well as changes to brain blood flow (“perfusion MRI”), which in turn is linked to function in the form of underlying neural activity (leading to “functional MRI”). This report includes discussion of functional MRI as this type of imaging was used in relation to one of the AFL research projects discussed in **chapter 7**. A variety of different sequences are used to support functional MRI.
- 81 It is important to understand that advanced MRI research is generally based on analysis of groups of patients. To detect subtle differences present in one group, but not another, often requires groups of many individuals. This is quite different to the use of clinical MRI for diagnosis in a single individual. Differences identified by analysis of groups are often not detectable in any one individual. This is a well-established challenge in functional MRI: individual level functional MRI can require hours of scanning, making clinical or diagnostic use of functional MRI impractical, with a few exceptional circumstances.
- 82 Positron Emission Tomography (**PET**) scans have also emerged as a method to evaluate possible neurodegenerative diseases. In summary, PET scanning involves injecting into a vein a small amount of a radioactive-labelled dye which can be detected by a PET scanner. A more detailed explanation is set out below. This explanation refers to a PET scanner being used together with a computerized tomography scanner (**CT scanner**):¹⁵

¹⁵ ‘PET scan’, *Better Health Channel* (Web Page)
<<https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/pet-scan>>.

A PET scan involves the painless injection of a small amount of a 'positron-emitting' radioactive material (called a radiopharmaceutical). Images of the body are then taken using a PET scanner. The camera detects emissions coming from the injected radiopharmaceutical, and the computer attached to the camera creates two and three-dimensional images of the area being examined.

Areas where the injected radiopharmaceutical gathers (for example, fast-growing cancer cells) appear 'brighter' than normal tissues on the images. Almost all PET scanners today are combined with a CT scanner so that the PET images can be combined or fused with the CT images. This allows the nuclear medicine specialist to combine the structural information from the CT scan with the PET's functional information and improve the accuracy of the test. In these scanners, the person passes through both scanners on the one bed and in the same position...

PET imaging can provide information about the biochemical function of the brain. For example, epilepsy that can't be treated with medications is sometimes treated by surgical removal of the part of the brain that causes the seizures. PET scans can assist this surgery because it can show the exact part of the brain responsible for the person's epilepsy. PET imaging has also been used to assess people with other neurological diseases, including Alzheimer's disease and Parkinson's disease, because the images can show areas of the brain that are functioning differently to normal.

- 83 It has been said that "imaging studies of former contact sport athletes have yielded mixed results, but PET studies seem close to being able to identify CTE in living persons".¹⁶ The reason for this interest in PET is that dyes are emerging that bind to variants of the tau protein mentioned above, offering the potential for detection of this peptide in the brain during life. At this stage though, PET scanning is still limited to use as a research tool in relation to neurodegenerative diseases rather than a clinical diagnostic tool.
- 84 We are informed by Prof O'Sullivan that recruiting for imaging studies can be difficult. Many people are reluctant to participate in MRI scanning for purely research purposes as the procedure requires individuals to be in a confined space for an extended period. With respect to PET studies, recruitment can also be difficult because studies involve the injection of a radioactive substance, and some people may be reluctant to have a tracer injected into their bloodstream.

Neuropsychological testing

- 85 This type of testing can be undertaken by a neuropsychologist, with pen and paper, and also through computerised tests which use recognised neuropsychological testing methods. This type of testing examines different areas of a person's cognitive function which, as mentioned above, include processing speed, memory and attention.
- 86 A summary of neuropsychological testing is set out below:¹⁷

The use of neuropsychological techniques in the assessment of the brain-injured athlete is not new, although there has been a renewed interest in its use within the realm of sports

¹⁶ Willer BS, Haider MN, Wilber C, Esopenko C, Turner M, Leddy J (n 8).

¹⁷ Echemendia RJ, Putukian M, Mackin RS, Julian L, Shoss N. Neuropsychological test performance prior to and following sports-related mild traumatic brain injury. *Clin J Sport Med.* 2001;11(1):23-31. doi:10.1097/00042752-200101000-00005.

medicine. Neuropsychological testing provides an assessment and quantification of brain function by examining brain–behavior relationships...

Neuropsychological testing has been useful in the assessment of the acute and recovery phases of mTBI [mild traumatic brain injury]. These measurements assess memory recall, attention and concentration, problem-solving abilities, visual tracking, reaction time, and speed of information processing as well as other measures of cognitive function. Neuropsychological testing has been used specifically in the assessment of the head-injured athlete, in cross-sectional studies of athletes as well as in assessing the effects of heading in soccer players.

- 87 Neuropsychological testing usually involves an “assessment battery”, that is, a combination of neuropsychological tests.

Sampling of fluid biomarkers

- 88 There has also been some research involving the analysis of blood, urine and other bodily fluids to identify potential biomarkers that might be linked to concussions and assist in identifying when the body has recovered from a concussion.

- 89 At this stage, we understand scientists have identified some biomarkers that are linked to concussion but the understanding of how those biomarkers can be used to detect and manage concussions remains limited. For example, a recent study stated that:¹⁸

[F]urther research is still required to understand how these biomarkers reflect changes in the concussed brain, if they can indicate neurobiological recovery, and if their implementation in RTP [return to play] decisions can mitigate the cumulative burden of repeated brain injuries...

Despite increasing awareness that females may be more vulnerable to concussion than males, to date only a small selection of SRC [sports-related concussion] blood biomarker studies have incorporated female athletes. Unexpectedly, we found no utility of serum NfL, tau, UCHL1, and GFAP following SRC in females. This lack of efficacy may have resulted from genuine biological sex differences in SRC biomarker profiles, sex differences in injury severity, or our limitation of a low sample size of females.

- 90 Further, at this stage there is no single biomarker that can be used to detect whether a person has suffered a concussion.

Transcranial Magnetic Stimulation

- 91 Transcranial Magnetic Stimulation (**TMS**) uses a brief magnetic pulse to stimulate electrical activity in the underlying brain. It can be used to measure the integrity of pathways in the nervous system, for example, the transmission of signals that control movement. The following explanation is taken from a plain language statement and consent form prepared by neurophysiologist A/Prof

¹⁸ McDonald SJ, O'Brien WT, Symons GF, et al. Prolonged elevation of serum neurofilament light after concussion in male Australian football players. *Biomark Res.* 2021;9(1):4. doi:10.1186/s40364-020-00256-7.

Pearce, who specialises in TMS techniques, in relation to a study he conducted involving Australian football players:¹⁹

TMS involves placing a magnet over your head to stimulate parts of the brain that activate your hand muscles. The stimulation, a very brief pulse, feels like a tap on your head. Movement of your hand muscles is measured by electrodes on the muscle controlling your first finger.

Ocular motor assessment testing

- 92 This type of testing is also non-invasive and involves the use of purpose-built head and eyewear equipment. The testing investigates a person's eye function, in particular, their ocular-motor skills and the components of the ocular-motor nerve network that facilitate movement of the eyes, to better understand different aspects of cognitive function. An abstract for a recent scientific journal article about a study involving ocular motor assessment testing described the testing as follows:²⁰

A history of concussion has been linked to long-term cognitive deficits; however, the neural underpinnings of these abnormalities are poorly understood. This study recruited 26 asymptomatic male Australian footballers with a remote history of concussion (i.e. at least six months since last concussion), and 23 non-collision sport athlete controls with no history of concussion. Participants completed three ocular motor tasks (prosaccade, antisaccade and a cognitively complex switch task) to assess processing speed, inhibitory control and cognitive flexibility, respectively.

- 93 Below is some further explanation from the same article about ocular motor assessment testing:²¹

The PS block task assesses the ability to make visually guided saccades, an eye movement to a suddenly appearing visual target. Participants fixated on a central green cross for 1250–1750ms and performed saccades to a suddenly appearing peripheral target (1250–1750 ms), as it stepped horizontally and pseudo-randomly 5° or 10°, to the left or right of centre. A total of 24 trials were completed over one block.

The AS block task measures the ability to inhibit a pre-potent/reflexive response generated by a suddenly appearing target, and generate a response in the equal and opposite direction. Participants fixated on a central green cross for 1250–1750ms before the central green cross disappeared concomitantly with the appearance of a green target cross at either 5° or 10°, left or right of centre (1250–1750 ms). Participants performed a saccade to the diametrically opposite position, without looking at the green target. A total of 48 trials were completed over two blocks.

The switch task interleaves both PS and AS trials, and assess the ability to switch between these tasks.

- 94 We understand this type of testing can be used to assist with diagnosing concussions, assessing the severity of a concussion, and assessing recovery.

¹⁹ AFL.004.001.2209.

²⁰ Symons GF, Clough M, Mutimer S, et al. Cognitive ocular motor deficits and white matter damage chronically after sports-related concussion. *Brain Communications*. 2021;3(3). doi:10.1093/braincomms/fcab213, page 1.

²¹ Ibid, page 3.

Under-reporting of concussions and symptoms

- 95 There are various studies which show that athletes under-report concussions and symptoms.²² Under-reporting makes it harder for doctors to determine whether a player has suffered a concussion and the severity of the injury. It also poses a practical problem for researchers measuring the frequency, severity and symptomology of concussions, as well as recovery pathways and times. This in turn has implications for concussion management and return to play policy development and implementation.
- 96 Studies show that athletes who do not promptly report symptoms of a concussion or remove themselves from play are more likely to aggravate their head injuries and require additional time to recover.²³
- 97 As to the reasons for under-reporting, a 2013 US study observed that under-reporting appears to occur because athletes generally want to keep playing and/or may find it hard to tell if they have suffered a concussion.²⁴ The study also noted that some players didn't want to be perceived as letting their team down or looking "weak". Some players also said their responses depended on the attitude of coaching staff at the particular club they played at.²⁵
- 98 The Australian experience appears to be similar. A study conducted for the AFL in 2017 in relation to local community football relevantly stated:²⁶

Only four players were detected for further concussion screening on the basis of symptom report alone. By observing signs of concussion, an additional 22 players were identified for further screening, supporting previous research that suggests that symptom reporting [by players] alone is not always reliable in screening possible concussion.

- 99 In 2020, the authors of a study involving National Rugby League players in Australia stated:²⁷

17.2% of surveyed players reported sustaining a likely concussion over the past 2 years and not reporting to medical staff. 22% of NRL first grade players admitted to not reporting at least one concussion during the 2018 and 2019 seasons. The most common reason not to report was the player 'not wanting to be ruled out of the game or training session' (57.7%), followed by 'not wanting to let down the coaches or teammates' (23.1%). 85.4%

²² McCrea M, Hammeke T, Olsen G, Leo P, Guskiewicz K. Unreported concussion in high school football players: implications for prevention. *Clin J Sport Med*. 2004;14(1):13-17. doi: 10.1097/00042752-200401000-00003.

²³ See, for example, Kroshus E, Cameron KL, Coatsworth JD, et al. Improving concussion education: consensus from the NCAA-Department of Defense Mind Matters Research & Education Grand Challenge. *Br J Sports Med*. 2020;54(22):1314-1320. doi:10.1136/bjsports-2020-102185.

²⁴ Chrisman SP, Quitiquit C, Rivara FP. Qualitative study of barriers to concussive symptom reporting in high school athletics. *J Adolesc Health*. 2013; 52(3):330-335. doi: 10.1016/j.jadohealth.2012.10.271.

²⁵ Ibid.

²⁶ Reyes J, Mitra B, Makdissi M, et al. Visible signs of concussion and cognitive screening in community sports. *J Neurotrauma*. 2022;39(1-2):122-130. doi:10.1089/neu.2020.7425.

²⁷ This wording is taken from the abstract of the following article: Longworth T, McDonald A, Cunningham C, Khan H, Fitzpatrick J. Do rugby league players under-report concussion symptoms? A cross-sectional study of elite teams based in Australia. *BMJ Open Sport Exerc Med*. 2021;7(1):e000860. doi: 10.1136/bmjsem-2020-000860.

of surveyed players reported having concussion education by their club in the previous two seasons.

- 100 The authors of that study also observed that general education about concussion issues did not appear to be preventing under-reporting:²⁸

Despite players having annual education on the topic of concussion, the under-reporting of symptoms appears to be driven by the desire to continue playing or not to let the team down, rather than due to inadequate knowledge of the symptoms or consequences of concussion. It is likely that as long as player-reported symptoms are a significant part of the concussion assessment then a number of concussive injuries will be missed due to player under-reporting. The introduction of match day video review, independent 'spotters' and increased medical presence at games is designed to improve concussion identification rates.

- 101 A further study regarding community Australian football players included the following summary of conclusions:²⁹

Players generally understand that the AFL concussion guidelines protect their long-term welfare. However, their desire to play at all costs and help their team win is a common barrier to reporting concussion and adhering to guidelines. Leagues should take a lead role by mandating and enforcing the use of the guidelines and educating coaches, game day medical providers and players. The return-to-play component of the guidelines is complex and needs further consideration in the context of community sport

- 102 The article also stated:³⁰

A 'play at all costs' culture needs addressing

One of the most important messages to emerge from this study was that community [Australian football] players experience an intense competitive drive resulting in a 'play at all costs' mentality. This was expressed through players' willingness to deliberately deceive sports trainers, ignore the advice of health professionals and put team success ahead of their own health to help their team win.

- 103 As mentioned above, there is no single biomarker (that is blood or fluid test) that can be used to determine whether an individual has suffered a concussion. At professional levels, sport sideline video reviews are now commonly used to help objectively ascertain whether a player has suffered a concussion and overcome under-reporting issues. However, this option is not typically available in community football.

- 104 The above observations about under-reporting are consistent with what we were told during our interviews. We were also informed that some players will deliberately underperform during baseline neuropsychological testing.³¹ Further, we were informed that if return to play guidelines require minimum rehabilitation periods that are perceived by players as too long, then there is a risk that those

²⁸ Longworth T, McDonald A, Cunningham C, Khan H, Fitzpatrick J (n 27).

²⁹ White PE, Donaldson A, Sullivan SJ, Newton J, Finch CF. Australian Football League concussion guidelines: what do community players think? *BMJ Open Sport Exerc Med*. 2016;2(1):e000169. doi:10.1136/bmjsem-2016-000169.

³⁰ Ibid.

³¹ During our review we came across a media report on this issue as well. See further: Rita Panahi, 'Footy head knock fear', *Herald Sun* (Melbourne, 20 September 2014) 39.

guidelines may lead to further under-reporting. This is an issue that the AFL has taken into account when reviewing its return to play policies in recent years.³²

- 105 Our impression from the interviews we have conducted and material we have reviewed is that over time there has been less under-reporting of symptoms as general awareness about the potentially serious long-term impacts of concussions has improved. However, under-reporting continues. The community and sporting culture that supports a “play-at-all costs” mentality may have diluted over time but still persists. That culture emphasises values such as team spirit, loyalty, physical and mental toughness, determination and courage on the field at the expense of individual player health.

³² An example of this is the email chain with document identifier AFL.001.001.1247.

Areas of ongoing uncertainty in sport-related brain injury

106 There are several areas of ongoing uncertainty which add layers of complexity to the management of player health and regulation of contact sports. In this section we discuss three main areas of uncertainty that are pertinent to this review.

Long-term effects of concussion and sub-concussive impacts

107 First, it is unclear how and to what extent concussions or sub-concussive impacts might cause long-term neurodegenerative disease. Research in this area is ongoing. A 2020 article summarised the current scientific knowledge as follows:³³

... although there is now a stronger understanding of the potential mechanisms involved in the processes underlying concussion, the epidemiologic evidence, and the strength of this evidence, to support the long-term effects on cognition remains unclear. Understanding whether concussion in sport is significantly associated with worsening of cognitive function in later life is of paramount importance. Uncovering this possible association would have immediate repercussion on current play policy and regulations, and possibly on the listing of cognitive decline as an occupational disease for former players.

108 The same article also stated:³⁴

It is safe to say that some former contact sport athletes will face some level of neurodegeneration because of their sport-related concussions. It is also likely, given the available research on living athletes, that the rates of neurodegeneration are low. Concerns about children and sports-related concussion and the likelihood of experiencing neurodegeneration are legitimate but there is insufficient evidence to countermand the known benefits of sport participation.

109 It is generally acknowledged by scientists that there is a *correlation* between repetitive concussions and long-term neurodegenerative diseases. Some commentators consider a causal relationship may exist between repetitive head injuries and CTE, in accordance with particular scientific interpretations of causation rather than legal definitions, and with respect to specific sports only (such as boxing). Other commentators consider a causal relationship may exist generally between repetitive head injuries and CTE.³⁵

110 Results of new research into causal association is regularly being generated and published, making this area of uncertainty a particularly fertile ground for debate in the scientific community and the public arena. For example, even as this report was being finalised the results of a case-control study into neurodegenerative disease specifically in past rugby union players in Scotland was published, adding to the growing body of evidence addressing the association between sport-specific exposure to “concussions” and neurodegenerative disease

³³ Willer BS, Haider MN, Wilber C, Esopenko C, Turner M, Leddy J (n 8).

³⁴ Ibid.

³⁵ Nowinski CJ, Bureau SC, Buckland ME, et al. Applying the Bradford Hill Criteria for Causation to Repetitive Head Impacts and Chronic Traumatic Encephalopathy. *Front Neurol.* 2022;13:938163. doi: 10.3389/fneur.2022.938163.

(including in this case Parkinson's disease, dementia and Motor Neurone Disease) later in life.³⁶ That study concluded:³⁷

There remains a need for further research exploring the relationship between contact sports and risk of neurodegenerative disease. In the meantime, strategies to reduce exposure to head impacts and head injuries across all sports should continue to be developed and promoted, while measures to mitigate risk of adverse brain health in former athletes should be considered.

Clinical symptoms and physiological changes

- 111 The second area of uncertainty concerns the relationship between the resolution of clinical symptoms of a concussion (such as headaches) and the resolution of any physiological changes in the brain. In particular, how long it might take for physiological changes to resolve after clinical symptoms have resolved.
- 112 It is generally accepted that players should not return to play when they have residual clinical symptoms for various reasons including that there is an increased risk that they will be reinjured and suffer a more severe brain injury.³⁸ Comparatively, less is known about the impact of return to play before the resolution of physiological changes to the brain and, accordingly, there is less acceptance that return to play rules should account for the possibility of residual physiological change and uncertainty as to how they should do so.
- 113 We were informed by Prof O'Sullivan that physiological changes to the brain include changes to patterns of brain blood flow and patterns of brain activity. Such changes are also referred to in the literature as "metabolic disturbance"³⁹.
- 114 Although it is unclear what specific physiological changes a person may suffer after a concussion, there is some research identifying possible physiological markers. For example, a recent study of 20 AFL players, funded by the AFL, used functional MRI imaging to examine specific types of physiological markers in AFL players suffering from acute and sub-acute concussions.⁴⁰ The study concluded that physiological changes in particular areas of the brain persisted throughout the first month after the head impact.
- 115 Evidence from imaging studies and biomarker studies suggests that individuals may recover from symptoms before they recover from physiological changes.⁴¹

³⁶ See Russell ER, Mackay DF, Lyall D, et al. Neurodegenerative disease risk among former international rugby union players. *J Neurol, Neurosurg Psychiatry*. 2022;0:1-7. doi:10.1136/jnnp-2022-329675.

³⁷ Ibid, page 6.

³⁸ See, for example, Schneider KJ, Leddy JJ, Guskiewicz KM, et al. Rest and treatment/rehabilitation following sport-related concussion: a systematic review. *Br J Sports Med*. 2017;51(12):930-934. doi:10.1136/bjsports-2016-097475. In particular, pages 2 and 3.

³⁹ Kamins J, Bigler E, Covassin T, et al. What is the physiological time to recovery after concussion? A systematic review. *Br J Sports Med*. 2017;51(12):935-940. doi:10.1136/bjsports-2016-097464, page 3.

⁴⁰ Jackson GD, Makdissi M, Pedersen M, et al. Functional brain effects of acute concussion in Australian rules football players. *J Concussion*. 2019;3(1). doi: 10.1177/2059700219861200.

⁴¹ Wright DK, O'Brien TJ, Shultz SR. Sub-acute Changes on MRI Measures of Cerebral Blood Flow and Venous Oxygen Saturation in Concussed Australian Rules Footballers. *Sports Med Open*.

However, those studies do not provide any clear indication of how long it might take for physiological changes to resolve. An article published in 2017 which involved a systematic review of the literature on this issue observed that: “[a] definitive time point for physiological recovery after SRC [sports-related concussion] is yet to be determined”.⁴² This point is also confirmed by a more recent systematic review article dated 2022, which states:⁴³

In the future, alongside clinical recovery and successful completion of a graduated rehabilitation programme, improvement of a biomarker to baseline level could be included in criteria for RTP. Given neurophysiological and clinical recoveries may be distinct, this could mean an athlete who has clinically recovered from SRC could be precluded from RTP due to persisting biomarker abnormalities (eg Table 1)... It is unclear currently if returning to sport with incomplete neurophysiological recovery from SRC carries with it further neurological or non-neurological risks... Future work to establish the clinical significance and risk profiles of biomarkers is needed to allow their safe and effective use.

Consequences of premature return to play

116 Third, it is unclear what the impact of returning to play is when clinical symptoms have resolved but physiological changes persist. Several recent articles discuss ongoing physiological changes to the brain which are detected after clinical symptoms have resolved and players might have returned to play.⁴⁴ However, those articles do not go on to say what the impact of returning to play with those physiological changes is. For example, a recent article on a blood biomarker study has relevantly stated:⁴⁵

The clinical significance of persistently elevated biomarkers beyond the period of symptoms remains unknown and a potential focus for follow-up... further research is still required to understand how these biomarkers reflect changes in the concussed brain, if they can indicate neurobiological recovery, and if their implementation in RTP [return to play] decisions can mitigate the cumulative burden of repeated brain injuries.

2022;8(1):1-8. doi:10.1186/s40798-022-00435-w, page 5 and the articles referred to therein. McDonald SJ, O'Brien WT, Symons GF, et al (n 18), page 7.

⁴² Kamins J, Bigler E, Covassin T, et al (n 39), page 5.

⁴³ Senaratne N, Hunt A, Sotsman E, Grey MJ. Biomarkers to aid the return to play decision following sports-related concussion: a systematic review. *J Concussion*. 2022; 6(1). doi: 10.1177/20597002211070735, page 16.

⁴⁴ See, for example, Wright DK, O'Brien TJ, Shultz SR (n 41).

⁴⁵ McDonald SJ, O'Brien WT, Symons GF, et al (n 18), page 7.

Consensus statements on concussions in sport

- 117 Consensus statements and consensus groups are commonly used in science to bring together expertise on research topics and reach consensus positions on questions of practical importance. In a scientific field such as head injury and concussion, many groups may be working independently to generate evidence to guide practice. Consensus groups and consensus statements or guidelines respect the idea that policy should be based on areas of agreement in the scientific community.
- 118 We are informed by Prof O’Sullivan that in recent times, that is, over the last 20 years, consensus groups have moved from informal decision-making models to more formalised modes of decision making. Examples include the Delphi model or a modified Delphi model. The key elements of the Delphi model are as follows:⁴⁶
1. There is a facilitator who organizes the Delphi study.
 2. The facilitator recruits a group of individuals with some expertise on the topic.
 3. The facilitator compiles a questionnaire with a list of statements that the experts rate for agreement.
 4. The facilitator gathers responses from the members of the group using the questionnaire.
 5. The facilitator gives anonymous feedback to individuals in the group about how their responses compare to the rest of the group.
 6. The members of the group are able to revise their responses to the questionnaire after receiving the feedback.
 7. Responses converge across rounds of questionnaires, with some statistical criterion being used to define consensus.
- 119 We are also informed by Prof O’Sullivan that the practices of consensus groups in science have changed in the past 20 years and there is a risk of judging previous consensus statements by standards that have evolved since they were published. For example, a search in the NIH National Library of Medicine (PubMed.gov) for the combination of the terms “Delphi” and “Consensus Statement” yields 519 publications in the period 2016-20 but only 56 for the period 2006-10.
- 120 Since 2001, a consensus group process has been used to formulate consensus statements for the management of concussions suffered in sporting contexts (at both professional and amateur levels). To date, there have been five international conferences organised by sporting bodies including the International Ice Hockey Federation (IIHF), Federation Internationale de Football Association (FIFA) and the International Olympic Committee Medical Commission (IOC). The AFL is not part of the organising committee, but members of the AFL’s Concussion Working Group have attended the conferences over time.⁴⁷

⁴⁶ Jorm AF. Using the Delphi expert consensus method in mental health research. *Aust N Z J Psychiatry*. 2015;49(10):887-897. doi: 10.1177/0004867415600891, page 889.

⁴⁷ This includes A/Prof McCrory as well as A/Prof Davis, Dr Makkissi and Dr Maddocks.

- 121 The general aim of the conferences is “to provide recommendations for the improvement of safety and health of athletes who suffer concussive injuries”.⁴⁸ At the end of each conference, a subset of attendees is asked to prepare a consensus statement summarising the matters discussed, process of reaching consensus and agreed conclusions. We refer to that subset as the author panel.
- 122 The statements canvass various practical medical issues, such as defining what constitutes a concussion, how to conduct a sideline evaluation of an athlete, the signs and symptoms of a concussion, what testing and treatment should be undertaken after a suspected concussion, management and rehabilitation, concussion prevention and education.
- 123 The consensus group process has produced the following five Consensus Statements to date:
- (a) “Summary and agreement statement of the first International Conference on Concussion in Sport, Vienna 2001” (**2001 Consensus Statement**);⁴⁹
 - (b) “Summary and agreement statement of the 2nd International Conference on Concussion in Sport, Prague 2004” (**2004 Consensus Statement**);⁵⁰
 - (c) “Consensus Statement on Concussion in Sport: the 3rd International Conference on Concussion in Sport held in Zurich, November 2008” (**2008 Consensus Statements**);⁵¹
 - (d) “Consensus Statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012” (**2012 Consensus Statement**);⁵²
 - (e) “Consensus statement on concussion in sport – the 5th international conference on concussion in sport held in Berlin, October 2016” (**2016 Consensus Statement**);⁵³
- 124 A further conference is scheduled for later this year in Amsterdam. For convenience, we refer to these conferences as the Concussion in Sport Group conferences.

⁴⁸ Aubry M, Cantu R, Dvořák J, et al. Summary and agreement statement of the First International Conference on Concussion in Sport, Vienna 2001. *Phys Sportsmed*. 2002;30(2):57-63. <<https://bjsm.bmj.com/content/36/1/6>>.

⁴⁹ Ibid.

⁵⁰ McCrory P, Johnston K, Meeuwisse W, et al. Summary and Agreement Statement of the Second International Conference on Concussion in Sport, Prague 2004. *Phys Sportsmed*. 2005;33(4):29-36;41-44. doi: 10.3810/psm.2005.04.76.

⁵¹ McCrory P, Meeuwisse W, Johnston K, et al. Consensus Statement on Concussion in Sport: The 3rd International Conference on Concussion in Sport Held in Zurich, November 2008. *J Athl Train*. 2009;44(4):434-444. <https://bjsm.bmj.com/content/43/Suppl_1/i76>.

⁵² McCrory P, Meeuwisse W, Aubry M, et al. Consensus statement on Concussion in Sport - The 4th International Conference on Concussion in Sport held in Zurich, November 2012. *Phys Ther Sport*. 2013;14(2):e1-e13. <<https://bjsm.bmj.com/content/47/5/250>>.

⁵³ McCrory P, Meeuwisse W, Dvořák J, et al. Consensus statement on concussion in sport-the 5th international conference on concussion in sport held in Berlin, October 2016. *Br J Sports Med*. 2017;51(11):838-847. doi:10.1136/bjsports-2017-097699.

125 A/Prof McCrory has been involved in the author panel for each statement and was either the lead author or Chair of the author panel for the 2004, 2008, 2012 and 2016 Consensus Statements.

Criticisms of the group

126 There have been various criticisms of the group over time. A recent critique is set out in a 2021 article titled “Toward Complete, Candid, and Unbiased International Consensus Statements on Concussion in Sport” published in the Cambridge University Press Journal of Law, Medicine & Ethics (**2021 Article**).⁵⁴ Fifteen individuals co-authored the article. In summary, the article makes five criticisms:

- (a) the process for preparing the Consensus Statements has not been transparent;
- (b) the process has not been rigorous enough;
- (c) the pool of experts has not been broad enough and has been dominated by individuals with close relationships to professional and amateur sports organisations⁵⁵;
- (d) the Consensus Statements are not independently peer reviewed; and
- (e) the Consensus Statements are not sufficiently conservative and “have promoted sports-friendly viewpoints”⁵⁶.

127 Earlier this year an article was published which discusses the process undertaken to prepare the Consensus Statements. The article is titled “Concussion in sport: the consensus process continues” (**2022 Article**).⁵⁷ The 2022 Article was written by nine authors, some of whom have been part of the author panels for the Consensus Statements. The article relevantly states as follows.⁵⁸

Every 4 years researchers and clinicians with expertise in SRC [sport-related concussion] are brought together to summarise the published literature and provide updated, evidence-informed recommendations regarding the evaluation and management of concussions. To date, there have been five consensus statements. This 20-year journey has been supported by sports organisations including the IOC, IIHF, FIFA and later by Fédération Equestre Internationale, World Rugby and the Fédération Internationale de l'Automobile. The sporting bodies are then able to take the evidence summaries and consensus recommendations that are created and develop concussion guidelines specific to their sports.

⁵⁴ Casper ST, Bachynski KE, Buckland ME, et al. Toward Complete, Candid, and Unbiased International Consensus Statements on Concussion in Sport. *J Law Med Ethics*. 2021;49(3):372-377. doi:10.1017/jme.2021.56. See also Michael Buckland et al, ‘Concussion in sport: conflicts of interest drive scandal’, *Insight Plus: Empowered by AMPco* (Web Page, 11 April 2022) <<https://insightplus.mja.com.au/2022/13/concussion-in-sport-conflicts-of-interest-drive-scandal/>>.

⁵⁵ Ibid, page 373.

⁵⁶ Ibid.

⁵⁷ Schneider KJ, Patricios J, Echemendia RJ, et al. Concussion in sport: the consensus process continues. *Br J Sports Med*. May 2022. doi:10.1136/bjsports-2022-105673.

⁵⁸ Ibid, page 1.

The authorship group of the Consensus Statements has led the development and writing of the resulting output of the meetings including a quadrennial consensus statement and the accompanying Concussion Recognition Tool and Sports Concussion Assessment Tools (SCAT) for adults and children. Authors have been selected based on their research and clinical expertise in the area of concussion, including consideration for representation from broad geographical and content areas. The concussion consensus group remains aware of the need for a rigorous scientific process and has ensured since its inception that all outputs are made freely available to athletes and their medical providers.

128 In relation to the upcoming conference, the 2022 Article states:⁵⁹

This conference brings together researchers, clinicians and stakeholders with an interest in concussion in adults, children and athletes with disabilities, to summarise and present the latest science, discuss the current state of the evidence and write the sixth International Consensus Statement on Concussion in Sport.

A series of systematic reviews on key topics in SRC (acute screening, follow-up postinjury evaluation, rest and exercise, treatment/rehabilitation, persistent symptoms, recovery, return to sport, residual/ long-term effects, retirement, risk reduction/ prevention) are currently in preparation. The conference begins with 2 days of open meetings where the latest evidence is summarised and discussed. The accepted abstracts for each topic area will be presented as posters and the two top ranked abstracts in each category will be presented as podium presentations at the beginning of each topic of discussion. Each systematic review will then be presented, followed by a discussion period, which will be scribed for reference during the panel meeting. The third day is a consensus meeting that focuses on answering predetermined clinically relevant questions. The participants in the consensus meeting have been selected based on their expertise and/or publishing record in SRC, while keeping in mind geographical and specific areas of content knowledge. Finally, the fourth day will focus on development and updating of tools such as the SCAT. The scientific committee is cognisant [sic] that SRC is a critical area of public health interest and will embrace a broader spectrum of topics, experts and participants than ever before. A separate manuscript will describe the details of the methodology used.

129 Returning to the 2021 Article's criticisms, we understand the process for preparing consensus statements has evolved since 2001 and has moved towards more a formalised decision-making model. We were informed during the review that a modified Delphi model was used to prepare the most recent Consensus Statement.

130 We agree that further information could be published to explain the consensus process and improve its transparency. For example, if an individual is invited to be on the author panel but declines, it may be desirable that this is explained in the statement.⁶⁰

131 As to whether the process is rigorous enough, it is difficult to reach a concluded view on that issue given the limited information in the public domain and the fact that there exists a variety of views within the relevant medical community as to

⁵⁹ Schneider KJ, Patricios J, Echemendia RJ, et al (n 57), page 1.

⁶⁰ We were informed during our interviews that Dr Ann McKee was invited to be on the author panel for the 2016 Consensus Statement but declined to attend. We also note that the 2008 Consensus Statement refers to five individuals being invited to be on the author panel but who did not attend. The reason for their non-attendance is not provided.

this. Relevantly, during our review we obtained a copy of the agenda for the 2012 conference which includes information about the various seminars given.⁶¹

- 132 Further, as mentioned above, during our review we interviewed Prof Davis, Dr Makdissi and Dr Maddocks. Each of those individuals were part of the author panels for the 2012 and 2016 Consensus Statements. We also interviewed other individuals who the AFL arranged to attend the conference. We were informed that the systematic review is rigorous. However, we also interviewed A/Prof Pearce who observed that during those reviews some critical literature may have been excluded due to the breadth of the exclusion criteria used.
- 133 We subsequently reviewed articles about the systematic reviews for the 2016 Consensus Statements. For the purposes of this investigation, we do not need to reach a concluded view on the appropriateness of those reviews. Nevertheless, we make the following three observations.
- 134 **First**, a typical exclusion criterion is whether an article contains original research.⁶² It seems to us that may well be an appropriate criterion even though it might result in the exclusion of numerous articles.
- 135 **Secondly**, some reviews excluded studies which did not include athletes. Depending on the topic being investigated by the systematic review that may be an appropriate exclusion criterion. For example, it seems appropriate to include that criterion in a study about the effectiveness of side-line testing⁶³ and strategies to reduce the risk of concussion in sports⁶⁴. However, in other instances non-athlete original research may be relevant; for example, where the topic being investigated is indicators for the duration of clinical recovery.⁶⁵
- 136 **Thirdly**, while several articles contained detailed information about the review process, in some instances it seems additional information could have been provided to make clearer what the specific inclusion and exclusion criteria were.⁶⁶
- 137 Similarly, it is difficult to comment on whether the pool of experts is sufficiently broad and whether the group is inappropriately dominated by individuals with relationships to professional and amateur sports organisations. Given the subject matter of the consensus statements is the management of concussions in sport, it seems to us appropriate, and indeed inevitable, that many of the invitees have experience with either professional or amateur sports organisations. However,

⁶¹ AFL.004.001.0649.

⁶² See, for example, Iverson GL, Gardner AJ, Terry DP, et al. Predictors of clinical recovery from concussion: a systematic review. *Br J Sports Med.* 2017;51(12):941-948. doi:10.1136/bjsports-2017-097729.

⁶³ Patricios J, Fuller GW, Ellenbogen R, et al. What are the critical elements of sideline screening that can be used to establish the diagnosis of concussion? A systematic review. *Br J Sports Med.* 2017;51(11):888-894. doi:10.1136/bjsports-2016-097441.

⁶⁴ Emery CA, Black AM, Kolstad A, et al. What strategies can be used to effectively reduce the risk of concussion in sport? A systematic review. *Br J Sports Med.* 2017;51(12):978-984. doi:10.1136/bjsports-2016-097452.

⁶⁵ Iverson GL, Gardner AJ, Terry DP, et al (n 62).

⁶⁶ See, for example, Feddermann-Demont N, Echemendia RJ, Schneider KJ, et al. What domains of clinical function should be assessed after sport-related concussion? A systematic review. *Br J Sports Med.* 2017;51(11):903-918. doi:10.1136/bjsports-2016-097403.

greater disclosure could perhaps be provided by those individuals who were paid to attend the conferences by sporting organisations by, for example, disclosing any travel payments or reimbursements they received.

138 Further, we were informed during our interviews that the attendees for the conferences have included individuals with a variety of views on concussions. By way of example, Prof Robert Cantu has been on the author panel for each of the five consensus statements. Prof Cantu is the Founding member and Chairman of the Medical Advisory Board for the Concussion Legacy Foundation in Boston, a group formed in 2007 which advocates for improving the way sporting bodies manage concussions and taking a relatively conservative approach to the management of concussions.⁶⁷

139 As to the suggestion that the Consensus Statements are not independent because they have not been independently peer reviewed, we note that the collaborative process for preparing the statements means peer review of each individual recommendation is built into the process. We are informed by Prof O'Sullivan that a sufficiently broad consensus process will often include many of the people who would be appropriate independent peer reviewers. Further, a sufficiently broad consensus should include an appropriate cross-section of views on the relevant topic. Consequently, the issue of peer review of consensus statements is not straightforward. However, it is now considered best practice to perform peer review which largely considers the methodology used to prepare the consensus statement and whether all appropriate information is included in the final consensus statement. Again, there is a danger of assessing previous statements by standards that have evolved since they were published.

140 The 2021 Article also criticises the Consensus Statements as not being conservative enough. Many of the criticisms are framed at a high level and seek to impugn each of the Consensus Statements without, in our view, appropriately considering the state of scientific knowledge at the relevant points in time at which the statements were published; or grappling with the practical problems facing sporting bodies, athletes, sports doctors and sports rule-makers seeking to balance numerous conflicting considerations to reach an appropriate response to head injury risk found in a wide range of contact sports. The 2021 Article also does not state *how* the Consensus Statements should be more conservative. For example, the article states:⁶⁸

Past statements have also included signatories who have consistently downplayed the risks of concussion injury and sought to emphasize all that we do not yet know rather than all that we do know, a pattern that was first established in concussion research for sports by the NFL MTBI Committee. Such statements have ignored the precautionary principle, whose grounding in the concept of social responsibility requires scientists and researchers to act to protect the public from potential harm long before absolute metaphysical certainty has been achieved.

141 While we consider sporting organisations should have regard to the precautionary principle, the precautionary principle cannot be considered in

⁶⁷ See further: 'About us: Mission & History' *Concussion Legacy Foundation* (Web Page) <<https://concussionfoundation.org/about/mission-history>>.

⁶⁸ Casper ST, Bachynski KE, Buckland ME, et al (n 54), page 374.

isolation from the potential adverse consequences of taking an overly cautious approach. For example, as we observe above, under-reporting of concussion symptoms is well recognised and if minimum exclusion periods are perceived as being overly long, this might lead to an increase in the amount of under-reporting, making it more difficult for doctors to diagnose and treat players. This does not mean that caution should be thrown to the wind; but rather that all consequences of conservative decisions based upon precautionary principles ought to be considered.

142 As part of our review, we have noticed an anomaly with the consensus guidance regarding return to play. The 2001, 2004, 2012 and 2016 Consensus Statements each state that players should not return to play on the day of injury. However, the 2008 Consensus Statement includes a carve out for some return to play on the same day. The reasoning for that carve out is unclear given the statement acknowledged that in some cases there may be delayed onset of symptoms. The carve out may be an example of a situation where a more conservative approach should have been taken.

143 The 2001 Consensus Statement relevantly stated as follows:⁶⁹

When a player shows ANY symptoms or signs of a concussion:

- (1) The player should not be allowed to return to play in the current game or practice.
- (2) The player should not be left alone; and regular monitoring for deterioration is essential.
- (3) The player should be medically evaluated after the injury.
- (4) Return to play must follow a medically supervised stepwise process.

A player should never return to play while symptomatic. "When in doubt, sit them out!"

144 Conversely, the 2008 Consensus Statement included the following carve out:⁷⁰

With adult athletes, in some settings, where there are team physicians experienced in concussion management and sufficient resources (eg, access to neuropsychologists, consultants, neuroimaging, etc) as well as access to immediate (ie, sideline) neurocognitive assessment, return to play management may be more rapid. The RTP strategy must still follow the same basic management principles, namely full clinical and cognitive recovery before consideration of return to play. This approach is supported by published guidelines, such as the American Academy of Neurology, US Team Physician Consensus Statement, and US National Athletic Trainers Association Position Statement. This issue was extensively discussed by the consensus panellists and it was acknowledged that there is evidence that some professional American football players are able to RTP more quickly, with even same day RTP supported by National Football League studies without a risk of recurrence or sequelae. There are data however, demonstrating that at the collegiate and high school level, athletes allowed to RTP on the same day may demonstrate NP deficits post-injury that may not be evident on the sidelines and are more likely to have delayed onset of symptoms. It should be emphasised however, that the young (<18) elite athlete should be treated more conservatively even though the resources may be the same as for an older professional athlete (see Section 6.1).

⁶⁹ Aubry M, Cantu R, Dvořák J, et al (n 48), page 8.

⁷⁰ McCrory P, Meeuwisse W, Johnston K, et al (n 51), page i78.

145 The 2012 Consensus Statement then said:⁷¹

It was unanimously agreed that no RTP on the day of concussive injury should occur. There are data demonstrating that at the collegiate and high school levels, athletes allowed to RTP on the same day may demonstrate NP deficits postinjury that may not be evident on the sidelines and are more likely to have delayed onset of symptoms.

146 Despite the example above, we consider the general assertion in the 2021 Article, that the guidelines are not sufficiently conservative, to be imprecise, unsupported by examples or practical alternatives, and based on a principle of acting in advance of availability of evidence. We consider that it was appropriate for the consensus groups to weigh a number of guiding principles, not only precaution, in reaching a position.

Minimum rehabilitation periods

147 As explained below, the Consensus Statements have not to date prescribed a minimum rehabilitation period but have included some comments on typical recovery periods and what the rehabilitation process should involve.

148 As to typical recovery periods, the 2004 Consensus Statement said:⁷²

In simple concussion, an athlete suffers an injury that progressively resolves without complication over 7–10 days. In such cases, apart from limiting playing or training while symptomatic, no further intervention is required during the period of recovery, and the athlete typically resumes sport without further problem.

149 The 2008 Consensus Statement said:⁷³

The panel however unanimously retained the concept that the majority (80–90%) of concussions resolve in a short (7–10 day) period, although the recovery time frame may be longer in children and adolescents.

150 This statement was repeated in the 2012 Consensus Statement. However, the 2016 Consensus Statement referred to a longer period of time. It stated “most individuals recover in 10-14 days”.⁷⁴

Steps in the rehabilitation process

151 As to what the rehabilitation process should involve, since 2001 the Consensus Statements have referred to a graded loading rehabilitation program. For example, the 2001 Consensus Statement said:⁷⁵

the athlete be completely asymptomatic and have normal neurological and cognitive evaluations before the start of the rehabilitation programme. Therefore the more prolonged the symptom duration, the longer the athlete will have sat out. The athlete will then proceed stepwise with gradual incremental increases in exercise duration and intensity, and pause or backtrack with any recurrence of concussive symptoms.

⁷¹ McCrory P, Meeuwisse W, Aubry M, et al (n 52), page 3.

⁷² McCrory P, Johnston K, Meeuwisse W, et al (n 50), page 197.

⁷³ McCrory P, Meeuwisse W, Johnston K, et al (n 51), page i77.

⁷⁴ McCrory P, Meeuwisse W, Dvořák J, et al (n 53), page 842.

⁷⁵ Aubry M, Cantu R, Dvořák J, et al (n 48), page 8.

152 The 2004 Consensus Statement said:⁷⁶

- (1) No activity, complete rest. Once asymptomatic, proceed to level 2.
- (2) Light aerobic exercise such as walking or stationary cycling, no resistance training.
- (3) Sport specific exercise—for example, skating in hockey, running in soccer; progressive addition of resistance training at steps 3 or 4.
- (4) Non-contact training drills.
- (5) Full contact training after medical clearance.
- (6) Game play.

With this stepwise progression, the athlete should continue to proceed to the next level if asymptomatic at the current level. If any post-concussion symptoms occur, the patient should drop back to the previous asymptomatic level and try to progress again after 24 hours.

153 The 2008 Consensus Statement said:⁷⁷

Return to play protocol following a concussion follows a stepwise process as outlined in **table 1**. With this stepwise progression, the athlete should continue to proceed to the next level if asymptomatic at the current level. Generally each step should take 24 hours so that an athlete would take approximately one week to proceed through the full rehabilitation protocol once they are asymptomatic at rest and with provocative exercise. If any postconcussion symptoms occur while in the stepwise programme, the patient should drop back to the previous asymptomatic level and try to progress again after a further 24-hour period of rest has passed. [emphasis added]

154 Below is table 1:

Table 1 Graduated return to play protocol

Rehabilitation stage	Functional exercise at each stage of rehabilitation	Objective of each stage
1. No activity	Complete physical and cognitive rest	Recovery
2. Light aerobic exercise	Walking, swimming or stationary cycling keeping intensity <70% maximum predicted heart rate No resistance training	Increase heart rate
3. Sport-specific exercise	Skating drills in ice hockey, running drills in soccer. No head impact activities	Add movement
4. Non-contact training drills	Progression to more complex training drills, eg passing drills in football and ice hockey May start progressive resistance training)	Exercise, coordination, and cognitive load
5. Full contact practice	Following medical clearance participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6. Return to play	Normal game play	

155 The 2012 Consensus Statement included a similar version of table 1 and included the following additional text regarding the timing of each step:⁷⁸

Generally, each step should take 24 h so that an athlete would take approximately 1 week to proceed through the full rehabilitation protocol once they are asymptomatic at rest and with provocative exercise. If any post concussion symptoms occur while in the stepwise

⁷⁶ McCrory P, Johnston K, Meeuwisse W, et al (n 50), page 202.

⁷⁷ McCrory P, Meeuwisse W, Johnston K, et al (n 51), page i78.

⁷⁸ McCrory P, Meeuwisse W, Aubry M, et al (n 52), page 3.

programme, then the patient should drop back to the previous asymptomatic level and try to progress again after a further 24 h period of rest has passed.

156 The 2016 Consensus Statement modified the above table 1 as follows:⁷⁹

Consensus statement			
Table 1 Graduated return-to-sport (RTS) strategy			
Stage	Aim	Activity	Goal of each step
1	Symptom-limited activity	Daily activities that do not provoke symptoms	Gradual reintroduction of work/school activities
2	Light aerobic exercise	Walking or stationary cycling at slow to medium pace. No resistance training	Increase heart rate
3	Sport-specific exercise	Running or skating drills. No head impact activities	Add movement
4	Non-contact training drills	Harder training drills, eg, passing drills. May start progressive resistance training	Exercise, coordination and increased thinking
5	Full contact practice	Following medical clearance, participate in normal training activities	Restore confidence and assess functional skills by coaching staff
6	Return to sport	Normal game play	

NOTE: An initial period of 24–48 hours of both relative physical rest and cognitive rest is recommended before beginning the RTS progression. There should be at least 24 hours (or longer) for each step of the progression. If any symptoms worsen during exercise, the athlete should go back to the previous step. Resistance training should be added only in the later stages (stage 3 or 4 at the earliest). If symptoms are persistent (eg, more than 10–14 days in adults or more than 1 month in children), the athlete should be referred to a healthcare professional who is an expert in the management of concussion.

157 As noted above, there have been various criticisms of the Concussion In Sport Group, however, we understand there is general support in the scientific and medical community for a graded return to sport strategy like the one set out in the 2016 Consensus Statement.

AFL adoption of the consensus statements

158 The AFL has prepared guidelines on concussion management for the AFL level since at least 2008, which were updated in 2011, 2013, 2015, 2016, 2017, 2018, 2019, 2020, 2021 and 2022.⁸⁰ The 2020, 2021 and 2022 versions also apply to the AFLW. Further, there is a separate set of guidelines specific to community level football. The first version of the community guidelines was prepared in 2011 and was updated in 2013, 2017 and 2021.⁸¹ The current version is dated 2021.

159 The various guidelines refer to and cite contemporaneous Consensus Statements. Based on our review, the AFL guidelines on concussion are generally consistent with the Consensus Statements, and this is clearly deliberate. For example, the AFL guidelines adopt the guidance on how to conduct a sideline evaluation of an athlete, the signs and symptoms of an acute concussion, what testing and treatment should be undertaken after a suspected concussion, management and rehabilitation of a concussion injury, concussion prevention and education.

160 After the 2016 conference in Berlin, the AFL arranged for representatives to attend a conference in Ireland in 2017 to meet with representatives of 10 sporting codes and 11 sporting governing bodies/federations to discuss how to implement the 2016 Consensus Statement. The outcomes of that meeting are published.⁸²

⁷⁹ McCrory P, Meeuwisse W, Dvořák J, et al (n 53), page 840.

⁸⁰ We were informed there was also a 2006 version but have not sighted it in our review. The document identifiers for the AFL guidelines are: AFL.003.001.0024; AFL.003.001.0025; AFL.003.001.0026; AFL.003.001.0029; AFL.003.001.0030; AFL.003.001.0017; AFL.003.001.0018; AFL.003.001.0019; AFL.003.001.0020; AFL.003.001.0021; AFL.004.001.1364; AFL.021.001.0005.

⁸¹ AFL.021.001.0001; AFL.021.001.0002; AFL.021.001.0003; AFL.003.001.0012.

⁸² See further, Patricios JS, Ardern CL, Hislop MD, et al. Implementation of the 2017 Berlin Concussion in Sport Group Consensus Statement in contact and collision sports: a joint position

We were also informed during the review that since 2017 there have been further annual meetings between representatives of those sporting codes to discuss the management of concussion issues. We understand that this group is referred to by participants as the “Collisions In Sport” group. We use that term in this report.

The AFL’s current concussion guidelines

- 161 The AFL currently has in place two sets of guidelines which are:
- (a) “Guidelines for the Management of Sport-Related Concussion at AFL & AFLW Level” (**2022 AFL and AFLW Guidelines**);⁸³ and
 - (b) “The Management of Sport-Related Concussion in Australian Football: With Specific Provisions for Children and Adolescents (Aged 5 to 17 Years)” (**2021 Community Guidelines**).⁸⁴
- 162 Copies of those documents are included at Annexures 3 and 4 respectively of this report. We understand both sets of guidelines are based on the 2016 Consensus Statement which recommends a graded return to play program. Many sporting codes have a graded return to play program.⁸⁵
- 163 We have observed a tendency by commentators to discuss these guidelines at a high level which can lead to confusion and even inaccuracy. For example, on occasion the guidelines have been described as a “12-day rule” which is an incomplete description of the guidelines and ignores the various steps involved in the rehabilitation process which have been included based on recommendations from doctors and having regard to the current scientific literature. We discuss some of the key features of the guidelines relevant to this report below.

2022 AFL and AFLW Guidelines

- 164 The guidelines apply on game days and at training sessions. They address various issues including how to diagnose a concussion, rehabilitation, baseline testing during pre-seasons, screening of new players to obtain any relevant concussion history information and what education should be provided to players, coaches and other medical staff about concussions.
- 165 The guidelines state that it is the sole responsibility of the club doctor to determine the medical fitness of a player to return to play or training. During our witness interviews we were informed that before the introduction of the guidelines, the decision whether to return to play was left to the player. Consequently, the guidelines shift decision making responsibility. We think that

statement from 11 national and international sports organisations. *Br J Sports Med.* 2018;52(10):635-641. doi:10.1136/bjsports-2018-099079. See also Davis GA, Makdissi M, Bloomfield P, et al. Concussion Guidelines in National and International Professional and Elite Sports. *Neurosurgery.* 2020;87(2):418-425. doi:10.1093/neuros/nyaa057.

⁸³ AFL.021.001.0005.

⁸⁴ AFL.003.001.0012.

⁸⁵ For example, Basketball Australia, Cricket Australia, Hockey Australia, International Cricket Council, National Football League (US), National Rugby League, New Zealand Rugby League, National Hockey League.

shift is appropriate. During our witness interviews some interviewees referred to scenarios where senior AFL players would try to get back onto the field after being concussed.

- 166 The guidelines provide criteria to identify when a player has suffered a concussion; for example, where the player has fallen to the ground and not taken any protective action during the fall. The guidelines also mandate that club doctors use the “CSx App”, a diagnostic tool which includes the AFL Head Injury Assessment form (**HIA form**) and the Sport Concussion Assessment Tool 5th edition (**SCAT5**). The HIA form has been developed by the AFL and the SCAT5 is a document that was prepared as part of the 2016 Consensus Statement.
- 167 Both the HIA form and SCAT5 must be completed where a club doctor suspects the player has suffered a concussion. The guidelines state that the AFL Medical Director has access to all HIA forms and SCAT5 assessments through the CSx App and the information is used for various purposes including to assess compliance with the guidelines and as part of ongoing education and research activities.
- 168 The HIA form includes the criteria for a concussion or suspected concussion in the guidelines and requires the club doctor to confirm whether those symptoms have been observed. The SCAT5 includes some further tests and an assessment of symptom severity. For example, the club doctor must assess whether a player is experiencing particular symptoms and the level of severity.
- 169 Where there is a suspicion that a player has suffered a concussion but further evaluation is required, the player must be removed from the field for the assessment and cannot return to the playing surface for at least 15 minutes. The guidelines also specify when a player must be removed from the play for further assessment. For example, where the player has been motionless on the ground for more than 2 seconds.
- 170 As part of the off-field assessment, the club doctor is required to review any available video of the incident. After those further assessments, if the doctor considers the player has not suffered a concussion the player may be returned to play but must be monitored for the duration of the match or training and undergo a further SCAT5 assessment at the completion of the match (and/or the following day).
- 171 The guidelines state that if a player has suffered a concussion they must not return to play or training on the day of the incident.
- 172 The prescribed rehabilitation process has various steps and specifies minimum periods for completing each step. It appears to us that there are 11 steps in total. If a player completes those steps without requiring additional time, then the earliest the player can return to play is on the 12th day after the day on which the concussion was suffered.
- 173 The first step requires the player to rest for 24 to 48 hours. Under the second step the player may undertake general daily activities that do not provoke symptoms for a minimum period of 24 hours. The player can move on to step 3

only if they have been completely free of concussion related symptoms for 24 hours and have been given medical clearance to enter the graded loading program (steps 3 to 11). Below is a table from the guidelines which provides further information on each step.

Table 1. Guideline for **minimum** return to play following concussion: AFL/AFLW

Step	Rest	Recovery	Graded loading – individual program			Graded loading - full team training						Return to play
<i>Components</i>	Rest	Symptom-limited activity	Light aerobic exercise	Moderate aerobic exercise	Sport-specific exercise	Non-contact training	Recovery	Limited contact training	Recovery	Full contact	Recovery	Return to play
<i>Goal</i>		Daily activities that do not provoke symptoms	Light aerobic exercise (e.g. walking/jog/cycling at slow to medium pace) No resistance training	Moderate aerobic exercise (i.e. Increased heart rate) No resistance training	Increased intensity and duration of activity Add sports specific drills (e.g. goal kick, stationary handball, etc) Commence light resistance training	Return to full team training sessions – <u>non-contact only</u>	Can participate in other components of the training program (e.g. weights)	Full team training – but able to participate in drills with incidental contact (including tackling)	Can participate in other components of the training program (e.g. weights)	Full team training	Can participate in other components of the training program (e.g. weights)	
<i>Duration</i>	24-48 hours	Minimum 24 hours	Minimum 24 hours	Minimum 24 hours	Minimum 24 hours	At least 1 day between sessions to monitor for recurrence of symptoms		At least 1 day between sessions to monitor for recurrence of symptoms		At least 1 day between sessions to monitor for recurrence of symptoms		
<i>Requirements to move to next stage</i>		24 hours completely free of concussion related symptoms and medical clearance to enter graded loading program	Remain completely free of any concussion-related symptoms	Remain completely free of any concussion-related symptoms	Remain completely free of any concussion-related symptoms and medical clearance to commence full team training	Remain completely free of any concussion-related symptoms – and player confident to participate in training		Remain completely free of any concussion-related symptoms – and player confident		Remain completely free of any concussion-related symptoms – player confident to participate in training – and medical clearance for unrestricted return to play		

- 174 The guidelines also provide some guidance on how the rehabilitation process should be modified if a player continues to exhibit symptoms beyond the periods referred to in table 1. For example, the guidelines state that where clinical signs persist beyond 48 hours from the initial injury, a slower return to play strategy should be adopted. Further, where symptoms persist beyond 10 to 14 days, the guidelines recommend that the club doctor should seek assistance from an independent clinician with expertise in concussion management.
- 175 As mentioned above, the guidelines also include a section on screening which emphasises the importance of baseline testing. For example, the guidelines state:
- All players should have annual preseason baseline testing including neurological assessment, SCAT5 and a computerised screening cognitive test (e.g. Cognigram).
 - Annual baseline testing promotes ongoing education of players, and facilitates interpretation of post-injury test scores, which ultimately enhances decisions regarding diagnosis and assessment of recovery. If a player does not have baseline tests for comparison, a more conservative approach to diagnosis and return to play should be used.
 - In the instance that a player has a significant concussion history (either a number of concussions or history of prolonged recovery) more detailed baseline testing – including formal neuropsychological testing, is strongly recommended.

2021 Community Guidelines

- 176 These guidelines are similar to the Guidelines for the AFL and AFLW but are tailored to a broader community audience.
- 177 The AFL funded a study in 2017 which involved trained individuals attending community games to observe whether concussions were being adequately detected in the absence of real time video footage which is used at the professional level. At the time, in community games, detection occurred either by team personnel with limited medical training or by players self-reporting their symptoms. The study found that additional training is required to assist community team personnel to recognise when players have signs of concussion requiring further assessment.⁸⁶
- 178 The current guidelines which post-date that study provide a clearer list of symptoms which indicate when a player has suffered a concussion. Further, the guidelines mandate the presence of a first aid provider at every match and state that:⁸⁷
- ALL players with a suspected concussion need an urgent medical assessment (with a registered medical doctor).
- 179 Like the Guidelines for the AFL and AFLW, the 2021 Community Guidelines refer to the use of an app (in this case an app called “HeadCheck”) to assist with the recognition and management of a suspected concussion.

⁸⁶ Reyes J, Mitra B, Makkissi M, et al (n 26).

⁸⁷ AFL.003.001.0012, [3.4(b)].

180 The return to play process under these guidelines is also similar to the process prescribed by the Guidelines for the AFL and AFLW. The overall minimum rehabilitation period is 12 days after the day on which the concussion was suffered and the guidelines state that a player should not start the graded loading program until their concussion-related symptoms have been fully resolved for at least 24 hours.⁸⁸ Further, if any symptoms return while exercising, the player “should go back to the previous symptom free step and seek medical advice”.⁸⁹ Schedule 2 includes a flow chart of the rehabilitation process which is reproduced on the next page.

⁸⁸ AFL.003.001.0012, [4.4(a)].

⁸⁹ *Ibid*, [4.4(f)].

SCHEDULE 2: PHASES OF REST, RECOVERY AND RETURN TO PLAY FOLLOWING CONCUSSION

Focus	Goal	Requirements to move to next stage
Rest		
Rest	<ul style="list-style-type: none"> Help speed up recovery 	<ul style="list-style-type: none"> Complete physical and cognitive rest in the first 24 – 48 hours
Recovery		
Symptom limited activity	<ul style="list-style-type: none"> Two days of activities that do not provoke symptoms 	<ul style="list-style-type: none"> No concussion-related symptoms at rest or with physical or brain activity for at least 1 day and the player has successfully returned to work/school The player should also have a medical clearance (e.g. physiotherapist, sports trainer, first aider) to confirm that the player has had no concussion-related symptoms for at least 1 day
Graded Loading – individual program		
Light / moderate aerobic exercise	<ul style="list-style-type: none"> Light / moderate aerobic exercise (e.g. walking, jogging, cycling at slow to medium pace) No resistance training 	<ul style="list-style-type: none"> Remain completely free of any concussion-related symptoms
Recovery day		
Sport-specific exercise	<ul style="list-style-type: none"> Increased intensity (e.g. running at an increased heart rate) and duration of activity Add sports specific drills (e.g. goal kick, stationary handball) Commence light resistance training 	<ul style="list-style-type: none"> Remain completely free of any concussion-related symptoms The player should also have a medical clearance (e.g. physiotherapist, sports trainer, first aider) to confirm that the player has had no concussion-related symptoms for at least 1 day
Recovery day		
Graded Loading – full team training		
Limited contact training	<ul style="list-style-type: none"> Return to full team training – non-contact except drills with incidental contact (incl. tackling) 	<ul style="list-style-type: none"> Remain completely free of any concussion-related symptoms Player confident to return to full contact training
Recovery day		
<i>Clearance by a medical doctor is required before returning to the final full contact training session and competitive contact sport</i>		
Full contact training	<ul style="list-style-type: none"> Full team training 	<ul style="list-style-type: none"> Remain completely free of any concussion-related symptoms Player confident to participate in a match
Recovery day		
Return to Play		

Note: Schedule 2 outlines the minimum process to follow in returning to play following a concussion. The earliest that a player may return to play (once they have successfully completed a graded loading program and they have obtained medical clearance) is on the 12th day after the day on which the concussion was suffered.

A more conservative approach is required if there is a lack of baseline testing and active medical practitioner oversight of each stage of the graded return to football. Section 4.4 of these guidelines also outlines the importance of a more conservative approach in certain situations including for children and adolescents, players with a history of concussion and where there is a recurrence of symptoms at any stage during the return to play program.

181 The guidelines include additional considerations for children and adolescents, such as when it is appropriate to return to school.

Concussion panels

- 182 The AFL has set up a concussion panel process which may be used by AFL clubs to provide advice to players who suffer from complex concussion injuries and are considering whether to retire. The panel typically includes four to five independent medical experts. Although the process was set up by the AFL, it is funded by the club of the relevant player using the service.
- 183 The panel process is potentially a very useful tool to assist clubs and players to manage complex concussions effectively. During our review we formed the view that the panel process may be underutilised or utilised after a player has suffered from the symptoms of a complex concussion or other brain injury for several months. We also formed the view that the AFL should encourage clubs to use the panel process proactively and promptly when a player is identified as suffering from a complex concussion.
- 184 Dr Makdissi informed us that encouraging “early use” of the panel process is not feasible or practical for two main reasons.
- 185 **First**, there has been some difficulty in recruiting panel members as the panel service is typically provided outside normal work hours.
- 186 **Secondly**, specialists have declined to be involved given the growing scrutiny of medical professionals involved in managing sports-related concussion injuries and the increasing adversarial nature of the work in managing such injuries.
- 187 Dr Makdissi also referred us to the Neurology Network established by the AFL which includes a list of various clinicians with expertise in the management of concussions. Players can consult individual doctors on that list sequentially, but the network does not include a panel process where a player can consult various experts at the same time.
- 188 While Dr Makdissi raises valid observations, we remain of the view that given the difficulties with managing complex concussions, and the inefficiencies that can arise from seeing various specialists sequentially, the AFL should encourage early use of the panel process. If additional steps need to be taken to schedule panel reviews during business hours, those steps should be taken, and the panel members should be remunerated accordingly. If necessary, the AFL should also consider recruiting interstate experts for the panel.

CHAPTER 3: WORK UNDERTAKEN BY A/PROF MCCRORY

First term of reference

189 The first term of reference asks us to report on the following issues:

The work, research and/or advice (**Work**) Associate Professor Paul McCrory (**McCrory**) undertook for the AFL over time. Itemise to the extent possible the specific research projects or advice streams on which McCrory conducted or participated in.

Overview

- 190 A/Prof McCrory assisted the AFL mostly in an unpaid capacity around his other substantial work commitments which included working as a neurologist at a clinic and working as a salaried researcher for the Florey Institute. Consequently, in preparing this chapter we have had to consider the meaning of “work”, “research” and “advice” in a different setting to a traditional employer/employee relationship or principal/contractor relationship. We have interpreted those words broadly but note the following qualifications.
- 191 As to meaning of “work”, we make the following three general observations.
- 192 **First**, A/Prof McCrory has published extensively on concussion and neurodegenerative diseases. Although the AFL and AFL players are clearly prominent reference points in much of his research (including his collaborations with others), save for two scientific journal articles in our view those publications were not “for the AFL”, as the articles were not funded by the AFL or the product of research funded by the AFL, and the articles were not requested by the AFL. Similarly, A/Prof McCrory has presented at several conferences about concussion issues and the AFL. Again, many of those presentations were not funded or requested by the AFL. As part of this chapter, we identify the presentations where the AFL requested A/Prof McCrory to present on its behalf.
- 193 **Secondly**, in this section we have included references to AFL funded research work undertaken by the Florey Institute in which A/Prof McCrory participated as a salaried researcher of the Florey Institute. Given the research was funded by the AFL, we consider this work could fall within the scope of the above term of reference if a broad interpretation is applied.
- 194 **Thirdly**, A/Prof McCrory also treated some retired AFL players in his capacity as a neurologist after they were referred to him by the AFL for the purposes of the project which commenced in 2014 (the **Past Player Project**). A/Prof McCrory issued invoices to the AFL for that work, which the AFL paid. We have treated that clinical care as “work” for the purposes of this term of reference.
- 195 As to the meaning of “advice”, our inquiry focusses on substantive scientific and medical advice within the scope of A/Prof McCrory’s expertise as a neurologist. We have excluded some ad hoc opinions A/Prof McCrory provided during email correspondence on general administrative issues and media articles.
- 196 The AFL receives numerous proposals to fund or otherwise support research projects. From time-to-time, A/Prof McCrory also proposed research opportunities to the AFL. We do not consider those proposals constitute advice and have excluded them from consideration in this chapter. We have also excluded other emails containing high level discussions about third party research proposals.
- 197 A/Prof McCrory started practising as a doctor in 1984. During 1984 to 2011 A/Prof McCrory was involved in the AFL Doctors’ Association (**AFLDA**), which is separate to the AFL and which we have not included as work, research or advice for the purpose of this term of reference.

- 198 We have sighted a small number of emails from the period 2008 to 2010 between employees of the AFL and A/Prof McCrory but do not consider those emails evidence of work, research or advice that A/Prof McCrory provided to the AFL.
- 199 During 2011, A/Prof McCrory's engagement with the AFL increased when he became part of the AFL's Concussion Working Group. We were informed by Dr Harcourt during the review that he invited A/Prof McCrory to be part of the Concussion Working Group because he was keen to get A/Prof McCrory into the group given A/Prof McCrory's leadership in the concussion field as an author of each of the then contemporaneous Consensus Statements (being the 2001, 2004, 2008 Consensus Statements).
- 200 The purpose of the Concussion Working Group was:⁹⁰
- to assist the AFL Research Board⁹¹ in steering the current suite of concussion projects, and identifying which further steps were necessary to ensure we are doing all that we can to consolidate the current best practice approach.
- 201 During 2011, the following individuals were identified as members of the group:⁹²
- The projects are being guided by a working party consisting of Dr Hugh Seward (AFLMOA), Dr Michael Makdissi, Prof Paul McCrory, Assoc Prof Gavin Davis, Dr Peter Harcourt, Dr Harry Unglik, Lawrie Woodman and Shane McCurry.
- 202 During 2011, Dr Unglik and Dr Harcourt were both AFL Medical Commissioners.⁹³ Dr Seward, Mr Woodman and Mr McCurry also worked for the AFL. Dr Makdissi, A/Prof McCrory and A/Prof Davis were not employed by the AFL. Dr Makdissi was then a club doctor for the Hawthorn Football Club and A/Prof Davis was, and continues to practice as, a neurosurgeon.
- 203 Since 2011, the group membership has changed.⁹⁴ We consider the core group members during the period 2011 to January 2021 were: A/Prof McCrory, Dr Harcourt, Dr Clifton, Dr Makdissi, A/Prof Davis and Dr Maddocks.
- 204 In a memorandum to the AFL Executive dated 1 April 2016, A/Prof McCrory was described together with Dr Makdissi, A/Prof Davis and Dr Maddocks as the "AFL's primary concussion advisors/researchers".⁹⁵ The AFL's view of A/Prof McCrory's advisory role did change over time though. A board paper dated 10 May 2018, stated that A/Prof McCrory is:⁹⁶

⁹⁰ AFL.004.001.1318. The role of the Concussion Working Group has now been replaced by the AFL's Concussion Scientific Committee.

⁹¹ The AFL's Research Board has been in existence for many years and is responsible for making decisions about what research the AFL will fund. That Research Board oversees all research projects, not just concussion research related projects. We have found no evidence that A/Prof McCrory was involved in the AFL's Research Board.

⁹² AFL.001.001.0751.

⁹³ A role that existed before the Chief Medical Officer role was introduced.

⁹⁴ See for example, AFL.001.001.0718 which refers to additional members including representatives of the AFLPA.

⁹⁵ AFL.004.001.0445.

⁹⁶ AFL.004.001.0467.

an AFL consulting neurologist for current and past players, and provides advice on policy. However his views on CTE (that it may not represent a unique pathology and is over diagnosed in the US) does not reflect the AFL position on the issue. Dr Michael Makdissi (Hawthorn FC Club Doctor and AFLDA President) is our primary concussion advisor/researcher.

- 205 From around the date of that board paper, we have noticed a decline in A/Prof McCrory's involvement in the AFL's management of concussion issues, until January 2021 when A/Prof McCrory withdrew from the AFL's Concussion Working Group. The circumstances of that withdrawal are discussed further in **chapter 8**.
- 206 Given A/Prof McCrory has assisted the AFL on various matters for approximately 10 years, we have based our findings on the first term of reference largely on contemporaneous documents provided to us by the AFL. Minutes were not produced for all meetings, consequently, there may have been more meetings that A/Prof McCrory attended than are recorded below. Our visibility of the specific work A/Prof McCrory undertook as a researcher on AFL funded research is also limited as we did not inspect any internal records from the Florey Institute in this review. However, we have had regard to published articles and correspondence about that work with AFL employees. We consider the materials we have reviewed are sufficient for the purposes of responding to this term of reference.
- 207 In the next sections we discuss the work, research and advice undertaken by A/Prof McCrory for the AFL chronologically, starting from 2011.
- 208 A/Prof McCrory has rarely been paid by the AFL for services provided to the AFL. There was one occasion in 2012 where the AFL paid A/Prof McCrory a one-off fee of \$500 to review an incident involving an AFL player who returned to play after receiving a head knock. Further, as mentioned above, A/Prof McCrory has charged the AFL for services provided to retired players who were referred to him by the AFL for treatment. That referral occurred in the context of the Past Player Project.⁹⁷

⁹⁷ We were informed the invoices issued by A/Prof McCrory for neurology consultations in relation to the Past Player Project addressed to the AFLPA were paid for by the AFL.

Period before 2011

- 209 In 1983, A/Prof McCrory graduated with a Bachelor of Medicine / Bachelor of Surgery from the University of Melbourne.⁹⁸ The following year, A/Prof McCrory became a team doctor for the Collingwood Football Club and also became involved in the AFLDA, which is separate to the AFL.⁹⁹ Over time, the AFLDA has produced some work outputs which the AFL has used, such as annual injury reports, and the 2008 concussion guidelines. We have not come across any evidence which indicates that A/Prof McCrory was involved in assisting with the preparation of those documents. Consequently, we have not treated A/Prof McCrory's involvement with the AFLDA as "work, research and/or advice" undertaken for the AFL.
- 210 We have sighted a small number of emails from the period 2008 to 2010 between employees of the AFL and A/Prof McCrory. In summary, the emails show that the AFL was liaising with A/Prof McCrory from time to time about potential research project opportunities for the AFL to participate in and about an AFL proposal to host a conference on various medical issues. We do not consider those emails evidence work, research or advice that A/Prof McCrory provided to the AFL.

2011

- 211 As mentioned above, during 2011 there was a noticeable increase in email correspondence between AFL employees and A/Prof McCrory about concussion issues when A/Prof McCrory joined the Concussion Working Group. From early 2011 there were various emails between A/Prof McCrory and the AFL about new articles on concussion research, including both media and scientific journal articles.¹⁰⁰
- 212 During 2011, A/Prof McCrory also worked on revising and updating the AFL's 2008 concussion guidelines. We understand Dr Makdissi and Lawrie Woodman were the primary authors and that A/Prof McCrory assisted the drafting process. The guidelines were published in April 2011.¹⁰¹
- 213 In April 2011, A/Prof McCrory presented at an IOC conference on the AFL. We understand this presentation was not requested or otherwise sanctioned by the AFL.¹⁰²
- 214 The AFL also invited A/Prof McCrory to attend a meeting in August to discuss the AFL's broader concussion strategy, which he attended.¹⁰³ This is the earliest meeting of the Concussion Working Group that we came across in our review.

⁹⁸ A copy of his curriculum vitae is AFL.001.001.0569.

⁹⁹ Formerly known as the AFL Medical Officers' Association.

¹⁰⁰ See, for example, AFL.001.001.1751; AFL.001.001.0031; AFL.001.001.0744.

¹⁰¹ AFL.001.001.0787 and AFL.001.001.0788.

¹⁰² AFL.001.001.0616.

¹⁰³ AFL.004.001.1871 is a copy of the agenda for that meeting. AFL.001.001.1775 and AFL.001.001.1776 are copies of cover email and attachment post-meeting. The attachment summarises the concussion projects then underway across the AFL.

215 After that meeting, the AFL circulated a summary of the “Concussion Projects Underway Across the AFL”. There are 13 project items listed in the document. Item 13 refers to A/Prof McCrory. Our understanding is that the project was not then on foot, but the discussion was about a potential future project. Item 13 states:

13. Immediate support protocol for past or current players who have had head injuries during their career (McCrory/AFLPA)

An immediate support protocol and study will be established for past or current players who have concerns that head injuries during their career have created ongoing problems with mental health or cognitive function. This will encompass an initial assessment, appropriate medical referral, comprehensive investigations and development of a management strategy.

Funded by: AFLPA?

216 In September 2011, the Florey Institute approached the AFL to introduce itself and explore avenues for research on the potential long-term effects of concussion.¹⁰⁴ A/Prof McCrory was invited to an introductory meeting, which occurred in late October 2011.¹⁰⁵ While this meeting is not, in our view, responsive to the first term of reference, it is relevant to the AFL’s relationship with the Florey Institute, which is discussed in more detail later in this report.

¹⁰⁴ AFL.001.001.2817.

¹⁰⁵ AFL.001.001.2780; AFL.001.001.2899.

2012

217 In 2012, A/Prof McCrory:

- (a) shared some example concussion guidance documents from other sporting codes with the AFL and provided observations on those guidelines to the AFL;¹⁰⁶
- (b) provided advice to the AFL regarding a suggestion then being discussed in the media that an AFL player should be forced to retire after sustaining three concussions;¹⁰⁷
- (c) provided comments on a draft internal AFL paper to be provided to the AFL Commission regarding concussion issues;¹⁰⁸
- (d) provided feedback on a concussion guidelines information sheet for parents of children and adolescents playing community level football;¹⁰⁹
- (e) provided comments on a draft AFL media release in relation to a concussion in football conference scheduled for March 2013;¹¹⁰ and
- (f) in response to a request from the AFL, A/Prof McCrory shared with the AFL copies of his slides from the 2012 conference in Zurich for the Concussion in Sport Group. At the conference A/Prof McCrory presented on:¹¹¹
 - (i) “Current & Retired athletes with chronic symptoms: the spectrum of clinical presentation”;
 - (ii) “What is the lowest threshold to make a diagnosis of concussion?”; and
 - (iii) “Australian Football”.

218 We understand the AFL did not request or otherwise sanction the presentation at the 2012 Zurich conference about the AFL. Further, we understand the AFL did not pay for A/Prof McCrory to attend the 2012 Zurich conference.

219 In addition to the above matters, during 2012 the AFL asked A/Prof McCrory to assist with an investigation into the circumstances in which an AFL club permitted a player to return to play after the player was removed from the game due to a head knock. The AFL paid A/Prof McCrory \$500 to conduct that investigation, which the contemporaneous documents indicate was the AFL’s standard payment for such investigations.¹¹²

¹⁰⁶ AFL.001.001.009; AFL.001.001.0012; AFL.001.001.0259; AFL.001.001.0260.

¹⁰⁷ AFL.001.001.0238.

¹⁰⁸ AFL.001.001.0617.

¹⁰⁹ AFL.001.001.0631.

¹¹⁰ AFL.001.001.0641.

¹¹¹ AFL.001.001.0644; AFL.001.001.0645; AFL.001.001.0647; AFL.001.001.0650.

¹¹² AFL.004.001.1645; AFL.002.001.0023; AFL.001.001.2834; AFL.001.001.1213; AFL.001.001.0001.

2013

220 In 2013, A/Prof McCrory:

- (a) provided mark ups on a draft AFL media release regarding the AFL's concussion conference scheduled for March;¹¹³
- (b) presented at the concussion conference in March;¹¹⁴
- (c) attended Concussion Working Group meetings in May and November;¹¹⁵
- (d) prepared the survey that was used in the Past Player Project and liaised with various individuals about the survey, including Ian Prendergast on behalf of the AFLPA;¹¹⁶
- (e) was involving in other general planning to set up the Past Player Project;¹¹⁷ and
- (f) provided input on the draft 2013 AFL concussion guidelines and an executive summary document.¹¹⁸

¹¹³ AFL.001.001.0640.

¹¹⁴ AFL.001.001.2753.

¹¹⁵ AFL.004.001.2434; AFL.001.001.2275.

¹¹⁶ AFL.001.001.1641; AFL.001.001.0368; AFL.001.001.2125; AFL.001.001.2178;
AFL.001.001.2179; AFL.001.001.2180.

¹¹⁷ AFL.001.001.0655; AFL.001.001.0656.

¹¹⁸ AFL.001.001.0618; AFL.001.001.0619; AFL.001.001.0628.

2014

221 In 2014, A/Prof McCrory:

- (a) liaised with various individuals in relation to getting the survey for the Past Player Project ready to be launched online;
- (b) was involved in discussions about how data would be shared with the AFLPA and the need for a further memorandum of understanding with the AFLPA to deal with the issue;¹¹⁹
- (c) responded to questions from the AFLPA on concussion management issues at the request of the AFL;¹²⁰
- (d) attended Concussion Working Group meetings in April and May;¹²¹
- (e) assisted with fundraising efforts in relation to AFL research projects including the Past Player Project. This involved attending a conference in New York hosted by the American National Football League (**NFL**) in August 2014. Although A/Prof McCrory is not named on the agenda as an AFL representative,¹²² and his travel costs were covered by the NFL,¹²³ in our view A/Prof McCrory nevertheless acted as an AFL representative together with Dr Harcourt and Dr Makdissi at the conference. Relevantly, A/Prof McCrory gave a presentation with Dr Harcourt and Dr Makdissi about the AFL's concussion work. A/Prof McCrory also assisted with preparation of the AFL PowerPoint presentation;¹²⁴
- (f) provided feedback on a HIA form to be used with the AFL concussion guidelines;¹²⁵
- (g) assisted the AFL with development of an app based on tools prepared by the Concussion in Sport Group;¹²⁶
- (h) liaised with the AFL about the progress of AFL funded research being undertaken by the Florey Institute;¹²⁷
- (i) provided notes of his preliminary findings on the Past Player Project survey to the AFL;¹²⁸ and

¹¹⁹ AFL.001.001.1594; AFL.001.001.1172; AFL.001.001.1565; AFL.001.001.01017; AFL.001.001.0221.

¹²⁰ AFL.001.001.2389; AFL.001.001.2394.

¹²¹ AFL.001.001.0850; AFL.001.001.2267.

¹²² AFL.001.001.0164.

¹²³ Letter from 1 July 2022 from A/Prof McCrory, [9].

¹²⁴ AFL.001.001.0447; AFL.001.001.0173; AFL.001.001.0155; AFL.001.0156; AFL.001.001.0236; AFL.001.001.0160.

¹²⁵ AFL.001.001.0198; AFL.001.001.0200; AFL.001.001.1581; AFL.001.001.0181; AFL.001.001.0121.

¹²⁶ AFL.001.001.0205.

¹²⁷ AFL.001.001.0089; AFL.001.001.0330; AFL.001.001.0443.

¹²⁸ AFL.001.001.0481; AFL.001.001.0482.

- (j) had appointments with at least six retired AFL players as part of the clinical component of the Past Player Project.

2015

222 In 2015, A/Prof McCrory:

- (a) provided some feedback on an AFL wellness questionnaire for current AFL players;¹²⁹
- (b) had appointments with at least nine retired AFL players as part of the clinical component for the Past Player Project. He had multiple appointments with one individual;
- (c) provided some views on suggested next steps regarding the use of the Past Player Project survey data, the clinical follow-up process for participants who were offered further assessments, and opportunities for further research;¹³⁰
- (d) provided his views on photosensitive epilepsy in response to an email query from Dr Harcourt;¹³¹
- (e) provided comments on a draft revised HIA form;¹³² and
- (f) assisted the AFL to put together a referral network of neurologists. This was a list of neurologists in each state who could be recommended for treatment of concussion and related issues.¹³³

¹²⁹ AFL.001.001.0218.

¹³⁰ AFL.001.001.0046; AFL.001.001.0096; AFL.001.001.0208.

¹³¹ AFL.001.001.0043.

¹³² AFL.001.001.0059; AFL.001.001.0060.

¹³³ AFL.001.001.0151; AFL.001.001.0152; AFL.001.001.0154.

2016

223 In 2016, August, A/Prof McCrory:

- (a) prepared and circulated a PowerPoint presentation which summarised the retired player survey data;¹³⁴
- (b) provided copies of the questionnaires used by him for the Past Player Project to Dr Harcourt and Dr Clifton; and
- (c) had appointments with six retired AFL players as part of the clinical component of the Past Player Project. In some instances, he had multiple appointments with particular individuals.

224 In April 2016, A/Prof McCrory also gave a presentation at a Florey Institute conference about concussion issues, neurodegenerative diseases and the AFL. We have found no evidence which suggests the AFL requested or otherwise sanctioned that presentation.

225 In October 2016, A/Prof McCrory attended the Concussion In Sport Group meeting in Berlin. We were informed that the AFL did not pay for A/Prof McCrory to attend that conference on its behalf.

¹³⁴ AFL.001.001.0102 and AFL.001.001.0103.

2017

226 Despite the observation made at paragraph 204 above, A/Prof McCrory's involvement with the AFL noticeably decreased from 2017 onwards. That change is consistent with observations made by various individuals during the interviews we conducted. A/Prof McCrory continued to be copied to emails involving the Concussion Working Group but was not active on the email chains.

227 In 2017, A/Prof McCrory:

- (a) provided input into the draft 2017 AFL concussion guidelines for the AFL level;¹³⁵
- (b) provided input into the development of the concussion panel process including marking up the proposed process document;¹³⁶
- (c) had appointments with four retired AFL players as part of the clinical pathway for the Past Player Project. He treated one player twice in 2017; and
- (d) was asked to treat an umpire who had suffered a head injury at a pre-season club training session. We were informed the umpire was referred by the then consultant doctor to the AFL Umpiring Department.

228 In 2017, there was a Collision In Sport conference in Dublin, which the AFL attended. The records that we have reviewed indicate A/Prof McCrory did not attend that conference.¹³⁷ We were also informed by the AFL that A/Prof McCrory did not attend the conference.

¹³⁵ AFL.001.001.0123 and AFL.001.001.0124.

¹³⁶ AFL.001.001.0352 and AFL.001.001.353.

¹³⁷ See, for example, AFL.004.001.0780.

2018

229 In 2018, A/Prof McCrory:

- (a) attended an AFL meeting on 10 May to discuss the status of the Past Player Project;¹³⁸
- (b) had appointments with at least five retired AFL players as part of the clinical component of the Past Player Project. In some instances, he had multiple appointments with particular individuals;
- (c) in response to a request from Dr Harcourt, reviewed video footage of an incident involving an AFL player to provide an opinion on whether the club doctor should have removed the player from play in accordance with the AFL concussion protocol in place at the time;¹³⁹
- (d) attended a dinner meeting in August with the Concussion Working Group;¹⁴⁰ and
- (e) attended a meeting in September with the AFL and Florey Institute to discuss next steps on the AFL funded Florey Institute imaging projects.¹⁴¹

230 In October, A/Prof McCrory also attended a Collision In Sport conference in London. The records we have seen show that he attended on behalf of the NFL, not the AFL.¹⁴² Four other individuals are recorded as having attended on behalf of the AFL (Dr Davis, Dr Harcourt, Dr Clifton and Dr Makdissi).

231 The agenda for the conference includes discussion about the “use of video in diagnosis”.¹⁴³ After the conference an article was published in September 2018 which was co-authored by the conference attendees. There were 18 authors in total, including A/Prof McCrory. The article is titled “International study of video review of concussion in professional sports”.¹⁴⁴ We consider A/Prof McCrory’s involvement in this conference was not undertaken for the AFL.

¹³⁸ AFL.001.001.01425; AFL.001.001.1426; AFL.001.001.0697; AFL.001.001.1561.

¹³⁹ AFL.001.001.1596.

¹⁴⁰ AFL.001.001.2138.

¹⁴¹ AFL.001.001.1973; AFL.001.001.2487.

¹⁴² AFL.004.001.0780.

¹⁴³ AFL.001.001.1261.

¹⁴⁴ AFL.004.001.0695.

2019

232 In 2019, A/Prof McCrory:

- (a) attended a Concussion Working Group dinner meeting on 10 January;¹⁴⁵
- (b) was involved in the drafting of an article about imaging of current AFL players by the Florey Institute which was published in 2019.¹⁴⁶ There were nine authors. A/Prof McCrory was not the lead author;
- (c) had a series of appointments with one retired AFL player as part of the clinical component for the Past Player Project;
- (d) prepared and sent to the AFL letters about individuals that A/Prof McCrory had previously seen as part of the Past Player Project. We understand the purpose of those letters was to provide an update to the AFL on the results of further scans and assessments provided to those individuals after A/Prof McCrory had seen those patients, which the AFL intended to report back to the individuals; and
- (e) was involved in one of the AFL's concussion panels to provide advice to a player who had experienced ongoing concussion issues. Although the concussion panel process was paid for by the club of the relevant AFL player, we still consider this work is relevant to the first term of reference. The panel that A/Prof McCrory was involved in was a four-person panel.

233 In 2019, the AFL sent representatives to attend a Collision In Sport conference in Sweden. The records we have reviewed indicate that A/Prof McCrory did not attend the conference.¹⁴⁷ We were also informed by the AFL that A/Prof McCrory did not attend the conference.

¹⁴⁵ AFL.001.001.2988; AFL.001.001.2050.

¹⁴⁶ Jackson GD, Makkissi M, Pedersen M, et al (n 40).

¹⁴⁷ See, for example, AFL.004.001.0780.

2020 to 2022

- 234 In 2020, A/Prof McCrory had an appointment with one retired AFL player as part of the clinical component of the Past Player Project.
- 235 We have not found email correspondence which shows that A/Prof McCrory provided input on the AFL's 2020 concussion guidelines. We have found some emails in late 2020 and early 2021 where A/Prof McCrory provides some input on the draft 2021 guidelines.
- 236 In January 2021, A/Prof McCrory requested to be removed from the Concussion Working Group based on the content of the second draft of the 2021 AFL and AFLW Guidelines. We will discuss the circumstances in which A/Prof McCrory removed himself from the group further in **chapter 8**.
- 237 Since then, three scientific journal articles related to the Florey Institute Work have been prepared. Two of the articles have been published and the third is awaiting final acceptance for publication.
- (a) Jackson GD, Makdissi M, Pedersen M, et al. Functional brain effects of acute concussion in Australian rules football players. *J Concussion*. 2019;3(1). doi: 10.1177/2059700219861200;
 - (b) Pedersen M, Makdissi M, Parker DM, et al. Quantitative MRI as an imaging marker of concussion: evidence from studying repeated events. *Eur J Neurol*. 2020;27(10):e53-e54. doi:10.1111/ene.14377; and
 - (c) Mito R, Parker DM, Abbott DF, Makdissi M, Pedersen M, Jackson GD. White matter abnormalities characterize the acute stage of sports-related mild traumatic brain injury. *Brain Commun*. 2022;4(4):fcac208. doi:10.1093/braincomms/fcac208.
- 238 A/Prof McCrory was involved in preparing the first and second of these, although he was not the lead author. A/Prof McCrory denies any involvement in preparation of the third, or indeed any knowledge about it.¹⁴⁸

¹⁴⁸ Letter from A/Prof McCrory dated 7 October 2022, [27].

Conclusion

239 During the period 2011 to January 2021, A/Prof McCrory undertook a variety of work, research and advice for the AFL in a largely unpaid capacity. His involvement with the AFL decreased from 2018. A/Prof McCrory withdrew from the AFL's Concussion Working Group in January 2021. While he continued to be a co-investigator for the Florey Institute imaging projects funded by the AFL, in 2020 imaging for those projects was paused due to lockdown restrictions and has not re-started. Three journal articles have subsequently been prepared, two of which were co-authored by A/Prof McCrory and have been published as at the date of this report. A/Prof McCrory is not a co-author of the third unpublished article and denies involvement in its preparation.

CHAPTER 4: PLAGIARISM ALLEGATIONS

Second term of reference

240 The second term of reference states as follows:

McCrory's admitted and alleged plagiarism of research or other academic articles by him, including:

- a. the instances of plagiarism identified and/or admitted by McCrory or alleged against him;
- b. the extent to which such plagiarism related to and/or materially may prejudice the Work undertaken by McCrory in relation to:
 - i. concussion research or data generally;
 - ii. the Concussion in Sport Group.

Overview

241 Plagiarism has been defined as:¹⁴⁹

the use of others' published and unpublished ideas or words (or other intellectual property) without attribution or permission, and presenting them as new and original rather than derived from an existing source.

242 Plagiarism can be intentional or unintentional. The term also covers practices of varying seriousness, from an inadvertent failure to use quotation marks to deliberate copying of the work of others.

243 The minimum threshold requirements for plagiarism are unclear. In our review we have excluded examples where part of a sentence may have been copied or a frequently used explanation of a medical or scientific term has been used. We consider those examples are not sufficiently serious to be labelled as plagiarism for the purposes of this review.

244 There are also different modes of plagiarism such as plagiarism of text, plagiarism of ideas and self-plagiarism. Those modes can also overlap. For example, in some cases plagiarism of text can also include plagiarism of ideas.

245 Self-plagiarism consists of recycling and republishing one's own previous work, also referred to as redundant publication. Self-plagiarism has also been described as:¹⁵⁰

the practice of an author using portions of their previous writings on the same topic in another of their publications, without specifically citing it formally in quotes. This practice is widespread and sometimes unintentional, as there are only so many ways to say the same thing on many occasions, particularly when writing the Methods section of an article.

246 There are varying views on whether self-plagiarism constitutes research misconduct. For example, the World Association of Medical Editors has stated:¹⁵¹

Although [self-plagiarism] usually violates the copyright that has been assigned to the publisher, there is no consensus as to whether this is a form of scientific misconduct, or how many of one's own words one can use before it is truly "plagiarism". Probably for this reason self-plagiarism is not regarded in the same light as plagiarism of the ideas and words of other individuals. If journals have developed a policy on this matter, it should be clearly stated for authors.

247 There is a body of academic literature discussing the potential negative consequences of self-plagiarism and whether it is less reprehensible and warrants lesser admonishment than plagiarism of others.¹⁵² For example, some self-plagiarism can lead to the impression that a greater amount is known about a topic than is the case (by creating the illusion of a body of publications which

¹⁴⁹ World Association of Medical Editors (WAME) Publication Ethics Committee, 'Recommendations on Publication Ethics Policies for Medical Journals', *WAME* (Web Page) <<https://wame.org/recommendations-on-publication-ethics-policies-for-medical-journals>>.

¹⁵⁰ Ibid.

¹⁵¹ Ibid.

¹⁵² See, for example, Das N, Panjabi M. Plagiarism: Why is it such a big issue for medical writers? *Perspect Clin Res*. 2011;2(2):67-71. doi:10.4103/2229-3485.80370.

in reality derive from a less significant source), or that an individual has contributed more to knowledge on a certain topic than in reality. As to the latter, we note that some researchers rely on citation scores to promote their research; that is, the number of times their written work is cited. Examples of citation scores include Research Gate scores and Google Scholar citation scores. However, given the debate about the impropriety of self-plagiarism is unresolved, we have focussed on plagiarism of text of others only.

- 248 Plagiarism is a form of research misconduct. Other forms of research misconduct include falsification of data or misrepresenting the results of a study to support a study hypothesis. Depending on the seriousness of the research misconduct, it can detract from the quality of published research that can be relied on for future use. Commentary in this area relevantly identifies the following four types of detrimental effects that can arise from research misconduct: individual costs, brand costs, capital costs and human costs.¹⁵³ Individual costs refers to costs to the individual researcher who engaged in the misconduct. Brand costs concerns costs to the brand of the university, publication or journal associated with the research. Capital costs include the following:¹⁵⁴

A case of misconduct can set off a chain reaction of capital loss to a publication or academic institution, including losses incurred while financing deceptive research, money spent to investigate the case itself, as well as costs associated with repairing the damage caused by the incident. Most organizations keep such information private, given the embarrassing and sensitive nature of misconduct.

- 249 Human costs concern the impacts to third parties such as patients and the broader general public. As to human costs, it has been said:¹⁵⁵

Although papers containing misconduct are being retracted at a greater rate than ever before, that does not necessarily mean that the retracted materials have not influenced ongoing research and even medical treatment in a negative way.

- 250 As explained below, the instances of plagiarism that A/Prof McCrory has admitted to, and the further instances that we have identified, are limited and we consider it unlikely that they would give rise to any human costs, however, A/Prof McCrory's conduct appears to have impacted his personal reputation. As to brand and capital costs the position is less clear.

- 251 An important issue for the purposes of our review is the extent to which plagiarism enhanced A/Prof McCrory's reputation as a concussion expert and thereby increased his influence on policy in this field. The effect of plagiarism on the standing of experts and thereby policy debate has been highlighted in the scientific literature.¹⁵⁶

- 252 The instances of plagiarism we have identified below are, in our view, limited in impact to arguably enhancing (and subsequently, upon discovery, diminishing)

¹⁵³ 'True Costs of Research Misconduct', *iThenticate* (Web Page, 2012) <<https://www.ithenticate.com/resources/papers/research-misconduct>>.

¹⁵⁴ Ibid.

¹⁵⁵ Ibid.

¹⁵⁶ Kennedy D. Research fraud and public policy. *Science (NY)*. 2003;300(5618):393. doi:10.1126/science.300.5618.393.

the standing of A/Prof McCrory as an expert. We consider the evidence does not support a finding that any plagiarism materially contributed to or enhanced A/Prof McCrory's reputation as a concussion expert; although, there may have been some minor enhancement of reputation through sheer weight of publication numbers.

- 253 The instances of plagiarism we have identified do not concern fabrication, falsification or misrepresentation of substantive research.
- 254 Further, in our view, there is no evidence that plagiarism affected the content of A/Prof McCrory's advice to AFL or materially affected the AFL's guidelines on concussion, in large part because there is no accusation of falsification or fabrication of relevant research.

Methodology

- 255 A/Prof McCrory has published extensively in scientific and medical journals. With Gordon Legal's assistance, we identified over 400 articles, editorials, letters to the editor, book reviews, books and book chapters authored by A/Prof McCrory, either as a sole-author or co-author. Given that volume of material, our approach to this term of reference has involved four separate lines of enquiry. Having regard to the subject matter of this review, we have focussed on articles about concussion and neurodegenerative diseases.
- 256 **First**, we wrote to A/Prof McCrory and asked him to identify any written work he has authored which includes instances of plagiarism.
- 257 **Secondly**, we reviewed public commentary regarding plagiarism allegations against A/Prof McCrory.
- 258 **Thirdly**, we asked Gordon Legal to write to the British Journal of Sports Medicine and make enquiries as to the status of their investigation into A/Prof McCrory's work. On 18 July 2022, Gordon Legal received the following response:

Apologies for the delay in responding to your letter of 5 July 2022 to Professor Jonathan Drezner. I am replying on Professor Drezner's behalf as Head of Legal at BMJ.

We note your request for information regarding BMJ's investigation into Dr McCrory's work. Unfortunately, we are not in a position to answer your specific questions for several reasons.

Firstly, our investigation into these matters is ongoing and I am sure you will understand that we want our investigation to be both thorough and fair. We appreciate how important the Australian Football League's concerns are, but we do not consider that it is appropriate to provide further information than is already publicly available. Secondly, we have limited resources and do not have the time or capacity to engage with third parties in relation to independent investigations.

As part of BMJ's commitment to transparency, the BJSM website (<https://bjsm.bmj.com>) will be updated as the investigation continues with all the information considered appropriate for release.

I appreciate that this reply may be disappointing, but I hope it clarifies our position.

- 259 However, shortly before our review was completed, the British Journal of Sports Medicine published the results of its investigation.¹⁵⁷
- 260 **Fourthly**, we asked Gordon Legal to use plagiarism detection software to review A/Prof McCrory's published written work for instances of plagiarism. We asked Gordon Legal:
- (a) to remove from the review set those articles which do not relate to concussion issues or neurodegenerative diseases;

¹⁵⁷ Macdonald H, Ragavooloo S, Abbasi K, Drezner J. Update on the investigation into the publication record of former BJSM editor-in-chief Paul McCrory. *Br J Sports Med.* 2022;0:1-2. doi:10.1136/bjsports-2022-106408.

- (b) to only review those articles of which A/Prof McCrory was the sole author or, in instances of co-authorship, the lead author. For co-authored articles of which A/Prof McCrory was not the lead author it is less clear what the extent of his involvement was in the drafting process. Although A/Prof McCrory is a co-author of many publications, for a large proportion (in the vicinity of 50%) he was not the lead author; and
- (c) to remove from the review set the small number of letters to the editor and book reviews which did not contain substantive scientific research (less than 10).

261 Our review considered the articles identified by the British Journal of Sports Medicine internal review (the results of which are published in **Macdonald H, Ragavooloo S, Abbasi K, Drezner J. Update on the investigation into the publication record of former BJSM editor-in-chief Paul McCrory. *Br J Sports Med.* 2022;0:1-2. doi:10.1136/bjsports-2022-106408**). We have set out below our own findings based upon our review and our resulting conclusions. We neither endorse nor disagree with the conclusions reached and views expressed by the British Journal of Sports Medicine but acknowledge that they present the important perspective of the academic journal most affected by plagiarism engaged in by its own former editor.

262 During our review we could not obtain electronic copies of approximately 26 book chapters where A/Prof McCrory was the sole or lead author. The majority of those chapters were published during the period 1993 to 2006. We also could not obtain electronic copies of approximately 22 journal articles and/or editorials. Those articles were published between 1991 to 2002. Although we could not obtain copies of those documents, given our findings in relation to the other documents, we are comfortable that the plagiarism review has been sufficiently rigorous. We also observe that a small number of those documents may not be about concussion or neurodegenerative diseases; for example, one chapter is titled "Cardiovascular Problem in Exercise".¹⁵⁸

¹⁵⁸ Paul McCrory, 'Cardiovascular Problem in Exercise' in Peter Brukner and Karim Khan (eds) *Clinical Sports Medicine* (McGraw-Hill, 1993).

Admitted instances of plagiarism

- 264 A/Prof McCrory has admitted that the following seven editorials contain instances of plagiarism:
- (a) “Commotio cordis”;¹⁵⁹
 - (b) “Should we treat concussion pharmacologically?”;¹⁶⁰
 - (c) “A cause for concern?”;¹⁶¹
 - (d) “Definitions for the purist”;¹⁶²
 - (e) “The time lords – measurement and performance in sprinting”;¹⁶³
 - (f) “How should we teach sports medicine?”;¹⁶⁴ and
 - (g) “Take nothing but pictures, leave nothing but footprints...?”¹⁶⁵.
- 265 These editorials were identified by Nicholas Brown as instances of potential plagiarism in a blog written by him which is dated 7 March 2022.¹⁶⁶ We understand Mr Brown is a data analyst at Linnaeus University.¹⁶⁷
- 266 The British Journal of Sports Medicine’s website contains a webpage updated on 6 April 2022 which confirms that one editorial was retracted, being the editorial titled “The time lords – measurement and performance in sprinting”.¹⁶⁸
- 267 A/Prof McCrory wrote the above editorials in his capacity as editor of the British Journal of Sports Medicine. The editorials are not substantive articles about

¹⁵⁹ McCrory P. Commotio cordis. *Br J Sports Med.* 2002;36(4):236-237. doi:10.1136/bjism.36.4.236.

¹⁶⁰ McCrory P. Should we treat concussion pharmacologically? The need for evidence based pharmacological treatment for the concussed athlete. *Br J Sports Med.* 2002;36(1):3-5. doi:10.1136/bjism.36.1.3.

¹⁶¹ McCrory P. A cause for concern? *Br J Sports Med.* 2005;39(5):249. <<https://bjism.bmj.com/content/39/5/249>>.

¹⁶² McCrory P. Definitions for the purist. *Br J Sports Med.* 2005;39(11):786. <<https://bjism.bmj.com/content/39/11/786>>.

¹⁶³ McCrory P. The time lords--measurement and performance in sprinting. *Br J Sports Med.* 2005;39(11):785-786. <<https://bjism.bmj.com/content/39/11/785>>.

¹⁶⁴ McCrory P. How should we teach sports medicine? *Br J Sports Med.* 2006;40(5):377. <<https://bjism.bmj.com/content/40/5/377>>.

¹⁶⁵ McCrory P. Take nothing but pictures, leave nothing but footprints...? *Br J Sports Med.* 2006;40(7):565. doi:10.1136/bjism.2006.029231.

¹⁶⁶ Nicholas Brown, ‘Some examples of apparent plagiarism and text recycling in the work of Dr Paul McCrory’, *Nick Brown’s blog* (Blog Post, 7 March 2022). <<http://steamtraen.blogspot.com/2022/03/some-examples-of-apparent-plagiarism.html>>.

¹⁶⁷ This is based on the following article: Melissa Davey, Stephanie Convery and Emma Kemp, ‘New plagiarism claims against sport concussion guru Paul McCrory’ (Web Page, 23 September 2022) <<https://www.theguardian.com/sport/2022/sep/23/new-plagiarism-claims-against-sport-concussion-guru-paul-mccrory>>.

¹⁶⁸ Jonathan Drezner, Kamran Abbasi and Helen Macdonald, ‘BJSM Statement on Plagiarism’, *British Journal of Sports Medicine* (Web Page, 6 April 2022) <<https://bjism.bmj.com/pages/bjism-statement-on-plagiarism-2>>.

scientific or medical research. They are short one or two page introductory articles.

268 We also observe that five of the seven editorials do not relate to concussion and/or neurodegenerative diseases.¹⁶⁹ For example, the article titled “The time lords – measurement and performance in sprinting” discusses timing technology in relation to sprinting. The article titled “Take nothing but pictures, leave nothing but footprints...?” is about the environmental footprint associated with major sporting events.

¹⁶⁹ The two editorials regarding concussion and/or neurodegenerative issues are titled “Should we treat concussions pharmacologically” and “A cause for concern”.

Editorials: additional instances of plagiarism identified

- 269 We have identified the following two further instances of plagiarism in editorials written by A/Prof McCrory for the British Journal of Sports Medicine which relate to concussion issues or neurodegenerative diseases:
- (a) “Clinical governance in sports medicine”;¹⁷⁰ and
 - (b) “Cheap solutions for big problems?”.¹⁷¹
- 270 The first editorial includes a handful of phrases which appear to have been copied from another editorial that has not been footnoted. That other article is titled “Time for a collective approach from medical specialists to clinical governance”.¹⁷² No complete sentences were copied.
- 271 The second editorial includes sentences copied in full. The source article¹⁷³ has been footnoted on one occasion, but quotation marks were not used. The use of a single footnote is in our view strictly insufficient although it does provide some acknowledgment to the original author.
- 272 We have reviewed a more recent blog post by Mr Brown dated 22 September 2022, which alleges that an additional editorial written by A/Prof McCrory contains plagiarised text.¹⁷⁴ The editorial is titled ‘The “piriformis syndrome” – myth or reality?’.¹⁷⁵ Mr Brown alleges that the editorial contains self-plagiarism. As mentioned above, given the debate about the impropriety of self-plagiarism is unresolved, we have focussed on plagiarism of text of others only. We also observe that this editorial is not about concussion or neurodegenerative diseases. For those reasons, we have not identified this editorial as a further instance of plagiarism.

¹⁷⁰ While this editorial is not primarily concerned with concussion or neurodegenerative diseases, it does reference the Concussion in Sport Group conference in 2001. For that reason, we have included it in our review. The full citation for the editorial is: McCrory P. Clinical governance in sports medicine. *Br J Sports Med.* 2003;37(6):472. doi:10.1136/bjism.37.6.472.

¹⁷¹ McCrory P. Cheap solutions for big problems? *Br J Sports Med.* 2007;41(9):545. <<https://bjsm.bmj.com/node/74359>>.

¹⁷² Scott I. Time for a collective approach from medical specialists to clinical governance. *Intern Med J.* 2002;32:499-501. doi.org/10.1046/j.1445-5994.2002.00299.x.

¹⁷³ Kramer A, Erickson K and Colcombe S. Exercise, cognition and the aging brain. *J Appl Physiol.* 2006;101:1237-1242. doi:10.1152/jappphysiol.000500.2006.

¹⁷⁴ Nicholas Brown, ‘Further apparent (self-)plagiarism in the work of Dr Paul McCrory’, *Nick Brown’s blog* (Blog Post, 22 September 2022). <<https://steamtraen.blogspot.com/2022/09/further-apparent-self-plagiarism-in.html>>.

¹⁷⁵ McCrory P. The “piriformis syndrome” – myth or reality? *Br J Sports Med.* 2001;35:2009-211. doi: 10.1136/bjism.35.4.210.

Articles: additional instances of plagiarism identified

273 We also identified two journal articles containing plagiarised text:

- (a) “Sports Concussion and the risk of chronic neurological impairment”;¹⁷⁶ and
- (b) “What is the lowest threshold to make a diagnosis of concussion?”.¹⁷⁷

274 In relation to the first article, the following highlighted text has been copied. As the extract indicates, a footnote was provided but the text was not included in quotation marks:¹⁷⁸

McKee et al⁷⁰ examined 12 cases of CTE and found 3 athletes with CTE who also developed a progressive motor neuron disease with profound weakness, atrophy, spasticity, and fasciculations several years before death. In these 3 cases, there were abundant TDP- 43–positive inclusions and neurites in the spinal cord in addition to tau neurofibrillary changes, motor neuron loss, and corticospinal tract degeneration. The TDP-43 proteinopathy associated with CTE is similar to that found in frontotemporal lobar degeneration with TDP-43 inclusions, in that widespread regions of the brain are affected. Akin to frontotemporal lobar degeneration with TDP-43 inclusions, in some individuals with CTE, the TDP-43 proteinopathy extends to involve the spinal cord and is associated with motor neuron disease. This is the first pathological evidence that repetitive head trauma experienced in collision sports might be associated with the development of a motor neuron disease.

275 Although the original article is cited, we consider copying such a large body of text without quotation marks strictly constitutes plagiarism, albeit of a relatively minor nature.

276 In relation to the second article, the following highlighted text has been copied:¹⁷⁹

Athletes often minimise and/or do not report their symptoms because they want to play and believe that their symptoms are mild enough to safely play through them. It is common for athletes, at all levels, to assume that ‘having their bell rung’ is part of the game, and they do not realise the significant possible consequences of playing with concussion.

In a study of high-school football players, only 47.3% of players with a concussion reported their injury. Of those who did not report, 66.4% did not think their injuries were serious enough to report, 41% did not want to be held out of play and 36.1% did not realise their symptoms were consistent with concussion. In this study, when injuries were reported, they were most often reported to an athletic trainer. It is important that the culture of sports change such that athletes, parents, coaches and healthcare providers understand the significance of unreported, repetitive concussive injury. This is most important at the youth level where sports-trained medical providers, such as athletic trainers and team physicians, are often not available.

¹⁷⁶ McCrory P. Sports Concussion and the Risk of Chronic Neurological Impairment. *Clin J Sport Med.* 2011;21(1):6-12. doi: 10.1097/JSM.0b013e318204db50.

¹⁷⁷ McCrory P, Meeuwisse W, Echemendia R, Iverson G, Dvořák J and Kutcher J. What is the lowest threshold to make a diagnosis of concussion? *Br J Sports Med.* 2013;47:268-271. doi: 10.1136/bjsports-2013-092247.

¹⁷⁸ McCrory P (n 176), page 8.

¹⁷⁹ McCrory P (n 177), page 3.

Recognition of concussive impacts

The first step in evaluating and managing concussion is recognition of injury. Although a big hit gathers the attention of medical staff and others present, it is important to realise that the mechanism of injury may be subtler and not as obvious. The mechanism of injury may not even be a single impact, but rather the combined effects of multiple hits over a short period of time (minutes). In a study evaluating the relationship between the force of impact in college football and clinical outcome, magnitude of impact did not correlate with clinical injury.⁴¹ This study used accelerometers embedded into the football helmet and evaluated athletes with a clinical programme involving preinjury baseline testing (symptoms, neuropsychological testing, postural balance testing) and repeat postinjury testing. The postinjury measures were compared with the baseline measures. The impact magnitude of the hits in concussed athletes ranged from 60.51 to 168.71 g, yet no significant relationships between these impacts (linear or rotational, location) and the change scores for symptom severity, postural stability or neurocognitive function were found.

Physical signs of acute sports concussion

The symptoms of concussion are one component of diagnosis with the other components including a neurological examination, cognitive assessment and balance evaluation. The physical examination is important to exclude other critical diagnoses, as well as to determine whether additional emergent evaluation is necessary.

- 277 The highlighted text is from an article titled “The Acute Symptoms of Sport-Related Concussion: Diagnosis and On-field Management”,¹⁸⁰ which was not cited in the second article. In our view this instance of plagiarism is more serious than the instance identified in the first article but does not evidence any fabrication, falsification or misrepresentation of substantive research.
- 278 In Mr Brown’s blog post referred to above, Mr Brown also alleged five further articles written by A/Prof McCrory contain plagiarised text.¹⁸¹ Those documents are listed below:
- (a) “Does second impact syndrome exist?”;¹⁸²
 - (b) “Treatment of recurrent concussion”;¹⁸³
 - (c) “What advice should we give to athletes post-concussion?”;¹⁸⁴
 - (d) “Second impact syndrome or cerebral swelling after sporting head injury”;¹⁸⁵ and

¹⁸⁰ Putukian M. The Acute Symptoms of Sport-Related Concussion: Diagnosis and On-field Management. *Clin Sports Med.* 2011;30:49-61. doi:10.1016/j.csm.2010.09.005.

¹⁸¹ Nicholas Brown (n 174).

¹⁸² McCrory P. Does Second Impact Syndrome Exist? *Clin J Sport Med.* 2001;11(3):144-149. doi: 10.1097/00042752-200107000-00004.

¹⁸³ McCrory P. Treatment of Recurrent Concussion. *Curr Sports Med Rep.* 2002;1(1):28-32. doi: 10.1249/00149619-200202000-00006.

¹⁸⁴ McCrory P. What advice should we give to athletes postconcussion? *Br J Sports Med.* 2002;36:316-318. doi: 10.1136/bjism.36.5.314.

¹⁸⁵ McCrory P, Davis G and Makdissi M. Second Impact Syndrome or Cerebral Swelling after Sporting Head Injury. *Curr Sports Med Rep.* 2012;11(1):21-3. doi: 10.1249/JSR.0b013e3182423bfd.

- (e) “Nerve entrapments of the lower leg, ankle and foot in sport”.¹⁸⁶
- 279 Mr Brown alleges that the first three articles are examples of self-plagiarism. As mentioned above, we have focussed on plagiarism of text of others only. Consequently, we have not identified those articles as evidence of plagiarism.
- 280 The fourth article was co-authored by A/Prof McCrory together with A/Prof Davis and Dr Makdissi. Mr Brown alleges that the article includes:
- (a) self-plagiarised text from a 2005 article authored by A/Prof McCrory;
 - (b) text from an article by Christopher Randolph and Michael Kirkwood;¹⁸⁷ and
 - (c) text from a chapter written by A/Prof Davis.¹⁸⁸
- 281 For the reasons mentioned above, we have excluded from this review instances of self-plagiarism.
- 282 While the fourth article does include phrases from the article authored by Christopher Randolph and Michael Kirkwood, the article has been cited. In our view the quantity of text copied is not sufficient to constitute plagiarism. We also observe that the copied text extracts on Mr Brown’s blog differ to the plagiarism software results we rely on.
- 283 As to the allegation that text has been copied from a chapter written by A/Prof Davis, we observe that this fourth article was co-authored by A/Prof Davis. Consequently, we do not consider this to be an instance where A/Prof McCrory has plagiarised the text of another person without appropriate attribution. We also observe that the fourth chapter cites the book chapter at footnote 7.
- 284 We have excluded the last article identified by Mr Brown on the basis that it does not concern concussion or neurodegenerative diseases.

¹⁸⁶ McCrory P, Bell S and Bradshaw C. Nerve Entrapments of the Lower Leg, Ankle and Foot in Sport. *Sports Med.* 2002;32(6):371-391. doi: 10.2165/00007256-200232060-00003.

¹⁸⁷ Randolph C and Kirkwood M. What are the real risks of sport-related concussion, and are they modifiable? *J Int Neuropsychol Soc.* 2009;15(4):512–520. doi:10.1017/S135561770909064X.

¹⁸⁸ Gavin Davis. ‘Neurological outcomes’ in Michael W. Kirkwood and Keith Owen Yeates (eds), *Mild traumatic Brain Injury in Children and Adolescents: From Basic Science to Clinical Management* (Guilford Press, 2012), 99.

Book chapters: additional instances of plagiarism identified

285 During our review, including by reference to Mr Brown’s blog posts, we have also identified instances of plagiarism in the following book chapters authored by A/Prof McCrory:

- (a) “Head Injuries in Sports” (published in 2015);¹⁸⁹
- (b) “Concussion – Onfield and Sideline Evaluation”;¹⁹⁰
- (c) “Concussion revisited: A historical perspective”;¹⁹¹
- (d) “Head injuries in sport” (published in 2005);¹⁹² and
- (e) “Neurologic Problems in Sport”.¹⁹³

286 We have found overlapping examples of plagiarism of text and self-plagiarism. As mentioned above, there is some debate as to how self-plagiarism should be considered. A distinction could potentially be drawn between self-plagiarism of articles where the infringer is the sole-author of the original article versus the infringer being a co-author and not the lead author of the original article. In the latter case, it is arguable that it is not self-plagiarism at all; or that it depends upon which parts of the co-authored paper were written by whom.

287 The first two book chapters include text copied from various articles written by A/Prof McCrory alone as well as articles co-authored by A/Prof McCrory. By way of example, both chapters include almost verbatim the following text from a systematic review article. The lead author of that article was A/Prof Andrew Gardner:¹⁹⁴

Tremendous media attention surrounding sport-related concussion has been directed towards the potential for long-term problems in athletes with high exposure to head contact (ie, both concussive and subconcussive impacts) during a career in contact sport. This attention has been fuelled by the publication of autopsy case studies of retired professional athletes and research reporting increased mortality rate due to neurodegenerative diseases in former professional athletes. There is also evidence from retrospective surveys supporting an association between long-term cognitive, psychiatric and neurobehavioural problems and participation in sport.

In recent years, chronic traumatic encephalopathy (CTE) has been redefined from the original condition resembling Alzheimer’s disease (AD) in professional boxers to a new

¹⁸⁹ Paul McCrory, ‘Head Injuries in Sports’ in Mahmut Nedim Doral and Jon Karlsson (eds), *Sports Injuries*, (Springer-Verlag Berlin Heidelberg, 2015) 2935.

¹⁹⁰ Paul McCrory and Michael Turner, ‘Concussion – Onfield and Sideline Evaluation’ in David McDonagh and David Zideman (eds), *The IOC manual of emergency sports medicine*, (Wiley Blackwell, 2015) 93.

¹⁹¹ Paul McCrory, ‘Concussion revisited: A historical perspective’ in Isabelle Gagnon and Alain Ptitto (eds), *Sports Concussions: A Complete Guide to Recovery and Management*, (CRC Press, 2019) 9.

¹⁹² Paul McCrory, ‘Head injuries in sport’ in Gregory P Whyte, Mark Harries and Clyde Williams (eds), *ABC of Sports and Exercise Medicine*, (Blackwell Publishing, 2005) 8.

¹⁹³ Paul McCrory, ‘Neurologic Problems in Sport’ in Martin P Schweltnus (ed), *Olympic Textbook of Medicine In Sport*, (Blackwell Publishing, 2008) 412.

¹⁹⁴ Gardner A, Iverson GL and McCrory P. Chronic traumatic encephalopathy in sport: a systematic review. *Br J Sports Med*. 2014;48:84-90. doi: 10.1136/bjsports-2013-092646, page 84.

condition observed in athletes, military personnel and civilians that shares many features with known psychiatric disorders and other forms of dementia.

288 The third book chapter includes text copied from an article co-authored by A/Prof McCrory. The lead author is Prof Karen Johnston.¹⁹⁵ While the article has been included in the reference list and there is an in-text reference to the article, a few sentences have been copied and quotation marks were not used. Overall, despite there being some acknowledgment to the original article, we consider this is strictly an example of plagiarised text.

289 As to the third book chapter we also observe, for completeness, that Mr Brown has identified two sentences which were taken from a news article. The news article is titled "How Teddy Roosevelt helped save football".¹⁹⁶ Below are the sentences as they appear in the book chapter:¹⁹⁷

In 1905 alone, at least 18 people died and more than 150 were injured playing football. People were especially shaken by the November 1905 death of Union College halfback Harold Moore, who died of a cerebral hemorrhage after being kicked in the head while trying to tackle a New York University player. President Theodore Roosevelt summoned coaches and athletic advisers from Harvard University, Yale University, and Princeton University to the White House to discuss how to improve the game of football.

290 We agree the sentences have been copied and that the original author ought to have been cited. Quotation marks should also have been used. Given the content of the text relates to largely historical matters though, we consider this to be a minor instance of plagiarism.

291 As to the fourth book chapter, Mr Brown alleges it contains examples of self-plagiarism. For the reasons stated above, we have excluded self-plagiarism from our review. Mr Brown also alleges that it contains examples of plagiarism of the 2001 Consensus Statement, of which A/Prof McCrory was a co-author. While A/Prof McCrory cited the 2001 Consensus Statement, given the amount of text copied, in our view, quotation marks ought to have been used. We consider this a further minor instance of plagiarism.

292 As to the fifth book chapter, this chapter includes the following highlighted text which has been copied:¹⁹⁸

Although exercise prescription is gaining favor as a therapeutic strategy to minimize the loss of functional capacity in chronic diseases, it remains underutilized as an intervention strategy in the MS population. However, a growing number of studies indicate that exercise in patients with mild to moderate MS provides similar fitness and psychologic benefits as it does in healthy controls with minimal adverse effects (White & Dressendorfer 2004).

¹⁹⁵ Johnston K, McCrory P, Mohtadi N and Meeuwisse W. Evidence-Based Review of Sport-Related Concussion: Clinical Science. *Clin J Sport Med* 2001;11(3):150-159. doi: 10.1097/00042752-200107000-00005.

¹⁹⁶ Katie Zezima, 'How Teddy Roosevelt helped save football', *The Washington Post* (Web Page, 29 May 2014) <<https://www.washingtonpost.com/news/the-fix/wp/2014/05/29/teddy-roosevelt-helped-save-football-with-a-white-house-meeting-in-1905/>>.

¹⁹⁷ Paul McCrory (n 191), page 11.

¹⁹⁸ Paul McCrory (n 193), page 425.

Despite the often unpredictable clinical course of MS, exercise programs designed to increase cardiorespiratory fitness, muscle strength, and mobility provide benefits that enhance lifestyle activity and quality of life while reducing risk of secondary disorders.

- 293 While the source article is referred to as an in-text reference, given the amount of text copied, in our view, quotation marks should have been used.
- 294 Mr Brown has also detected sentences in this chapter from an article titled “Vertebral Artery Dissection”.¹⁹⁹ That article is included in the reference list for the fifth book chapter. A/Prof McCrory has also referred to the article with in-text references. Given the sentences copied, in our view, quotation marks should have been used. Consequently, we regard this as a further minor instance of plagiarism.
- 295 Although we have identified the above additional instances of plagiarism in book chapters, we consider those examples are relatively minor instances of plagiarism.
- 296 Mr Brown’s blog post dated 22 September 2022 identifies two further book chapters as containing plagiarised text. Those chapters are titled:
- (a) “Rehabilitation of acute head and facial injuries”;²⁰⁰ and
 - (b) “Who should retire after repeated concussions” (published in 2007).²⁰¹
- 297 Mr Brown alleges that the first two chapters are examples of self-plagiarism. As mentioned above, we have focussed on plagiarism of text of others only. Consequently, we have not identified those chapters as evidence of plagiarism.

¹⁹⁹ Showalter W, Esekogwu V, Newton KI, Henderson SO. Vertebral Artery Dissection. *Acad. Emerg. Med.* 1997;4:991-995. <<https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1553-2712.1997.tb03666.x>>.

²⁰⁰ Paul McCrory et al, ‘Rehabilitation of Acute Head and Facial Injuries’ in Roald Bahr (ed), *The IOC Manual of Sports Injuries* (John Wiley & Sons, 2012), 95.

²⁰¹ Paul McCrory, ‘Who should retire after repeated concussions’ in Domhnall MacAuley and Thomas Best (eds), *Evidence-based sports medicine* (Blackwell Publishing, 2007) 93. We also observe that there is a 2002 version of this chapter authored by A/Prof McCrory from the first edition of this text.

Conclusion

- 297 This report refers to 16 instances of plagiarism by A/Prof McCrory during his career. A/Prof McCrory informed us of seven editorials which contained plagiarised text. A further two editorials, two articles and five book chapters have also been identified during this review.
- 299 The instances of plagiarism that A/Prof McCrory has admitted to, and the further instances that we have identified, are limited and in our opinion at the less serious end of the spectrum. In our view, they do not affect or taint the work that A/Prof McCrory has undertaken for the AFL. Given our findings in relation to A/Prof McCrory's published written work, we consider the evidence does not support a finding that any plagiarism materially contributed to or enhanced A/Prof McCrory's reputation as a concussion expert. Rather, it constitutes an unfortunate and embarrassing blemish upon his professional (particularly academic) reputation which has disappointed some with whom he has had a professional association and who held him in high regard, including research collaborators, students, patients and organisations such as the AFL. Such associated parties may even have felt concerned about the potential for damage to their own reputation through association with A/Prof McCrory (indeed this review may evidence this concern in part) although we have seen no evidence of such collateral adverse effect.
- 300 As explained in other chapters of this report, we have made findings about some aspects of A/Prof McCrory's conduct which we consider are unsatisfactory, but those findings are not in any way connected with the plagiarism allegations.
- 301 In our view, there is no evidence that alleged plagiarism affected the content of his advice to AFL or materially affected the AFL's guidelines on concussion, in large part because there is no accusation of falsification or fabrication of relevant research.

CHAPTER 5: Undertaking to the Medical Board of Australia

Third term of reference

302 The third term of reference states as follows:

McCrory's undertaking to the Medical Board of Australia provided in May 2018 that he would not perform neurodiagnostic procedures and/or nerve conduction studies and/or electromyography, including:

- a. the circumstances in which the undertaking was given;
- b. what McCrory informed the AFL or any other person who reasonably ought to have been informed, regarding the undertaking;
- c. whether McCrory acted inconsistently with the undertaking in:
 - i. any research projects connected to the AFL; or
 - ii. any treatment or assessment of any AFL or AFLW player or retired player.

Overview

303 The undertaking A/Prof McCrory provided to the Medical Board of Australia (**Undertaking**) states as follows:²⁰²

Dr Paul McCrory [MED0001117299] provides the following undertaking to the Medical Board of Australia (the Board):

I will not perform neurodiagnostic procedures and/or nerve conduction studies and/or electromyography until approved to do so by the Board.

304 The Undertaking does not prevent A/Prof McCrory from generally practising as a neurologist. Rather, the Undertaking applies to a specific set of procedures largely involving the peripheral nervous system (that is, outside the brain and spinal cord). The Undertaking also appears to capture a procedure known as electroencephalograms (**EEG**), which involves the central nervous system. The procedures covered by the Undertaking are types of neurophysiological testing which are occasionally undertaken to investigate certain issues, most commonly issues affecting particular nerves.

305 In March 2016, the Australian and New Zealand Association of Neurologists (**ANZAN**) published new guidance material which outlines specific training requirements for individuals administering neurodiagnostic procedures. Consistent with the information provided to us by Prof O’Sullivan, A/Prof McCrory informed us that around the time he gave the Undertaking, practitioners were required to undertake further specific training in accordance with the ANZAN guidelines in order to conduct electrophysiological or neurodiagnostic testing and he did not wish to go through that process. Consequently, he gave the Undertaking. A/Prof McCrory’s election to provide the Undertaking rather than complete the further training was not unusual or indicative of any impropriety.

306 Given the nature of the Undertaking and the actual services A/Prof McCrory provided to the AFL, in our view A/Prof McCrory was not required to inform the AFL about the Undertaking. We have also not identified “any other person who reasonably ought to have been informed” about the Undertaking.

307 We understand from the individuals we interviewed that the AFL was not aware of the Undertaking before the media published some limited information about the Undertaking earlier this year.

308 During our review we have not come across any evidence which suggests that A/Prof McCrory has acted inconsistently with the Undertaking.

²⁰² The undertaking can be accessed here at <<https://www.ahpra.gov.au/Registration/Registers-of-Practitioners.aspx#search-results-anchor>>.

Regulatory context

309 The Australian Health Practitioner Regulatory Agency (**Ahpra**) implements the National Registration and Accreditation Scheme of health practitioners across Australia. It works together with 15 different boards, one of which is the Medical Board of Australia. The Medical Board of Australia:²⁰³

- registers medical practitioners and medical students
- develops standards, codes and guidelines for the medical profession
- investigates notifications and complaints about medical practitioners
- where necessary, conducts panel hearings and refers serious matters to Tribunal hearings
- assesses international medical graduates who wish to practise in Australia, and
- approves accreditation standards and accredited courses of study.

310 Ahpra also works with accreditation authorities. We are informed by Prof O’Sullivan that ANZAN is the main accreditation organisation for neurologists in Australia. The Royal Australasian College of Physicians (**RACP**) is also responsible for some accreditation of neurologists.

311 A neurologist is a clinician who deals with “disorders ranging from diseases of muscle to disorders of cognitive function and behaviour, using clinical tools ranging from molecular biology through electrophysiology to functional neuroimaging”.²⁰⁴

312 In March 2016, ANZAN introduced new guidance material which recommends specific training for individuals administering neurodiagnostic procedures.²⁰⁵ There are now three “training levels” or “levels of competency”.²⁰⁶ We understand that all neurologists trained in Australia should have level 1 training which is administered by the RACP. Level 2 and 3 training is only required for those neurologists “who wish to perform electrophysiological investigations in clinical practice”.²⁰⁷ Those higher levels of training are optional and are administered by ANZAN.

313 Levels 2 and 3 provide different levels of training for “EMG” which “is used as a synonym for electrodiagnostic medicine, incorporating [electromyography], nerve conduction studies, evoked potentials and related techniques”.²⁰⁸

314 Level 2 requires 6 months full-time supervised training (or its equivalent part-time) and, if completed, permits a neurologist to perform clinical neurophysiology in clinical practice. Level 3 requires 12 months full-time supervised training (or its equivalent part-time) and, if completed, permits a neurologist to specialise in

²⁰³ ‘About’, *Medical Board Ahpra* (Web Page) <<https://www.medicalboard.gov.au/About.aspx>>.

²⁰⁴ ‘Neurology as a career’, *ANZAN* (Web Page) <<https://www.anzan.org.au/neurologytraining/neurologyasacareer.asp>>.

²⁰⁵ Australian and New Zealand Association of Neurologists, *ANZAN requirements for training in clinical neurophysiology (EEG/EP/EMG)*, (March 2016). The publication can be accessed at <https://www.anzan.org.au/downloads/EEG_EMG%20Training%20ANZAN%20March%202016%20Final.pdf>.

²⁰⁶ *Ibid*, page 2.

²⁰⁷ *Ibid*.

²⁰⁸ *Ibid*.

clinical neurophysiology as well as supervise a laboratory service in a teaching hospital or academic institution.

315 We were informed by Prof O'Sullivan that a neurologist who has level 1 training but not level 2 or 3 training may provide specialist advice to patients with brain injuries or policy advice on concussion-related issues. If a neurophysiological test becomes necessary for a patient, the neurologist can refer the patient to an appropriately trained colleague to perform that test.

316 The Undertaking refers to three specific terms: "neurodiagnostic procedures", "nerve conduction studies" and "electromyography". We are informed by Prof O'Sullivan that there is some overlap between these terms. Neurodiagnostic procedures (also known as electrodiagnostic medicine) is a broad term which includes nerve conduction studies and electromyography.

317 Nerve conduction studies involve:²⁰⁹

the stimulation of nerves with small electrical impulses over several points (usually limbs) and measuring the resultant responses. Surface electrodes are used to both deliver and detect the electrical impulses (*Figure 1*). The test is safe and well tolerated with only minor discomfort and no long term side effects. Most patients describe the effects as a 'tingling' or 'tapping' sensation.

318 Electromyography:²¹⁰

is typically undertaken in conjunction with [nerve conduction studies] when more specific information is required. Electromyography is most commonly used to investigate weakness and helps distinguish myopathic from neurogenic causes. Fine needles are inserted into muscle fibres and then the patient is asked to contract these muscles.

319 The term neurodiagnostic procedures also appears to capture EEGs. An EEG may be described as follows:²¹¹

During the EEG, flat metal discs (electrodes) will be placed all over your scalp. They are usually kept in place with a sticky paste. You won't need to cut your hair.

These discs are also attached to wires that send the electrical signals to a computer to record the brain waves. You won't feel any sensations from the discs.

You will need to keep still during the test. You may be asked to do some deep breathing, look at a flashing light or sleep during the test.

An EEG takes about an hour, but may be longer for a sleep recording. Sometimes EEGs are conducted when you have purposely been sleep-deprived.

²⁰⁹ Huynh W, Kiernan MC. Nerve conduction studies. *Aust Fam Physician*. 2011;40(9):693-697. <<https://www.racgp.org.au/afp/2011/september/nerve-conduction-studies>>, page 693.

²¹⁰ *Ibid*, page 695.

²¹¹ 'Electroencephalogram (EEG)', *Health Direct* (Web Page, April 2021) <<https://www.healthdirect.gov.au/electroencephalogram-eeeg>>.

Circumstances in which the Undertaking was given

320 We were informed by A/Prof McCrory that he voluntarily gave the Undertaking at the conclusion of an Ahpra investigation.²¹² A/Prof McCrory's letter to us dated 30 June 2022 stated as follows:

I voluntarily gave the undertaking to the Medical Board at the conclusion of an AHPRA investigation... The investigation followed a self-notification made to AHPRA as required under section 130 of the Health Practitioner Regulation National Law Act 2009 as my scope of practice changed at one of the hospitals where I worked. Around this time, practitioners were required to undertake further specific training (now accreditation) in order to conduct electrophysiological or neurodiagnostic testing, and I did not wish to go through this process. As I advised the Medical Board at this time, I did not intend to return to conducting neurodiagnostic testing as this was not where my professional focus or interests lay, and it was in these circumstances that I gave the undertaking confirming the same.

321 No details of the investigation were provided. We requested copies of correspondence regarding the Undertaking; however, no copies were provided.²¹³

322 We also asked A/Prof McCrory the following question:²¹⁴

Did the circumstances surrounding your provision of that undertaking have anything to do with your research regarding concussion, your relationship with the AFL, or your provision of clinical care to any AFL, AFLW or retired players?

323 A/Prof McCrory answered "No".²¹⁵

324 We also asked A/Prof McCrory:²¹⁶

Since providing the undertaking, has Dr McCrory conducted any neurodiagnostic procedures, nerve conductive studies and/or electromyography on any AFL, AFLW player or retired player?

325 A/Prof McCrory answered "No".²¹⁷

326 We asked A/Prof McCrory when in 2018 the Undertaking was provided.²¹⁸ He responded as follows:²¹⁹

I stopped performing neurophysiological testing in 2015, but the undertaking as it now appears on the public register was accepted by the Medical Board on 18 May 2018.

327 Before receiving the above responses from A/Prof McCrory, we attempted to obtain further information about the Undertaking from Ahpra.²²⁰ However, Ahpra

²¹² Letter from A/Prof McCrory dated 30 June 2022.

²¹³ Letters to A/Prof McCrory dated 16 May 2022, 3 June 2022 and 17 June 2022.

²¹⁴ Letter to A/Prof McCrory dated 16 June 2022.

²¹⁵ Letter from A/Prof McCrory dated 30 June 2022.

²¹⁶ Letter to A/Prof McCrory dated 16 June 2022.

²¹⁷ Letter from A/Prof McCrory dated 30 June 2022.

²¹⁸ Letter to A/Prof McCrory dated 27 July 2022.

²¹⁹ Letter from A/Prof McCrory dated 19 August 2022.

²²⁰ Letter to Ahpra dated 25 May 2022.

informed us that due to the regulatory regime within which it operates it could not disclose the information we requested.²²¹

²²¹ Letter from Ahpra dated 3 June 2022.

Who A/Prof McCrory informed about the Undertaking

- 328 We understand A/Prof McCrory did not inform the AFL about the Undertaking before ceasing his involvement with the Concussion Working Group in January 2021 or subsequently. We have interviewed various current and former AFL employees. They have each confirmed they first became aware of the Undertaking through media reports. We have not come across any correspondence or other documents which indicate that the AFL became aware of the Undertaking before it was reported in the media. We are also not aware of A/Prof McCrory informing any other third party about the Undertaking before the media published details of it earlier this year.
- 329 Given the nature of the Undertaking and the actual services A/Prof McCrory provided to the AFL, in our view A/Prof McCrory was not required to inform the AFL about the Undertaking. In reaching this view we also consider it relevant that A/Prof McCrory was neither an employee nor contractor of the AFL. We have also not identified “any other person who reasonably ought to have been informed” about the Undertaking.

Whether A/Prof McCrory acted inconsistently with the Undertaking

- 330 We have not sighted any evidence which suggests that A/Prof McCrory has acted inconsistently with the Undertaking. For completeness, we note that our ability to investigate this issue has been limited to the information provided to us by persons we interviewed who had consulted with A/Prof McCrory.
- 331 During our review we interviewed several retired AFL players who saw A/Prof McCrory in consultations during the period 2015 to 2019. We asked those individuals what treatments they received during their consultations with A/Prof McCrory (if any). With their permission we also reviewed medical records about their consultations with A/Prof McCrory. Based on the responses we received and medical records we have reviewed, we have not identified any instances where A/Prof McCrory conducted any neurodiagnostic procedures, nerve conduction studies or electromyography on those individuals.
- 332 We did find records showing that one retired player had nerve conduction studies. That procedure was not conducted by A/Prof McCrory. A/Prof McCrory referred that patient to a colleague who performed the nerve conduction studies.
- 333 We also asked the AFL to confirm whether it has any records which evidence A/Prof McCrory conducting any neurodiagnostic procedures including nerve conduction studies or electromyography on any current or retired AFL and/or AFLW players. The AFL informed us it does not have any such records.

Conclusion

- 334 The circumstances in which A/Prof McCrory gave the Undertaking include the introduction of new guidance by ANZAN on training requirements for neurodiagnostic procedures. We were informed by A/Prof McCrory that he did not wish to undertake that additional training. A/Prof McCrory also informed us that before he gave the Undertaking, he was subject to an Ahpra investigation. However, we do not know the details of that investigation.
- 335 Given the limited scope of the Undertaking, in our view A/Prof McCrory was not required to disclose the Undertaking to the AFL and we have not identified any other person who reasonably ought to have been informed about the Undertaking.
- 336 In this review we have found no evidence which suggests that A/Prof McCrory has acted inconsistently with the Undertaking.

CHAPTER 6: TREATMENT OF PLAYERS

Fourth term of reference

337 The fourth term of reference states:

The circumstances in which McCrory treated or assessed AFL or AFLW players or retired players, including:

- a. the circumstances of the referral of such patients to McCrory (e.g. on recommendation of the AFL or Club or GP or otherwise);
- b. the nature of reporting about the outcome of such referrals (e.g. to the AFL or Club or GP or otherwise);
- c. the remuneration paid to McCrory in respect of such consultations (e.g. was McCrory remunerated by the patient or the AFL or the Club or otherwise?).

Overview

- 338 This term of reference is not time limited, and we understand that A/Prof McCrory was first registered as a medical practitioner in 1983. However, given the context of this review, we have focussed on the period 2011 to the date of this report.
- 339 We have been limited in our ability to investigate this term of reference because many of the documents responsive to this term of reference are health records, which are subject to privacy laws and other restrictions. Consequently, the discussion below is general in nature.
- 340 This chapter does not deal with the Past Player Project other than by observing that as part of that project, A/Prof McCrory provided clinical treatment to some retired AFL players. **Chapter 7** addresses the Past Player Project in detail.
- 341 During the review, we were informed that A/Prof McCrory has treated and assessed various AFL, AFLW, and retired players over time. The referral channels, and hence the reporting avenues and payment arrangements, varied.
- 342 In relation to current players, we were informed that club doctors would normally refer the players themselves without involving the AFL in that process, and the club would usually pay for A/Prof McCrory's services if a gap payment was required because the treatment is not covered by Medicare. We understand that in those circumstances reporting would usually be to the patient and referring doctor in accordance with standard practice, and not to the AFL. We observe, however, that having regard to A/Prof McCrory's standing and specialisation and his connection with the AFL and clubs, referral of AFL players for concussion was likely in any event.
- 343 We also observe that between 2017 and 2022, the AFL's concussion guidelines included A/Prof McCrory as part of the "AFL's Neurology Network",²²² together with three other Melbourne doctors.²²³ In our view the inclusion of A/Prof McCrory's name in those guidelines may have prompted some club doctors to refer current players to A/Prof McCrory. The concussion guidelines for 2022 did not include a list of practitioners for concussion referrals and we were informed that the AFL's intention is to produce an updated and broader list of concussion specialists for use by clubs from 2023.

²²² The 2022 AFL and AFLW guidelines (AFL.021.001.0005) refer to this network as the "AFL Neurological Referral Network".

²²³ See further AFL.003.001.0017; AFL.003.001.0018; AFL.003.001.0019; AFL.003.001.0020; AFL.003.001.0021. With respect to the 2022 AFL and AFLW guidelines, AFL.021.001.0005 does not contain a list of the AFL Neurological Referral Network doctors.

Retired Players

344 In relation to retired players who saw A/Prof McCrory generally in his capacity as a specialist and not in connection with any AFL funded research project, we understand based on the information provided to us during interviews and our review of the AFL's internal documents that:

- (a) many retired players will continue to see their club doctors and may have been referred to A/Prof McCrory by those doctors;
- (b) given A/Prof McCrory's reputation as a leading neurologist, general practitioners not affiliated with AFL clubs but treating retired players may have referred those individuals to A/Prof McCrory from time to time;
- (c) ordinarily the patient would be responsible for payment for any services rendered by A/Prof McCrory; and
- (d) reporting would be to the patient and referring doctor, not the AFL.

Clinical treatment within Past Player Project

- 345 The only AFL funded research project that we are aware of that A/Prof McCrory has been involved in, and which has included a clinical treatment component, is the Past Player Project. We understand that A/Prof McCrory saw 28 participants in consultations. He saw some individuals on multiple occasions.
- 346 The majority of those 28 individuals were referred to A/Prof McCrory by the AFL's employed doctors, namely, Dr Harcourt and/or Dr Arain. As to payment, we were informed by the AFL that it paid any gap payments arising from those appointments.
- 347 In relation to reporting, we understand A/Prof McCrory provided some correspondence back to Dr Harcourt and Dr Arain. On occasion when an individual had a referral letter from their personal doctor instead, A/Prof McCrory copied correspondence to Dr Harcourt and/or Dr Arain.

Conclusion

- 348 As part of the Past Player Project A/Prof McCrory provided clinical treatment to some retired AFL players. **Chapter 7** addresses the Past Player Project in detail.
- 349 A/Prof McCrory has treated and assessed various AFL, AFLW, and retired players over time. The referral channels, and hence the reporting avenues and payment arrangements, varied.
- 350 In relation to current players, club doctors would normally refer the players themselves without involving the AFL in that process, and the club would usually pay for A/Prof McCrory's services if a gap payment was required because the treatment is not covered by Medicare. We understand that in those circumstances reporting would usually be to the patient and referring doctor in accordance with standard practice, and not to the AFL.
- 351 We also observe that between 2017 and 2021, the AFL's concussion guidelines included A/Prof McCrory as part of the "AFL's Neurology Network", together with three other Melbourne doctors.²²⁴ In our view the inclusion of A/Prof McCrory's name in those guidelines may have prompted some club doctors to refer current players to A/Prof McCrory. We observe, however, that having regard to A/Prof McCrory's standing and specialisation and his connection with the AFL and clubs, referral of AFL players for concussion was not unlikely in any event. The concussion guidelines for 2022 did not include a list of practitioners for concussion referrals and we were informed that the AFL's intention is to produce an updated and broader list of concussion specialists for use by clubs from 2023.

²²⁴ AFL.003.001.0017; AFL.003.001.0018; AFL.003.001.0019; AFL.003.001.0020; AFL.003.001.0021.

CHAPTER 7: RESEARCH PROJECTS

Fifth term of reference

352 The fifth term of reference requires us to report on various aspects of any research projects “announced, proposed, conducted or participated in by McCrory and the AFL including in relation to the risks of brain injury to players in Australian Football”.

353 The fifth term of reference states as follows:

In respect of all research projects announced, proposed, conducted or participated in by McCrory and the AFL including in relation to the risk of brain injury to players of Australian Football:

- (a) the nature of those research projects;
- (b) the nature of McCrory’s involvement in those research projects (and/or the involvement of the Florey Institute of Neuroscience and Mental Health and/or the AFL), including in respect of:
 - (i) the grant or receipt of funding grants;
 - (ii) the design and administration of the research project; and
 - (iii) any internal management arrangements by or with the AFL for oversight of, or information and knowledge acquisition from, the research project;
- (c) issues of independent ethical governance of those research projects, including compliance with applicable generally accepted protocols for ethical oversight of scientific research;
- (d) any interim or final findings of such research, including the whereabouts and content of:
 - (i) any associated data, including the results of any medical assessments undertaken in connection with the research project, including neuropsychological assessments or scans;
 - (ii) any quantitative or qualitative analysis or interpretation of any medical assessments or associated data;
- (e) the circumstances in which research projects concluded (or the status of any project which is ongoing);
- (f) to the extent that any players, including retired players, of Australian Football were invited to participate in research projects as subjects:
 - (i) what they were told in advance of their participation about the nature, extent and purpose of the research project; and
 - (ii) what information they were provided over time in relation to the findings in the course of the research project and/or at the conclusion of the research project (if applicable); and
- (g) to the extent that any concerns were identified regarding the health of any players, including retired players, of Australian Football, what actions were taken in respect of those concerns.
- (h) the nature of McCrory’s involvement in the preparation of, or research relating to any conclusions drawn or comments made in the AFL Annual Injury reports.

354 The terms “research project” and “participated in” are not defined in the fifth term of reference. Given the potentially broad scope of those terms, we have excluded:

- (a) projects A/Prof McCrory has been involved in where the AFL’s only involvement was the provision of data. We were informed that on occasion the AFL provided A/Prof McCrory with data for research he was undertaking but the AFL was not otherwise involved in the project. An example of this is the AFL providing A/Prof McCrory with data for his PhD research during the period 1992 to 2000; and
- (b) descriptive research where A/Prof McCrory and some AFL employees may have co-authored articles regarding the current state of science on particular issues relating to concussion management and neurodegenerative diseases.²²⁵

²²⁵ See, for example, article titled “International study of video review of concussion in professional sports”. The article had 18 co-authors, including A/Prof McCrory and Patrick Clifton. The article was published in 2019. The full citation is: Davis GA, Makdissi M, Bloomfield P, et al. International study of video review of concussion in professional sports. *Br J Sports Med.* 2019;53(20):1299-1304. doi:10.1136/bjsports-2018-099727.

Overview

- 355 The first part of this chapter canvasses the national ethics framework that applies to research projects involving human participation.
- 356 We then discuss the two research projects which we consider fall within the scope of this term of reference. The first project is described below as the “Pilot Study” and the second project, which has been reported about in the media, is the “Past Player Project”. There is some overlap between the two projects. The Pilot Study commenced in 2010 and continued until 2019. The Past Player Project commenced in 2014.
- 357 In between the two projects, the Florey Institute and the AFL together also sought to set up a larger flagship project which had an estimated cost of \$3 million for the first three years and then \$1.5 million for each subsequent year. Efforts to procure funding for this project continued until around 2019 but the funding for the flagship project was never obtained.
- 358 The Past Player Project, which involved a more modest budget, did however proceed. The funding for this was provided by the AFL, with the Florey Institute also contributing by way of in kind support that was not fully formally reimbursed. The Past Player Project included a research component (using advanced imaging at the Florey Institute) and also a clinical component run by the AFL. A/Prof McCrory was involved in the project both in his capacity as a researcher at the Florey Institute and as a neurologist treating patients.
- 359 After discussing the above matters, we set out our views on ethical issues arising from each project.
- 360 In the last section of this chapter, we discuss sub-paragraph 5(h) of the terms of reference which does not concern a research project but asks us to review the annual injury reports prepared by the AFL and comment on the nature of A/Prof McCrory’s involvement in the preparation of those reports, or any conclusions drawn, or comments made in the reports about A/Prof McCrory’s research.

Ethical governance of human research projects

- 361 In Australia, there is a federal statutory body, known as the National Health and Medical Research Council (**NHMRC**), which is required to issue guidelines for the conduct of medical research, including research involving human participants.²²⁶
- 362 The NHMRC has published two relevant documents that we discuss in this section, being:
- (a) the “National Statement on Ethical Conduct in Human Research” (the **National Statement**); and
 - (b) the “Australian Code for the Responsible Conduct of Research” (the **Code**).
- 363 The documents were developed by the NHMRC together with the Australian Research Council and Universities Australia.
- 364 In summary, these documents set out a process for obtaining approval by a Human Research Ethics Committee (**HREC**) before undertaking some forms of research involving human participation. There are approximately 200 HRECs registered in Australia which have been approved by the NHMRC.²²⁷
- 365 As part of the approval process, the researcher would typically need to prepare a protocol document explaining the project, as well as information sheets and consent forms to be provided to the research participants. We understand that for the two research projects discussed in this report involving the Florey Institute, the researchers applied to a HREC for ethics approval. Those ethics approvals are discussed further below. We were informed by Prof O’Sullivan that if a project continues for over ten years, then it will be necessary to re-apply for ethics approval.

National Statement

- 366 The National Statement:²²⁸

must be used to inform the design, ethical review and conduct of human research that is funded by, or takes place under the auspices of, any of the bodies that have developed this National Statement (NHMRC, ARC, UA).

In addition, the National Statement sets national standards for use by any individual, institution or organisation conducting human research. This includes human research undertaken by governments, industry, private individuals, organisations, or networks of organisations.

²²⁶ *National Health and Medical Research Council Act 1992* (Cth). See, for example, section 10.

²²⁷ ‘Human Research Ethics Committees’, *Australian Government National Health and Medical Research Council* (Web Page) <<https://www.nhmrc.gov.au/research-policy/ethics/human-research-ethics-committees>>.

²²⁸ National Statement on Ethical Conduct in Human Research 2007 (Updated 2018). The National Health and Medical Research Council, the Australian Research Council and Universities Australia. Commonwealth of Australia, Canberra, page 6.

367 The National Statement defines “human research” broadly, as follows:²²⁹

Human research is conducted with or about people, or their data or tissue. Human participation in research is therefore to be understood broadly, to include the involvement of human beings through:

- **taking part in surveys**, interviews or focus groups;
- undergoing psychological, physiological or **medical testing** or treatment;
- being observed by researchers;
- researchers having access to their personal documents or other materials;
- the collection and use of their body organs, tissues **or fluids** (eg skin, blood, urine, saliva, hair, bones, tumour and other biopsy specimens) or their exhaled breath;
- **access to their information (in individually identifiable, re-identifiable or non-identifiable form) as part of an existing published or unpublished source or database.** [emphases added]

368 The National Statement also explains when ethics approval by a HREC is required before a research project is undertaken. The National Statement says:²³⁰

5.1.6 The following types of research require review by a Human Research Ethics Committee (HREC):

- (a) all research that involves more than low risk;
- (b) research falling under the following chapters (except where research on collections of non-identifiable data under these chapters satisfies the conditions for exemption from review – see paragraphs 5.1.22 and 5.1.23):

- *Chapter 4.1: Women who are pregnant and the human fetus*
- *Chapter 4.4: People highly dependent on medical care who may be unable to give consent*
- *Chapter 4.5: People with a cognitive impairment, an intellectual disability, or a mental illness*
- *Chapter 4.7: Aboriginal and Torres Strait Islander Peoples*

and some categories of research falling under

- *Chapter 4.6: People who may be involved in illegal activities* (see first bolded paragraph for details).

369 Paragraph 2.1.6 defines “low risk” research as follows:²³¹

Research is ‘low risk’ where the only foreseeable risk is one of discomfort. Where the risk, even if unlikely, is more serious than discomfort, the research is not low risk.

370 A research project involving MRI imaging typically requires ethics approval as use of an MRI machine exposes the participant to a strong magnetic field which can cause adverse consequences if the individual has metal in their body (such

²²⁹ National Statement on Ethical Conduct in Human Research 2007 (Updated 2018). The National Health and Medical Research Council, the Australian Research Council and Universities Australia. Commonwealth of Australia, Canberra, page 7.

²³⁰ Ibid, page 84.

²³¹ Ibid, page 15.

as a pacemaker). Being in an MRI machine may also cause individuals who suffer from claustrophobia to feel distressed.

371 As to studies involving surveys, the National Statement does not prescribe the circumstances when ethics approval is required. However, we are informed by Prof O'Sullivan the conventional approach is to obtain ethics approval if a survey is undertaken with the intention of analysing and then publishing the results. Alternatively, if that intention does not arise until after the survey is undertaken, then permission is subsequently sought from participants before any publication occurs. Separate to the conventional approach, there is also commentary which discusses the broader benefits of obtaining ethics approval for any survey-based investigation, such as improved project design and ensuring appropriate measures are taken to respect the interests of participants.²³²

372 The National Statement also relevantly says:

5.2.17 Information about research should be presented to participants in ways that help them to make good choices about their participation, and support them in that participation. These ways must take into account:

- (a) whether the information is best communicated through speech, writing, some other way, or a combination of these;
- (b) the need for accurate and reliable translation (written and/or oral) into a participant's first language or dialect;
- (c) culture and its effects on how language (English or other) is understood;
- (d) educational background and level;
- (e) age;
- (f) visual, hearing or communication impairment.

5.2.25 **All documents and other material used in recruiting potential research participants, including advertisements, letters of invitation, information sheets and consent forms, should be approved by the review body.** [emphasis added]

373 Chapters 2.2 and 2.3 deal with obtaining consent from participants. We have extracted what we consider are some key parts of those chapters below.

Consent to participate in research must be voluntary and based on sufficient information and adequate understanding of both the proposed research and the implications of participation in it.

2.2.5 Consent may be expressed orally, in writing or by some other means (for example, return of a survey, or conduct implying consent), depending on:

- (a) the nature, complexity and level of risk of the research; and
- (b) the participant's personal and cultural circumstances.

2.2.6 Information on the following matters should also be communicated to participants. Except where the information in specific sub-paragraphs below is also deemed necessary for a person's voluntary decision to participate, it should be kept distinct from the information described in paragraphs 2.2.1 and 2.2.2:

- (a) any alternatives to participation;
- (b) how the research will be monitored;
- (c) provision of services to participants adversely affected by the research;

²³² Newson AJ, Lipworth W. Why should ethics approval be required prior to publication of health promotion research? *Health Promot J Austr.* 2015;26(3):170-175. doi: 10.1071/HE15034.

- (d) contact details of a person to receive complaints;
- (e) contact details of the researchers;
- (f) how privacy and confidentiality will be protected;
- (g) the participant's right to withdraw from further participation at any stage, along with any implications of withdrawal, and whether it will be possible to withdraw data;
- (h) the amounts and sources of funding for the research;
- (i) financial or other relevant declarations of interests of researchers, sponsors or institutions;
- (j) any payments to participants;
- (k) the likelihood and form of dissemination of the research results, including publication;
- (l) any expected benefits to the wider community;
- (m) any other relevant information, including research-specific information required under other chapters of this National Statement.

The Code and guidelines about the Code

374 The Code “establishes a framework for responsible research conduct that provides a foundation for high-quality research, credibility and community trust in the research endeavour”.²³³ It includes lists of responsibilities that apply to research institutions and individual researchers.

375 In relation to institutions, the Code relevantly states:²³⁴

To foster responsible research conduct, institutions will...

- R7 Support the responsible dissemination of research findings. Where necessary, take action to correct the record in a timely manner.
- R8 Provide access to facilities for the safe and secure storage and management of research data,...

376 A similar requirement is imposed on researchers:²³⁵

Researchers will uphold the principles of responsible research conduct in all aspects of their research. To this end, researchers will:

- R23 Disseminate research findings responsibly, accurately and broadly. Where necessary, take action to correct the record in a timely manner.

²³³ Australian Code for the Responsible Conduct of Research 2018. National Health and Medical Research Council, Australian Research Council and Universities Australia. Commonwealth of Australia, Canberra, page 1.

²³⁴ Ibid, page 3.

²³⁵ Ibid, page 4.

377 The NHMRC has also published guides to assist with implementation of the Code. The guide on “Publication and dissemination of research: A guide supporting the Australian Code for the Responsible Conduct of Research” relevantly states:²³⁶

Researchers have a responsibility to disseminate a fulsome account of their research. The account should include relevant negative results as well as findings that may be contrary to any stated hypothesis. Decisions about how research will be published or disseminated should not be inappropriately influenced by the nature and direction of results...

In fulfilling responsibilities related to accuracy and timeliness (see section 4.2), completeness and transparency (see section 4.6), researchers should be aware of questionable or unscrupulous practices, such as ‘predatory publishing/publications’ and unreasonable delays in publication and dissemination, including unjustified publication embargoes.

²³⁶ Publication and dissemination of research: a guide supporting the *Australian Code for the Responsible Conduct of Research*. National Health and Medical Research Council, Australian Research Council and Universities Australia. Commonwealth of Australia, Canberra, page 4.

Pilot Study

- 378 This project commenced in 2010, before the AFL and the Florey Institute entered into discussions about potential research projects the two organisations could undertake together. The Pilot Study was initially undertaken by the Brain Research Institute, one of the predecessor organisations which was later amalgamated with other organisations to form the Florey Institute in 2012.²³⁷
- 379 The AFL did not become involved in the project until late 2013, when it started paying for imaging.²³⁸
- 380 The Florey Institute described the funding for the study as follows:²³⁹

The study was primarily funded through a combination of fellowship support for the Chief Investigators via the National Health & Medical Research [Council] [NHMRC], and the AFL providing funding support directed to salary costs of Dr Makdissi and research assistants and MRI acquisition and assessment costs.

Ethics application documents

- 381 Before the project commenced, the researchers prepared an ethics approval form which was submitted to the University of Melbourne's Behavioural and Social Sciences Human Ethics Sub-Committee in December 2009 (**Ethics Application**). The project was approved on 25 February 2010.²⁴⁰
- 382 The researchers named on the form are Dr Makdissi, A/Prof McCrory and Prof Graeme Jackson.
- 383 We were informed that the focus of this study was "to assess the applicability of advanced neuroimaging techniques in assessing mild traumatic brain injury".²⁴¹ The Ethics Application set out the following key research questions which the project sought to answer:²⁴²

Key questions:

1. Can advanced neuroimaging techniques detect changes in brain activity following mild TBI?
2. Do changes observed in the injured brain correlate with the clinical state of the patient (particularly symptoms and cognitive deficits) following mild TBI?
3. Are there specific changes detected using advanced neuroimaging techniques that correlate with outcome following mild TBI?

²³⁷ Letter from Florey Institute dated 18 August 2022, [1.2].

²³⁸ AFL.002.001.0067.

²³⁹ Letter from Florey Institute dated 18 August 2022, Annexure 1, page 4.

²⁴⁰ Copies of the ethics approval application form and approval letter were provided to us by the Florey Institute.

²⁴¹ Letter from Florey Institute dated 18 August 2022, [2.2].

²⁴² Application for approval of a project involving human participants, ID number 0830367.1, page 1.

384 Context for those questions was also provided in the Ethics Application. That context included the following statements:²⁴³

Although many patients recover uneventfully following mild TBI, complications such as prolonged symptoms, depression and cognitive deterioration can occur. The problem for clinicians when managing mild TBI is that currently there are no validated predictors of outcome and no direct measures of recovery. Instead, clinical management relies on monitoring indirect measures of brain function, such as symptoms and screening cognitive tests. With considerable advancements in neuroimaging in recent years, newer imaging techniques may provide a window to directly observe changes that accompany mild TBI. The aim of the current project is to investigate the role of novel neuroimaging techniques in the assessment of brain disturbance, using concussion in sport as a human model for mild TBI.

385 The methodology for the project included some typical clinical testing, such as completing a symptom checklist, a computerised screening cognitive test, standard MRI imaging. It also included some further advanced research MRI imaging (taking the total imaging time to about 1 hour and 10 minutes). As the project initially focused on current players who had recently suffered a concussion, the proposed methodology envisaged that players would have repeat assessments until they had clinically recovered from their concussions. The Ethics Application relevantly stated:²⁴⁴

Players will have repeat assessments until clinical recovery (i.e. recovery of symptoms, return to baseline on tests of cognitive function and absence of changes on neuroimaging). Previous data demonstrate that approximately 90% of concussed athletes recover symptoms and cognitive deficits within 7-10 days of injury. In the current study, we anticipate that most concussed players will be tested twice following injury. Players will be tested in the subacute stages following a concussive injury (within 48 hours) and again at 7-10 days post-injury to confirm clinical recovery. This timeframe of assessment reflects current best practice protocols in the management of concussion in sport.⁽¹³⁾ Any player that has not recovered within two weeks of injury will be retested again at 6-12 months after their injury and then 12 monthly for a maximum of 2 years (maximum number of assessments performed on any subject = 5). All outcome measures will be repeated at each assessment.

386 The Ethics Application referred to participation of current AFL players and National Rugby League (**NRL**) players who would be referred to the study by their team doctor following a concussion diagnosis provided the player consented to that referral. The Ethics Application also referred to the recruitment of up to 30 subjects with 30 additional age, sex and education matched uninjured controls over a period of 3 years. The Ethics Application does not refer to any AFL involvement in recruitment of participants.

387 In relation to feedback for research participants, the Ethics Application states:²⁴⁵

The player will be free to withdraw their data from the study at any time without prejudice. This will be emphasized to team doctors and players (through the plain language statement). The principle [sic] investigator will provide concussed players with a plain

²⁴³ Application for approval of a project involving human participants, ID number 0830367.1, page 1.

²⁴⁴ Ibid, page 3.

²⁴⁵ Ibid, page 6.

language statement and consent form, before they undergo testing. Players will also be advised that their data will remain confidential at all times (through the use of player codes).

388 We have also reviewed the plain language statements provided to controls and other participants. As to the process for feedback, both plain language statements provided the following information:

How will I receive feedback?

Once the research has been completed, a brief summary of the findings will be available to you. It is also possible that the results will be presented at academic conferences.

389 The plain language statement for the non-control group also stated:

What will I be asked to do?

...

The results of the symptom checklist, computerized test of brain function and structural MRI scans will be provided to your team doctor. These test [sic] are usually performed by your doctor following a concussive injury and the results are important in determining whether you have recovered from the injury or not. The results of the newer MRI sequences will not be given to your team doctor, as we are not sure what these results mean at present. If any unexpected or abnormal findings are identified on the MRI sequences, your primary care physician (team doctor and/or general practitioner) will be notified and arrangements will be made for further testing or neurological referral as appropriate.

An overall summary of the results of the newer MRI sequences will be made available to you and your team doctor at the end of the study. [emphasis added]

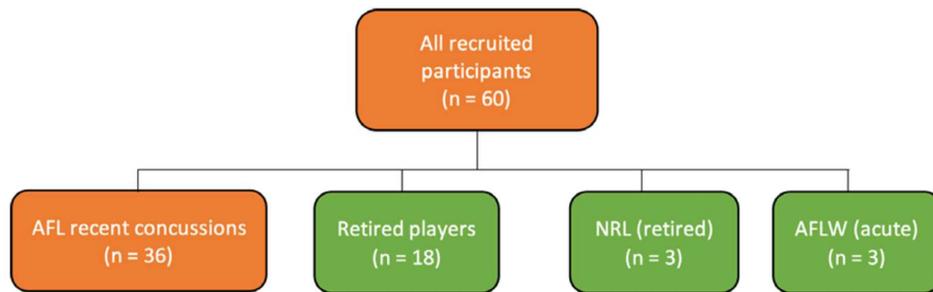
Participation

390 We were informed by the Florey Institute that in total the following numbers of participants have been involved in the Pilot Study:²⁴⁶

Year	# of participants	# of scans
2010	1	1
2011	2	2
2012	4	6
2013	1	3
2014	3	4
2015	13	17
2016	14	18
2017	6	15
2018	12	18
2019	4	10
Total	60	94

²⁴⁶ Letter from Florey Institute dated 18 August 2022, Annexure 1, page 3.

391 The Florey Institute also provided the following breakdown of participants:²⁴⁷



392 In the next section we briefly summarise the outputs from the Pilot Study. We have been informed by the Florey Institute that it does not intend to produce any further outputs from the Pilot Study.²⁴⁸

Publications in relation to the Pilot Study

393 Three scientific journal articles were published in relation to this study. The articles are dated 2019, 2020 and 2022. A/Prof McCrory is named as a co-author on the 2019 and 2020 articles.

394 The 2019 article discusses the findings in relation to 20 current AFL players who were imaged while suffering from acute concussions.²⁴⁹ Those players were scanned with MRI and the results are based on functional MRI imaging. The 2020 article is in the style of a letter to the editor and focusses on scanning in relation to one particular AFL player who experienced a total of seven sports-related concussions between May 2015 to March 2019.²⁵⁰

395 The Florey Institute also provided us with an advanced version of a manuscript for a further article. That article refers to imaging of 30 current AFL players using diffusion MRI. A/Prof McCrory is not named as a co-author on the preprint we have been given.

396 Each of the articles investigates the short-term pathophysiological changes to the brain that occur after a concussion. Relevantly, the 2019 article states:²⁵¹

SRC and its impact on the pathophysiological functioning of the brain has received widespread interest in recent years. However, we still do not fully understand physiological brain changes that occur after a concussion, and conventional clinical neuroimaging is usually normal. Therefore, we utilized an advanced MRI method to help quantify functional MRI changes in acutely concussed Australian rules footballers. We observed differences between acutely concussed Australian rules footballers and controls in brain regions comprising the right lateralized cognitive control network and the salience network (Figure

²⁴⁷ Letter from Florey Institute dated 18 August 2022, Annexure 1, page 4.

²⁴⁸ Ibid, [3.1]-[3.3].

²⁴⁹ Jackson GD, Makdissi M, Pedersen M, et al (n 40).

²⁵⁰ Pedersen M, Makdissi M, Parker DM, et al. Quantitative MRI as an imaging marker of concussion: evidence from studying repeated events. *Eur J Neurol.* 2020;27(10):e53-e54. doi:10.1111/ene.14377.

²⁵¹ Jackson GD, Makdissi M, Pedersen M, et al (n 40), page 3.

1), concordant with previous meta-analytic findings in people with mild traumatic brain injury.

- 397 We have found limited examples of reporting by the Florey Institute to the AFL on this project. For example, A/Prof McCrory and Dr Makdissi provided some updates during Concussion Working Group meetings. However, we have not sighted any written updates provided by the Florey Institute to the AFL, nor evidence of any systematic or formal reporting schedule or plan. We requested copies of any such reporting from the Florey Institute. None were produced in response to those requests.²⁵²
- 398 As mentioned above, there was overlap between the Pilot Study and the Past Player Project. We discuss the involvement of individual participants more fully in the section below about the Past Player Project.

²⁵² Florey Institute letter dated 22 July 2022, [2.1]; letter to Florey Institute dated 25 July 2022, [11]; letter from Florey Institute dated 18 August 2022, [4.1]-[4.2]; email to Florey Institute dated 29 August 2022; letter from Florey Institute dated 12 September 2022.

Developments in the AFL's relationship with the Florey Institute

399 As mentioned in **chapter 3**, around early September 2011 the Florey Institute and AFL started discussing potential avenues for collaborative research. On 7 September 2011, a representative of the Florey Institute sent an email to Shane McCurry (then on the AFL's Research Board) requesting an initial meeting between Florey Institute scientists and representatives of the Research Board to explore supporting further research at the Florey Institute.²⁵³ The meeting subsequently occurred on 27 October 2011.²⁵⁴

400 During November 2011 to May 2012 there were further discussions between the AFL and the Florey Institute.²⁵⁵ An internal AFL memorandum dated 2 February 2012 relevantly stated:²⁵⁶

An investment by the NFL of \$100 million over the 10 year CBA into medical research including concussions should be noted. Our own investment is only \$300k per year and this is for all research of which only a portion is for medical projects. Concussion research in particular is expensive compared with other injuries due to the complexity of the parts involved (i.e. the brain) and the advanced equipment required. There are several projects we would like to do but which are currently outside the scope of our budget, and there are only limited opportunities for leveraging third party funding without losing control of the research focus. We may want to consider how best to fund some of our research endeavours going forward and this may require an increased internal annual investment

401 The minutes of an internal AFL meeting in May 2012 also relevantly stated:²⁵⁷

Discussions are at an advanced stage regarding a proposed partnership with the Florey Neurosciences Institute (FNI), one of the World's leading brain research centres based in Melbourne. The partnership would be used to leverage significant third party funding for advanced longer term concussion research including use of advanced functional MRI imaging technology.

402 A/Prof McCrory appears to have been involved in discussions about the potential AFL-Florey Institute partnership and encouraged the formation of that partnership.²⁵⁸

403 During July to September 2012, the AFL drafted a memorandum of understanding between it and the Florey Institute, and there were discussions between the two organisations about the draft document.²⁵⁹ Although referred to as a memorandum of understanding, the document itself is called the "Research Collaboration Agreement".²⁶⁰ The agreement was dated 1 October 2012 and executed on 11 October 2012.²⁶¹

²⁵³ AFL.001.001.2899.

²⁵⁴ AFL.001.001.2565.

²⁵⁵ AFL.004.001.1896; AFL.001.001.0706. See also, AFL.001.001.1714 and AFL.004.001.1866.

²⁵⁶ AFL.004.001.1896.

²⁵⁷ AFL.001.001.0720.

²⁵⁸ AFL.001.001.2926.

²⁵⁹ AFL.004.001.1249; AFL.001.001.2906. AFL.001.001.1711; AFL.001.001.0736.

²⁶⁰ AFL.001.001.0737.

²⁶¹ Letter from Florey Institute dated 22 July 2022 and response from Florey Institute dated 5 October 2022, [2.6].

404 The Research Collaboration Agreement was not limited to a specific project but encompassed general future research to be undertaken by the Florey Institute on mild traumatic brain injuries with the AFL. We have summarised some of the terms below:

- (a) the agreement was for a 12-month period which would automatically renew annually for a further term of 12 months unless a party gave written notice terminating the agreement (clause 1);
- (b) the Florey Institute agreed to “undertake the Research in a diligent and timely manner” and “provide quarterly reports on the progress of the Research to the AFL and at such other times as may be requested” (clause 3);
- (c) the AFL agreed to “assist in sourcing funds and related support for the Research” and “use reasonable endeavours to facilitate access to the players” (clause 4);
- (d) the parties agreed to establish two bodies – a Collaborative Board of Management (**Board of Management**) and Collaborative Scientific Management Committee (**Scientific Committee**). The Board of Management would be responsible for identifying and recommending the best way to approach funding opportunities and meet no less than twice a year. The Scientific Committee would meet no less than once a quarter and was responsible for setting objectives for the proposed research, reviewing and monitoring project outcomes to ensure they meet those objectives, including approving the methodology proposed for each project (clause 6); and
- (e) the parties agreed that the AFL would become the absolute owner of the Project Intellectual Property (clause 9.2).

405 The Research Collaboration Agreement is silent on the specific funding to be provided by the AFL or third parties. However, contemporaneous documents discuss funding targets of \$3 million for the first three years, with a further \$1.5 million per year once established.²⁶² Those funding targets were provided in relation to a flagship research project that would include research involving current and retired Australian football players and, in subsequent years, players from other codes as well.

²⁶² AFL.001.001.1676. See also AFL.004.001.1252; AFL.004.001.1244.

Attempts to set up a flagship project

406 We have reviewed a draft project proposal which includes more information about costings and the stages for the project.²⁶³ The proposal had two broad components: assessments in relation to current players and assessments in relation to retired players. The proposed assessments for current players included obtaining baseline data during the pre-season period, clinical data from a neurological examination and neuropsychological assessment during the acute stages of a concussion, imaging data, analysing video footage of the concussion incident(s), neurophysiological measures and eye movement tracking tests. The proposal included similar tests for the retired player component, as well as blood samples being taken to check for genetic markers.

407 The proposal also included the following draft budget:²⁶⁴

	Start up phase (year 1)	Start up phase (year 2)	Running phase (year 3)
Equipment:			
Eye movement analysis equipment (iView Tracker – SensoMotoric iView + HD videoscreen)	\$150,000		
Computer resources	\$40,000		
Personnel:			
Program director		\$40,000 (0.2FTE)	\$82,400 (0.4FTE)
Named postdoctoral fellow: M. Makdissi (includes on-costs)	\$80,000 (0.5FTE)	\$82,400 (0.5FTE)	\$83,000 (0.5FTE)
Research assistant (includes on costs)	\$80,000 (1.0FTE)	\$82,400 (1.0FTE)	\$166,000 (2.0FTE)
Physicist (includes on costs)	\$50,000 (0.5FTE)	\$51,500 (0.5FTE)	\$106,000 (1.0FTE)
Psychologist (includes on costs)	\$50,000 (0.5FTE)	\$51,500 (0.5FTE)	\$106,000 (1.0FTE)
PhD Student stipend	\$25,000 (1.0FTE)	\$25,750 (1.0FTE)	\$26,500 (1.0FTE)
Outcome measures:			
Cognitive testing: (\$1000 per test)	\$50,000	\$100,000	\$100,000
3T MRI with advanced sequences (\$1860 per 90min scan)	\$93,000	\$186,000	\$186,000
Biomechanical analysis of injuries (\$750 per analysis)	\$37,500	\$75,000	\$75,000
Neurophysiology (\$200 per test)	\$10,000	\$20,000	\$20,000
Gene testing (\$1000 per test)	\$50,000	\$100,000	\$100,000
Other direct costs:			
Transport costs to and from facility	\$5,000	\$10,000	\$10,000
Follow up of retired players	\$20,000	\$20,000	\$20,000
Travel and small items budget	\$30,000	\$30,000	\$30,000
Statistical analysis			\$25,000
Total direct costs	\$780,500	\$874,550	\$1,135,900
Infrastructure costs (indirect and facility costs) 20%	\$152,100	\$174,910	\$227,180
TOTAL	\$912,600	\$1,049,460	\$1,363,080

408 The expected outcomes at three years were set out as follows:²⁶⁵

1. Provide detailed information on the epidemiology of concussion in sport, including accurate data on injury rates and mechanism of injury. With this data, we will be able to define the extent of the problem, identify potential risk factors for injury and develop intervention strategies to reduce the risk of mild TBI;
2. Establish the role of advanced technologies (such as functional or ultrastructural neuroimaging techniques, eye-movement tracking, electroencephalograms etc) in the diagnosis and assessment of mild TBI;
3. Define the long-term risks associated with TBI in sport and identify the risk factors for poor outcome in individuals who suffer TBI;
4. Validate clinical guidelines for the management of concussion; and

²⁶³ AFL.001.001.1676.

²⁶⁴ Ibid.

²⁶⁵ Ibid.

5. Translate and disseminate the research data to community level programs to improve the management of TBI across all sports and all levels of competition.

409 It seems that in around March 2013 the AFL and the Florey Institute issued a joint press release announcing the partnership. The media release relevantly states:²⁶⁶

To coincide with the first *Concussion in Football Conference* to be held in Australia, the Florey Institute and the AFL joined forces in seeking \$3 million in third party funding support to enable the full scope of planned research to proceed.

The collaboration is the first of its kind and plans to work over the next 5-10 years to enhance the current range of projects to:

- attract significant funding to enable a coordinated and comprehensive research program;
- improve screening processes to identify players at risk of longer term issues; and
- enhance decision-making about concussed players returning to play or training.

Meetings to advance the flagship project

410 Based on the records we have been provided with, it appears the Board of Management met on three occasions (2 May 2013, 19 December 2013 and 25 June 2014) and that the Scientific Committee met on one occasion (10 May 2013). We have included some extracts from the minutes for those meetings below. A/Prof McCrory was a member of the Scientific Committee and was identified as a representative of the Florey Institute rather than the AFL.²⁶⁷ He was not on the Board of Management.

411 The minutes for the Board of Management meeting on 2 May 2013 relevantly state:²⁶⁸

4. CURRENT BUDGET

- It was agreed that \$100k seed funding from the AFL Research Board will be provided for Dr Michael Makdissi's ongoing research. This \$100k consists of a \$60k salary, plus \$40k for scans and other approved outgoings
- It was noted that the strategy needs to be developed to secure further funding for the research program. Any further expenditure is subject to funding secured.

5. STRATEGY FOR SOURCING PROJECT FUNDING

- The NFL are the primary target for funding, as they have a total of \$200m available funding (\$100m from the NFL Administration, \$40m from NFL owners and \$60m from General Electric)
- Members of the AFL Commission and Executive will be travelling to the US in July so a funding strategy must be agreed to prior to departure
- *ACTION: The Florey members will update and broaden the current research proposals prior to the July US trip*
- *ACTION: AFL to have follow up discussion with Phil Scanlan (Consul General to NY) and Richard Ellenbogen in relation to organising a meeting with NFL Executives in July.*
- Secondary funding targets include the TAC (and other state based equivalent organisations), Siemens, Defence force, NHMRC, ARC and the NFLPA
- *ACTION: The Florey will contact Jeff Rosenfeld in relation to potential Armed Forces funding*

²⁶⁶ AFL.001.001.2009.

²⁶⁷ Memorandum to the AFL Executive dated 26 February 2013 (AFL.004.001.1252).

²⁶⁸ AFL.004.001.1218.

412 The minutes for the Scientific Committee meeting on 10 May 2013 relevantly state:²⁶⁹

- The proposed \$100k funding for Dr Mākdissi would include continuing of his research stipend (approx. \$60k), scan costs (approx. \$20k) plus funds for administration of the database (approx. \$20k).
- It was suggested that given the investment by the AFL, high impact research and outcomes are desired to ensure a return. Florey members responded that the pilot study will stand up to scrutiny, involve cutting edge imaging, but is not a research program.
- In terms of the broader research proposal, it was agreed that relevant details are not yet present, and the proposal needs refinement and updating. Add-ons to the research such as collection of blood, use of biomarkers were also discussed, but require funding.
- NFL Proposal – The strategy for the proposal to the NFL was discussed. It was agreed that the proposal needs to include a unique wow factor that the US cannot provide themselves, which was suggested to be the AFL’s access to the players for ongoing scans and research during and after their career. Secondly, the cutting edge nature of the technology and scans able to be produced should also be highlighted.
- A concurrent application to GE was also discussed and approved.
- A further \$100m funding opportunity from the Obama Administration was also raised via the National Science Council, which also has a tie to the NFL.
- Media opportunities were also discussed for the group via AFL Media. It was suggested that the work of Dr Mākdissi, and any potential funding from the NFL (if successful) would provide positive media, especially to counteract the 60 Minutes story.
- ACTION: Florey members plus the Committee Chair, Secretary and AFL Media representative will discuss the strategy of the NFL/GE proposal, and the Florey will then produce a refined and more detailed proposal, specifically the budget and how the various pieces of research fit together. This will be tailored towards leveraging funding from the NFL/GE.

413 On 16 October 2013, the Florey Institute issued an invoice to the AFL for the “Research Collaboration Agreement” in the amount of \$110,000.²⁷⁰ This funding is referred to in the minutes above. While the arrangements with the Florey Institute for the flagship project were being set up, Dr Mākdissi was undertaking work in relation to the Pilot Study mentioned above. Dr Mākdissi was also involved in a separate project at the Florey Institute funded by the AFL involving reviewing video footage of concussion incidents occurring during the AFL season. It did not involve imaging individuals. As far as we are aware, A/Prof McCrory was not involved in that project.

414 On 19 December 2013, there was a further Board of Management meeting. The minutes include some notes regarding further discussion of funding avenues.²⁷¹

415 On 25 June 2014, the third and final Board of Management meeting occurred. The minutes record attempts made by the Florey Institute to obtain funding.²⁷² The minutes also refer to the AFL’s fundraising attempts. Despite the attempts that were being made, we understand that none were successful. The AFL’s attempt to obtain funding from the NFL is discussed further in **chapter 8** below. Those attempts included attending an NFL conference in New York during

²⁶⁹ AFL.004.001.1296.

²⁷⁰ AFL.002.001.0067.

²⁷¹ AFL.004.001.1226.

²⁷² AFL.004.001.1237. The document heading says “agenda”, but the content appears to include actual notes from the meeting and the metadata refers to this document as minutes. Consequently, we have treated the document as minutes rather than an agenda.

August 2014 where the NFL listened to and considered various proposals for research funding.

- 416 Regarding the status of research undertaken as at 25 June 2014 with the funding provided by the AFL, the minutes state:²⁷³

Existing funding for the Player Assessment and Scanning project will expire at the end of 2014, which to date has covered Michael Makkissi's time and approximately 20 player scans (pilot study only)

- 417 Given no external funding was obtained, the partnership proceeded on the basis of the AFL funding only. From 2013, we understand the AFL paid the following amounts to the Florey Institute:²⁷⁴

Year	Total amount paid by AFL based on Florey Institute invoices (GST inclusive)
2014	\$152,391.80
2015	\$159,500
2016	\$114,235
2017	\$70,167.90
2018	\$77,300
2019	\$32,890
2020	\$55,000 ²⁷⁵
2021	No invoices issued
2022	No invoices issued
TOTAL	\$661,484.70

- 418 On 12 June 2019, the Florey Institute terminated the Research Collaboration Agreement.²⁷⁶ The termination letter does not provide any reasons for the termination. We asked various interviewees why the agreement was terminated. We were told they were not aware of the reasons for the termination. We also asked the Florey Institute²⁷⁷ and received the following response:²⁷⁸

We understand that the RCA was terminated in the context of the parties' shared understanding that, following a number of unsuccessful attempts by the Florey Institute researchers to secure funding necessary to advance the research from any of competitive grants, philanthropy or the AFL, the research program would not be able to proceed in the manner contemplated by the parties.

- 419 The above response is consistent with comments we have seen in contemporaneous documents about the various attempts made to obtain external funding.²⁷⁹ We were informed that requests were made internally by AFL

²⁷³ AFL.004.001.1237.

²⁷⁴ AFL.002.001.0074.

²⁷⁵ It is unclear to us which component of work this invoice relates to. The invoice description is "2020 Advanced Research Scanning". However, as explained in paragraphs 390 to 392 above, the Florey Institute appears to have ceased imaging for the Pilot Study in 2019. See further: AFL.004.001.1279.

²⁷⁶ AFL.004.001.1207.

²⁷⁷ Letter to Florey Institute dated 25 July 2022.

²⁷⁸ Letter from Florey Institute dated 18 August 2022, [7.2].

²⁷⁹ See, for example, AFL.004.001.1237.

officers to senior AFL management for additional funding, but that further funding was not provided. We were also informed that AFL officers considered the AFL could have provided additional funding for the project.

Past Player Project

- 420 As mentioned above, the Past Player Project was the product of failed attempts to secure funding for a flagship project. It started with an online survey. Individual responses were then reviewed and filtered into three cohorts. Further assessments were undertaken in relation to the highest priority cohort. Those assessments included both clinical assessment and the opportunity to participate in research assessments which included MRI imaging with the Florey Institute. Some additional individuals also became involved in the project even though they had not completed the original survey.
- 421 Given the various aspects of the Past Player Project, this section is discussed in four parts as follows:
- (a) the survey;
 - (b) the clinical component;
 - (c) the Florey Institute imaging research component; and
 - (d) other ethics issues relevant to the project.

The Survey

- 422 In this section we explain the process for preparing and implementing the online survey tool completed by approximately 550 retired AFL players. Unlike a conventional research project, the survey was a collaboration between the Florey Institute, the AFL and AFLPA.
- 423 The AFL paid the Florey Institute \$27,500 for work regarding the survey.²⁸⁰ We explain the Florey Institute's involvement in the survey below (which as far as we can tell was undertaken primarily by A/Prof McCrory). We were informed by the Florey Institute that this payment was likely applied to the engagement of the provider of the information technology platform for the online survey and associated work.²⁸¹
- 424 The planning process for the online survey commenced in early September 2013. The email exchanges we have sighted indicate that the purpose of the survey was to screen players to identify retired players who might be suffering from ongoing effects of repeat head injuries during their AFL playing careers.²⁸²
- 425 An email from 4 September 2013 sent by A/Prof McCrory relevantly states:²⁸³

Currently we have

1. brief screening tool for retired players (4 pages)
2. Screening tool for spouse/partners (3 pages)
3. Detailed questionnaire for players with problems (takes 30-60 mins depending on cognitive issues)
4. Detailed medical history questionnaire for retired players who don't have a GP or medical info (about 30 mins to complete)

We figure the only practical route to access the majority of players and coordinate results is online given there are about 5000 retired players across Australia. The AFLPA has current emails etc for about 2000 of these last time I spoke to Ian Prendergast and they were working on accessing more.

Cost and timing depends on how we do this. It would be worth a meeting with Ian prendergast/matt finnis to see what is possible from their end re accessing emails or whatever of retired players. If we had to do it by mail and then collate and go through and analyse 5000 responses it is a big job !! In our draft budget of the initial \$100,000 we had earmarked 20k to develop this project as an online database so this could be discussed further.

Did you want to meet to discuss?

- 426 On 13 September 2013, there was a meeting between A/Prof McCrory, Dr Clifton and Dr Harcourt to discuss the proposed survey.²⁸⁴

²⁸⁰ AFL.004.001.1265.

²⁸¹ Florey Institute response dated 5 October 2022, [2.7].

²⁸² AFL.001.001.2485.

²⁸³ AFL.001.001.1641.

²⁸⁴ AFL.001.001.1959.

427 It seems the following month the AFLPA first became involved in the Past Player Project.²⁸⁵ As explained below, the AFLPA took on an active role to assist with setting up the survey and circulated the survey to its database of retired players.

428 During November 2013, further work was done by A/Prof McCrory to prepare the survey. The AFL was also taking steps to prepare a media release and online documents that would be used to encourage retired players to complete the survey.²⁸⁶

429 On 27 November 2013, A/Prof McCrory sent an email explaining the then status of the project and survey as follows:²⁸⁷

This is a study funded by the AFL and conducted by the Florey (AFL and Florey have an existing MOU re research in concussion) with the support of the AFLPA. The study is looking at the long term health of retired AFL players and Dr Peter Harcourt and Pat Clifton as well as the AFL Concussion Working Group (Inc Mark Evans) has been instrumental in developing this idea

The plan initially is to screen all past players with an online survey and then any players identified will be medically assessed in more detail as a second step. The survey we are talking about here re the logos is the first step.

On the front page of the survey we would like to have the AFL logo in addition to the AFLPA and the Florey logos. There will also be a message from David Parkin who is the 'face' of this study and possibly a message from Andrew Demetriou or Mike Fitzpatrick (Pat Clifton is discussing with them whether they want this as well)

The online survey is likely to be open for 3-4 months in early 2014 and then the results analysed and a report to the AFL Working Group made...

430 During December 2013, A/Prof McCrory sent the draft survey to Ian Prendergast (who was then the General Manager at the AFLPA), and Mr Prendergast provided a response to the draft.²⁸⁸ His response noted that the AFLPA's database has 2035 members "of what we believe to be 5,650 living past AFL/VFL members".²⁸⁹

431 During December 2013, A/Prof McCrory was also following up with Dr Clifton on the status of letters to be signed by Andrew Demetriou and David Parkin endorsing the survey to be included in the online materials for the survey.²⁹⁰ He continued to follow up in January 2014 and it seems the online launch materials were finalised around early February 2014.²⁹¹

432 During February to April 2014, a memorandum of understanding was drafted to permit information sharing between the Florey Institute, AFL and AFLPA. We

285 AFL.001.001.2157.

286 AFL.004.001.2454.

287 AFL.001.001.0036.

288 AFL.001.001.2179; AFL.001.001.2180; AFL.001.001.2178.

289 AFL.001.001.2178.

290 AFL.001.001.0327.

291 AFL.001.001.0505; AFL.001.001.2286.

understand that document was executed by the various parties during late April to mid-May.²⁹² Relevantly, there were terms that:

- (a) the Florey Institute would analyse and review any responses received following distribution of the Survey by the AFLPA, subject always to any obligations it has under the Research Collaboration Agreement (clause 4(c)); and
- (b) if, after any analysis and review conducted in accordance with clause 4(c), the Florey Institute determined that a player required further assessment, the Florey Institute must provide the AFLPA with the particular player's survey responses and identifying information and provide recommendations regarding any further assessment required (clause 4(d)).

433 On 28 May 2014, there was a Concussion Working Group meeting where the project was discussed. The minutes relevantly state:²⁹³

2.4. Past Player Screening Survey - *Paul McCrory*

- The past player survey will be live within the next few days to a week, some minor database verification issues need to be resolved
- The referral process in the event of issues being identified was discussed, and it was resolved that the player ID number goes to the Player's Association for staff to follow up
- It was noted that remaining funding for possible scanning of affected players will be very slim, given the cost of \$1000 per scan
- Some players will also be scanned who are not presenting with symptoms (if requested), who will operate as controls

434 The survey was launched in June 2014. During the month before the launch there were media reports which suggested that the AFL had agreed to fund an unlimited number of brain scans and had provided millions of dollars in funding for research with the Florey Institute. However, the AFL had not made any such commitment. It may be that there was some conflation between the AFL's previous media release mentioned in paragraph 409 above to seek funding for the flagship project in the vicinity of \$3 million and the subsequent rollout of the Past Player Survey.

435 By way of example, one article published by *The Sunday Age* stated:²⁹⁴

The AFL has committed to funding an unlimited number of brain scans for retired footballers to address memory and mental health problems that have struck footballers in retirement... The initial estimate for funding the program is \$3 million, but the AFL has effectively committed to spend as much as it takes to assess the brain function of its living alumni.

²⁹² AFL.004.001.3360.

²⁹³ AFL.001.001.1662.

²⁹⁴ Samantha Lane, 'AFL steps up research into brain trauma' *The Sunday Age*, (Melbourne, 18 May 2014) 3.

436 Another article published by The Sun-Herald stated:²⁹⁵

Meanwhile, the AFL has committed to funding an unlimited number of brain scans for retired footballers as the code ramps up its response to one of the most troubling issues in world sport - concussion...

The initial estimate for funding the program is \$3 million, but in a major breakthrough for the code, the AFL has effectively committed to spend as much as it takes to assess the brain function of its living alumni.

437 A further article published in the Canberra Times stated:²⁹⁶

The initial estimate for funding the program is \$3 million, but in a major breakthrough for the code the AFL has effectively committed to spend as much as it takes to assess the brain function of its living alumni... **It's expected a report on the progress of the project will be tabled in 12 months.** [emphasis added]

438 As to the above bolded text, we have not seen any evidence of an agreement to table a progress report including who the report would be tabled with.

439 There was a subsequent AFL media release dated 23 June 2014 which provided an overview about the AFL's concussion research activities, including a brief summary of the screening survey but it did not respond directly to the above reports.²⁹⁷

440 The survey was also launched in June 2014.²⁹⁸ The survey was launched online with some accompanying documents including a letter from prominent former player David Parkin and AFL CEO Gillon McLachlan.

441 The letter from David Parkin relevantly states:²⁹⁹

This is a short, simple survey that will provide invaluable insight into the potential longer term impacts of concussion in Australian football. I would therefore urge you to be as detailed and forthcoming in your responses as possible – the information gained will only be as valuable as the responses you provide.

This survey has been developed and certified by a number of leading experts and in conjunction with the Florey Institute, an organization recognized as an international leader in brain research. **The information gathered is designed to identify those respondents who may require more in depth assessment.** It's important to note that confidentiality is of paramount importance here – any information obtained will be stored securely at the Florey, de-identified and only reported on an aggregate basis.

This survey is available to all former players so if you know of any former AFL/VFL players who are not registered with the AFLPA, we ask that you encourage them to contact that organisation, or their former AFL/VFL club or the AFL itself to take part in this survey. [emphasis added]

²⁹⁵ Daniel Cherny and Samantha Lane, 'Jeers all round for fans who booed at concussed umpire' *The Sun-Herald* (Sydney, 18 May 2014) 59.

²⁹⁶ Samantha Lane, 'Ex-footballers to get free brain scans' *The Canberra Times*, (Canberra, 18 May 2014) 40.

²⁹⁷ AFL.004.001.0786.

²⁹⁸ AFL.004.001.1237.

²⁹⁹ AFL.001.001.2404.

442 We observe the letter from David Parkin referred to additional in-depth assessments for some participants after completing the survey. The letter does not expressly identify whether those assessments were purely for research purposes or for clinical treatment purposes. The letter from Gillon McLachlan was more high level and did not include any information on steps that would occur after completion of the survey.³⁰⁰

443 In November 2014, after the survey had been live for approximately five months, Dr Clifton asked A/Prof McCrory for a copy of the preliminary findings, which A/Prof McCrory provided.³⁰¹ A/Prof McCrory's summary noted that there had been 404 responses with 40 incomplete responses. The summary states that 80% of individuals had reported returning to play on the day of a concussion and only 30% had told a doctor about their concussion. Of the surveyed individuals 30% believed that they were experiencing long term effects of concussion.

444 On 17 February 2015, Dr Clifton sent an email to A/Prof McCrory summarising next steps on the past player survey and clinical component of the project, also described as the "Referral Pathway".³⁰²

- Past Player Survey – Feedback to those past players who have completed the survey is a key priority. Paul to provide Pat with the ability to access the results to date asap, to allow tracking of response rate, and assessment of current data. Paul, Pat and Pete to also sit down and go over segmenting the respondents based on specific follow up required (if any).
- Referral Pathway – Players to be referred via Peter and Andrew Daff if without a GP referral and costs to be claimed via Medicare. The AFL will cover the gap. Peter to be briefed where appropriate on the players referred.

445 On 2 March 2015, A/Prof McCrory provided the actual survey data to the AFL.³⁰³ By this time there were approximately 546 player responses.³⁰⁴

446 During our review we also identified a PowerPoint presentation prepared by A/Prof McCrory dated 12 April 2016 "summarising the retired player survey data".³⁰⁵

³⁰⁰ AFL.001.001.2199; AFL.001.001.2300.

³⁰¹ AFL.001.001.0481; AFL.001.001.0482.

³⁰² AFL.001.001.1184.

³⁰³ AFL.001.001.2365.

³⁰⁴ AFL.001.001.0046.

³⁰⁵ AFL.001.001.0102; AFL.001.001.0103.

The clinical component

- 447 We discuss this component of the project by year. As explained below, the clinical component suffered from a lack of planning from the outset and was not properly resourced. This may well be because the Past Player Project was conceived of as a research program, with little thought being given to how participant expectations of clinical assessment and treatment may be managed.
- 448 The clinical treatment provided to players included appointments with concussion specialists; that is, neurologists such as A/Prof McCrory and neurosurgeons. Some retired players also received neuropsychological assessments and imaging. Depending on the individual some other tests were also offered to investigate particular issues further.
- 449 We understand that during the period 2015 to 2020 the AFL facilitated clinical treatment for approximately 95 retired AFL players. We were informed the AFL spent the following amounts on clinical treatment for those retired players up to 2020:³⁰⁶

Year	Amount
2015	\$10,459
2016	\$38,677
2017	\$6,642
2018	\$59,697
2019	\$46,356
2020	\$19,271
TOTAL	\$181,102

- 450 These amounts are not insignificant. However, the focus of our observations below is on the processes involved in the provision of clinical care, and resources allocated to implementing the program, rather than the specific amounts spent by the AFL on actual clinical care. We consider the program suffered from poor planning and that treatment was generally not provided in a timely way. We did meet with one participant who was generally happy with his experience of the program, but the majority of interviewees were not. Further, the AFL dedicated very limited human resources to the project which slowed down the project and caused various delays. Had the project been better resourced, it is possible that many of the problems identified below could have been mitigated, if not avoided.
- 451 Later in this chapter at paragraphs 537 to 542, we discuss delays by A/Prof McCrory in reporting back to the AFL on individuals that he treated as part of this project. We do not rehearse those observations here save to make the general observation that some of the delays were significant. In extreme cases, including of participants who we interviewed, the delay spanned several years and caused considerable frustration and confusion for the individuals who were waiting to hear back on the results of the further assessments they had undertaken. Those

³⁰⁶ This table was prepared having regard to the accounting information contained in AFL.004.001.2769 for the years 2015 and 2017 and further information provided by the AFL for the subsequent years.

delays were aggravated by further delays in the AFL reporting back to the individuals after receiving correspondence from A/Prof McCrory.

2015

452 On 9 April 2015, A/Prof McCrory provided some views on next steps including proposals for the AFL to provide further funding for the survey tool to be developed further.³⁰⁷ However, those proposals were not taken up by the AFL.³⁰⁸

453 Later that same day, there was a Concussion Working Group meeting. The minutes focus on progressing the referral of players for further assessments. The minutes stated:³⁰⁹

3.4. Past Player Screening Survey - Paul McCrory & Patrick Clifton (Appendix 6)

Paul noted that 546 responses have been collected to date – 1/3 of the players have self-reported problems, sleep poorly and report mental health issues. He has no evidence at this point that there is a high incidence of long-term concussion related problems. Paul also suggested more detailed mental health data should be collected from the past players.

The group discussed the referral process for players who have provided data. It was agreed that a sub-group will convene to assess current results, determine relevant sub-groups and develop appropriate follow ups. A 2 month timeframe has been set for completion of all follow-ups.

ACTION – Patrick to organise a time with AFL, AFLPA and Florey representatives. The AFLPA will also follow up with respondents who have not provided a complete dataset.

454 Despite the terms of the tripartite MOU mentioned above at paragraph 432, no analysis was undertaken by the Florey Institute to identify individuals requiring further assessment. Rather, we were informed that after receiving the data, Dr Harcourt and Dr Clifton categorised the responses into three different cohorts. Steps were also taken to set up a national network of neurologists and neurosurgeons who AFL players could be referred to.

455 Although the above minutes refer to a two-month time frame for follow-ups, we understand the follow-up process took longer. It seems from the correspondence that the cohort categorisation occurred sometime during April to July 2015.

456 On 6 July 2015, Dr Harcourt sent an email to A/Prof McCrory which observed that approximately 50 individuals had been flagged for further assessment. We understand those individuals were allocated to cohort 2. Cohort 3 included individuals who may require follow up but presented fewer indicators of treatment than cohort 2. Cohort 1 included individuals who were identified as not requiring follow-up. Dr Harcourt's email stated:³¹⁰

Thank you for the catch up today where we discussed the follow up of surveyed players who have been identified with potential issues related to past head injury.

As discussed, we need to manage this process from both clinical and research perspectives. While we are researching the impact of long term neurological problems in past players, we also need to have a process for managing the clinical and treatment needs for individual players.

³⁰⁷ AFL.001.001.0046.

³⁰⁸ This was also around the time that Dr Clifton asked for breakdowns of expenditure by the Florey Institute. That issue is discussed further below in **chapter 8**.

³⁰⁹ AFL.001.001.0850.

³¹⁰ AFL.001.001.1472.

We have gone through the survey data you provided and have identified at least 50 players who we think need further assessment. When we next meet we can go through the data again and have your input on this list as well.

I believe follow up needs to be clinically relevant to the individuals. This may involve further questionnaires of the player and his family members (part of the original plan), a neurological examination, neuropsychological testing and other investigations. I suggest that this is done as a formal medical referral of individual players to an appropriate specialist clinician such as yourself. This would entail accessing reasonable Medicare funding for part of the costs. Obviously there are some costs that are not covered by Medicare.

I believe we should use this project to develop a network of specialist practitioners bearing in mind that we will need clinical support in different Australian states. Alongside this will be the need to develop a protocol of clinical management to ensure consistency of care as well as data collection.

Can you give some consideration to:

1. Whether you would be comfortable for a formal specialist referral process (e.g. from a GP, club doctor or an AFL Medical Director to yourself as a specialist neurologist) as the next management step?
2. What clinical protocols would be required to ensure consistent management and research integrity?
3. Likely costs above any Medicare funding of the clinical components?
4. A national network of appropriately qualified specialists?
5. A simpler 'collection' tool to identify 'at risk' past players through other channels such as the AFL Clubs (I will forward a draft email separately for your input)?

Basically the AFL needs to develop a nationally relevant clinical pathway for players with potential long standing health issues that may be related to head trauma they suffered during their playing careers. [emphases added]

457 On 14 July 2015, A/Prof McCrory responded to those questions, and provided his estimated costs.³¹¹ After that email there are further emails in July 2015 about putting together a list of individuals for a national network of clinical concussion experts.³¹² The process for setting up that network continued over the next 12 months.³¹³ Unfortunately no procedure document was prepared setting out what the clinical pathway would involve. Rather, retired players simply received a referral to see a concussion expert, such as A/Prof McCrory, who explained the process as discussed further in **chapter 7**.

458 In November 2015, Dr Harcourt stated in an email:³¹⁴

I will also have to work on the wording of my email to make sure the players understand that they can opt out of the research side. Clearly we will need a steering committee overseeing this.

459 Despite that comment, we understand that no steering committee was established. Further, the cover emails with the referral letters did not necessarily include an explanation about the distinction between clinical and research

³¹¹ AFL.001.001.0096.

³¹² AFL.001.001.1507; AFL.001.001.1613.

³¹³ AFL.001.001.1506; AFL.001.001.1636; AFL.001.001.1508.

³¹⁴ AFL.001.001.1637.

assessments. For research activities often feedback is not provided to participants about the results of the investigations. For individuals who have not participated in research activities before this may be unexpected, confusing and disappointing. Where problems with an individual's health are detected in research activities there is generally a feedback process, however, for some research activities such as advanced MRI imaging the processes are investigative and may not yield any clear results that can be used for clinical purposes.

460 We have reviewed some of the letters between AFL referrers and A/Prof McCrory in relation to players who we interviewed who gave us permission to review their health records. Those letters indicate that during the preliminary meetings in 2015, A/Prof McCrory was referring players simultaneously for both further clinical assessments and also for research imaging by the Florey Institute. For example, one letter states:

I have also given him a copy of the questionnaire for his partner to complete and return, secondly I will organise for him to have some formal neuroimaging at the Florey and thirdly some formal neuropsychological assessment of his memory.

461 Another letter from A/Prof McCrory states:

I will send you a more detailed report once all the information is to hand but in essence he was able to have his scan yesterday at the Florey and then this morning he has had a neuropsychological assessment done.

462 It is unclear from that correspondence what explanations were provided to the individuals by A/Prof McCrory about the distinction between clinical treatment versus research activities and whether they understood the difference. Dr Makdissi, who supervised the MRI imaging at the Florey Institute, and was not involved in the clinical component, informed us that some individuals seemed confused as to the purpose of imaging. He told us that even though consent forms and plain language statements were provided to those individuals it seemed to him that they may still be confused about the nature of the imaging being undertaken. This view was confirmed by many of the retired players we interviewed.

463 The Florey Institute has stated in correspondence to us that the survey "was separate and distinct from the Florey Institute's own imaging activities involving any current or past players",³¹⁵ and "was not undertaken by Florey as a recruitment activity for the imaging study".³¹⁶ Although that may have been the Florey Institute's intention, the practical effect of A/Prof McCrory's actions indicates that survey participants were recruited for the Florey Institute's imaging study.

³¹⁵ Letter from Florey Institute dated 18 August 2022, [2.3].

³¹⁶ Ibid, [2.5].

2016

- 464 More players received clinical treatment in 2016 compared with 2015 and the process continued as identified above, with the AFL referring particular individuals to a specialist and the specialist then controlling the subsequent referrals for further assessments.
- 465 In December 2016, Dr Arain began working for the AFL as a medical consultant. His main responsibility was to take over the management of the Past Player Project which was then being run by Dr Clifton and Mr Gustin.³¹⁷ Dr Arain worked for the AFL on a part-time basis, for about one day a week. He was given carriage of the clinical program with limited additional resources.
- 466 Dr Arain informed us that in the beginning he spent a significant amount of time converting paper files into proper electronic medical files. He also mentioned that there was some anxiety amongst survey participants who had not yet received feedback from the AFL on the status of their survey results and that there was difficulty getting in touch with participants.

³¹⁷ AFL.001.001.1318.

2017

- 467 In response to confusion expressed by participants about the mix of clinical and research assessments being offered, in June 2017, Dr Arain circulated a draft email to the Concussion Working Group with a revised process for triaging retired players. That process included three phases. Phase 1 related to completion of the survey. Phase 2 focussed purely on clinical assessments; that is, clinical neurological evaluations and clinical mental health assessments. Phase 3 focussed on research activities (functional MRI testing by the Florey Institute, TMS testing by Dr Pearce and ocular motor assessment testing by Dr White). Dr Arain circulated a draft email about that process to the members of the Concussion Working Group.³¹⁸ That revised process de-emphasised the research activities. This was perhaps unsurprising given the confusion expressed by participants expecting clinical outcomes and also having regard to Dr Arain's primary background as a clinical practitioner.
- 468 A/Prof McCrory did not agree with the suggested revised process and sent an email setting out his concerns. It seems to us that A/Prof McCrory was largely concerned with the de-prioritisation of the research activities which he was involved in.³¹⁹ Dr Harcourt responded to A/Prof McCrory's concerns. His email relevantly states:³²⁰
- Basically the follow up of past players has required 2 aspects – clinical support (duty of care and not research driven) and research studies. The former is not a part of the overall research project and not subject to scientific rigor nor ethics requirements. We discovered this issue when we started to engage the past players who had an expectation of some personalised support and feedback.
- 469 Dr Arain subsequently sent the draft email to the retired player cohort.³²¹ Despite that email, it seems that there continued to be confusion over which assessments were for clinical purposes as opposed to research activities. Again, this is perhaps unsurprising as the distinction is not straightforward, especially for those not medically experienced.
- 470 Around this time, A/Prof McCrory became less responsive to email correspondence. For example, in September 2017, Dr Arain requested copies of clinical correspondence from A/Prof McCrory "for the ex players you have seen" in order to conduct an audit for the retired players who had completed the clinical component of the project.³²² Dr Arain sent follow up emails in October and November but did not receive a response from A/Prof McCrory.

³¹⁸ AFL.001.001.1379.

³¹⁹ This observation is not intended to criticise A/Prof McCrory for his interest in the research components of the Past Player Project nor suggest that he considered clinical support of past players unimportant. Rather, it highlights the evolving tension between the original research objectives and the clinical imperatives that were becoming increasingly apparent.

³²⁰ AFL.001.001.1527 (this email chain includes each of the three emails).

³²¹ AFL.004.001.3402.

³²² AFL.001.001.3023.

2018

- 471 In May 2018, the AFL held a meeting to discuss aspects of the clinical component in greater detail. Dr Arain prepared minutes.³²³ The minutes indicate there were problems with getting in touch with retired players and identifying neuropsychologists outside of Victoria who could provide treatment. The minutes also referred to the implementation of a protocol “for uniformity across Australia” and “[c]entralising of referral pathway through AFL”.
- 472 Further, the minutes stated that the process for clinical treatment would involve a standard non-research MRI and assessment by a neuropsychologist before the retired player was referred to a concussion expert (such as a neurologist). Subsequent emails indicate this revised process was eventually adopted.³²⁴
- 473 A/Prof McCrory expressed criticisms by reply email about this further change to the clinical protocol. Dr Harcourt’s responses to A/Prof McCrory’s email relevantly stated:³²⁵

I note your issue with pre-consultation NP and standard MRI investigations. As you know we discussed moving to a new longitudinal format to overcome the blockages of the current program and this measure is a temporary. It is an attempt to move through the current cohort in as efficient way as we can in order to get some data (as opposed to very little or none)...

There is some wastage in this program. We know that some players have missed many appointments with clinicians and researchers. This is probably our most vexing issue and why we have tried to make the process, in the short term, more efficient. We think that our plans beyond the current cohort will be more effective and the link to quality clinicians easier to manage.

³²³ AFL.001.001.1425; AFL.001.001.1426.

³²⁴ AFL.001.001.1176.

³²⁵ AFL.001.001.1561.

2019-2020

- 474 During mid-2019, Dr Pip Inge joined the AFL as a Medical Consultant and worked part-time for one day a week. In 2020, because of the Covid-19 pandemic, Dr Inge was stood down for six months and then resumed working for the AFL again.
- 475 Dr Arain continued to work for the AFL for part of 2019. In March 2019, Dr Arain sent an email to A/Prof McCrory relaying a retired player's concerns about the way he had been recruited into a PET research study. We interviewed the individual concerned and he confirmed the following concerns noted in Dr Arain's email to A/Prof McCrory:³²⁶

He was annoyed for a few reasons

- He felt you recruited him for PET scans but did not really explain it was for research and he felt he was not told about all the blood tests- He said he was told that if he underwent the PET scans we will be able to use the data to tell future players based on a blood test if they are at risk of CTE from head knocks
- he hasn't received the payment for doing the PET scans
- he wasn't told how much blood they would take- 12 bottles
- he was unsure if it was research or clinical
- he was told or his understanding was that the spots on MRI were due to high cholesterol (although historically his levels were really just borderline) and definitely had nothing to do with head knocks
- he was started on a statin by you which he is not happy about as he feels all possible side effects were not discussed
- he is waiting on a follow up appointment by you and has heard nothing
- he was expecting results from the PET scans

- 476 We observe that the references to PET scanning were to a PET study being conducted by Professor Christopher Rowe, for which the AFL later withdrew support. Although the patient's concerns were expressed about A/Prof McCrory (who was an investigator for the PET study but not the organiser or manager of it) it seems to us that responsibility for the informed consent process probably lay with Prof Rowe. For present purposes, the important point is simply that the email demonstrates that despite the AFL's efforts to help participants understand the distinction between clinical assessments and research activities, confusion persisted among participants and perhaps also within the AFL as to the allocation of responsibilities for various tests forming part of the research components of the Past Player Program and what expectations they might have of results from them.
- 477 During 2019, the AFL also took more active steps to relay clinical feedback to participants. The AFL requested clinical correspondence from doctors who had seen retired players and prepared summary letters for various retired players summarising the treatment they had received, and some high level suggested next steps. Those letters were prepared around December 2019 but were not emailed out until mid-2020.
- 478 The participants who received clinical treatment were generally part of cohort 2. However, not all members of cohort 2 received a follow up letter from the AFL. Some cohort 3 individuals also received clinical treatment but no follow up

³²⁶ AFL.001.001.1381.

correspondence from the AFL. We did sight a precedent letter for cohort 3 individuals. It is unclear to us why that letter was never utilised.

The Florey Institute research imaging component

- 479 It seems the imaging component occurred contemporaneously with the clinical component, however, fewer players opted into the research scans. We have been informed 15 retired AFL players were imaged by the Florey Institute after the survey was first published. Before the survey was published only three retired AFL players had already been imaged.³²⁷
- 480 As at the date of this report, no published work has been produced based on those scans. We asked the Florey Institute whether it intends to publish any such work and were informed that it does not as minimum recruitment levels have not been met. We asked what the Florey Institute meant by “minimum recruitment levels” and received the following response:³²⁸

As to the phrase “minimum recruitment levels”, the Florey Institute understands that for the foreshadowed further research to be meaningful, a substantial number of players (including past players) would need to have been recruited. There is likely to be greater variation in the cohort of players characterised as ‘concussion with chronic symptoms’, because of their age and the increased likelihood of comorbidity. A larger number of players in this cohort would therefore be needed to attain meaningful conclusions.

To illustrate this further, the recruitment levels that were considered necessary at the time are set out in an application for NHMRC Ideas Grant funding submitted in 2019 by proposed lead investigator Professor David Abbott of the Florey Institute (and which was unsuccessful), which indicated that the investigators would seek to recruit 180 subjects, with 45 subjects in each of four groups.

- 481 The views expressed by the Florey Institute as to what may be required to produce publishable data from the existing imaging were not the only ones expressed to us. We were informed by Dr Makdissi, the chief investigator of the Florey Institute imaging project and current AFL Chief Medical Officer, that subject to some additional controls being imaged sufficient data could be obtained to report on the imaging of retired players undertaken. Dr Makdissi suggested the imaging of additional controls may cost \$20,000. However, the Florey Institute disagreed, informing us that assessment of the cost and complexity of proceeding to reporting stage required consideration of more than just imaging costs for further controls. Other factors that would need to be taken into account are the time to recruit controls, data analysis costs and infrastructure and staffing salary costs. The Florey Institute also reiterated the concern that simply imaging additional controls may not be sufficient, as without greater participant numbers, the study may be underpowered, with associated risk of false positives and false negatives.³²⁹
- 482 It is not possible for us to resolve this difference of opinion and nor do we think it necessary. Notwithstanding the potential difficulties referred to by the Florey Institute with obtaining useful output from the imaging already conducted, in our view, it would be preferable for those difficulties and the associated costs to be

³²⁷ Letter from Florey Institute dated 18 August 2022, [5.6].

³²⁸ Correspondence from Florey Institute dated 12 September 2022.

³²⁹ Florey Institute response dated 5 October 2022, [2.9].

realistically assessed and acknowledged and that every effort be made to secure an output from the existing imaging if possible — whether through the imaging only of controls or, if necessary, additional participants.

- 483 Research participants are entitled to expect that projects will be pursued through to completion, so that their voluntary contributions of time and effort are not wasted. It is also an ethical principle that participants should be given the option of being informed of the general outcome and results of a study. We consider that the Florey Institute should ensure this project can be completed if that is possible (acknowledging any qualifications to the conclusions based on the power of the study) and that participants are informed of the outcome, as appropriate.³³⁰
- 484 We also observe that the ethics documents which applied to the imaging project were focussed on current player participants and providing feedback to club doctors to relay to those individuals. The ethics documents did not spell out a clear process for providing feedback to retired player participants. That was unfortunate and, with the benefit of hindsight, could have been avoided. We were informed by Dr Makdissi that he had sought to amend the ethics documents when the Past Player Project commenced and submitted an amendment application to the University of Melbourne, but for unknown reasons the amendment was not made. In 2019, when the ethics approval documents were renewed, they expressly referred to retired player participants. However, we were informed no further imaging was undertaken after that renewal occurred.
- 485 We understand that some retired players requested copies of their research scans and imaging reports. We have not sighted any instances of reports being provided to those individuals.

³³⁰ On this point we also refer to the World Medical Association's declaration of Helsinki regarding ethical principles for medical research involving human subjects. That declaration was adopted in June 1964 and relevantly states at paragraph 26: "All medical research subjects should be given the option of being informed about the general outcome and results of the study". See further, <<https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects>>.

Other ethics issues relevant to the project

486 We have identified two general issues.

487 **First**, we understand the Florey Institute obtained ethics approval for the imaging component of the Past Player Survey, but not the survey component. Based on the National Statement, we consider ethics approval for the survey component was probably not required. However, if such ethics approval had been obtained then plain language statements would have been prepared for participants and, in our view, those plain language statements may have helped to alleviate some of the confusion that arose in relation to the purpose of the survey.

488 We were informed by Prof O'Sullivan that it is common for a program of research work to span across a number of protocols and ethics permissions. Adding a distinct clinical group (head injury) to an existing imaging project by amending an existing ethics application is an accepted practice. It would be possible to seek ethical approval to recruit participants based on pre-existing survey responses (performed for reasons other than research and not requiring ethical permission).

489 **Secondly**, in April 2016, A/Prof McCrory made comments during a public presentation about the survey responses for the Past Player Project which we consider ought not to have been made. We understand these comments do not refer to any imaging of any retired AFL players.³³¹

And when we're screening retired footballers and we've screened about 600 so far, 30% of players are worried about problems. Not surprising we're dealing with 50 and 60 year old people. They've got worries for all sorts of reasons. Of all that population that we've screened so far, we've found one with Alzheimer's disease. And that's all. We haven't found any that match the American experience. So again that's 600 and we hopefully will do the other 5 and half thousand or whatever there is over time.

490 Prof O'Sullivan's view, with which we agree, is that the above comments overstate the actual research that was undertaken. The comments convey the impression that by "screening" A/Prof McCrory means that the researchers have looked carefully for Alzheimer's disease or other dementia utilising a testing process, but our understanding of the survey is that for most respondents no further assessment or investigation was performed. In drawing a comparison with the "American experience" there is also a suggestion that similar methods have been used to those used in investigation of CTE in American football but that different results have been found. As discussed above, CTE is typically diagnosed post-mortem and not using a survey. The comparison made was thus inapt and likely to mislead.

³³¹ The Florey Institute of Neuroscience and Mental Health, 'The Concussion "Crisis" - Media, Myths and Medicine - Associate Professor Paul McCrory' (YouTube, 7 April 2016) 34:16-34:47 <<https://www.youtube.com/watch?v=oPrpTj2Edp8>>.

Annual Injury Reports

- 491 Sub-paragraph 5(h) of the terms of reference asks us to consider the nature of A/Prof McCrory's involvement in the preparation of, or research relating to any conclusions drawn or comments made in the AFL Annual Injury reports. Those reports have been prepared since 1993.
- 492 We were informed that the Annual Injury Reports are derived from club player movement reports, which are submitted by the clubs to the AFL on a weekly basis. Those reports are reviewed by the clubs for accuracy at the end of each season – after a process of confirmation and consolidation, those reports are then used to produce the AFL Annual Injury reports. We were provided with copies of each AFL Annual Injury report.
- 493 We were informed by A/Prof McCrory that he has not had any involvement in drafting or otherwise providing input in any AFL Annual Injury reports.³³² That answer is consistent with our review of the reports themselves and the AFL's internal documents.
- 494 The reports for 1993 to 2014 (inclusive) do not list A/Prof McCrory as an author or collaborator and instead refer to other individuals.³³³ In relation to that period, the reports for 1993, 1998, 2006 and 2010 to 2014 include a couple of footnotes to scientific journal articles co-authored by A/Prof McCrory. We consider those brief references do not evidence any material reliance on A/Prof McCrory's research to inform the AFL's policy on concussion management. We also observe that from 2011, the AFL instead used the Concussion Working Group to inform its concussion management policy.
- 495 The reports for 2015 to 2020 do not include a list of authors.³³⁴ Rather, the reports include a list of collaborators which are: the AFL Doctors' Association, AFL Physiotherapists Association and the AFL Football Operations Department. The reports for that period are noticeably shorter than previous years and contain minimal commentary on the published data. We observed a single footnote to the 2016 Consensus Statement co-authored by A/Prof McCrory in the 2016 Annual Injury Report.³³⁵ We consider the Consensus Statement does not constitute research by A/Prof McCrory given it was prepared by a consensus group.

³³² Letter from A/Prof McCrory dated 30 June 2022.

³³³ AFL.019.001.0001 (1993) to AFL.019.001.0018 (2010); AFL.013.001.0002 (2011) to AFL.013.001.0005 (2014).

³³⁴ AFL.013.001.0006 (2015) to AFL.013.001.00010 (2020).

³³⁵ AFL.013.001.0007.

Conclusion

- 496 In this chapter, two particular research projects were discussed: the Pilot Study and the Past Player Project. We focussed primarily on the Past Player Project which involved both a clinical component and research component.
- 497 The project was funded, overseen and managed by the AFL. The project started with an online screening survey which was completed by approximately 550 retired AFL players. Based on the survey results, individuals were identified for further assessment and then invited to participate in further research and receive clinical treatment paid for by the AFL. The research imaging was undertaken by the Florey Institute and the clinical treatment was provided by a network of medical practitioners, one of whom was A/Prof McCrory. Some retired players were also invited to participate in separate cross-sectional research programs.
- 498 In our view the project was under-funded and under-resourced from the outset. It suffered from a lack of stewardship and coordination. There was accordingly no clear plan for how the project would be rolled-out and implemented, and how it may simultaneously accommodate clinical and research objectives. Consequently, there were no clear guidelines, processes or communication strategies to ensure that participants were not confused about what tests or procedures related to clinical treatment as opposed to being purely for research purposes. Many participants had disappointed expectations of medical advice and follow-ups from tests that were for research rather than clinical purposes.
- 499 Although there have been attempts in recent years to rectify some of the problems with the project, as at the date of this report there is no published research explaining the results of the research imaging undertaken on retired AFL players. Some clinical assistance has been provided to participants who were flagged as requiring further treatment. While some of that assistance was provided in a timely way, other assistance was not. Some of the delay involved tardiness by A/Prof McCrory in reporting back to the AFL. However, there were also delays by the AFL in reporting results and advice from medical practitioners back to patients. This appears to us to have been a function of poor planning and governance and under-resourcing rather than being attributable to inaction by individual officers within the AFL, who were attempting to manage the project as best they could with limited time and resources.
- 500 In relation to term of reference 5(h) which did not concern research work but rather the AFL's annual injury report, we have found no evidence of involvement by A/Prof McCrory in drafting the annual injury reports. In a handful of reports, we found some references to journal articles A/Prof McCrory co-authored, but we do not consider those references influenced the conclusions in the reports in any material way.

CHAPTER 8: RELATIONSHIP BETWEEN A/PROF MCCRORY AND THE AFL

Sixth term of reference

501 The sixth term of reference states:

The nature and propriety of the relationship between McCrory and the AFL in his performance of the Work. In particular:

- a. McCrory's formal or informal engagement to provide the Work. In the event of formal engagement, the terms of that engagement including any financial or non-financial benefits paid to McCrory for the Work;
- b. reporting lines for the Work to AFL officers, employees or agents or other advisors and the nature of that reporting with respect to Work outcomes; and
- c. the nature and quality of the interface between McCrory and AFL officers, employees or agents in the performance of the Work;
- d. representation by McCrory of the AFL on the Concussion in Sport Group and/or any other external body and the nature of that representation.

Overview

- 502 A/Prof McCrory was recruited by the AFL to its Concussion Working Group in 2011 and assisted the AFL until he withdrew from the Concussion Working Group in January 2021. He was not engaged as an employee or contractor. Rather, he largely assisted the AFL in an unpaid capacity and the arrangement was informal. We have not found any examples of A/Prof McCrory representing the AFL on any external bodies during this period. However, we consider he did act in a representative capacity for the AFL at an NFL conference in 2014, notwithstanding that he may not have been attending that conference solely in that capacity and notwithstanding that he may not have considered himself to be so doing.
- 503 The relationship between A/Prof McCrory and the AFL started off well but deteriorated from about 2017 onwards. Although we have identified problematic aspects of the relationship between A/Prof McCrory and the AFL, we have not found any examples of conduct that constitute impropriety (in the sense that we understand that term, as explained below). Despite that, the informality of the arrangement and lack of structure and sophistication in reporting lines created the potential for impropriety and detracted from the levels of accountability and transparency that could be expected of an entity of the AFL's size and public profile.
- 504 As to the scope of the sixth term of reference, the term "Work" was defined in the first term of reference to include "work, research and/or advice". In this chapter we refer to some of our findings in relation to the first term of reference.
- 505 We also note that sub-paragraphs (b) and (c) are similar and overlap to some extent. In relation to sub-paragraph (b) we have focussed on the AFL's oversight of A/Prof McCrory's work, including whether there were clear lines of reporting such as would facilitate appropriate transparency and accountability. We also comment on whether A/Prof McCrory provided, and was required to provide, timely updates and progress reports to the AFL regarding matters he was working on involving the AFL.
- 506 In relation to sub-paragraph (c) we focus more on the general nature of the relationship between the AFL and A/Prof McCrory, including the deterioration of that relationship.

Engagement to provide the Work

- 505 Sub-paragraph (a) of the sixth term of reference asks us to address the nature and propriety of A/Prof McCrory's engagement with the AFL. In this section we deal with the nature of the engagement. We address the question of propriety separately at the end of this chapter.
- 508 As discussed in **chapter 3**, during 2011, Dr Harcourt (on behalf of the AFL) asked A/Prof McCrory to be a member of the AFL's Concussion Working Group. There were no written terms of engagement, and the arrangement was informal. Over time, A/Prof McCrory's association with the AFL expanded to include involvement in research work funded by the AFL.
- 509 A/Prof McCrory's informal engagement with the AFL ended when he chose to withdraw from the Concussion Working Group in January 2021. The circumstances leading up to that withdrawal are discussed further below in this chapter.
- 510 A/Prof McCrory largely assisted the AFL in an unpaid capacity. A/Prof McCrory was not an employee or contractor for the AFL, but his role can be likened to that of an advisor or consultant.
- 511 In relation to the AFL's research imaging projects that A/Prof McCrory participated in, we were informed that the Florey Institute paid A/Prof McCrory for that work as a salaried employee. The AFL did not separately pay A/Prof McCrory for his involvement in any research imaging.

Financial benefits

- 512 In 2012, A/Prof McCrory was paid a one-off fee of \$500 to review footage of a head contact incident during a match to assist the AFL with an investigation into how the incident was managed by an AFL club on match day.
- 513 During 2014 to 2019, A/Prof McCrory issued invoices to the AFL and AFLPA (which were paid by the AFL) in relation to clinical consultations he conducted with retired AFL players as part of the Past Player Project.
- 514 We have come across two scientific journal articles dated 2019 where A/Prof McCrory has disclosed that some of his travel reimbursements were paid for by the "AFL, FIFA and NFL".³³⁶ We asked the AFL whether it had provided any travel reimbursements to A/Prof McCrory. We were informed the AFL does not have any records of any such reimbursements. Further, we observed that a more detailed disclosure form which appears to have been completed by A/Prof McCrory and is dated 2017 referred only to travel reimbursements provided to him by FIFA and the NFL.³³⁷

³³⁶ Iverson GL, Terry DP, Luz M, et al. Anger and depression in middle-aged men: Implications for a clinical diagnosis of chronic traumatic encephalopathy. *J Neuropsychiatry Clin Neurosci*. 2019;31(4):328-336. doi:10.1176/appi.neuropsych.18110280; and Marklund N, Bellander B-M, Thelin EP, et al. Treatments and rehabilitation in the acute and chronic state of traumatic brain injury. *J Intern Med*. 2019;285(6):608-623. doi:10.1111/joim.12900.

³³⁷ AFL.018.001.0023.

Non-financial benefits

- 515 The terms of reference refer to “non-financial benefits paid”. Having regard to the word “paid”, this may be construed narrowly, so as to refer to tangible benefits other than fees or salary. However, we have taken a purposive approach to the words “non-financial benefits” and identified intangible benefits enjoyed by A/Prof McCrory by reason of his association with the AFL. We think this approach reflects the likely intent of the terms of reference given the focus on the “relationship” between A/Prof McCrory and the AFL, including all mutually beneficial aspects, and not just the commercial or legal arrangements between them.
- 516 A/Prof McCrory’s involvement with the Concussion Working Group gave him unique access to some of AFL’s resources and opportunities that he may not have otherwise had. For example, A/Prof McCrory requested, and the AFL provided to him, data on concussion rates in the AFLW which had not yet been publicly released.³³⁸ A/Prof McCrory was also invited to attend meetings regarding new concussion related research initiatives and technology.³³⁹ Further, A/Prof McCrory was provided with a unique opportunity to be involved in or have influence over AFL decisions regarding research projects, and at various stages pitched ideas for research and workshops which the AFL could support.³⁴⁰
- 517 We note for completeness that we have identified these non-financial benefits to A/Prof McCrory in response to a term of reference. It should in fairness be acknowledged that the benefits of early or exclusive access to concussion data or information enjoyed by A/Prof McCrory were reciprocal because such access was for mutually beneficial purposes. The benefit to the AFL was access to advice and guidance to inform research direction and initiatives such as potential rule changes, without formally engaging a consultant or incurring consultancy fees. Further, it should be acknowledged that in providing advice and services to the AFL, A/Prof McCrory was diverting time and expertise from his other professional pursuits. There were thus both sacrifices by A/Prof McCrory and benefits to the AFL as the quid pro quo for the benefits enjoyed by A/Prof McCrory from the relationship.

³³⁸ AFL.001.001.0333.

³³⁹ AFL.001.001.1962.

³⁴⁰ See, for example, AFL.001.001.1630; AFL.001.001.1103; AFL.001.001.0406; AFL.001.001.0559.

Reporting Lines

- 516 Sub-paragraph (b) of the sixth term of reference asks us to address the reporting lines between A/Prof McCrory and the AFL, as well as the nature and propriety of those reporting lines. We deal with the issue of propriety separately at the end of this chapter.
- 519 We understand that the Concussion Working Group did not have a clearly defined position in the AFL's organisational structure but was used generally to assist the AFL Research Board to review research proposals relating to concussion issues, as well as to prepare the concussion guidelines. The AFL employees and contractors involved in the Concussion Working Group were part of the AFL's Football Operations Department.
- 520 The evidence suggests that there were three main lines of communication between the AFL and A/Prof McCrory, as follows:
- (a) the primary line of communication was to Dr Harcourt, in his capacity as one of two Medical Commissioners and then, subsequently, as Chief Medical Officer;
 - (b) to a lesser extent, there was a line of communication to Dr Clifton, who started at the AFL in 2012 as a junior analyst and in mid-June 2018 became the Head of Health, Safety & Laws; and
 - (c) also to a lesser extent, from 2017 to 2020, there was a line of communication to Dr Arain, in his role as a Medical Consultant for the AFL. Dr Arain's role was to assist with managing the Past Player Project.
- 521 We discuss the nature of those lines of communication further below by reference to particular time periods. As a general observation, the lines of communication did not appear to comprise "reporting lines", in the conventional sense. There was no formalised protocol or directive suggesting or recognising that any of these three communication points within the AFL had control or authority over A/Prof McCrory. Rather, they were persons with responsibility for the projects in which A/Prof McCrory had involvement. The reporting was informal; that is, there were no regular meetings or documents in which A/Prof McCrory reported back to the AFL on work he was doing. The AFL also did not provide specific deadlines for work it asked A/Prof McCrory to undertake. A/Prof McCrory provided updates via email and during occasional meetings. However, these were ad-hoc and not pursuant to any structure or process or with any prescribed regularity.
- 522 Hence, when we refer hereafter to "reporting lines", we are doing so to reflect the terms of reference but with the clarification that the term is not entirely apt and connotes a level of formality, hierarchy and control that was not present.
- 523 The lack of resources dedicated by the AFL to the Concussion Working Group and Past Player Project likely contributed to the poor quality of the reporting lines and practices between A/Prof McCrory and the AFL, because there were limited resources to establish and implement any structures or processes to oversee

and follow up on A/Prof McCrory's work. More regular active oversight by the AFL may have helped to mitigate the reporting problems we have identified below.

2011 to 2013

524 We did not see signs of reporting deficiencies during this period. A/Prof McCrory was generally responsive to emails and completed work within a reasonable period of time.

2014 to 2016

525 During this period the reporting lines continued to work adequately save for two aspects.

526 **First**, A/Prof McCrory was not responsive to Dr Clifton's requests for more information on how the Florey Institute had used AFL funding. We have seen examples of this from October 2014 to April 2015.

527 We observe that A/Prof McCrory was unlikely to have been the person responsible for accounting for day-to-day research funding expenditure. This was more likely the responsibility of finance administration or operations personnel. The point here is not to identify a dereliction of accounting duties by A/Prof McCrory, but rather to illustrate problematic aspects of the informality of the relationship and reporting lines between AFL personnel and A/Prof McCrory, leading to failures in communications regarding important practical matters.

528 Relevantly, on 27 October 2014, the Florey Institute sent an invoice to the AFL for the Past Player Project. The description said "Past Player Survey" and the invoiced amount was \$27,500 (GST inclusive). The invoice contained no further details.³⁴¹

529 On 28 November 2014, Dr Clifton sent an email to A/Prof McCrory which relevantly stated:³⁴²

Also, I have been advised by finance that I will need further documentation on the funding drawn upon throughout the year. Can you organise bi-monthly reports?

530 There was no response to this email in the documents provided to us by the AFL. We have also not sighted any bi-monthly reports from the Florey Institute.

531 On 29 April 2015, Dr Clifton also sent an email to A/Prof McCrory which stated:³⁴³

Paul, Peter [Harcourt] and I are keen to come to the Florey at some stage over the next couple of weeks to go over budget for the partnership and where the current funds have been allocated and utilised...

³⁴¹ AFL.002.001.0072.

³⁴² AFL.001.001.2342.

³⁴³ AFL.001.001.1190.

532 When asked by A/Prof McCrory what the purpose of the meeting was, Dr Clifton responded.³⁴⁴

We need greater visibility on the current allocation of the funding provided for 2015 and what the expenditure has been to date. In lieu of a meeting we will need to obtain a breakdown in YTD and projected spend...

533 A/Prof McCrory then responded:³⁴⁵

What is 'greater visibility'? Can you explain this to me in more simple terms? You guys actually specified the budget requirements (i.e funding Michaels [sic] position with the remainder for scanning etc) in the original discussions. This was discussed and agreed with Pete (and Shane McCurry at the time) at the outset. I am really taken aback by that statement and the implication.

As far as meetings go, as you know I have to reschedule patients in order to attend during office hours. I have done this on numerous occasions to attend meetings with yourself and others at the AFL. This costs me in time and lost income to achieve but I have done this over a long time really without complaint. To try and arrange a meeting in a short time frame (e.g. next 2 weeks but not on a monday or tuesday) during office hours is problematic. I think you need to be a little more reasonable in this regard. What is the rush?

I have no problems with providing a breakdown. This will need to be organised via our operations manager...

534 In the materials provided to us we did not identify any breakdown provided by the Florey Institute's Operations Manager. We are not aware whether anyone at the AFL or A/Prof McCrory ever raised the matter directly with the Operations Manager.

535 We also note that a subsequent invoice issued by the Florey Institute in 2016 in relation to the Past Player Project contained a one-line description with no breakdown.³⁴⁶

536 In our view Dr Clifton's requests for breakdowns of expenditure funded by the AFL were reasonable, and indeed required for financial transparency and accountability. We noticed that in subsequent years the Florey Institute invoices included additional information.³⁴⁷ On the basis of the information provided to us it is not possible to determine whether Dr Clifton's requests to A/Prof McCrory for an expenditure breakdown did not result in that occurring for some time because of a failure of the AFL, A/Prof McCrory or the Florey Institute to press the Florey Institute's Operations Manager. We note that this was not a matter about which we sought clarification from the Florey Institute. For present purposes, the key point is that this subject was one upon which communication and reporting between the AFL and A/Prof McCrory appeared inadequate and problem-generating.

537 **Secondly**, A/Prof McCrory's reporting back to the AFL on his consultations with some participants of the Past Player Project was tardy. As part of the clinical

³⁴⁴ AFL.001.001.1190.

³⁴⁵ Ibid.

³⁴⁶ AFL.004.001.1277.

³⁴⁷ See, for example, AFL.004.001.1268.

component Dr Harcourt (a general practitioner) provided referral letters for retired players to see A/Prof McCrory. Below we set out some observations about A/Prof McCrory's reporting back to Dr Harcourt.

- 538 In relation to two retired players, A/Prof McCrory had an initial consultation with each individual during 2015 and sent letters to Dr Harcourt about those consultations shortly afterwards. A/Prof McCrory also referred those individuals for further assessments (including MRI imaging and neuropsychological testing). Those further assessments were undertaken during 2015 and 2016. However, A/Prof McCrory did not prepare any further correspondence to Dr Harcourt reporting back on those additional assessments until 31 May 2019. The delay in further reporting is clearly excessive.
- 539 We also observe that in September 2017, Dr Arain requested from A/Prof McCrory copies of correspondence "for the ex players you have seen".³⁴⁸ This request seems to have been disregarded.
- 540 In relation to one retired player, A/Prof McCrory saw the individual in early 2016 and referred him for tests, which were undertaken during 2016 to 2018, but A/Prof McCrory did not send Dr Harcourt any reports until 31 May 2019.
- 541 In relation to two retired players who A/Prof McCrory saw during 2016, A/Prof McCrory sent brief letters to Dr Harcourt foreshadowing he would provide more detailed reports after additional assessments were done. On 31 May 2019, A/Prof McCrory sent the foreshadowed reports to Dr Harcourt. Based on the AFL's accounting records we are not aware of those two individuals undertaking further relevant assessments during 2016 to 31 May 2019. Nevertheless, we consider the detailed reports provided in May 2019 should have been provided sooner, particularly given the follow-up September 2017 correspondence from Dr Arain mentioned above. That correspondence also specifically mentioned one of the individuals in this category.³⁴⁹
- 542 In relation to five further retired players, A/Prof McCrory sent letters to Dr Harcourt shortly after seeing those players during either 2015 or 2016 and referred the individuals for additional assessments. However, after those additional assessments were completed A/Prof McCrory did not send further correspondence to Dr Harcourt reporting back on the results of those assessments.

2017 to January 2021

- 543 From 2017, the quality of reporting between A/Prof McCrory and each of Dr Harcourt and Dr Clifton deteriorated. Dr Arain also started working for the AFL in 2017. There seems to have been problems with the reporting line between A/Prof McCrory and Dr Arain from the outset with A/Prof McCrory appearing reluctant to accept a reporting responsibility to Dr Arain, with whom he had no prior professional relationship.

³⁴⁸ AFL.001.001.3023.

³⁴⁹ Ibid.

544 We also observed during our review that from 2017 A/Prof McCrory was generally less responsive to emails from the Concussion Working Group. For example, A/Prof McCrory responded to some emails several weeks and even months after they were sent.³⁵⁰ Several AFL interviewees confirmed that A/Prof McCrory became less responsive to communications from the AFL from about this time.

545 One matter which appears to have contributed to the decline in the relationship was the decision to redesign the Past Player Project to prioritise the clinical component and de-prioritise the research aspects. The emails suggest that this affected A/Prof McCrory's efforts in relation to research projects which involved recruitment of retired AFL players. For example, on 5 December 2018 A/Prof McCrory stated in an email to Dr Harcourt:³⁵¹

Peter

Can we chat about this before you head off? We have been trying to discuss this for the last 12 months without a lot of success each time we meet.

We have recruitment targets for the study given that it is externally funded and to wait another month or two until we meet is not possible as that means the recruitment window must be extended which adds to staffing costs

The study requirements go beyond what is currently being organised by Zee (i.e the neuropsychological testing and basic MRI scanning) so that information cannot be used for the study and we do not have ethics to use that information in any case. Where retired players volunteer to be in the study then these tests need to be repeated. This seems a waste of scarce resources

It would seem that we have the funding in place and mechanism to accelerate testing retired players who are already on your prioritised list,. [sic] Surely this is of mutual benefit.

Previously at one of the meetings it was agreed that Zee would forward a list of retired players who have had or in the pipeline for testing. Nothing has been done re this

Lets chat about this please

regards, paul

546 In the next section of this report, we comment more generally on the changing nature of the relationship between the AFL and A/Prof McCrory over time.

³⁵⁰ See, for example, email chains AFL.001.001.1385 and AFL.001.001.3023.

³⁵¹ AFL.001.001.1626. See also email six months earlier dated 20 June 2018, AFL.001.001.1561.

Nature and quality of the interface between A/Prof McCrory and AFL

547 Sub-paragraph (c) of the sixth term of reference asks us to consider the nature and quality of the interface between A/Prof McCrory and the AFL.

2011 to 2013

548 During this period, it appears to us that the relationship between the AFL and A/Prof McCrory was relatively good, which is consistent with our observation above that during this period we did not see signs of reporting deficiencies.

2014 to 2016

549 During this period, in addition to the reporting issues mentioned above, we identified a situation where A/Prof McCrory's conduct potentially compromised an attempt by the AFL to obtain funding for research it was interested in pursuing.

550 By way of background, in late August 2014, the NFL hosted a Think Tank Conference in New York to discuss research proposals it would consider funding. An NFL flyer on the conference stated:³⁵²

In three weeks, we will convene the International Professional Sports Concussion Research Think Tank at the National Football League's headquarters in New York City. On behalf of the organizing committee, we are excited for an interactive and stimulating meeting that will result in collaborative research proposals designed to improve our respective sports and enhance athlete health. In an effort to make the meeting as productive as possible, we are making two requests of the attendees:

1) If you represent a professional sports organization, we would ask that you describe the scientific research that your league is currently funding on concussion. This presentation should be delivered in powerpoint format and limited to 10 slides and only 10 minutes. Our goal is to keep these presentations concise but informative so that the think tank is aware of ongoing research and can avoid supporting duplicative projects...

Following the presentations we will proceed with an open discussion moderated by a member of the organizing committee. This roundtable format will consist of three "think-tank" scientific sessions intended to consider proposed ideas on a) concussion diagnosis, b) concussion management and c) concussion treatment.

2) Please send us one or more ideas for needed research that fit into any or all of the three categories previously listed – diagnosis, management and treatment...

551 A/Prof McCrory was on the organising committee for the conference.³⁵³ On 14 August 2014, Richard Ellenbogen (member of the NFL's Head, Neck and Spine Committee) sent an email to Willem Meeuwisse, Jiří Dvořák and A/Prof McCrory which relevantly stated:³⁵⁴

The group on this e-mail will be the final scientific decision makers on the collaborative research and will carry the burden of proposing who is funded to those funding us.

³⁵² AFL.001.001.1483.

³⁵³ AFL.001.001.0164.

³⁵⁴ AFL.001.001.1701.

552 We are not aware whether the above email reflects the extent of A/Prof McCrory's ultimate involvement in the decision making with respect to research and funding proposals from the conference (which he denies),³⁵⁵ but it does emphasise his influence in the field.

553 Notwithstanding his apparent involvement to some extent on the organising committee, A/Prof McCrory also assisted the AFL with its preparation for the conference, which included putting together funding pitches for research projects.³⁵⁶ Relevantly, the minutes for a Concussion Working Group meeting in May 2014 state:³⁵⁷

Paul conveyed to the group that a meeting will be held in August in New York with representatives from the NFL, NHL, FIFA and Rugby Union to discuss funding concussion research and the potential for collaboration. The likely area for AFL involvement is sideline assessment tools, which aligns well with our current priorities...

554 On Wednesday, 20 August 2014, Dr Harcourt sent an email to A/Prof McCrory and others about the upcoming proposal and the AFL's strategy.³⁵⁸

As explained earlier today attached are the NFL concussion presentation and proposed research projects for consideration at the Concussion Think Tank in New York this weekend. The presentation has a short video of the game as an introduction.

I am hopeful we will achieve one funded project and the most likely would be the sideline test one (\$1.46M) which we know the NFL are focused on. The total cost of all projects is over \$6M. I think there would be some interest in all these projects.

Our major selling points are the research capability and experience of the AFL, access to subjects and strong stakeholder (AFLPA and AFLDA) alignment.

Pete

555 A/Prof McCrory presented at the conference together with Dr Harcourt and Dr Makdissi.³⁵⁹ Despite that, after the AFL presentation and while the conference was still on foot, A/Prof McCrory supported another research proposal presented by the British Horseracing Authority (**BHA**). We were informed that Dr Harcourt was both surprised and disappointed that A/Prof McCrory chose to support the BHA proposal.

556 We asked A/Prof McCrory about the BHA proposal. He responded as follows:³⁶⁰

... we had been told by the NFL immediately after our presentation at the meeting that there [sic] were not interested in funding the AFL-Florey research, as they felt that they had already committed significant funding to similar areas. The same was true of most of the proposals from various sports. As a scientist and researcher, the only project that I believed the NFL were likely to support was one put forward by the BHA. Given the

³⁵⁵ Letter from A/Prof McCrory dated 25 July 2022, [18]; letter from A/Prof McCrory dated 19 August 2022, [12]-[14].

³⁵⁶ AFL.001.001.0447; AFL.001.001.1662_0002; AFL.001.001.1725.

³⁵⁷ AFL.001.001.1662_0002.

³⁵⁸ AFL.001.001.1487.

³⁵⁹ A copy of the PowerPoint presentation with speaking notes is AFL.001.001.1488.

³⁶⁰ Letter from A/Prof McCrory dated 25 July 2022, [18].

circumstances, I agreed that it should be supported. While I have worked with the BHA over the years, I was not involved in that specific funding application prior to the meeting.

557 Dr Harcourt disagreed that the NFL rejected the AFL's proposal on the same day as the AFL presentation. He recalls the conversation occurred the following day. If this is correct, it is unclear what discussions took place over the course of that evening in relation to the competing funding proposals or A/Prof McCrory's role, if any, in those discussions.

558 In our letter dated 27 July 2022, we asked A/Prof McCrory the following further questions:

22. This is the first time that counsel have been informed about this conversation or of the sentiments conveyed by the NFL. Would A/Prof McCrory please provide further details of:

- a. How A/Prof McCrory was informed by the NFL of their position and by who specifically?
- b. Who A/Prof McCrory is referring to when he says "we had been told"?
- c. What was specifically said to him by the NFL?

23. We also refer to the following statement in paragraph 18:

As a scientist and researcher, the only project that I believed the NFL were likely to support was one put forward by the BHA.

24. Would A/Prof McCrory please provide further details of:

- a. When he formed the view that the only project the NFL were likely to support was the one put forward by the BHA, and in particular whether it was after the NFL conveyed the information referred to in paragraph 21 above?
- b. Why he formed that view?
- c. Whether he told Dr Harcourt, Dr Makdissi and/or Patrick Clifton that he thought the only project the NFL were likely to support was one put forward by the BHA?

559 A/Prof McCrory responded to those questions. His response relevantly stated:³⁶¹

12. As to the questions at sub-paragraph (a), my recollection is that Rich Ellenbogen, supported by Jeff Miller, made these comments at the meeting to all attendees...

17. At the meeting, Rich Ellenbogen said to the attending group that as the NFL had already committed money for **research into long term issues around concussion**, this was not an area that they would be interested in funding further. The AFL-Florey proposals centred mainly around this aspect of concussion research.

18. On the other hand, the BHA idea that was presented was simply a slide, noting the extremely high rate of concussions in jockeys (many times that of NFL footballers). The NFL personnel were interested in that point in particular, as they could see an opportunity to look at a very high risk group to study their head trauma and impacts. That was largely the extent of the information and level of detail presented. I agreed that this presented a possible angle to study head trauma, given none of the other sports in attendance had the injury rates approaching that of jockeys. I presume that

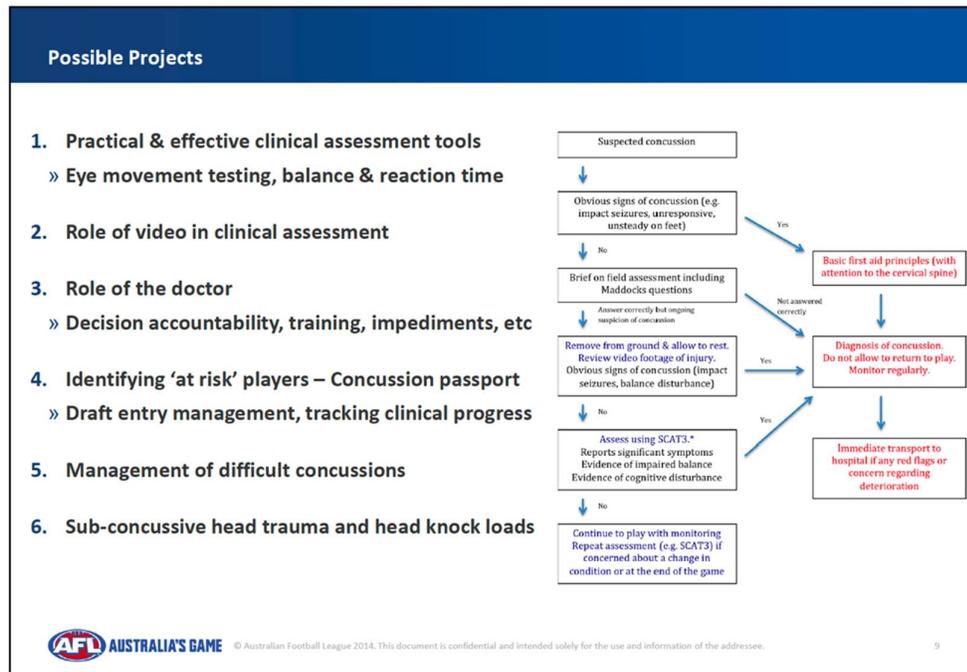
³⁶¹ Letter from A/Prof McCrory dated 19 August 2022, [12]-[19].

the NFL would have had further discussions to elaborate on the details of a fundable study with the BHA, but I am not aware of those discussions.

19. I cannot recall whether I specifically told the AFL attendees about my views at this point, but given we were all sitting in the same room, I would have assumed it was rather obvious. [emphasis added]

560 The proposition that the NFL rejected the AFL’s research proposals because they mainly concerned “research into long term issues around concussion” is inconsistent with the AFL documents referred to in paragraphs 553 and 554 above. Those documents indicate the AFL’s pitch focussed on sideline assessment tools to diagnose acute concussions, as A/Prof McCrory himself had previously indicated to the AFL that the NFL was interested in sponsoring research on that topic.

561 The following slide from AFL’s PowerPoint presentation given at the NFL conference also shows that the AFL presented various ideas for research regarding acute concussion issues.³⁶²



562 Given the above, it seems to us that there may have been other reasons why the NFL rejected the AFL’s research proposals. However, we do not need to investigate those other reasons for the purposes of responding to the sixth term of reference.

563 We acknowledge that the NFL conference was over eight years ago and that the attendees’ recollections of events at that time could be imperfect. It is not necessary to reach any concluded view about whether A/Prof McCrory acted improperly in a way that damaged the AFL’s interests or altered its prospects of

³⁶² AFL.001.001.1488.

obtaining funding. However, the events of the NFL conference are relevant insofar as they show that there were problems in the nature of the relationship between A/Prof McCrory and the AFL in 2014. The problems involved a lack of clarity in functions and transparency and hence a lack of accountability. This resulted in the possibility of actual or perceived lack of professional fidelity and disappointed expectations of loyalty to the AFL.

564 There is another reason (apart from the effect of the effluxion of time on memory) that we describe these effects as possibilities about which we are reluctant to express any concluded view. This is that there appears to have been no suggestion of professional impropriety or breach of trust ever put by the AFL to A/Prof McCrory following the NFL conference, and the AFL continued to use A/Prof McCrory as one of its primary concussion advisors. In a memorandum to the AFL Executive dated 1 April 2016, A/Prof McCrory was referred to as one of the AFL's three primary concussion advisors/researchers.³⁶³ It is surprising to us that the AFL continued to place its trust in A/Prof McCrory after these events without insisting upon a more formal and accountable relationship.

2017 to January 2021

565 Between 2017 to 2018 there was a decline in the nature and quality of the interface between the AFL and A/Prof McCrory. An AFL board paper dated 10 May 2018 stated that A/Prof McCrory is:³⁶⁴

an AFL consulting neurologist for current and past players, and provides advice on policy. However his views on CTE (that it may not represent a unique pathology and is over diagnosed in the US) does not reflect the AFL position on the issue. Dr Michael Makdissi (Hawthorn FC Club Doctor and AFLDA President) is our primary concussion advisor/researcher.

566 We also noticed that during the period between 2017 and 2018, A/Prof Davis and Dr Makdissi became more prominent advisors to the AFL on concussion issues generally. For example, A/Prof Davis recommended the introduction of a concussion panel process based on his experience with medical panels in other settings.³⁶⁵ A/Prof Davis discussed the idea with A/Prof McCrory but took carriage of it. Concussion panels are now used by the AFL to assist with providing advice to players who suffer from complex concussion injuries where clinical symptoms persist beyond the usual recovery periods.

567 There was also a concern noted in the minutes of an internal AFL meeting on 4 December 2018 that A/Prof McCrory might be causing confusion amongst participants of the Past Player Project about the purpose of particular procedures, that is, whether they were clinical and would be part of the player's individualised treatment or were for research purposes only and would not form part of the player's treatment. The minutes relevantly stated:³⁶⁶

Pete to contact Paul McCrory. The process must be clear to the player. Issue that he is using Tracey and Helen [neuropsychologists] without being in our program – being

³⁶³ AFL.004.001.0445.

³⁶⁴ AFL.004.001.0467.

³⁶⁵ AFL.001.001.2383.

³⁶⁶ AFL.004.001.2431.

recruited through a side door. He can't be saying that this is part of the program. Players think this PET is standard for follow up. If he wants to recruit, it needs to be after the program, not in the middle of a clinical assessment. We didn't agree on this with Paul & AFL. Chris Rowe has been involved and likely has been pushing Paul to get people on board.

568 From the start of 2019 to January 2021, we noticed significantly less correspondence between the AFL and A/Prof McCrory, which is consistent with the sentiments and reservations expressed in the AFL Executive memo mentioned above.

569 In the following paragraphs we set out a brief chronology of the events in December 2020 to January 2021 leading to the withdrawal of A/Prof McCrory from the Concussion Working Group.

570 As discussed in **chapter 2**, at this stage imaging can detect physiological changes in the brain but there is ongoing uncertainty at present as to how imaging regarding physiological changes can be used to inform return to play policies. We also observe that many individuals are reluctant to participate in MRI imaging for research purposes. Those diagnostic limitations provide the context to the discussions within the Concussion Working Group about the 2021 AFL and AFLW concussion guidelines.

571 On 17 December 2020, Michael Makdissi prepared the first draft of the concussion guidelines for the 2021 AFL and AFLW seasons which he circulated to the Concussion Working Group via email (the **First Draft**).³⁶⁷ The First Draft included changes to the 2020 guidelines and relevantly stated:³⁶⁸

The graduated loading program should be commenced 24 hours after the player has recovered clinically and should be conducted over a minimum of five days, in accordance with the current consensus guidelines.

Based on these timeframes – the **minimum** time period that a player can return to play after a concussion is **7 days after their injury** (see table 2). For this to happen – the player **MUST** have recovered completely on testing in the immediate post-match assessment period (i.e. record a normal/return to baseline SCAT5 before leaving the changerooms/recovery immediately after the game). And not have any recurrence of symptoms with any step in the process.

³⁶⁷ AFL.001.001.1233 and AFL.001.001.1234.

³⁶⁸ AFL.001.001.1234.

572 Below is a table from the First Draft:

Table 2. Guideline for *minimum* return to play following concussion

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9
Resolution of clinical features in the immediate post-match period	Rest	Symptom limited activity	Light aerobic exercise	Sport specific exercise (Increased HR & basic skills)	Non-contact training drills (add weights)	Full contact training drills	Return to play		
Resolution of clinical features within 24 hours of injury	Rest	Symptom limited activity	Symptom limited activity	Light aerobic exercise	Sport specific exercise (Increased HR & basic skills)	Non-contact training drills (add weights)	Full contact training drills	Return to play	
Resolution of clinical features within 48 hours after injury	Rest	Symptom limited activity	Symptom limited activity	Symptom limited activity	Light aerobic exercise	Sport specific exercise (Increased HR & basic skills)	Non-contact training drills (add weights)	Full contact training drills	Return to play

573 On 20 December 2020, A/Prof Davis provided some input. A/Prof McCrory also provided feedback on the draft. His email relevantly states:³⁶⁹

Great draft and I have made some comments below

1. I think as an overall concept it should be more prescriptive rather than optional and advisory. It potentially creates too much wiggle room to minimise time off. The previous protocols had a similar approach and it really doesn't seem to have moved the AFL docs very far towards getting them to do NP/imaging etc

2. I am not sure this draft makes the process more conservative and a rapid turn around will inevitably attract criticism. If we wanted to encourage an increasingly conservative approach, which I think is really important, then we really should be trying to push out the RTP timeline and encourage missing 2-3 weeks rather than 6 days. The Bostonians have also picked up on a 6 day turn around as a criticism touchpoint and their point has gained a lot of traction in the UK rugby articles. This is also important as a leadership issue for all levels of football as role models. The idea below makes a minimum 14 day turn around but happy if it goes longer.

3. Our own neuropsychological and imaging data (as well as the literature) shows that recovery takes longer than that time frame set out in these guidelines AND we don't seem to incorporate any objective assessment in the RTP strategy even though the text mentions the concept of a multidisciplinary approach in the section on diagnosis/acute assessment side of the issue yet RTP may be the more important use of these strategies.

4. We don't really have the scientific backup to support a concept that whether someone recovers on the day of injury/has delayed sx/prolonged sx makes such a difference in RTP timeframe. While it is plausible, we do highlight the evolving nature of injury in the document and yet not account for it fully in the RTP strategy...

³⁶⁹ AFL.001.001.0127.

- 574 We were informed by A/Prof McCrory that the reference to the “UK rugby articles” was a reference to newspaper articles at the time which he no longer has copies of.³⁷⁰ We have found one such article attached to an email circulated by A/Prof McCrory on 9 December 2020.³⁷¹ The article described a group of retired rugby players who had been diagnosed with dementia and were proposing to take legal action against the Rugby Football Union in England and the Welsh Rugby Union. It did not comment on return to play policies.
- 575 We understand the reference to the “Bostonians” is a reference to the Boston University Research CTE Centre.³⁷² That research centre works together with the Concussion Legacy Foundation mentioned in **chapter 2** above to investigate CTE and other long-term consequences of repetitive head impacts.
- 576 On 21 December 2020, Dr Makdissi responded to A/Prof McCrory’s email with some comments.³⁷³ Dr Harcourt responded on the same day “[a]ll good ideas for discussion”.³⁷⁴ There was then a gap in the email correspondence until 14 January 2021.
- 577 On 14 January 2021 at 5:31pm, Dr Makdissi circulated a second draft of the guidelines (the **Second Draft**). Dr Makdissi’s cover email stated:³⁷⁵

Thanks all for your input
I have re-drafted the guidelines (attached)

Key points are

1. It is a minimum of 8 days before return to play (and that is for players who recover on the day of their injury)

This essentially means that nearly all players will miss at least 1 game

The average time to clearance for return will be about 12-14 days

The management remains a medical decision rather than a specified time frame - so that the players who need it most (those with prolonged symptoms) have a much longer return to play time frame

2. It is an incremental change from previous guidelines, without significant changes in our approach/philosophies

This is all pending further guidance from the "Paris" meeting later in the year

3. There is a focus on research including

- impact sensors

- imaging

- new tools for concussion assessment

Would be grateful for further comments from the group

Regards
michael

³⁷⁰ Letter from A/Prof McCrory dated 19 August 2022, [3].

³⁷¹ AFL.001.001.0133; AFL.001.001.0134.

³⁷² See further: <<https://www.bu.edu/cte/about/>>.

³⁷³ AFL.001.001.1247.

³⁷⁴ AFL.001.001.0899.

³⁷⁵ AFL.001.001.1247 and AFL.001.001.1248.

578 At 6:56pm, A/Prof McCrory replied as follows:³⁷⁶

See my previous email

I still disagree with this strategy for the same reasons.

If this is the final version agreed to by the AFL then please remove my name from the document and the referral network

Regards, Paul

579 At 7pm, Stephen Meade requested a call to discuss the issue further.³⁷⁷

580 At 7:17pm, A/Prof McCrory sent an email directly to Dr Harcourt. That email stated amongst other things:³⁷⁸

You are aware that the **advanced MR imaging studies from concussed AFL players show abnormalities that persist longer than the current and proposed RTP time frames.** Only this week, **Monash reported biomarker abnormalities in community football persisting for at least 2 weeks after their concussion symptoms had resolved.** All of this is completely in line with other published work.

I am afraid I cannot support management guidelines that do not reflect the current and evolving science.

Given your comments and the way the guidelines are evolving, I can see no option but to 'resign' from whatever honorary involvement I have with the AFL.

Please ensue [sic] that my name is removed from the future guideline documents and/or other material [emphases added]

581 Dr Harcourt responded to A/Prof McCrory's email saying "I am surprised by your email... We should meet to discuss all this".³⁷⁹ We were informed there was no subsequent meeting.

582 On 19 January 2021 Mr Meade again requested a call with A/Prof McCrory. By email dated 19 January 2021 A/Prof McCrory stated:³⁸⁰

Stephen

Thanks for the email

I have resigned my (honorary) involvement with the AFL and are no longer involved in this process but I am happy to chat at some stage

The CISG guidelines make the point in the preamble of the document that recommendations need to evolve based on scientific developments over time. It is not enough to adopt a specific recommendation from 2016 and say that the guidelines have been 'followed'. Research from the AFL has shown concussion recovery takes longer than the time frame in the proposed 2021 guidelines. Hence my point

³⁷⁶ AFL.001.001.1292.

³⁷⁷ Ibid. Stephen Meade is the Head of Legal & Regulatory. We were informed that during 2021 he became involved in the Concussion Working Group.

³⁷⁸ AFL.001.001.0914.

³⁷⁹ Ibid.

³⁸⁰ AFL.001.001.2961.

I hope that makes sense

with kind regards, paul

583 Mr Meade requested a call again on 25 January 2021.³⁸¹ We were informed by both Mr Meade and A/Prof McCrory that there was no subsequent phone call between them.

584 We were also informed that Dr Makdissi tried to call A/Prof McCrory to discuss the guidelines further but did not receive a response. A/Prof McCrory indicated he did have a call with Dr Makdissi,³⁸² however could not recall any specific details of the conversation. Whether there was a conversation or not is not something we need to resolve and the content of any call is unknown in any event.

585 Dr Makdissi informed us that the 2021 AFL and AFLW Guidelines are consistent with the 2016 Consensus Statement which focus on return to play after the resolution of clinical symptoms. The draft 2021 AFL and AFLW Guidelines required the resolution of symptoms before a player can return to play.

586 In our letter to A/Prof McCrory dated 27 July 2022 we asked A/Prof McCrory to confirm the details of the Monash study he was referring to in his email dated 14 January 2021. A/Prof McCrory confirmed those details for us. The relevant article is titled "Prolonged elevation of serum neurofilament light after concussion in male Australian football players".³⁸³ The conclusion of that article states:³⁸⁴

Serum NfL may aid in SRC [sports-related concussion] diagnosis throughout the acute and sub-acute stages of injury in males, but further work is required for biomarkers of SRC in females. As our findings indicate that axonal injury may persist beyond symptom resolution and into the sub-acute stages of SRC, serum biomarkers such as NfL may prove to have utility for informing neurobiological recovery and RTP decisions.

587 This study is another example of preliminary research work identifying potential biomarkers that can be used to assist with diagnosis of concussion in athletes and observes the persistence of physiological changes beyond the resolution of clinical symptoms. However, the study did not make further findings regarding the impacts of return to play before the resolution of those physiological changes. The article relevantly states:³⁸⁵

The clinical significance of persistently elevated biomarkers beyond the period of symptoms remains unknown and a potential focus for follow-up.

³⁸¹ AFL.001.001.2961.

³⁸² Letter from A/Prof McCrory dated 25 July 2022, [8]; letter to A/Prof McCrory dated 27 July 2022, [5]-[7]; letter from A/Prof McCrory dated 19 August 2022, [2].

³⁸³ McDonald SJ, O'Brien WT, Symons GF, et al (n 18).

³⁸⁴ Ibid, page 8.

³⁸⁵ Ibid, page 7.

588 We also asked A/Prof McCrory:

... would A/Prof McCrory please provide the details of any other studies recording the then “current and evolving science” that he considers the draft guidelines did not reflect.

589 By letter dated 19 August 2022, A/Prof McCrory referred us to 57 articles, which we have reviewed. The list of those articles from A/Prof McCrory’s letter is included as Annexure 6. We make the following observations about those articles:

- (a) several articles focus on the identification of potential biomarkers which could be used in the future as clinical tools in the diagnosis and management of concussion injuries. Consequently, the articles do not propose steps that can be taken for clinical treatment but rather avenues for further research;
- (b) several articles reported ongoing physiological changes after resolution of clinical symptoms, but did not discuss the potential impacts to individuals if they returned to playing contact sport before resolution of those physiological changes;
- (c) a handful of articles were directed at investigating the use of different types of technology or neurocognitive testing to better diagnose the incidence and potential severity of concussions, rather than confirm whether it is appropriate for an individual to return to playing contact sport; and
- (d) the return to play models referred to in several articles, which those articles did not criticise, were based on the resolution of clinical symptoms rather than the resolution of physiological changes.

590 The literature that A/Prof McCrory referred us to confirms that there is no single biomarker which can presently be relied on for a return to play policy and that individuals should return to play after following a graded rehabilitation program which involves the resolution of clinical symptoms together with a buffer period at the end. In these circumstances, it appears to us that the Second Draft was not inconsistent with the literature A/Prof McCrory directed us to. It was a requirement of the Second Draft that a player’s clinical symptoms must be resolved before returning to play. Consequently, if it took longer than 8 days for that to occur, the player would be excluded from play for a longer period.

591 In his letter to us dated 25 July 2022, A/Prof McCrory noted there were other reasons why he ended his relationship with the AFL. By our letter dated 27 July 2022 we asked A/Prof McCrory to identify the “other reasons”. In his response dated 19 August 2022, A/Prof McCrory stated:

All I would add to my previous comments is to say that all the ‘other reasons’ related to shortcomings and failures within the AFL to prioritise concussion, including research, investigations and measures to address the same in players. I became increasingly frustrated about the lack of action on player safety around concussion at both an organisational and an individual level; eventually reaching a tipping point with the 2021 guidelines.

- 592 In our view, it is plausible that A/Prof McCrory withdrew from the Concussion Working Group because of frustrations he felt regarding the AFL's failure to prioritise research activities and initiatives concerned with concussion. Consistently with A/Prof McCrory's characterisation of the AFL's approach to the 2021 guidelines as "a tipping point",³⁸⁶ it seems unlikely that A/Prof McCrory withdrew solely or primarily because of any concerns he had about the AFL's Second Draft. There are two reasons for this.
- 593 **First**, it seems to us that the Second Draft was not clearly inconsistent with the current and evolving literature that existed as at January 2021 (although we acknowledge that A/Prof McCrory's concerns with the AFL's second draft were not expressed to be exclusively founded upon inconsistency with the scientific research to date and the conclusions that may be drawn with certainty therefrom, but also upon inconsistency with the "evolving" direction of the science and the consequential prudence of taking a conservative approach; upon A/Prof McCrory's desire for a more prescriptive return to play regime; and upon the objective of taking a more conservative approach than in previous versions).
- 594 **Secondly**, it would have been open, and perhaps more reasonable, for A/Prof McCrory to debate the merits of the Second Draft in order to effect the changes he considered were in the interests of player safety. In this regard, we observe that the Second Draft was not the final draft. As discussed in **chapter 2**, the final version of the 2021 AFL and AFLW Guidelines did take a more conservative approach than the Second Draft, imposing a minimum rehabilitation period of 12 days. This suggests that the Concussion Working Group would have been receptive to constructive engagement from A/Prof McCrory. We have seen no documents suggesting the contrary. It is indeed possible that the amendments between the AFL's Second Draft and the final version were in part due to A/Prof McCrory's observations before his withdrawal from the process.
- 595 Ultimately, it is not possible or necessary for us to form any concluded view as to the true reasons for A/Prof McCrory withdrawing from the relationship that had developed between him and the AFL. There is no reason to doubt that it was a combination of factors that led to a gradual deterioration in the relationship, including A/Prof McCrory's growing frustration about the AFL's failure to prioritise concussion research and initiatives and culminating in his disagreement with the approach being taken to the 2021 guidelines.

³⁸⁶ Letter from A/Prof McCrory dated 19 August 2022, [7]; letter from A/Prof McCrory dated 7 October 2022, [2] and [5].

Representation by A/Prof McCrory of the AFL

- 596 Sub-paragraph (d) of the sixth term of reference asks us to identify any instances where A/Prof McCrory has represented the AFL on any external bodies, including the Concussion in Sport Group discussed earlier in this report. We have focussed our inquiry on the period 2011 to January 2021. As explained below, in our view during that period A/Prof McCrory did not represent the AFL on any such external bodies.
- 597 As mentioned in **chapter 2**, there have been five Concussion in Sport Group conferences to date, which occurred in 2001, 2004, 2008, 2012 and 2016. Three of those conferences occurred before the AFL asked A/Prof McCrory to be a member of its Concussion Working Group in 2011. By 2011, A/Prof McCrory was already an established member of the author panel for the Consensus Statements. We have not come across any evidence which suggests the AFL asked A/Prof McCrory to attend the conferences on its behalf and were informed that the AFL did not pay for A/Prof McCrory to attend any of the conferences.
- 598 The other group or external body which we think is relevant to sub-paragraph (d) is the Collision in Sport group mentioned above in **chapter 3**. That group is a group of representatives from various international sporting organisations, including the AFL, who have met to discuss implementation of the Consensus Statements. To date that group has had four meetings, which occurred in 2017, 2018, 2019 and 2021.³⁸⁷ The group has also published some articles arising from those meetings.³⁸⁸
- 599 We reviewed a spreadsheet summarising the attendees of each of these conferences. That spreadsheet indicates A/Prof McCrory only attended the 2018 conference and that he attended the conference as a representative of the NFL.³⁸⁹ This was confirmed to us by the AFL. The AFL also informed us that it has not paid for A/Prof McCrory to attend those conferences. Other individuals attended the conference on behalf of the AFL and their travel costs were paid for by the AFL.
- 600 As mentioned above, we have not treated the NFL conference in 2014 as an external body for the purposes of this term of reference.

³⁸⁷ We were informed the 2021 conference was online due to the Covid-19 pandemic.

³⁸⁸ See, for example, Patricios JS, Ardern CL, Hislop MD, et al (n 82).

³⁸⁹ AFL.004.001.0780.

The question of impropriety

- 601 The sixth term of reference directs attention to both the “nature and propriety” of the relationship between A/Prof McCrory and the AFL in the performance of the work. We have addressed above the “nature” of that relationship. We now consider the issue of “propriety”.
- 602 Evaluation of propriety entails a normative judgment as to whether the relationship in question was legally or morally appropriate, proper or right. It seems to us a different question to that of desirability, prudence or appropriateness from the perspective of sound governance and accountability.
- 603 In relation to term of reference 6(a), we consider that there was nothing legally or morally improper, inappropriate or wrong with the informality of the relationship that evolved between A/Prof McCrory and the AFL, or with the enjoyment by the former of any financial or non-financial benefits from that relationship. The financial benefits in particular were insubstantial.
- 604 However, we are of the view that the informality of the relationship tended to detract from the levels of transparency and accountability that would have been desirable between the AFL and a leading concussion expert upon whom it relied for advice and some services.
- 605 In relation to term of reference 6(b), we make the same observations. Informality and lack of structure in reporting lines probably in themselves fell short of what could be described as impropriety. However, it certainly created potential for impropriety and fell short of the levels of accountability and transparency that could be expected of an entity with the AFL’s size and public profile, especially having regard to the health and safety implications of the issues with which A/Prof McCrory and the AFL were jointly engaged. We think this potential was evidenced by:
- (a) the failure of the AFL to insist upon, and A/Prof McCrory’s failure to cause the Florey Institute to provide sufficient detail of expenditure on the Past Player Project before 2017 (see paragraphs 526 to 536 above); and
 - (b) the failure of the AFL to insist upon, and A/Prof McCrory to provide timely reporting on tests and assessments on at least 10 participants during the Past Player Project (see paragraphs 537 to 542 above).
- 606 In relation to term of reference 6(c), we also make similar observations. The lack of structure and formality in the relationship between A/Prof McCrory and the AFL did not in itself amount to impropriety.
- 607 However, it gave rise to the potential for impropriety through lack of transparency and accountability. In our view this potential was evidenced by the conflicted functions and allegiances A/Prof McCrory seemed to have in respect of the research project funding efforts of the AFL at the August 2014 NFL Think Tank Conference. It appears to us inappropriate that the AFL did not possess, and A/Prof McCrory did not convey, a clear understanding that the latter was not in

attendance solely to assist with the AFL researching funding efforts but may instead level support to an alternate sporting organisation's efforts.

608 In relation to term of reference 6(d), we have not identified any impropriety in representation by A/Prof McCrory of the AFL on the Concussion in Sport Group or other external bodies.

Conclusion

- 609 A/Prof McCrory was recruited by the AFL to its Concussion Working Group in 2011 and assisted the AFL until he withdrew from the Concussion Working Group in January 2021. He was not engaged as an employee or contractor. Rather, he largely assisted the AFL in an unpaid capacity and the arrangement was informal. We have not found any examples of A/Prof McCrory representing the AFL on any external bodies during this period.
- 610 The relationship between A/Prof McCrory and the AFL started off well but deteriorated from about 2017 onwards. It is difficult to identify a specific turning point in the relationship, but it appears that the AFL's decision to focus on the clinical treatment of retired players rather than the research component of the Past Player Project may have contributed to the deterioration in the relationship.
- 611 A/Prof McCrory reported primarily to Dr Harcourt at the AFL and, to a lesser extent, Dr Clifton and Dr Arain. Over time there were problems with each of those reporting lines, in particular, in relation to the reporting on A/Prof McCrory's involvement in the Past Player Project.
- 612 Although we have identified problems with the nature of the relationship between A/Prof McCrory and the AFL, we have not found any examples of conduct that constitute impropriety. Despite that, the informality of the arrangement and lack of structure in reporting lines created the potential for impropriety and detracted from the levels of accountability and transparency that could be expected of an entity with the AFL's size and public profile.

CHAPTER 9: RECOMMENDATIONS

Seventh term of reference

613 The seventh term of reference states:

The AFL seeks:

- a. any recommendations in respect of the collation and use of any existing data, including the results of any medical assessments, scans and testing previously undertaken in connection with the research projects or other Work, or any quantitative or qualitative analysis or interpretation of such data, associated with any research projects identified in the course of the review. Specifically, to the extent that any previous research projects may be found to be unfinished or unsatisfactorily concluded, what steps ought now be taken to optimize the research outcomes and learnings of the data collected; and
- b. any other recommendations that may be considered appropriate.

Overview

- 614 We have prepared recommendations that fall into four categories.
- 615 **First**, structural, governance and resourcing recommendations concerning the need to have a better resourced and more formally accountable advisory team on brain injury issues. This category also includes recommendations for coordinating and supervising structures to avoid some of the problems which arose from having an informal Concussion Working Group which met on an intermittent basis.
- 616 **Secondly**, research program recommendations. This includes the use of existing data obtained from the Past Player Project which has not yet been used in any published research work. As part of this category, we also address the AFL's plans for future research on concussions and neurodegenerative diseases.
- 617 **Thirdly**, clinical program recommendations concerning the AFL's plans to continue offering clinical treatment to retired AFL players who are assessed as requiring further treatment.
- 618 **Fourthly**, we have set out some further general recommendations based on various other matters that we have observed during our review.
- 619 In relation to each of the categories we have set out below the context and circumstances giving rise to the recommendations. Some of that background reflects, or is referable to, the information provided above in respect of earlier terms of reference.
- 620 Insofar as the recommendations touch upon scientific, medical and research matters, they are made in consultation with, and with the support of, Prof O'Sullivan.

Structural, governance and resourcing recommendations

- 621 From 2011 to mid-2021, the AFL primarily received advice on concussion issues from its Concussion Working Group. The group managed various issues such as the drafting of concussion guidelines, triaging research project proposals and occasionally monitoring the progress of ongoing research projects.
- 622 The group included various external consultants who assisted on an unpaid basis, and the group itself was relatively informal. Most of the correspondence occurred via email with occasional meetings, many of which were after hours dinner meetings. The group was not overseen by any other committees. The group also had access to limited funding which impeded its ability to support and advance projects.
- 623 In mid-2021, under the stewardship of the General Manager Legal and Regulatory, Stephen Meade, the AFL replaced the Concussion Working Group with a new governance structure. The new structure includes five separate working groups, being:

- (a) Research & Innovation;
- (b) Medical;
- (c) State & Community Football;
- (d) Risk, Insurance & Legal; and
- (e) Communications & Media.

624 The introduction of this new structure was a significant and positive shift from the informality of the past.

625 We consider the introduction of groups focussing on different aspects of concussion management is sensible and appropriate. Each working group has its own business plan setting out the group's annual objectives and plans to help clarify each group's role.

626 In this chapter we have focussed on the Research & Innovation, Medical and State & Community Football working groups as those groups are the ones which deal with issues relevant to the matters that have arisen in this review.

627 The role of the Research & Innovation working group is:³⁹⁰

To lead innovation in the prevention, detection and management of concussion in Australian football, and steward research into sport-related concussion outcomes to enable translation of findings into evidence-based best practice.

628 The role of the Medical working group includes:³⁹¹

To provide medical oversight and expertise on content of concussion education programs across all levels of Australian Football, including the AFL/AFLW, community competitions, pathway programs and school football.

To ensure that the medical aspects of concussion protocols across all competitions are consistent, contemporary and best practice to facilitate injury prevention, early identification and optimal clinical management pathways from the time of injury, through recovery and safe return to play. This includes simple and pragmatic translation of guidelines to community competitions, pathway programs and school football, which all come with their own unique challenges (e.g. limited expertise or resources)...

To help identify opportunity and develop strategies to reduce the risk of concussion and repetitive head trauma in Australian football through rule or policy changes, alterations to preparation of players (e.g. training techniques, etc) and/or use of protective equipment.

629 The role of the State & Community Football working group is:³⁹²

To provide input into the implementation and amendment of the Guidelines for Concussion Management in Community Football (Community Guidelines) as required. To support the communication of the AFL Community Concussion Guidelines to State and Community football organisations. To ensure up to date information regarding concussion is accessible

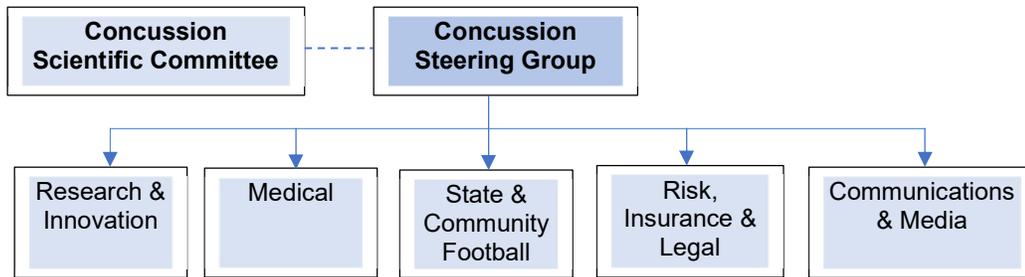
³⁹⁰ AFL.008.001.0024.

³⁹¹ AFL.008.001.0023.

³⁹² AFL.008.001.0026.

to the community network including schools. To conduct concussion education sessions / forums for State and community football organisations including schools. To act as a conduit between State and community football organisations and the AFL ensuring two-way communication of all concussion related information including escalation of risk and urgent matters

630 The working groups report to the Concussion Steering Group.³⁹³ The Concussion Steering Group obtains expert scientific input from the Concussion Scientific Committee. Below is a diagram that represents the new structure:



631 As explained below, the AFL has also recruited additional medical and scientific experts who can offer the AFL a broader range of expertise. Relevantly, A/Prof Willmott will chair the scientific committee and lead the Research & Innovation working group. A/Prof Willmott has significant experience in brain injury research through her work at Monash University. The AFL has also recruited Rachel Elliott who will co-chair the Concussion Steering Group together with Mr Meade. We understand Ms Elliott is an experienced project manager who has previously worked for Monash Health, a medical organisation which includes Monash Medical Centre, Casey Hospital, Dandenong Hospital and Monash Children’s Hospital.

Working groups

632 We make three observations about the Research & Innovation, Medical and State & Community Football working groups, bearing in mind that the new structure is relatively recent and will no doubt be subject to review and refinement as its strengths and weaknesses become apparent.

633 **First**, we consider the initiatives allocated to each working group are sensible and appropriate. For example, we understand the State & Community Football group is actively involved in rolling out concussion education initiatives for community and state football leagues. The Medical working group is delivering education initiatives for AFL and AFLW players. We have seen the PowerPoint presentation used by the Medical working group for presentations and seminars with clubs and think it is a useful resource which explains key issues in relation to concussion in simple terms.³⁹⁴ Below is an example slide:

³⁹³ AFL.008.001.0003.

³⁹⁴ AFL.009.001.0002.

Day of injury – recognise & remove

Responsibilities:

- Come off the ground when asked
- Be honest with how you are feeling
- Further assessment (including a review of the video of the incident)
- Take care of your teammates – if someone is not right, let the doctor know

Decision made on all information

Time and space is needed

634 **Secondly**, we consider the membership of each working group seems generally appropriate, but some additional recruitment may be required to ensure particular groups are able to complete the work allocated to them in a timely way. The State & Community Football working group membership seems to be sufficiently diverse and appropriately resourced. With respect to the other two groups, we consider additional junior employees and/or contractors should be considered as most members are senior advisors, and more ‘on the ground’ support may be desirable, including for the sake of continuity and renewal of corporate knowledge and expertise.

635 The members of the State and Community Football Working Group are:³⁹⁵

Name	Title
Rob Auld	AFL EGM of Game Development – Chair
Matt Duldig	South Australian National Football League General Manager Football
Barry Gibson	AFL Community Football Manager QLD
Matt Glossop	AFL Talent High Performance Lead
Dr Sean Gorman	AFL Senior Policy Advisor in Inclusion and Social Policy
Andrew Hughes	AFL Community Football Operations Manager
Dr Makdissi	AFL Chief Medical Officer (attends as required)
Madeline Penny	AFL Head of Game Development Investment and Community Football Operations
Brenton Sanderson	AFL Community Umpiring Manager
Jess Smith	AFL National Female Talent Manager
James Ceely	AFL Head of Participation and Programs

636 The members of the Research & Innovation working group are:³⁹⁶

Name	Title
A/Prof Wilmott	AFL Head of Concussion Innovation & Research - Chair
Dr Makdissi	AFL Chief Medical Officer
Dr Harcourt	Previous AFL Chief Medical Officer

³⁹⁵ AFL.008.001.0026.

³⁹⁶ AFL.008.001.0024 and AFL.020.001.0003.

Dr Inge	AFL Medical Consultant
Mr Tom Gastin	AFL Football Analysis & Administration Manager
Mr Billymo Rist	AFLPA Head of Program Development
Dr Jonathan Reyes	AFL Concussion Research Lead (neuropsychologist)
Dr Erin Hoare	AFL Mental Health & Wellbeing

637 The members of the Medical working group are:³⁹⁷

Name	Title
Dr Makdissi	AFL Chief Medical Officer - chair
Dr Harcourt	Previous AFL Chief Medical Officer
Dr Inge	AFL Medical Consultant
Dr Anik Shawdon	AFL Medical Consultant
A/Prof Davis	Neurosurgeon (external consultant, assists in unpaid capacity)
Katie Davies	Neuro-rehabilitation physiotherapist
Dr Barry Rigby	AFL Doctors' Association representative
A/Prof Shannon Springer	General Practitioner and A/Prof of Aboriginal and Torres Strait Islander Health at Bond University

638 **Thirdly**, each working group's business plan contains information which we consider will assist the Concussion Steering Group to monitor the progress of the group. Relevantly, the business plans include specific initiatives for the group to work on including key performance indicators (**KPIs**) and timing for completion of those initiatives. By way of example, the first initiative in the business plan for the Medical working group states:³⁹⁸

Initiatives for 2022

#	Priority	Delivery KPI	Target impact
1	a) Refresh and deliver concussion education content to all AFL and AFLW players.	> 95% of AFL and AFLW players receive doctor led concussion education.	Improve understanding of concussion including risks, identification, management, and available supports.
	b) Evaluate the effectiveness of the education program through use of an online survey.	All eligible clubs represented in the feedback. >90% satisfaction with the content of the education program.	Assess impact of the education program on knowledge transfer and potential for behavior change; and seek feedback to improve future delivery of education programs.

639 The business plans for the Research & Innovation and Medical working groups also includes some "Other Delivery Priorities". Those priorities are long lists which are not tied obviously to any specific KPIs. Without further specificity, it seems to us that there is a risk that those other priorities will remain aspirational but may not be implemented in a timely way. Further, it may be difficult for the Concussion Steering Group to monitor those initiatives and they may be easily overlooked.

Concussion Steering Group

640 This group has its own terms of reference identifying key priorities.³⁹⁹ The group is co-chaired by Ms Elliot and Mr Meade. Other members include the chairs of

³⁹⁷ AFL.008.001.0023 and AFL.020.001.0003.

³⁹⁸ AFL.008.001.0023.

³⁹⁹ AFL.008.001.0007.

each working group, an AFLPA representative, a current AFLW player representative, a former AFL player and a representative from the AFL Coaches Association.⁴⁰⁰ The group generally meets every six weeks. We make three general observations about the Concussion Steering Group.

- 641 **First**, we consider the inclusion of player representatives across the AFL, AFLW and community level football is a positive development which should help the AFL to improve the content, understanding and implementation of its concussion management strategies and policies in the future. The Concussion Working Group did not include any such representatives. Having those representatives should provide the AFL with better visibility over what is occurring at the club level and de-mystify the AFL's stance on concussion issues.
- 642 The inclusion of player representatives should also assist the AFL to better understand the nuances that need to be considered for different competitions. For example, the minutes record that in the AFLW the largest proportion of concussion incidents occur during tackling, whereas for men's competitions concussions generally occur during marking contests.⁴⁰¹ Those nuances are important to understand given there is emerging scientific research which suggests that men and women respond differently to concussions which may need to be factored into concussion strategies and policies.⁴⁰²
- 643 It seems that useful feedback has already been provided by the player representatives to the Concussion Steering Group. For example, the minutes from the meeting on 8 December 2021 record the following feedback provided by Annalyse Lister, the AFLW representative:⁴⁰³

Whats working well: Clear intent from AFL that they're taking concussion seriously which is not always evident in other sports. Rule changes implemented have worked really well including 3rd umpire from AFL telling people to come off and go through protocols. 12 day protocol very appropriate. Clear to playing group that concussion is taken seriously.

Areas for improvement: Working away from subjective reporting and diagnostic measures, particularly in training and community levels where there is less medical support. Public awareness- promoting 'player health' rather than 'concussion management' to change attitudes and shift the culture. Very few players sharing condition with other players. Support for players with ongoing symptoms needs to be there. Baseline Scat tests yet to be done even though already in match sims. Tribunal measures are outcome based rather than about the actions leading to the issue, needs to be consistently measured.

AFLW Specific issues: No concussion education module, current ones aren't taken seriously so presentation would be helpful. AFLW players often cant [sic] go through concussion protocols set out as many have other jobs where they need more flexibility. Financial or other support may be needed.

⁴⁰⁰ AFL.020.001.0003.

⁴⁰¹ AFL.008.001.0019.

⁴⁰² See, for example, Kamins J, Bigler E, Covassin T, et al (n 39) and Paniccia M, Verweel L, Thomas SG, et al. Heart rate variability following youth concussion: how do autonomic regulation and concussion symptoms differ over time postinjury? *BMJ Open Sport Exerc Med.* 2018;4(1):e000355. doi:10.1136/bmjsem-2018-000355.

⁴⁰³ AFL.008.001.0010.

644 Another example of useful feedback is set out below:⁴⁰⁴

Second improvement point could be more education to public, coaches, players about long-term concussion consequences. After 3-4 weeks people often question players who are still affected by their concussion which leads to anxiety for player. Everyone's brain heals in its own time.

645 Further:⁴⁰⁵

Players think very short term, we need to enforce with them that they are making long term decisions by playing so should think long term. **Commentary often rewards players putting themselves in dangerous positions and players standing/reputation rises because of it, getting commentary around games to wind this back could be helpful.** [emphasis added]

646 With respect to the bolded text above, various individuals we interviewed during our review expressed concerns about public comments made by commentators, such as television and radio commentators, which appear to endorse and praise players who engage in dangerous play which puts them and others at an increased risk of suffering a concussion. Such play is often characterised expressly or implicitly as courageous or “gutsy” rather than risky, reckless and health-endangering. We think that kind of commentary needs to stop. It perpetuates and reinforces unhealthy and outdated attitudes and cultures that glorify dangerous play. It also contradicts and undermines the medical and scientific advice which the AFL, clubs and medical professionals are trying to provide to players to protect their brain health. It also obstructs efforts to reduce the problems of under-reporting that we canvassed in **chapter 2** of this report.

647 **Secondly**, according to its terms of reference, the main purpose of the Concussion Steering Group is to oversee, review and deliver the Strategic Plan. We consider the primary role should be monitoring each working group and ensuring that each group is on track to achieve the specific goals set out in each group's business plan, as well as monitoring budget and human resourcing issues. We observed that the business plans do not contain budgets. Yet the adequacy of resourcing and transparent allocation of funds is critical to the achievement of the objectives of the working groups.

648 We have reviewed the Strategic Plan, which is a high-level document setting out various goals over a five-year period and is intended to be a public facing document.⁴⁰⁶ While the Strategic Plan is a useful document for recording longer term and general goals and for communication to external stakeholders, in our view it is not an effective management tool for a group such as the Concussion Steering Group.

649 We also think greater focus on the accountability of the working groups addresses a concern noted in the October 2021 minutes that the new structure includes several additional individuals which could lead to a risk of decreased accountability.⁴⁰⁷ An increased focus of the Concussion Steering Group on

404 AFL.008.001.0011.

405 AFL.008.001.0010.

406 AFL.008.001.0021.

407 AFL.008.001.0015.

accountability of the working groups would also address our observation that in the past there have been few checks and balances on the Concussion Working Group with the effect that work has stagnated.

650 We sighted an annual report prepared by the Concussion Steering Group which identifies specific tasks being undertaken by working groups and the status of those tasks (such as in progress, completed, delayed etc).⁴⁰⁸ While that annual reporting is helpful, we consider it should also be occurring at during the regular meetings.

651 **Thirdly**, we have reviewed the minutes available for this group up to the date of this report and these demonstrate the potential problem we identify in our previous point.⁴⁰⁹ Most of the minutes focus on the proposed contents of the Strategic Plan, and do not evidence any significant oversight over work undertaken by the working groups to date. That is understandable given the new structure has only recently been put in place. However, in the future we would expect to see the minutes include more reporting on the status of each working group's progress and tracking against their respective business plans.

Concussion Scientific Committee

652 This committee is similar to the former Concussion Working Group in that it includes a number of the individuals involved in the former Concussion Working Group, and its primary purpose is to provide expert advice on research proposals. However, some changes have been made to introduce additional oversight and accountability. In that regard we refer to four features of the committee.

653 **First**, the committee has its own terms of reference identifying the committee's roles and responsibilities, which include the following:⁴¹⁰

- The AFL [Concussion Scientific Committee] will identify the AFL's concussion research priorities for the next 3 years and make recommendations to the AFL [Concussion Steering Group]...
- Conduct a novel, prospective, longitudinal follow-up research program for all current players.
- Contribute to the International Concussion in Sport Group Consensus meeting every 4 years, and make recommendations to the AFL [Concussion Steering Group] on incorporating the Consensus Statement's findings into the Guidelines for the Management of Sport-Related Concussion at the AFL & AFLW Level and Guidelines for Concussion Management in Community Football.
- Engagement with national and international scientific community to establish strategic research relationships and partnerships.
- Oversight of all AFL funded third party concussion research projects and progress reporting...

⁴⁰⁸ AFL.020.001.0003.

⁴⁰⁹ AFL.008.001.0009 (August 2021); AFL.008.001.0016 (September 2021); AFL.008.001.0015 (October 2021); AFL.008.001.0014 (November 2021); AFL.008.001.0010 (December 2021); AFL.008.001.0011 (February 2022); AFL.008.001.0012 (March 2022); AFL.008.001.0008 (April 2022); AFL.008.001.0013 (May 2022); AFL.014.001.003 (July 2022).

⁴¹⁰ AFL.008.001.0006.

654 **Secondly**, the terms of reference also seek to mandate attendance at meetings and ensure meetings occur on a regular and systematic basis:

AFL CSC meetings will be held at least quarterly, preferably in person (as permitted by local restrictions) at AFL House in Docklands or otherwise by audio-visual or telecommunications and will be scheduled to facilitate attendance by international membership. A quorum of 5 members will be considered sufficient for a meeting to proceed. **Apologies are required for non-attendance.** Minutes will be taken and distributed to all members and reported to the AFL CSG. [emphasis added]

655 **Thirdly**, the membership has been expanded to diversify the experience on the committee. The current members of the committee are:

- (a) AFL employees/contractors: A/Prof Wilmott (chair), Dr Harcourt, Dr Makdissi and Dr Kate Hall;
- (b) External national representatives: A/Prof Davis and A/Prof Andrew Gardner; and
- (c) External international representatives: Prof Tom McAllister and A/Prof Kathryn Schneider.⁴¹¹

656 Five of the individuals in the above list joined the group after January 2021: A/Prof Willmott, Dr Hall, A/Prof Gardner, Prof McAllister and A/Prof Schneider. Dr Hall is a clinical psychologist who is the AFL's Head of Mental Health & Wellbeing. A/Prof Gardner is a neuropsychologist. Prof McAllister is a psychiatrist and A/Prof Schneider is a physiotherapist. Both Prof McAllister and A/Prof Schneider practice in North America and have experience with externally funded concussion research projects.⁴¹² In our view the committee has an appropriate mix of expertise. That is, there are individuals with experience in research projects regarding brain injuries both domestically and internationally. The Concussion Working Group did not include as many individuals with experience in concussion research projects involving human participation. Rather, the individuals had more experience with clinical care issues.

657 Some of that expertise is apparent from comments made during the meetings. For example, the minutes from a meeting on 20 October 2021 state:⁴¹³

KS described the work that she has carried out in respect of concussion related prospective and longitudinal studies including in hockey, high school athletes and prevention detection and management in rugby...

TM explained the issues with large cohorts and long terms studies and the way in which these studies have evolved in his experience. He stated that there are different ways in which these studies can be structured, and that a combination of having a long-term longitudinal study, but one that it is done in shorter phases, is often desirable as it gives partial answers straight away. Further, a combination of longitudinal and cross-sectional studies can also be useful. He also stated that it is important to separate the funders from the researchers where possible...

⁴¹¹ AFL.020.001.0003.

⁴¹² See further, <<https://medicine.iu.edu/faculty/22290/mcallister-thomas>> and <<https://kinesiology.ucalgary.ca/research/kathryn-schneider>>.

⁴¹³ AFL.008.001.0017.

PH stated that we would want to avoid entering into a project whereby the researcher is carrying out the research but that they are not answering any specific or direct questions.

- 658 **Fourthly**, we consider the inclusion of international experts will assist the committee to have a more objective viewpoint on research proposals. Several committee members are affiliated with domestic research organisations and there is a potential for conflicts of interest or other difficulties in management of research undertaken by those organisations. The use of international experts can help to mitigate those issues. It also seems to us, based on our investigations during this review, that the committee is more cognisant of potential conflicts of interest in light of previous experiences with the Concussion Working Group and the Past Player Project. We would hope that a culture of awareness and disclosure of conflicts will be nurtured but perhaps compulsory disclosures should be considered as a condition of committee membership.
- 659 In this regard, we observe that the fact chief investigators or co-investigators on research projects funded by the AFL might also hold roles at the AFL does not necessarily mean that there is a conflict of interest. The reality is that neuroscience is a technical area and there are limited Australian experts who are appropriately qualified to undertake such research. However, in those instances where there is a potential for a conflict of interest to arise, the project proposal documents should set out clear deliverables and timing requirements to ensure that the projects can be appropriately overseen and managed.
- 660 Similarly, criticism of research purely on the basis that investigators are affiliated with sporting organisations is, we think, superficial. It seems to us inevitable that research in respect of injuries sustained in a sporting context will be undertaken by researchers with an interest in that field and be supported by sports organisations. This does not necessarily present a conflict that will infect the quality of the research and its outcomes as long as conflicting interests are disclosed and acknowledged so that potential confounding influences on research can be monitored and recognised. The substance of the research including the outputs and how data has been interpreted is what matters.
- 661 There is some overlap between the roles of the Concussion Scientific Committee and the Research & Innovation working group. However, we think the structure is appropriate, particularly as a starting point until the efficacy of the new structures are tested, as the working group can help triage the various research proposals that the AFL receives and identify areas requiring expert advice from the committee. Previously, the Concussion Working Group dealt with all research issues and did not have sufficient administrative support to deal with the issues in a timely manner.
- 662 We understand the AFL is yet to finalise its concussion research budget but has indicated in-principle support for a commitment of up to \$2,500,000 per year.⁴¹⁴ Consequently, it is unclear to us what funds are available to the Concussion Scientific Committee to support research projects. We observe that, historically, the AFL's lack of funding has hampered research projects. Consequently, for the Concussion Scientific Committee to do meaningful work and avoid some of the

⁴¹⁴ AFL.003.001.0001.

pitfalls experienced by the Concussion Working Group, it needs to be appropriately resourced.

663 As to the costs of medical research projects, we found the following comments in a 2012 AFL memorandum informative:⁴¹⁵

Our own investment is only \$300k per year and this is for all research of which only a portion is for medical projects. Concussion research in particular is expensive compared with other injuries due to the complexity of the parts involved (i.e. the brain) and the advanced equipment required. There are several projects we would like to do but which are currently outside the scope of our budget, and there are only limited opportunities for leveraging third party funding without losing control of the research focus. We may want to consider how best to fund some of our research endeavours going forward and this may require an increased internal annual investment

664 We understand that in subsequent years AFL funding for concussion research increased from about \$100,000 to \$300,000 per annum. We are not aware of additional funding being specifically allocated by the AFL to concussion research projects, as opposed to proposals to allocate such funding. We understand though that the AFL is currently considering making a significantly greater commitment to fund concussion research. This will be essential if the new governance structures are to achieve their stated objectives.

665 In summary, we recommend:

- (a) ongoing monitoring and review of the governance structures relevant to prevention, detection and management of concussion and long-term neurodegenerative conditions to ensure they are appropriate vehicles for their objectives and that their objectives are effectively implemented;
- (b) ongoing consideration and review of the membership of the working groups to ensure each is appropriately diverse and resourced to undertake allocated functions in a timely fashion. Presently, additional junior employees or contractors should be considered to support the current senior membership and to support continuity and renewal of knowledge and experience;
- (c) ongoing critique and review by the Concussion Steering Group of the business plans for each working group to ensure all initiatives are realistic, specific and tethered to an implementation plan with measurable outcomes which may be monitored;
- (d) retention of sufficient and diverse current player representation at all times on the Concussion Steering Group to enhance the content, understanding and implementation of concussion management strategies;
- (e) elevation to the primary functions of the Concussion Steering Group of:
 - (i) monitoring and oversight of the working groups;

⁴¹⁵ AFL.001.001.0720.

- (ii) ensuring each working group is accountable for timely delivery of the specific goals and initiatives in their respective business plans; and
 - (iii) ensuring the budget and human resource allocation for each working group is both adequate and properly utilised;
- (f) the terms of reference for the Concussion Steering Group be amended to include the primary functions referred to in sub-paragraph 665(e); and
- (g) adequate allocation and regular review of human and financial resources for the working groups, the Concussion Steering Group and the Concussion Scientific Committee to ensure they are enabled to discharge their functions and establish and implement their initiatives without being limited or unduly restricted by resourcing constraints.

Research program recommendations

666 In this part we provide some recommendations regarding the Past Player Project and the AFL's planned future longitudinal study.

Past Player Project recommendations

667 In our view, steps should be taken to pay for additional imaging to allow for a research output to be produced in relation to the retired AFL players who were imaged by the Florey Institute. We were informed that the financial commitment for the imaging for additional controls required for that process would be in the vicinity of \$20,000. We were also informed that expenses other than imaging for additional controls would be involved and that questions of the utility of the research results without additional participants may arise. These issues of cost and utility should be objectively assessed and resolved, and efforts made to secure some research output, even if that requires imaging of additional participants and not just controls. Research participants are entitled to expect that projects will be pursued through to completion, so that their voluntary contributions of time and effort are not wasted.

Proposed longitudinal project recommendations

668 In our view the AFL is supporting a reasonable mix of research regarding acute and sub-acute concussion issues. However, what is still lacking is effective support of longitudinal research. We understand that since mid-2021 the AFL has been working on a proposed longitudinal project. However, in some respects it seems that limited progress has been made to date.

669 The AFL's proposed longitudinal project includes the following three components:

- (a) **principal data collection:** this includes data about demographics, symptoms, cognitive and physical assessments, quality of life and lifestyle factors. It is intended that the principal data collection will occur at specific time points across the stages of a footballer's career including as a draftee, during various stages of a footballer's playing career, at the time the player is retiring and then at specific intervals during retirement;
- (b) **advanced data collection:** that is, brain imaging, blood biomarkers and genetic data. Again, this data collection would occur during various stages of a footballer's career; and
- (c) **brain donation upon death.**

670 We understand that significant time has been spent on planning how data will be collected, integrated and stored, which includes working through various privacy issues. There has also been significant planning in respect of the principal data collection and brain donation processes. However, the planning for advanced data collection is still at the very early stages.

671 We understand there is no specific budget for the advanced data collection component and the AFL intends to outsource the project via a tender process.

However, no tender documents have been prepared at this stage. We consider the advanced data collection component needs to be prioritised and a realistic budget committed for that purpose.

672 We also observe that research involving advanced data collection can be expensive and the AFL will need to ensure that any research involving advanced data collection is appropriately funded to allow researchers to obtain sufficient data to be able to reach meaningful conclusions.

673 Although the scope of the review is limited to adult neurology, as part of the AFL's continuing work on the longitudinal project perhaps consideration should also be given to the inclusion of children and teenage players and, if those cohorts are to be included, ensuring there is sufficient recruitment to make the data collected statistically relevant. Similarly, with respect to data collection involving female players, the data collection also needs to be significant enough to be statistically relevant. We understand from our investigations to date that it can be difficult to recruit for longitudinal projects and that significant efforts will need to be made to recruit participants. We would hope that this review highlights to a broader audience the importance of participating in longitudinal studies to improve the current scientific and medical understanding of concussions and neurodegenerative diseases.

674 We were also informed that the AFL is considering introducing six internal hubs to manage the longitudinal project with separate chairs. Those proposed hubs are:

- (a) governance, administration and operations;
- (b) principal data collection;
- (c) advanced data collection;
- (d) brain bank donation data collection;
- (e) data integration; and
- (f) data linkage.

675 At this stage it appears that the AFL is planning to collect and hold data internally. We recommend that an independent data custodian should be appointed to control both the process for data collection and access to that data. Prof O'Sullivan considers such a model, akin to independent data monitoring arrangements in sponsored clinical trials, may help to avoid concerns about the suppression of information which arose in relation to the Past Player Project.

Other research recommendations

676 We also make the following recommendations:

- (a) The AFL should develop a standard operating procedure for sponsorship of research projects to ensure it achieves standards of independent governance and oversight in other areas of medicine (for example,

pharmaceutical sponsored clinical trials). To achieve this, the AFL should have regard to the Code⁴¹⁶ and the NHMRC guide titled “Management of Data and Information in Research”,⁴¹⁷ and the responsibilities of institutions and researchers set out in that guide; and

- (b) The AFL should consider a commitment to open data sharing in future AFL-led research, whereby independent research groups could access de-identified data and replicate research findings. In particular, the AFL should develop a process for implementing section 2.5 of “Management of Data and Information in Research” and should consider other initiatives to maximise the public benefit from data collections internationally, for example the Concordat on Open Research Data;⁴¹⁸ and
- (c) The AFL should develop protocols or procedures to manage the potential conflicts of interest and other problems likely to arise when a medical professional is called upon to act as both treating clinician and researcher (as A/Prof McCrory was in relation to the Past Player Project). While this dual role is not particularly unusual or inherently inappropriate, it raises the potential for conflicts of interest for the clinician/researcher and misunderstanding on the part of the patient/participant. These protocols may include the nomination by a clinician of a colleague to support one of the functions when a conflict becomes difficult to manage. Recommendations that may assist in avoiding or managing patient/participant confusion and misunderstanding are addressed under “clinical program recommendations” below.

⁴¹⁶ See Chapter 7 discussing the Code including paragraphs 374 to 377.

⁴¹⁷ Management of Data and Information in Research: A guide supporting the *Australian Code for the Responsible Conduct of Research*. National Health and Medical Research Council, Australian Research Council and Universities Australia. Commonwealth of Australia, Canberra.

⁴¹⁸ Higher Education Funding Council for England, Research Councils UK, Universities UK and Wellcome Trust, ‘Concordat on Open Research Data’, *UKRI – UK Research and Innovation* (Web Page, 28 July 2016) <<https://www.ukri.org/wp-content/uploads/2020/10/UKRI-020920-ConcordatonOpenResearchData.pdf>>.

Clinical program recommendations

677 As mentioned in **chapter 7** more work needs to be done to follow up individuals who were involved in the clinical component of the Past Player Project who have not yet received follow up correspondence regarding the status of tests previously undertaken. We have provided to the AFL the names of the individuals we believe fall into this category in order that follow-up could be undertaken with expedition and in advance of our report. In this section we focus primarily on future implementation of the clinical program to avoid the problems discussed in **chapter 7**.

678 We understand that the AFL intends to continue offering clinical assistance to retired players who are presenting with symptoms indicative of longer-term neurodegenerative diseases. The Medical working group will supervise that work. Below is a summary of the program from the Medical working group's business plan:⁴¹⁹

5	Enhance and optimise the clinical care program for the support of AFL and AFLW past players.	100% of players that enquire about the past player program are triaged within 1 month of contact	<p>Review and optimize critical components of the clinical care program for past AFL and AFLW players with self-reported physical, psychological and cognitive health problems. With a particular focus on:</p> <ul style="list-style-type: none"> • Initial triage, • Process of referral to health care clinicians, • Provision of information back to the player, <hr/> <ul style="list-style-type: none"> • The co-ordination of care with player's usual general practitioner/health care providers, and • Promotion of engagement with the longitudinal research program. <p>Ensure that the program is sufficiently resourced and scalable to be able to handle current and likely increased demand in the future.</p>
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679 During the investigation one of the interviewees suggested that the addition of a nurse or an administrative assistant to the AFL's team might assist with triaging retired players in a timely way. We think that suggestion warrants consideration. We understand that the clinical program is administratively intensive, as it involves significant follow up with individual players and with medical specialists to whom they are referred. That is perhaps not surprising given that the individuals flagged for clinical care may be experiencing memory loss issues. We were informed that occasionally players will miss appointments and require rescheduling and appointment reminders.

⁴¹⁹ AFL.008.001.0023.

680 Resourcing issues were also noted in some AFL meeting minutes dated April 2022.⁴²⁰

Few things lacking including resourcing and coordination of care. Players come in and are assessed, good letters and assessment compiled but they probably don't get info back on who follows up and how its [sic] done.

681 We consider the clinical care program would also benefit from some upfront explanatory process by which the AFL explains to the retired player (and confirms in writing) what the process for the program will be, who to contact and how. Those written resources could be included on the AFL's website to help make the process clearer.

682 We also consider phone calls with participants should be followed up by an email confirming the contents of the call to avoid confusion. If it is intended that the individuals involved in the clinical care program are invited to participate in research, then those invitations need to be made carefully to ensure that the individuals understand what, if any, clinical benefit they might receive from participating in a specific research program. On that point we consider the following comments made by Prof McAllister during a Concussion Scientific Committee meeting are worth emphasising:⁴²¹

in [the] U.S they've had to work hard to tell players they are in research study not clinical study. Data wont [sic] be shared with player unless it is compelling and very necessary if there is a finding. If there is not a significant or actionable finding report doesn't go back. Legal cases have tried to subpoena research project information in U.S. Need to be clear which data is being used who will have it and who can access.

683 Where the AFL refers an individual to a medical practitioner directly or otherwise facilitates the referral, the AFL needs to make clear to the medical practitioner what their reporting obligations to the AFL will be and the timeframes for that reporting. Those obligations should be confirmed in writing to avoid the problems discussed in chapter 7. We also agree with the AFL's current approach, instituted by Dr Arain, of referring players for specific tests itself, rather than relying on third party medical practitioners to provide those referrals. If the AFL controls the referral process this should help the AFL to ensure that information is relayed back to participants in a timely way and to better identify gaps in clinical correspondence.

684 There also needs to be an internal process at the AFL for tracking participants in the program and ensuring that there is regular follow up where the status of an individual's progression through the program may be unclear. During our review we did not sight any "tracking" documents regarding the clinical component of the Past Player Project.

⁴²⁰ AFL.008.001.0018.

⁴²¹ Ibid.

Other recommendations

At the club level

- 685 During our interviews several interviewees referred to a shift from “old school” thinking around head injuries, where players would play on and not be encouraged to remove themselves from play until their clinical symptoms had resolved, to more conservative approaches. Some of those comments were made by interviewees who played in the 1970s and 1980s. But the comments also apply to more recently retired players. For example, one of the interviewees had previously been quoted as saying that during the early 2000s “there wasn’t as much awareness around concussion” and “[i]t was almost a badge of honour for players to continue playing after a serious knock”.⁴²²
- 686 Several retired players gave us examples of situations where they played on despite being concussed and “not feeling right”. Other retired players were told by their clubs that it was up to them to decide whether they should play on.
- 687 It seems to us the approach taken by clubs in the management of concussions has become more conservative over the past decade, but more can be done to improve the management of concussions. We emphasise the following remarks made by a player representative in a Concussion Steering Group meeting on 9 February 2022:⁴²³
- Current players said they’d still roll the dice on their health rather than miss a final. Past players told them you may feel ok to come back to play but that their performance was often subpar when they came back too soon. This an important point to put across to current players, that their performance is likely to be far below average if coming back too early.
- 688 Specific areas that clubs and leadership teams within clubs can work on, with the AFL’s support, are as follows:
- (a) actively encouraging players to be frank about their concussion symptoms in order to assist club doctors to identify whether a player has suffered a concussion and help the doctors to determine whether it is appropriate for the player to resume playing;
 - (b) assisting players to understand the importance of brain health and the potential long-term effects that can occur when a player suffers repeated concussions, as well as the increased risks of further injury if a player returns to play prematurely;
 - (c) obtaining more rigorous baseline testing for players which club doctors can use to help assess players;
 - (d) being more vigilant in monitoring whether players suffer concussions during training given the absence of video review facilities in training contexts;

⁴²² Queensland Brain Institute ‘Players’ Perspectives Ian Prendergast CEO, Rugby League Players Association’ *The Brain Magazine: Issue One Concussion*, Chapter 3.

⁴²³ AFL.008.001.0011.

- (e) actively encouraging players to protect their heads during play and teach techniques to players to assist them to do so; and
- (f) making clear to players that returning to play prematurely after suffering a concussion is not “tough” or something to be proud of.

689 We think the AFL should also be collaborating with clubs to ensure these efforts are properly resourced and implemented with consistent information and training strategies.

Concussion Panels

690 Given the difficulties with managing complex concussions, and the inefficiencies that can arise from seeing various specialists sequentially, the AFL should encourage early use of the panel process. If additional steps need to be taken to schedule panel reviews during business hours, those steps should be taken, and the panel members should be remunerated accordingly. If necessary, the AFL should also consider recruiting interstate experts for the panel.

691 It is unfortunate that some doctors feel reluctant to participate in the panel process due to the potential backlash they might face. Those concerns are understandable. During this review we have observed that the debate in the scientific community and broader media fora about sports-related concussion issues is at times unnecessarily emotional and personal. It is disappointing that the debate has become so polarised to the extent that it may even be counterproductive. We hope that this review highlights the need to have balanced and informed discussions about sports-related concussion issues.

Enforcement of the laws of the game

692 It seems to us that the laws of the game presently include rules that may deter players from engaging in reckless behaviour that puts other players at risk of suffering head injuries (see, for example rule 22.3 and 23.2). However, enforcement of those rules needs to be consistent to ensure that the rules actually have that purpose.

693 Player and public confidence in, and respect for, the rules requires that the rules and their rationale be properly communicated and understood. Rules of the game are of course constantly under scrutiny, and review and changes are always contentious. However, we recommend that the results of research and learning from the working groups and other parts of the structures described above ought to be actively considered in ongoing reviews of game rules.

2022 AFL and AFLW Guidelines

694 In our view the section on “Return to play” in the guidelines (page 13) and the table setting out the stages for the rehabilitation program could be amended so that it is clearer how many steps there are in the rehabilitation process and what minimum period applies to each step. Further, the range provided of 24-48 hours for rest should be explained.

2021 Community Guidelines

695 Similarly, in our view, the 2021 Community Guidelines could also be clarified by making clearer what the minimum recommended periods are for each suggested stage of the rehabilitation process.

CHAPTER 10: SUMMARY OF FINDINGS

696 In this section we set out a summary of our findings in relation to each term of reference as well as our recommendations under the seventh term of reference.

First term of reference: work undertaken by A/Prof McCrory

697 During the period 2011 to January 2021, A/Prof McCrory undertook a variety of work, research and advice for the AFL in a largely unpaid capacity. His involvement with the AFL decreased from 2018. A/Prof McCrory withdrew from the AFL's Concussion Working Group in January 2021. While he continued to be a co-investigator for the Florey Institute imaging projects funded by the AFL, in 2020 imaging for those projects was paused due to lockdown restrictions and has not re-started. Three journal articles have subsequently been prepared, two of which were co-authored by A/Prof McCrory and have been published as at the date of this report. A/Prof McCrory is not a co-author of the third unpublished article.

Second term of reference: plagiarism allegations

698 A/Prof McCrory informed us of seven editorials which contained plagiarised text. We have identified instances of plagiarism in a further two editorials, two articles and five book chapters.

699 The instances of plagiarism that A/Prof McCrory has admitted to, and the further instances that we have identified, are limited and in our opinion are at the less serious end of the spectrum. In our view, they do not affect or taint the work that A/Prof McCrory has undertaken for the AFL, in large part because there is no accusation of falsification or fabrication of relevant research.

700 Given our findings in relation to A/Prof McCrory's published written work, we consider the evidence does not support a finding that any plagiarism contributed to or enhanced A/Prof McCrory's reputation as a concussion expert. Rather, it constitutes an unfortunate and embarrassing blemish upon his professional (particularly academic) reputation which has disappointed some with whom he has had a professional association and who held him in high regard, including research collaborators, students, patients and organisations such as the AFL. Such associated parties may even have felt concerned about the potential for damage to their own reputation through association with A/Prof McCrory (indeed this review may evidence this concern in part) although we have seen no evidence of such collateral adverse effect.

Third term of reference: undertaking to the Medical Board of Australia

701 The circumstances in which A/Prof McCrory gave the Undertaking include the introduction of new guidance by ANZAN on training requirements for neurodiagnostic procedures. We were informed by A/Prof McCrory that he did not wish to undertake that additional training. A/Prof McCrory also informed us that before he gave the Undertaking, he was subject to an Ahpra investigation. However, we do not know the details of that investigation.

- 702 Given the limited scope of the Undertaking, in our view A/Prof McCrory was not required to disclose the Undertaking to the AFL and we have not identified any other person who reasonably ought to have been informed about the Undertaking.
- 703 In this review we have found no evidence which suggests that A/Prof McCrory has acted inconsistently with the Undertaking.

Fourth term of reference: treatment of players

- 704 In relation to current players, we were informed that club doctors would normally refer the players themselves without involving the AFL in that process, and the club would usually pay for A/Prof McCrory's services if a gap payment was required because the treatment is not covered by Medicare. We understand that in those circumstances reporting would usually be left to the patient and referring doctor in accordance with standard practice, and not to the AFL. We observe, however, that having regard to A/Prof McCrory's standing and specialisation and his connection with the AFL and clubs, referral of AFL players for concussion was likely in any event.
- 705 In relation to retired players who saw A/Prof McCrory generally in his capacity as a specialist and not in connection with any AFL funded research project, we understand based on the information provided to us during interviews and our review of the AFL's internal documents that:
- (a) many retired players will continue to see their club doctors and may have been referred to A/Prof McCrory by those doctors;
 - (b) given A/Prof McCrory's reputation as a leading neurologist, general practitioners not affiliated with AFL clubs but treating retired players may have referred those individuals to A/Prof McCrory from time to time;
 - (c) ordinarily the patient would be responsible for payment for any services rendered by A/Prof McCrory; and
 - (d) reporting would be to the patient and referring doctor, not the AFL.
- 706 The only AFL funded research project that we are aware of that A/Prof McCrory has been involved in, and which has included a clinical treatment component, is the Past Player Project. We understand that A/Prof McCrory saw 28 participants in consultations. He saw some individuals on multiple occasions.
- 707 The majority of those 28 individuals were referred to A/Prof McCrory by the AFL's medical consultants, namely, Dr Harcourt and/or Dr Arain. As to payment, we were informed by the AFL that it paid any gap payments arising from those appointments.
- 708 In relation to reporting, we understand A/Prof McCrory provided some correspondence back to Dr Harcourt and Dr Arain. On occasion when an individual had a referral letter from their personal doctor instead, A/Prof McCrory copied correspondence to Dr Harcourt and/or Dr Arain.

Fifth term of reference: research projects

- 709 The primary project discussed under this term of reference was the Past Player Project. That project was funded, overseen and managed by the AFL. The project started with an online screening survey which was completed by approximately 550 retired AFL players. Based on the survey results, individuals were identified for further assessment and then invited to participate in further research and receive clinical treatment paid for by the AFL. The research imaging was undertaken by the Florey Institute and the clinical treatment was provided by a network of medical practitioners, one of whom was A/Prof McCrory. Some retired players were also invited to participate in separate cross-sectional research programs.
- 710 In our view the project was under-funded and under-resourced from the outset. It suffered from a lack of stewardship and coordination. There was accordingly no clear plan for how the project would be rolled-out and implemented, and how it may simultaneously accommodate clinical and research objectives. Consequently, there were no clear guidelines, processes and communication strategies to ensure that participants were not confused about what tests or procedures related to clinical treatment as opposed to being purely for research purposes. Many participants had disappointed expectations of medical advice and follow-up from tests that were for research rather than clinical purposes.
- 711 Although there have been attempts in recent years to rectify some of the problems with the project, as at the date of this report there is no published research explaining the results of the research imaging undertaken on retired AFL players. Some clinical assistance has been provided to participants who were flagged as requiring further treatment. While some of that assistance was provided in a timely way, other assistance was not. Some of the delay involved tardiness by A/Prof McCrory in reporting back to the AFL. However, there were also delays by the AFL in reporting results and advice from medical practitioners back to patients. This appears to us to have been a function of poor planning and governance and under-resourcing rather than being attributable to inaction by individual officers within the AFL, who were attempting to manage the project with limited time and resources as best they could.
- 712 In relation to term of reference 5(h) which did not concern research work but rather the AFL's annual injury report, we have found no evidence of involvement by A/Prof McCrory in drafting the annual injury reports. In a handful of reports, we found some references to journal articles A/Prof McCrory co-authored but do not consider those references influenced the conclusions in the reports in any material way.

Sixth term of reference: relationship between A/Prof McCrory and the AFL

- 713 A/Prof McCrory was recruited by the AFL to its Concussion Working Group in 2011 and assisted the AFL until he withdrew from the Concussion Working Group in January 2021. He was not engaged as an employee or contractor. Rather, he largely assisted the AFL in an unpaid capacity and the arrangement was informal. We have not found any examples of A/Prof McCrory representing the AFL on any external bodies during this period.

714 The relationship between A/Prof McCrory and the AFL started off well but deteriorated from about 2017 onwards. It is difficult to identify a specific turning point in the relationship, but it appears that the AFL's decision to focus on the clinical treatment of retired players rather than the research component of the Past Player Project may have contributed to the deterioration in the relationship.

715 Although there were no "reporting lines", as that term is conventionally understood within professional structures and contexts, A/Prof McCrory's lines of communication with the AFL regarding work he was undertaking for or at the request of the AFL were primarily through Dr Harcourt and, to a lesser extent, Dr Clifton and Dr Arain. Over time, there were problems with each of those avenues of communication, in particular, in relation to the reporting arising from A/Prof McCrory's involvement in the Past Player Project.

Seventh term of reference: recommendations

716 In relation to structural, governance and resourcing, we recommend:

- (a) ongoing monitoring and review of the governance structures relevant to prevention, detection and management of concussion and long-term neurodegenerative conditions to ensure they are appropriate vehicles for their objectives and that their objectives are effectively implemented;
- (b) ongoing consideration and review of the membership of the working groups to ensure each is appropriately diverse and resourced to undertake allocated functions in a timely fashion. Presently, additional junior employees or contractors should be considered to support the current senior membership and to support continuity and renewal of knowledge and experience;
- (c) ongoing critique and review by the Concussion Steering Group of the business plans for each working group to ensure all initiatives are realistic, specific and tethered to an implementation plan with measurable outcomes which may be monitored;
- (d) retention of sufficient and diverse current player representation at all times on the Concussion Steering Group to enhance the content, understanding and implementation of concussion management strategies;
- (e) elevation to the primary functions of the Concussion Steering Group of:
 - (i) monitoring and oversight of the working groups;
 - (ii) ensuring each working group is accountable for timely delivery of the specific goals and initiatives in their respective business plans; and
 - (iii) ensuring the budget and human resource allocation for each working group is both adequate and properly utilised;
- (f) the terms of reference for the Concussion Steering Group be amended to include the primary functions referred to in sub-paragraph 716(e); and

- (g) adequate allocation and regular review of human and financial resources for the working groups, the Concussion Steering Group and the Concussion Scientific Committee to ensure that they are enabled to discharge their functions and establish and implement their initiatives without being limited or unduly restricted by researching constraints.

717 In relation to research project recommendations:

- (a) in particular, the Past Player Project, in our view, steps should be taken to pay for additional imaging to allow for a research output to be produced in relation to the retired AFL players who were imaged by the Florey Institute. We were informed that the financial commitment for the imaging for additional controls would be in the vicinity of \$20,000. We were also informed that expenses other than imaging for additional controls would be involved and that questions of the utility of the research results without additional participants may arise. These issues of cost and utility should be objectively assessed and resolved, and efforts made to secure some research output, even if that requires imaging of additional participants and not just controls. Research participants are entitled to expect that projects will be pursued through to completion, so that their voluntary contributions of time and effort are not wasted; and
- (b) as for the AFL's intended future longitudinal project, we recommend that the AFL should:
 - (i) prioritise the advanced data collection component and commit a realistic budget for that purpose;
 - (ii) ensure that any research involving advanced data collection is appropriately funded to allow researchers to obtain sufficient data to be able to reach meaningful conclusions;
 - (iii) consider the inclusion of children and teenage players and, if those cohorts are to be included, ensure there is sufficient recruitment to make the data collected statistically relevant and useful;
 - (iv) similarly, with respect to data collection involving female players, ensure there is sufficient recruitment to make the data collected statistically relevant and useful; and
 - (v) appoint an independent data custodian to control both the process for data collection and access to that data, noting that such processes may help to avoid concerns about the suppression of information which arose in relation to the Past Player Project.

718 We understand from our investigations to date that it can be difficult to recruit for longitudinal projects and that significant efforts will need to be made to recruit participants. We would hope that this review highlights to a broader audience the importance of participating in longitudinal studies to improve the current scientific and medical understanding of concussions and neurodegenerative diseases.

719 We make the following further recommendations in relation to future research projects:

- (a) the AFL should develop a standard operating procedure for sponsorship of research projects to ensure it achieves standards of independent governance and oversight in other areas of medicine (for example, pharmaceutical sponsored clinical trials). To achieve this, the AFL should have regard to the Code⁴²⁴ and also the NHMRC guide titled “Management of Data and Information in Research”,⁴²⁵ including the responsibilities of institutions and researchers set out in that guide;
- (b) the AFL should consider a commitment to open data sharing in future AFL-led research, whereby independent research groups could access de-identified data and replicate research findings. In particular, the AFL should develop a process for implementing section 2.5 of “Management of Data and Information in Research” and should consider other initiatives to maximise the public benefit from data collections internationally, for example the Concordat on Open Research Data;⁴²⁶ and
- (c) the AFL should develop protocols or procedures to manage the potential conflicts of interest and other problems likely to arise when a medical professional is called upon to act as both treating clinician and researcher (as A/Prof McCrory was in relation to the Past Player Project). While this dual role is not particularly unusual or inherently inappropriate, it raises the potential for conflicts of interest for the clinician/researcher and misunderstanding on the part of the patient/participant. These protocols may include the nomination by a clinician of a colleague to support one of the functions when a conflict becomes difficult to manage.

720 In relation to future implementation of the clinical program involving retired players, we recommend:

- (a) consideration be given to the addition of a nurse or an administrative assistant to the AFL’s team to triage retired players in a timely way;
- (b) the inclusion of an upfront explanatory process by which the AFL explains to the retired player (and confirms in writing) what the process for the program will be, who to contact and how. Those written resources could be included on the AFL’s website to help make the process clearer;
- (c) phone calls with participants should be followed up by an email confirming the contents of the call to avoid confusion. If it is intended that the individuals involved in the clinical care program are invited to participate in research, then those invitations need to be made carefully to ensure that

⁴²⁴ See chapter 7 discussing the Code including paragraphs 374 to 377.

⁴²⁵ Management of Data and Information in Research: A guide supporting the *Australian Code for the Responsible Conduct of Research*. National Health and Medical Research Council, Australian Research Council and Universities Australia. Commonwealth of Australia, Canberra.

⁴²⁶ Higher Education Funding Curial for England, Research Councils UK, Universities UK and Wellcome Trust (n 418).

the individuals understand what, if any, clinical benefit they might receive from participating in a specific research program;

- (d) where the AFL refers an individual to a medical practitioner or otherwise facilitates the referral, the AFL needs to make clear to the medical practitioner what their reporting obligations to the AFL will be and the timeframes for that reporting. Those obligations should be confirmed in writing. We also agree with the AFL's current approach, instituted by Dr Arain, of referring players for specific tests itself, rather than relying on third party medical practitioners to provide those referrals. If the AFL controls the referral process this should help the AFL to ensure that information is relayed back to participants in a timely way and to better identify gaps in clinical correspondence; and
- (e) an internal process at the AFL for tracking participants in the program and ensuring that there is regular follow up where the status of an individual's progression through the program may be unclear. During our review we did not sight any "tracking" documents regarding the clinical component of the Past Player Project.

721 Specific areas that clubs and leadership teams within clubs can work on, with the AFL's support, are as follows:

- (a) actively encouraging players to be frank about their concussion symptoms in order to assist club doctors to identify whether a player has suffered a concussion and help the doctors to determine whether it is appropriate for the player to resume playing;
- (b) assisting players to understand the importance of brain health and the potential long-term effects that can occur when a player suffers repeated concussions, as well as the increased risks of further injury if a player returns to play prematurely;
- (c) obtaining more rigorous baseline testing for players which club doctors can use to help assess players;
- (d) being more vigilant in monitoring whether players suffer concussions during training given the absence of video review facilities in training contexts;
- (e) actively encouraging players to protect their heads during play and teach techniques to players to assist them to do so; and
- (f) making clear to players that returning to play prematurely after suffering a concussion is not "tough" or something to be proud of.

722 We think the AFL should also be collaborating with clubs to ensure these efforts are properly resourced and implemented with consistent information and training strategies.

723 We recommend that the AFL also encourage clubs to use the concussion panel process proactively and promptly when they identify a player suffering from a complex concussion.

724 We recommend that the results of research and learning from the working groups and other parts of the structures described above ought to be actively considered in ongoing reviews of game rules.

725 In relation to the AFL's concussion guidelines, we consider that the current guidelines for the AFL, AFLW and community levels should be clarified by making clearer what the minimum recommended periods are for each suggested stage of the rehabilitation process.



Bernard F Quinn KC



Jane Lindgren

17 October 2022

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726 This bibliography is divided into the following six categories:

- (a) scientific and medical journal articles;
- (b) scientific and medical journal editorials;
- (c) other articles including newspaper articles;
- (d) book chapters;
- (e) legislation, guidelines and other guidance; and
- (f) other.

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ANNEXURE 1
ORIGINAL TERMS OF REFERENCE

**TERMS OF REFERENCE FOR INDEPENDENT REVIEW OF THE WORK, RESEARCH AND ADVICE TO THE
AFL FROM ASSOCIATE PROFESSOR PAUL MCCRORY**

Purpose of Terms of Reference

The AFL has commissioned an independent review by independent legal counsel into research and medical work connected with the AFL of Associate Professor Paul McCrory (**the review**). The terms of reference for the review are set out herein.

Matters for review

1. The work, research and/or advice (**Work**) Associate Professor Paul McCrory (**McCrory**) undertook for the AFL over time. Itemise to the extent possible the specific research projects or advice streams on which McCrory conducted or participated in.
2. McCrory's admitted and alleged plagiarism of research or other academic articles by him, including:
 - a. the instances of plagiarism identified and/or admitted by McCrory or alleged against him;
 - b. the extent to which such plagiarism related to and/or materially may prejudice the Work undertaken by McCrory in relation to:
 - i. concussion research or data generally;
 - ii. the Concussion in Sport Group.
3. McCrory's undertaking to the Medical Board of Australia provided in May 2018 that he would not perform neurodiagnostic procedures and/or nerve conduction studies and/or electromyography, including:
 - a. the circumstances in which the undertaking was given;
 - b. what McCrory informed the AFL or any other person who reasonably ought to have been informed, regarding the undertaking;
 - c. whether McCrory acted inconsistently with the undertaking in:
 - i. any research projects connected to the AFL; or
 - ii. any treatment or assessment of any AFL or AFLW player or retired player.
4. The circumstances in which McCrory treated or assessed AFL or AFLW players or retired players, including:

- a. the circumstances of the referral of such patients to McCrory (e.g. on recommendation of the AFL or Club or GP or otherwise);
 - b. the nature of reporting about the outcome of such referrals (e.g. to the AFL or Club or GP or otherwise);
 - c. the remuneration paid to McCrory in respect of such consultations (e.g. was McCrory remunerated by the patient or the AFL or the Club or otherwise?).
5. In respect of all research projects announced, proposed, conducted or participated in by McCrory and the AFL including in relation to the risk of brain injury to players of Australian Football:
- a. the nature of those research projects;
 - b. the nature of McCrory's involvement in those research projects (and/or the involvement of the Florey Institute of Neuroscience and Mental Health and/or the AFL), including in respect of:
 - i. the grant or receipt of funding grants;
 - ii. the design and administration of the research project; and
 - iii. any internal management arrangements by or with the AFL for oversight of, or information and knowledge acquisition from, the research project;
 - c. issues of independent ethical governance of those research projects, including compliance with applicable generally accepted protocols for ethical oversight of scientific research;
 - d. any interim or final findings of such research, including the whereabouts and content of:
 - i. any associated data, including the results of any medical assessments undertaken in connection with the research project, including neuropsychological assessments or scans;
 - ii. any quantitative or qualitative analysis or interpretation of any medical assessments or associated data;
 - e. the circumstances in which research projects concluded (or the status of any project which is ongoing);
 - f. to the extent that any players, including retired players, of Australian Football were invited to participate in research projects as subjects:
 - i. what they were told in advance of their participation about the nature, extent and purpose of the research project; and

- ii. what information they were provided over time in relation to the findings in the course of the research project and/or at the conclusion of the research project (if applicable); and
 - g. to the extent that any concerns were identified regarding the health of any players, including retired players, of Australian Football, what actions were taken in respect of those concerns.
6. The nature and propriety of the relationship between McCrory and the AFL in his performance of the Work. In particular:
- a. McCrory's formal or informal engagement to provide the Work. In the event of formal engagement, the terms of that engagement including any financial or non-financial benefits paid to McCrory for the Work;
 - b. reporting lines for the Work to AFL officers, employees or agents or other advisors and the nature of that reporting with respect to Work outcomes; and
 - c. the nature and quality of the interface between McCrory and AFL officers, employees or agents in the performance of the Work;
 - d. representation by McCrory of the AFL on the Concussion in Sport Group and/or any other external body and the nature of that representation.

Recommendations

7. The AFL seeks :
- a. any recommendations in respect of the collation and use of any existing data, including the results of any medical assessments, scans and testing previously undertaken in connection with the research projects or other Work, or any quantitative or qualitative analysis or interpretation of such data, associated with any research projects identified in the course of the review. Specifically, to the extent that any previous research projects may be found to be unfinished or unsatisfactorily concluded, what steps ought now be taken to optimize the research outcomes and learnings of the data collected; and
 - b. any other recommendations that may be considered appropriate.

ANNEXURE 2
AMENDED TERMS OF REFERENCE

ANNEXURE A

AMENDED TERMS OF REFERENCE FOR INDEPENDENT REVIEW OF THE WORK, RESEARCH AND ADVICE TO THE AFL FROM ASSOCIATE PROFESSOR PAUL MCCRORY

Date of Document: 12 May 2022

1. The work, research and/or advice (**Work**) Associate Professor Paul McCrory (**McCrory**) undertook for the AFL over time. Itemise to the extent possible the specific research projects or advice streams on which McCrory conducted or participated in.
2. McCrory's admitted and alleged plagiarism of research or other academic articles by him, including:
 - a. the instances of plagiarism identified and/or admitted by McCrory or alleged against him;
 - b. the extent to which such plagiarism related to and/or materially may prejudice the Work undertaken by McCrory in relation to:
 - i. concussion research or data generally;
 - ii. the Concussion in Sport Group.
3. McCrory's undertaking to the Medical Board of Australia provided in May 2018 that he would not perform neurodiagnostic procedures and/or nerve conduction studies and/or electromyography, including:
 - a. the circumstances in which the undertaking was given;
 - b. what McCrory informed the AFL or any other person who reasonably ought to have been informed, regarding the undertaking;
 - c. whether McCrory acted inconsistently with the undertaking in:
 - i. any research projects connected to the AFL; or
 - ii. any treatment or assessment of any AFL or AFLW player or retired player.
4. The circumstances in which McCrory treated or assessed AFL or AFLW players or retired players, including:
 - a. the circumstances of the referral of such patients to McCrory (e.g. on recommendation of the AFL or Club or GP or otherwise);
 - b. the nature of reporting about the outcome of such referrals (e.g. to the AFL or Club or GP or otherwise);
 - c. the remuneration paid to McCrory in respect of such consultations (e.g. was McCrory remunerated by the patient or the AFL or the Club or otherwise?).
5. In respect of all research projects announced, proposed, conducted or participated in by McCrory and the AFL including in relation to the risk of brain injury to players of Australian Football:
 - a. the nature of those research projects;
 - b. the nature of McCrory's involvement in those research projects (and/or the involvement of the Florey Institute of Neuroscience and Mental Health and/or the AFL), including in respect of:
 - i. the grant or receipt of funding grants;
 - ii. the design and administration of the research project; and

- iii. any internal management arrangements by or with the AFL for oversight of, or information and knowledge acquisition from, the research project;
 - c. issues of independent ethical governance of those research projects, including compliance with applicable generally accepted protocols for ethical oversight of scientific research;
 - d. any interim or final findings of such research, including the whereabouts and content of:
 - i. any associated data, including the results of any medical assessments undertaken in connection with the research project, including neuropsychological assessments or scans;
 - ii. any quantitative or qualitative analysis or interpretation of any medical assessments or associated data;
 - e. the circumstances in which research projects concluded (or the status of any project which is ongoing);
 - f. to the extent that any players, including retired players, of Australian Football were invited to participate in research projects as subjects:
 - i. what they were told in advance of their participation about the nature, extent and purpose of the research project; and
 - ii. what information they were provided over time in relation to the findings in the course of the research project and/or at the conclusion of the research project (if applicable); and
 - g. to the extent that any concerns were identified regarding the health of any players, including retired players, of Australian Football, what actions were taken in respect of those concerns.
 - h. the nature of Mr McCrory's involvement in the preparation of, or research relating to the any conclusions drawn or comments made in the AFL Annual Injury reports.
- 6. The nature and propriety of the relationship between McCrory and the AFL in his performance of the Work. In particular:
 - a. McCrory's formal or informal engagement to provide the Work. In the event of formal engagement, the terms of that engagement including any financial or non-financial benefits paid to McCrory for the Work;
 - b. reporting lines for the Work to AFL officers, employees or agents or other advisors and the nature of that reporting with respect to Work outcomes; and
 - c. the nature and quality of the interface between McCrory and AFL officers, employees or agents in the performance of the Work;
 - d. representation by McCrory of the AFL on the Concussion in Sport Group and/or any other external body and the nature of that representation.

Recommendations

- 7. The AFL seeks:
 - a. any recommendations in respect of the collation and use of any existing data, including the results of any medical assessments, scans and testing previously undertaken in connection with the research projects or other Work, or any quantitative or qualitative analysis or interpretation of such data, associated with any research projects identified in the course of the review. Specifically, to the extent that any previous research projects may be found to be unfinished or unsatisfactorily concluded, what steps ought now be taken to optimize the research outcomes and learnings of the data collected; and
 - b. any other recommendations that may be considered appropriate.

ANNEXURE 3
2022 CONCUSSION GUIDELINES FOR THE AFL AND AFLW



GUIDELINES FOR THE MANAGEMENT OF SPORT-RELATED CONCUSSION - AFL & AFLW

Developed by the AFL in collaboration with the AFL Doctors Association (AFLDA)

Issued by the AFL as a guideline under AFL Regulation 35 ('Medically Unfit Players')

For the 2022 AFL and AFLW Premiership Seasons

SUMMARY

Background

- In considering the best practice management of sport-related concussion (SRC), the priority remains the short- and long-term welfare of the player.
- The AFL Guidelines for the management of SRC adhere to the principles of management outlined in the Consensus Statement from the 5th International Conference on Concussion in Sport (Berlin, 2016). The Guidelines however are continually modified and enhanced in line with evolving scientific evidence.
- In following the Guidelines, the diagnosis of concussion and subsequent return to play remains an individual decision by the club doctor following the protocols and principles set forth in this document, via utilising clinical judgment, reviewing video replays of the incident and the evaluating of all the information available to the club doctor at the time of the player's assessment.

Definition

- SRC is a traumatic brain injury induced by biomechanical forces.
- For practical purposes, a player with any neurological symptoms or signs, video features of concussion and/or any evidence of a disturbance of mental state or cognitive function following trauma, is considered to have concussion requiring further medical assessment. In such circumstances, consideration must also be given clinically to excluding an underlying structural head and/or neck injury.

Screening

- All new players must undergo screening to determine the number of previous concussions sustained, history of prolonged recovery from concussion(s), and the player's previous management of concussion(s).
- All players should have annual preseason baseline testing including neurological assessment, SCAT5 and a computerised screening cognitive test (e.g. Cognigram).
- Annual baseline testing promotes ongoing education of players, and facilitates

interpretation of post-injury test scores, which ultimately enhances decisions regarding diagnosis and assessment of recovery. If a player does not have baseline tests for comparison, a more conservative approach to diagnosis and return to play should be used.

- In the instance that a player has a significant concussion history (either a number of concussions or history of prolonged recovery) more detailed baseline testing - including formal neuropsychological testing, is strongly recommended.

Education

- All AFL and AFLW players should receive annual education regarding SRC.
- The education should be doctor-led and include adequate time for Q & A.
- Regular education should also be provided to coaches, high performance staff, and other medical staff (e.g. trainers).
- Ideally, critical information is delivered to players to enable recognition of the common symptoms of concussion and know to report them. Players also need to understand AFL protocols including requirement for immediate removal for assessment if there is any suspicion of concussion (observed directly, observed on video or reported by other players/staff). Failure to follow AFL concussion guidelines could result in significant sanctions.
- It is also incumbent on players to report post-concussion symptoms accurately to facilitate return to play decisions.

On-field management

- **Any player diagnosed with concussion is not permitted to return to play or train on the day of injury.**
- The AFL Head Injury Assessment (HIA) form has been developed to assist in the identification of SRC and to standardise the assessment and management of players following head trauma on match day. The HIA is a rapid sideline screening tool for a suspected concussion. As such, it should be used in conjunction with the Sport Concussion Assessment Tool 5th edition (SCAT5) and clinical judgement.
- Both the HIA and SCAT5 have been incorporated in the CSx App. **Use of the App is mandatory for all assessments of concussion/suspected concussion.**
- **The HIA form must be completed via the CSx App for any impact or collision where there is a suspicion of neck injury or concussion.**

- **Sideline video review by the club doctor is mandatory in the assessment of a suspected concussion.** Video review allows direct observation of the mechanism of injury and identification of acute signs of concussion that may be brief and often not obvious from the bench.
- External independent reviewers, including medically trained spotters in the AFL Review Centre during for AFL games, and side-line Match-day doctor for AFLW games, will monitor the game for suspected head injury events. The external reviewers may flag incidents that may have been missed to the game day doctors, either via direct contact (AFLW) or a message on Hawkeye or direct phone communication (AFL).
- Players with a clear diagnosis of SRC on the HIA form must be **removed** from play and **not** returned to play on the day of injury.
- Where there is any clinical suspicion that a player has suffered a SRC, the player requires further evaluation including assessment of symptoms, orientation, balance and cognitive function (SCAT5) prior to making a definitive diagnosis.
- According to AFL Regulations, when a player is removed from the field of play for concussion assessment, the AFL Interchange Official must be notified. The player cannot return to the playing surface for at least 15 minutes (including quarter breaks) after this notification.
- In cases where the club doctor may have been concerned about a possible concussion; but after the sideline assessment (including additional information from the player, the assessment itself and inspection of available video of the incident) concussion is no longer suspected, then the club doctor can determine the disposition and timing of return to play for that player.
- The clinical features of SRC **may be delayed or evolve over several hours**. Consequently, **cases where there is any uncertainty about the diagnosis after initial assessment, the player must be managed conservatively on the day of injury (i.e. not returned to play).** Furthermore, all players who have had a concussion assessment during the match and are returned to play, must be regularly medically assessed during the match and undergo repeat SCAT5 assessment at the completion of the match (and/or the following day).

Return to play

- Decisions regarding return to sport (training or match play) following SRC rely on a multifaceted clinical approach managed by the club doctor.

- The minimum requirement is that a player must have returned to baseline level of symptoms and cognitive performance (if available), had resolution of all neurological signs, and have completed a graded loading program without recurrence of symptoms or signs of SRC.
- **A player with SRC cannot commence a graded loading program without recording a SCAT5 that has returned to baseline (without the requirement for pharmacotherapy to treat concussion-related symptoms).**
- The graded loading program can be commenced 24 hours after the player has recovered clinically.
- **Any player with symptoms or clinical features that persist beyond the immediate post game assessment period will miss the following match at a minimum**, unless in exceptional circumstances (to be discussed with the AFL Chief Medical Officer +/- an independent concussion expert – under the direction of the AFL Chief Medical Officer).
- **A conservative approach is especially important in cases where symptoms or clinical features persist beyond 48 hours; or those with any “modifying” factors i.e. young players, multiple concussions, learning disabilities, high symptom burden in the first few days after injury.¹ etc. In these cases, a greater period of initial rest may be required; and each stage of the graduated loading program should be conducted over a longer period of time (e.g. 2 or more days between each progression)**
- The AFL Chief Medical Officer will have access to all HIA forms and SCAT5 assessments through the CSx App. Information collected will be utilised for assessing compliance, auditing purposes and as part of ongoing education and research activities.

Management of difficult or complicated cases

- Cases in which symptoms or clinical features (e.g. cognitive deficit) persists for >7 days; complicated cases; or cases involving decisions regarding retirement due to SRC, should be managed in a multi-disciplinary manner. In any such case, it is strongly recommended that the club doctor involve an independent clinician with expertise in concussion management, to assist in management decisions.
- The AFL Neurological Referral Network and Concussion Panels have been established to facilitate clinical management of difficult cases.

Research

- The AFL has a long history in concussion research and strongly supports projects to

improve the diagnosis, assessment and outcomes after SRC; as well as to interventions to reduce the risk of head trauma and concussion.

BACKGROUND

- Concussion continues to be an important medical issue in contact and collision sports worldwide.
- In considering the best practice management of SRC, the priority remains the short- and long-term welfare of the player.
- The AFL Guidelines for the management of SRC adhere to the principles of management outlined in the Consensus Statement from the 5th International Conference on Concussion in Sport (Berlin, 2016). The Guidelines however are continually modified and enhanced in line with evolving scientific evidence.
- The 6th International Conference on Concussion in Sport was due to be held in Paris in 2020. This conference has been further postponed until October 2022 due to the Covid pandemic. The current guidelines however continue to reflect a more conservative approach to return to play decisions, pending guidance from the Conference later in 2022.
- The diagnosis of concussion and subsequent return to play remains an individual decision by the club doctor following the protocols and principles set forth in this document, via utilising good clinical judgment, reviewing of video replays of the incident and evaluating of all information available to the club doctor at the time of the player's assessment (subject to compliance with the specific requirements stated in these Guidelines).

PURPOSE

1. To protect the short- and long-term welfare of all players.
2. To provide best practice guidelines for the diagnosis and management of concussion in the AFL.

DEFINITION OF CONCUSSION¹

SRC is a traumatic brain injury induced by biomechanical forces. Several common features that may be utilised in clinically defining the nature of a concussive head injury include:

- *SRC may be caused either by a direct blow to the head, face, neck or elsewhere on the body with an impulsive force transmitted to the head.*
- *SRC typically results in the rapid onset of short-lived impairment of neurological function that resolves spontaneously. However, in some cases, signs and symptoms evolve over a number of minutes to hours.*

- *SRC may result in neuropathological changes, but the acute clinical signs and symptoms largely reflect a functional disturbance rather than a structural injury and, as such, no abnormality is seen on standard structural neuroimaging studies.*
- *SRC results in a range of clinical signs and symptoms that may or may not involve loss of consciousness. Resolution of the clinical and cognitive features typically follows a sequential course. However, in some cases symptoms may be prolonged.*

The clinical signs and symptoms cannot be explained by drug, alcohol, medication use, other injuries (such as cervical injuries, peripheral vestibular dysfunction, etc.), or other comorbidities (e.g. psychological factors or coexisting medical conditions, etc.).

- Diagnosis of concussion can be difficult because:
 - a. Clinical symptoms and signs can change rapidly and may evolve over time;
 - b. Many of the clinical features are not specific to concussion;
 - c. There is no test or biomarker that can be relied on for an immediate diagnosis, particularly on the sidelines²; and
 - d. Structural brain injury (e.g. contusion) can present with identical symptoms and clinical features and usually cannot be ruled out with the initial assessment.

Consequently, the diagnosis of concussion remains a clinical decision based on the serial assessment of a range of domains including symptoms (e.g. headache, difficulty concentrating, feeling like in a fog, emotional lability, etc); signs (e.g. loss of consciousness (LOC), motor incoordination); cognitive impairment (e.g. confusion, slowed reaction times); and neurobehavioural changes (e.g. irritability, not feeling quite right).
- For practical purposes, a player with any neurological symptoms or signs, video features of concussion and/or any evidence of a disturbance of mental status or cognitive function following trauma, is considered to have concussion requiring further medical assessment. In such circumstances, consideration must also be given clinically to excluding an underlying structural head and/or neck injury.

SCREENING

- All new players must undergo screening to determine the number of previous concussions sustained, history of prolonged recovery from concussion(s), and the player's previous management of concussion(s).

- All players should have annual preseason baseline testing including neurological assessment, SCAT5 and a computerised screening cognitive test (e.g. Cognigram).
- Annual baseline testing promotes ongoing education of players, and facilitates interpretation of post-injury test scores, which ultimately enhances decisions regarding diagnosis and assessment of recovery. If a player does not have baseline tests for comparison, a more conservative approach to diagnosis and return to play should be used.
- In the instance that a player has a significant concussion history (either a number of concussions or history of prolonged recovery) more detailed baseline testing - including formal neuropsychological testing, is strongly recommended.

EDUCATION

- All AFL and AFLW players should receive annual education regarding SRC.
- The education should be doctor-led and include adequate time for Q & A.
- Regular education should also be provided to coaches, high performance staff, and other medical staff (e.g. trainers).
- Ideally, critical information is delivered to players to enable recognition of the common symptoms of concussion and know to report them. Players also need to understand AFL protocols including requirement for immediate removal for assessment if there is any suspicion of concussion (observed directly, observed on video or reported by other players/staff). Failure to follow AFL concussion guidelines could result in significant sanctions.
- It is also incumbent on players to report post-concussion symptoms accurately to facilitate return to play decisions.
- Furthermore, players need to understand the short-term effects of SRC and potential long-term outcomes that may result from a single concussion, multiple concussions, and possibly from repeated head impacts.
- Coaches and club officials need to understand match day assessment protocols as well as graded return to play protocols, with an emphasis on a conservative approach. Return to play following a concussion is a medical decision.
- Other medical staff need to know how to recognise signs of a possible concussion and to report them to the club doctor.

ACUTE MANAGEMENT

1. Day of injury

Any player diagnosed with concussion is NOT permitted to return to play or train on the day of injury.

AFL Regulation 35 covers the obligations of AFL clubs, officials and medical personnel with regard to player medical fitness and the club doctor has sole responsibility to determine medical fitness of a player to return to play or training.

Head Injury Assessment

The AFL Head Injury Assessment (HIA) form has been developed to assist in the identification of concussion, and to standardise the assessment and management of players following head trauma on match day (Appendix 1). The HIA is a rapid sideline screening tool for a suspected concussion. As such, it should be used in conjunction with the Sport Concussion Assessment tool 5th edition (SCAT5) and clinical judgement.

Both the HIA and SCAT5 have been incorporated in the CSx App. **Use of the App is mandatory for all assessments of concussion/suspected concussion.**

Use of video

- **Sideline video review is mandatory in the assessment of a suspected concussion.**
Review of the video allows direct observation of the mechanism of injury and identification of acute signs of concussion that may be brief and often not obvious from the bench.
- Video review allows direct observation of the mechanism of injury, identification of early/immediate signs (e.g. no protective action, impact seizure or tonic posturing) as well as signs that may occur in the time period after the injury (e.g. lying motionless, motor incoordination, dazed or blank and vacant look). Consequently, it is important to review all available video footage focusing on the player in the immediate period following the injury.
- Video signs of concussion have been validated in the AFL.³ Through collaborations with other national and international sporting organisations, the definitions of these have been revised (Appendix 2).
- The AFL provides all available broadcast video feeds via the HawkEye system to the club

(AFL matches) or AFL officials bench (AFLW matches) at all match venues. This link enables the club to utilise real time video feeds, with variable playback speed, and multiple camera views.

- AFL Match Managers will monitor the operation of the HawkEye system, and any problems experienced with the provision of broadcast video feeds should be reported to the AFL Match Manager or AFL Ground Operations staff.
- External independent reviewers, including medically trained spotters in the AFL Review Centre during for AFL games, and side-line Match-day doctor for AFLW games, will monitor the game for suspected head injury events. The external reviewers may flag incidents that may have been missed, to the game day doctors either via direct contact (AFLW) or a message on Hawkeye or direct phone communication (AFL).

AFL Regulations

According to AFL Regulations, when a player is removed from the field of play for concussion assessment, the AFL Interchange Official must be notified. The player cannot return to the playing surface for at least 15 minutes (including quarter breaks) after this notification. The 15-minute time period facilitates medical assessment as it allows the SCAT5 to be completed in a quiet, distraction free environment, with the player in a resting state.

Removal from play

An injured player **must** be removed from play or training if **any** of the following clinical features are present (identified by direct observation, review of video feed and/or initial assessment of the player. Observations reported by players or other club support staff should also be taken into consideration):

a. Clear diagnosis of concussion requiring immediate removal and no return to play

1. Loss of consciousness
2. No protective action in fall to ground
3. Impact seizure or tonic posturing
4. Motor incoordination
5. Dazed, blank/vacant stare or player not his/her normal self
6. Behaviour change atypical of the player
7. Confusion or disorientation (e.g. fails Maddocks questions)
8. Memory impairment
9. Player reports significant, new or progressive concussion symptoms*

b. Requires immediate removal from play for further assessment (including SCAT5)

10. Lying motionless (for > 2 seconds)
11. Possible no protective action in fall to ground
12. Possible impact seizure or tonic posturing
13. Possible motor incoordination
14. Possible dazed, blank/vacant stare
15. Possible behaviour changes atypical of the player
16. Any clinical impression or uncertainty from the club doctor that the player is not quite right following trauma

* Symptoms should be interpreted according to the clinical presentation of the player. It is important to note that symptoms can be due to other diagnoses e.g. post-traumatic migraine, neck injury, eye injury, etc. Moreover, the clinical signs can also be caused by other injuries (such as cervical injuries, peripheral vestibular dysfunction etc), or other comorbidities (e.g. psychological factors or coexisting medical conditions etc). Care should be taken however when ascribing post-traumatic symptoms and signs to other diagnoses without objective evidence of injury to those systems, and a conservative approach should be followed.

Where there is a clear diagnosis of concussion

- The player should be medically evaluated using standard emergency management principles and particular attention should be given to excluding a cervical spine injury.
- The player must not be returned to play (or training) on the day of injury.
- The player must be monitored regularly for possible signs of deterioration or other warning signs of a potential underlying structural brain injury. The SCAT5 provides a useful assessment and monitoring tool and should be used at a convenient time following the injury (e.g. major break or after the match).
- **Any player with clinical features including abnormal neurological signs or a serious or structural head and/or neck injury requires emergency management and ambulance transport to a hospital with a neurosurgical unit.**

Where there is a clinical suspicion of concussion but no clear on-field diagnosis

- The HIA will assist such clinical decisions and must be utilised.

- The player should be removed from the field and must be assessed in a quiet distraction free environment with the athlete in a resting state.
- The player should be allowed to rest while the club doctor reviews the video footage of the injury where available (paying particular attention to signs of concussion such as tonic posturing or balance disturbance).
- The player should then be fully assessed, including use of the SCAT5.
- The time taken to complete the SCAT5 is at least 10 minutes.
- If the diagnosis of concussion is confirmed following assessment, then the player should not be returned to play or training on the day.
- In cases where the club doctor may have been concerned about a possible concussion; but after the sideline assessment (including additional information from the player, the assessment itself and inspection of available video of the incident) concussion is no longer suspected, then the club doctor can determine the disposition and timing of return to play for that player.
- The clinical features of SRC may be delayed or evolve over several hours. Consequently, any cases where there is uncertainty about the diagnosis after initial assessment, the player must be managed conservatively on the day of injury (i.e. not returned to play). Furthermore, all players who have had a concussion assessment during the match and are returned to play, must be regularly medically assessed during the match and undergo repeat SCAT5 assessment at the completion of the match (or the following day).
- In cases that are withheld from play on the day of injury with a presumptive diagnosis of concussion, but on subsequent assessment over the next 24-48 hours the diagnosis gets changed, the case details must be submitted to and discussed with the AFL Chief Medical Officer. This is only relevant for cases with isolated symptoms (e.g. headache) or signs (e.g. brief balance disturbance) with a clear alternate diagnosis.
- Although trainers and other staff may assist in the reporting of concussion symptoms and signs and the monitoring of a player on the field, it ultimately remains the club doctor's responsibility to oversee this process and determine the player's fitness to play.
- The club doctor is required to provide timely and full documentation (completed HIA and SCAT5 forms) of head injury assessments to the AFL Chief Medical Officer via the CSx App. Information collected will be utilised as part of ongoing education and research activities.

- Both the HIA and SCAT5 have been incorporated in the CSx App. Use of the App is mandatory for all assessments of concussion/suspected concussion.

2. Return to play

Key Points

- Decisions regarding return to sport (training or match play) following concussion rely on a multifaceted clinical approach managed by the club doctor.
- **Concussion often presents as an evolving injury and therefore regular assessments are required.**
- **Given the challenges and limitations in assessing players following concussion, a conservative approach is required.**
- **Early management following SRC is focused on relative rest to allow the player to recover from their injury. This is followed by a graded loading program which is designed to allow a conservative approach to recovery, with incremental increases in physical +/- cognitive load to ensure that concussion-related symptoms or signs do not recur.**
- Attention should be given to the early identification and treatment of confounding and coexisting pathologies, e.g. cervical spine injury, vestibular deficits, psychological factors, which may contribute to ongoing symptoms.
- Players must be monitored medically as they progress through the graded loading program. There should be 24 hours (or longer) for each step of the progression. If any symptoms recur, the player athlete should go back to the previous step.
- **The player must have a medical assessment prior to being cleared to return to full contact training with the group and being returned to play** (this includes assessment of the player's level of confidence and subjective level of performance with full training).
- **The minimum requirement for return to play is that a player must have returned to baseline level of symptoms and cognitive performance (if available), had resolution of all neurological signs, and has completed a graded loading program (see below) without recurrence of symptoms or signs of SRC.**

An overview of return to play progressions is provide in table 1.

Table 1. Guideline for **minimum** return to play following concussion: AFL/AFLW

Step	Rest	Recovery	Graded loading – individual program			Graded loading - full team training						Return to play
Components	Rest	Symptom-limited activity	Light aerobic exercise	Moderate aerobic exercise	Sport-specific exercise	Non-contact training	Recovery	Limited contact training	Recovery	Full contact	Recovery	Return to play
Goal		Daily activities that do not provoke symptoms	Light aerobic exercise (e.g. walking/jog/cycling at slow to medium pace) No resistance training	Moderate aerobic exercise (i.e. Increased heart rate) No resistance training	Increased intensity and duration of activity Add sports specific drills (e.g. goal kick, stationary handball, etc) Commence light resistance training	Return to full team training sessions – <u>non-contact only</u>	Can participate in other components of the training program (e.g. weights)	Full team training – but able to participate in drills with incidental contact (including tackling)	Can participate in other components of the training program (e.g. weights)	Full team training	Can participate in other components of the training program (e.g. weights)	
Duration	24-48 hours	Minimum 24 hours	Minimum 24 hours	Minimum 24 hours	Minimum 24 hours	At least 1 day between sessions to monitor for recurrence of symptoms		At least 1 day between sessions to monitor for recurrence of symptoms		At least 1 day between sessions to monitor for recurrence of symptoms		
Requirements to move to next stage		24 hours completely free of concussion related symptoms and medical clearance to enter graded loading program	Remain completely free of any concussion-related symptoms	Remain completely free of any concussion-related symptoms	Remain completely free of any concussion-related symptoms and medical clearance to commence full team training	Remain completely free of any concussion-related symptoms – and player confident to participate in training		Remain completely free of any concussion-related symptoms – and player confident		Remain completely free of any concussion-related symptoms – player confident to participate in training – and medical clearance for unrestricted return to play		

- Regular monitoring is essential. If symptoms recur, the player athlete should go back to the previous symptom-free phase.
- Medical clearance is required before entry into the graded loading program; progression to team training; and final clearance to return to play.
- In following these guidelines, the **earliest** that a player can return to play after a concussion is 12 days
- For players with concussion-related symptoms or clinical signs that persist beyond 48 hours a slower return to play strategy should be adopted.
- **A more conservative approach is important in cases where symptoms or clinical features persist beyond 48 hours; or those with any “modifying” factors i.e. young players, multiple concussions, learning disabilities, high symptom burden in the first few days after injury.† etc. In these cases, a greater period of initial rest may be required; and each stage of the graduated loading program should be conducted over a longer period of time** (e.g. by extending the number days between progressions, or increasing the number of days held at each stage of the graded return to play).
- In cases where symptoms or clinical signs persist beyond 10-14 days, the player should be managed in a multidisciplinary manner. In these cases, it is strongly recommended that the club doctor involve an independent clinician with expertise in concussion management, to assist in management decisions, including the return to play decision.
- The final determination regarding concussion diagnosis and/or fitness to play is a medical decision based on clinical judgment. The club doctor is in best position to make this clinical decision as they have training and experience in the assessment and management of SRC and have a detailed knowledge of the player (including typical presentation and affect), which can assist with identification of subtle behavioural changes that may accompany a concussion.
- The AFL Chief Medical Officer will have access to all HIA forms and SCAT5 assessments through the CSx App. Information collected will be utilised for assessing compliance, auditing purposes and as part of ongoing education and research activities.

Role of neuropsychological testing and other investigations

- Computerised screening cognitive tests provide a practical method to assist with the assessment of cognitive recovery. A number of computerized test platforms have been validated for use following SRC and are readily available (e.g. Cognigram, ImPACT).

- Overall, it is important to remember that neuropsychological testing is only one component of assessment, and therefore should not be the sole basis of management decisions. Neuropsychological testing does not replace the need for a full history and clinical/neurological examination.
- Given that concussion affects multiple domains, and there are currently no single objective tests of recovery, consideration should also be given to assessment using psychological screening tools, advanced imaging, formal neuropsychological assessment, and other biomarkers such as VOMs testing. Ideally, novel biomarkers for the diagnosis and assessment of recovery following SRC should be conducted within an overarching research program to help advance the knowledge base and improve management of SRC.

Role of imaging

- Conventional imaging (e.g. CT or MRI) should be considered in cases where there is concern regarding an underlying structural head/brain injury.
- If structural MRI is requested to assess for concussive injuries, such as microhaemorrhages, it is necessary that, at a minimum, the following sequences are obtained (and that the MRI facility, and reporting radiologists, are sufficiently experienced in neuroimaging): Sagittal T1, Axial T2, Axial DWI, Axial FLAIR, Axial SWI (or similar sequence), and Axial dual echo T2.
- Advanced imaging and investigation techniques (such as Diffusion Tensor Imaging, functional MRI, Magnetic Resonance Spectroscopy, quantitative EEG, etc.) have demonstrated changes in brain function, activation patterns and white matter fibre tracts in some studies of SRC.⁴ The clinical significance of these changes however remains unclear.

Role of baseline testing

- Baseline testing (e.g. SCAT5 and computerised cognitive screening test platforms such as Cogigram) is useful for interpreting post-injury scores.¹ If used, it is important to try to replicate baseline testing conditions.¹ If baseline data are not available, the player's post-injury results may be compared to normative data and combined with a more conservative return to play approach.

Management of difficult or complicated cases

- Difficult or complicated cases or decisions regarding retiring due to concussion should be managed in a multi-disciplinary manner. In any such case, it is strongly recommended that the club doctor involve an independent clinician with expertise in concussion management, to assist in management decisions, including the return to play decision.
- The AFL have established a network of clinicians with experience and expertise in the management of SRC (for names and contact details of the AFL Neurological Referral Network – see Appendix 3).
- Formal neuropsychological testing is strongly recommended for players with recurrent concussions and in cases where there may be uncertainty about a player’s clinical or cognitive recovery.
- MRI is also strongly recommended as part of assessment in difficult or complicated cases. See above for sequence recommendations for structural imaging.
- Advanced imaging and investigation techniques in approved research projects should be considered in difficult or complicated cases.
- The AFL have also established Concussion Panels to provide a mechanism for a timely and efficient expert multidisciplinary assessment of complex cases of concussion (see Appendix 4).
- Indications for an independent assessment (including Concussion Panels) include:
 - Decisions regarding retirement;
 - More than 2 concussions in any one season (including pre-season training),
 - Any case where symptoms persist beyond 4 weeks;
 - Any case where there is concern regarding increasing or recurrent symptoms with less trauma.

RESEARCH

- Research on SRC has been conducted in the VFL/AFL since 1985. The studies performed in Australian Football have helped form the basis of international management guidelines including the 2016 Berlin consensus statement.¹
- Key projects being supported by the AFL include:
 - a) Mouthguard impact sensor to allow measurement of all head impacts during games
 - b) Screening visual-occulomotor, vestibular tool (Bioeye) for the diagnosis and assessment of recovery

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Appendix 1
Match day HIA

Appendix 2. Definitions of video signs to identify a possible concussion#

	Yes	No
Lying motionless	Lying without purposeful movement on the playing surface, for >2 seconds*. Does not appear to move or react purposefully, respond or reply appropriately to the game situation (including teammates, opponents, umpires or medical staff). Concern may be shown by other players or match officials.	Reacts, responds or replies appropriately. Video shows no clear view of player on ground.
Tonic posturing	Involuntary sustained contraction of one or more limbs (typically upper limbs), so that the limb is held stiff despite the influence of gravity or the position of the player. The tonic posturing could involve other muscles such as the cervical, axial, and lower limb muscles. Tonic posturing may be observed while the athlete is on the playing surface, or in the motion of falling, where the player may also demonstrate no protective action	No clear evidence of tonic movements. Video shows no clear view of player on ground
No protective action - floppy	Falls to the playing surface in an unprotected manner (i.e., without stretching out hands or arms to lessen or minimise the fall) after direct or	Any motor response from player in process of falling. The player's arms are being held, so that they are unable to move to protect themselves.

	indirect contact to the head. The player demonstrates loss of motor tone (which may be observed in the limbs and/or neck*) before landing on the playing surface.	Insufficient time to react – rapid momentum carries the player to ground. Video shows no clear view of player falling.
Impact seizure	Involuntary clonic movements that comprise periods of asymmetric and irregular rhythmic jerking of axial or limb muscles	No clear evidence of clonic movements. Video shows no clear view of player on ground.
Slow to get up	Remains (sitting or lying) on the ground (without being held down by an opponent) despite play continuing (i.e. not upright on feet).	Return to feet (within an appropriate period of time) and continued to participate in the match (and/or the ball is not in play). Video shows no clear view of player on ground.
Motor incoordination	Appears unsteady on feet (including losing balance, staggering/stumbling, struggling to get up, falling), or in the upper limbs (including fumbling). May occur in rising from the playing surface, or in the motion of walking/running/skating.	Able to stand/walk/run in usual fashion. If assisted off the ground – does not have any signs of motor incoordination No attempts to move (e.g. stretchered off). Video shows no clear view of player.
Blank / Vacant Look	Player exhibits no facial expression or apparent emotion in response to the environment. <i>(*May include a lack of focus/attention of vision.</i>	Any facial expressions. Video does not show clear view of face.

	<i>Blank/vacant look is best appreciated in reference to the athlete's normal or expected facial expression)</i>	
Clutching at head/face	Reaches for head/face with one or both hands, and maintains hand(s) on head for more than 1 sec (not a simple wiping motion).	Does not reach for head. Wipes head/face with hand(s). Video shows no clear view of player. Holding cloth/dressing on head or face to manage bleeding
Facial Injury	Any facial laceration, facial bleeding, blood coming from mouth, epistaxis/nose bleed or apparent eye injury.	No visual signs of facial injury. Video shows no clear view of player's face.

adapted from

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ANNEXURE 4
2021 AFL COMMUNITY CONCUSSION GUIDELINES



THE MANAGEMENT OF SPORT-RELATED CONCUSSION IN AUSTRALIAN FOOTBALL

With Specific Provisions for Children and Adolescents
(Aged 5-17 Years)

FOR TRAINERS, FIRST-AID PROVIDERS, COACHES, CLUB OFFICIALS, PLAYERS AND PARENTS

APRIL 2021



All players with a suspected concussion must seek an urgent medical assessment with a registered doctor.

These guidelines do not replace the need to seek medical assessment and are intended to assist in the management of concussion only.

This document has been published by the AFL as a position statement on the management of concussion in Australian Football. It is based on guidelines developed by the AFL Concussion Working Group Scientific Committee.



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1. SUMMARY

- (a) Head impacts can be associated with serious and potentially fatal brain injuries.
- (b) In the early stages of injury, it is often not clear whether you are dealing with a concussion or if there is a more severe underlying structural head injury. For this reason, the most important steps in initial management include:
 - (i) Recognising a suspected concussion;
 - (ii) Removing the player from the match or training; and
 - (iii) Referring the player to a medical doctor for assessment.
- (c) Any player who has suffered a concussion or is suspected of having a concussion (i.e. in cases where there is no medical doctor present to assess the player or the diagnosis of concussion cannot be ruled out at the time of injury) must be medically assessed (see paragraph 3.4) as soon as possible after the injury and must NOT be allowed to return to play in the same match/training session.
- (d) There should be an appropriately accredited first aid provider at every match and the basic rules of first aid should be used when dealing with any player who is unconscious or injured.
- (e) Important steps for return to play following concussion include:
 - (i) A brief period of complete physical and cognitive rest (24-48 hours);
 - (ii) A period of symptom-limited activity to allow full recovery; and
 - (iii) A graded loading program (with monitoring).
 - (iv) Clearance by a medical doctor
- (f) Players should **not** enter the graded loading program until they have recovered from their concussion. Recovery means that **all concussion-related symptoms and signs have fully resolved** (for at least 24 hours) at rest and with activities of daily living, and they have successfully returned to work or school, without restrictions.
- (g) In addition to the processes outlined in this document, any concussed player must not return to competitive contact sport (including full contact training sessions) before having moved through the graded recovery process outlined in Schedule 2 and obtained medical clearance.
- (h) The earliest that a player may return to play (once they have successfully completed a graded loading program and they have obtained medical clearance) is on the 12th day after the day on which the concussion was suffered.
- (i) The AFL-approved concussion management app HeadCheck (www.headcheck.com.au) should be utilised to recognise and assist in the management of any suspected concussion for both adults and children.

2. BACKGROUND

2.1 Introduction

- (a) In considering the best practice management of sport-related concussion, the priority remains the short and long-term welfare of the player.
- (b) These guidelines have been developed on scientific basis that endorse an approach that prioritises **assessment, rest, recovery and a graded return to full participation.**
- (c) ***Children and adolescents typically take longer to recover following a concussion than adults.*** In general, children and adolescents (aged 5-17) require a different approach from adults because their brains are developing, and they need to continue learning and acquiring knowledge. As such, the priority is not just player welfare and return to sport, but a critical element is return to school and learning.

2.2 What is concussion?

- (a) Head impacts can be associated with serious and potentially fatal brain injuries. "Traumatic brain injury" is the broad term used to describe injuries to the brain that are caused by trauma.
- (b) The more severe injuries usually involve structural damage, such as fractures of the skull and bleeding in the brain. Structural injuries require urgent medical attention. Concussion typically falls into the milder spectrum of traumatic brain injury, without evidence of structural damage on traditional scans such as Computerised Tomography (**CT**) or Magnetic Resonance Imaging (**MRI**).
- (c) Concussion is caused by trauma to the brain, which can be either direct or indirect (e.g. whiplash injury). When the forces transmitted to the brain are high enough, they can injure or "stun" the nerves and affect the way in which the brain functions.
- (d) Concussion is characterised by a range of observable signs (such as lying motionless on the ground, blank or vacant look, balance difficulties or motor incoordination) or symptoms reported by the player (such as headache, blurred vision, dizziness, nausea, balance problems, fatigue and feeling "not quite right").
- (e) Other common features of concussion include confusion, memory loss and reduced ability to think clearly and process information. It is important to note that loss of consciousness is seen in only 10-20% of cases of concussion in Australian football. That is, the **player does not have to lose consciousness to have a concussion.**
- (f) The effects of concussion evolve or change over time. Whilst in most cases, symptoms improve, in some cases effects can worsen in the few hours after the initial injury. It is important that a player suspected of sustaining concussion be monitored for worsening effects and be assessed by a medical doctor as soon as possible after the injury.

- (g) The presence of concussion is occasionally associated with a neck injury and may be difficult to assess in the early period after head trauma. ***All concussed athletes should be considered to have a neck injury until medically cleared.***

2.3 What are the potential complications following concussion?

- (a) There are several risks and complications associated with concussion. These include:
- (i) Severe brain swelling (or “second impact syndrome”) which is a rare complication of head trauma in younger players;
 - (ii) Increased risk of further concussion or other injuries on return to play;
 - (iii) Prolonged symptoms (lasting greater than 14 days in adults; and greater than four weeks in children/adolescents);
 - (iv) Symptoms of depression and other psychological problems; and
 - (v) Long-term damage to brain function.
- (b) The risk of complications is thought to be increased by allowing a player to return to sport before they have fully recovered. This is why it is important to recognise concussion and keep the player out of full-contact training and matches until they have fully recovered, as outlined below.
- (c) Concussion can cause problems with memory and information processing, which interferes with the child’s ability to learn in the classroom. It is for this reason that it is strongly recommended that a child does not return to school until medically cleared to do so.
- (d) The AFL-approved concussion management app HeadCheck, is a useful resource that should be utilised to help manage the player’s recovery phase, including the child’s return to school and sport.

2.4 For children and adolescents (aged 5-17 years)

- (a) Symptom evaluation in a child often requires the addition of parent and/or teacher input.
- (b) A child is not to return to football, or other sport, until he/she has successfully returned to school/learning, is symptom-free, and has received medical clearance. However early introduction of limited physical activity is appropriate, as long as symptoms do not worsen – see paragraph 4 for more detail.
- (c) It is reasonable for a child to miss a day or two of school after concussion, but extended absence from school is uncommon.

3. MANAGEMENT GUIDELINES FOR SUSPECTED CONCUSSION

3.1 Initial management

- (a) The most important steps in the initial management include:
 - (i) Recognising a suspected concussion
 - (ii) Removing the player from the match or training session
 - (iii) Referring the player to a medical doctor for assessment
- (b) ***Refer flow diagram in Schedule 1 – Management of Concussion***

3.2 Recognising a suspected concussion

- (a) Any one or more of the following visual clues can indicate a possible concussion:
 - (i) Loss of consciousness or responsiveness
 - (ii) Lying motionless on ground/slow to get up
 - (iii) Vomiting
 - (iv) Seizure or convulsion
 - (v) Unsteady on feet / balance problems or falling over/incoordination
 - (vi) Grabbing/clutching of head
 - (vii) Dazed, blank or vacant look
 - (viii) Confused/not aware of plays or events
 - (ix) Impaired memory (unable to recall events leading up to or following the injury)
 - (x) Facial injury
 - (xi) Player does not seem like their normal self
- (b) Loss of consciousness, confusion and memory disturbance are all classic features of concussion. The problem with relying on these features to identify a suspected concussion is that they are not present in every case.

- (c) Symptoms reported by the player that should raise suspicion of concussion include:
- (i) Headache
 - (ii) Nausea or feel like vomiting
 - (iii) Blurred vision
 - (iv) Balance problems or dizziness
 - (v) Feeling “dinged” or “dazed”
 - (vi) “Don’t feel right”
 - (vii) Sensitivity to light or noise
 - (viii) More emotional or irritable than usual
 - (ix) Sadness
 - (x) Nervous/anxious
 - (xi) Neck pain
 - (xii) Feeling slowed down
 - (xiii) Feeling like in a fog
 - (xiv) Difficulty concentrating
 - (xv) Difficulty remembering
- (d) Tools such as *HeadCheck* or the Concussion Recognition Tool 5th edition (**CRT5**) should be used to help identify a suspected concussion.
- (e) It is important to note however that brief sideline evaluation tools (such as *HeadCheck* or the CRT5), are designed to help identify a suspected concussion. They are **not** meant to replace a more comprehensive medical assessment and should never be used as a stand-alone tool for the management of concussion.
- (f) Currently, there are no commercially available tools (impact sensors, goggles, balance apps, etc) that can be relied upon to either diagnose or exclude a concussion.
- (g) A pre-match/pre-training checklist should be printed and provided to trainers and other staff involved in the care of players. The checklist should include contact details for:
- (i) Local general practices;
 - (ii) Local hospital emergency departments; and
 - (iii) Ambulance services (000).

- (h) The pre-match checklist can also be provided to trainers and medical staff of the away team, who are likely to be less familiar with local medical services.

3.3 Removing the player from the match or training

- (a) The basic rules of first aid should be used when dealing with any player who is unconscious or injured.
- (b) Immobilisation of the neck in a cervical collar by a qualified first aid provider may be required. An appropriately sized collar should be available at every match and training session.
- (c) Removing the conscious player from the match or training session allows the first aid provider time and space to assess the player properly. Assessment should take place in a distraction-free environment, such as the change rooms.
- (d) Any player with a concussion or suspected concussion (i.e. in cases where there is no medical doctor present to assess the player or the diagnosis of concussion cannot be ruled out at the time of injury) **must be removed from play and not be allowed to return in the same match or training session. Do not** be swayed by the opinion of the player, trainers, coaching staff, parents or others suggesting premature return to play.

3.4 Referring the player to a medical doctor for assessment

- (a) Management of a head injury is difficult for non-medical personnel. In the early stages of injury, it is often not clear whether you are dealing with a concussion or there is a more severe underlying structural head injury.
- (b) For this reason, **ALL players with a suspected concussion need an urgent medical assessment (with a registered medical doctor)**. This assessment can be provided by a medical doctor present at the venue, local general practice or hospital emergency department.
- (c) It is useful to have a list of local doctors and emergency departments near the ground at which the match or training session is taking place. This resource can be determined at the start of each season (in discussion with local medical services).



3.5 Management of an unconscious player and when to refer to hospital

- (a) Basic first aid rules should be used when dealing with any unconscious player (i.e. danger, response, airway, breathing, circulation).
- (b) Care must be taken with the player's neck, which may have also been injured in the collision.
- (c) In unconscious players, the player must only be moved (onto the stretcher) by qualified health professionals, trained in spinal immobilisation techniques.
- (d) If no qualified health professional is on site, then do not move the player - await arrival of the ambulance.
- (e) If the unconscious player is wearing a helmet, do not remove the helmet unless trained to do so.
- (f) Urgent hospital referral is necessary if there is any concern regarding the risk of a structural head or neck injury.
- (g) Overall, if there is any doubt, an ambulance should be called, and the player transferred to hospital.
- (h) Urgent transfer to hospital is required for a player with any of the following:
 - (i) Neck pain or tenderness
 - (ii) Double vision
 - (iii) Weakness or tingling/burning in the arms or legs
 - (iv) Severe or increasing headache
 - (v) Seizure or convulsions
 - (vi) Loss of consciousness
 - (vii) Deteriorating conscious state
 - (viii) Vomiting
 - (ix) Increasing restlessness, agitation or combative behaviour

4. FOLLOW-UP MANAGEMENT

4.1 Important steps

- (a) Important steps for return to play following concussion include:
 - (i) Rest
 - (ii) Recovery – symptom-limited activity
 - (iii) Graded loading program (with monitoring)
 - (iv) Clearance by a medical doctor
- (b) ***See Schedule 2 for Phases of Rest, Recovery and Return to Play following Concussion***
- (c) The earliest that a player may return to play (once they have successfully completed a graded loading program and they have obtained medical clearance) is on the 12th day after the day on which the concussion was suffered.
- (d) Schedule 2 outlines the minimum process to follow in returning to play following a concussion. However, a more conservative approach is strongly recommended to allow a longer period of time for recovery where there is a lack of baseline testing and the absence of regular contact between players and a medical doctor limits the ability to assess recovery following concussion.

4.2 Complete (physical and cognitive) rest

A brief period of complete physical and cognitive rest in the first 24-48 hours after injury helps symptoms improve/resolve.

4.3 Recovery – symptom-limited activity

- (a) After a brief period of complete rest, players can gradually become more active as long as the activity does not bring on or worsen any symptoms.
- (b) This period should start with simple day to day things such as watching TV, reading the papers, using social media, going for a walk, etc.
- (c) The duration and/or intensity of the activity may need to be limited based on appearance and/or worsening of symptoms.
- (d) The player should progress slowly back to full work/school during this period (for specific return to school provisions, see section below).
- (e) The priority for students is to successfully return to school/university before returning to sport.
- (f) Recovery means that the player has **no concussion-related symptoms at rest or with both physical and brain activity**, they have recovered back to their baseline on specific tests of balance, brain function, etc, and that they have successfully returned to work and/or school, without restrictions.

- (g) The recovery period will be variable in length (days to weeks) across different people and level of injury, noting that **children and adolescents typically recover slower**.
- (h) A more conservative approach is required if there is a lack of baseline testing and active medical practitioner oversight of each stage of the graded return to football.
- (i) If the player has concussion-related symptoms for more than 10-14 days (or four weeks in children/adolescents), or there is any uncertainty about recovery following concussion, then review by a medical practitioner with expertise in concussion (e.g. sport and exercise medicine physician, neurologist) is strongly recommended.

4.4 Graded loading program (with monitoring)

- (a) **Players should not enter the graded loading program until they have recovered from their concussion. Recovery means that all concussion-related symptoms and signs have fully resolved (for at least 24 hours) at rest and with activities of daily living, and they have successfully returned to work/school, without restriction.** Ideally, the player should have a medical clearance before entry into the graded loading program.
- (b) Given the challenges and limitations in assessing recovery following concussion, a conservative approach is required regarding return to play. The graded loading program allows incremental increases in physical plus/minus cognitive load once the player has recovered to ensure that concussion-related symptoms or signs do not return (which is a sign of incomplete recovery).
- (c) **A more conservative approach is important in children or adolescent athletes as it is recognised that recovery from concussion tends to be slower in this group. A more conservative approach is likely to include longer timeframe for recovery of symptoms and entry into graded loading program and/or longer time spent at each step in the graded loading program.**
- (d) Review with a medical doctor (and a more conservative approach to return to play) is also important in:
 - (i) Players with a history of multiple concussions – especially in the same season
 - (ii) Players who fail to progress through their return to play program due to a recurrence of symptoms
 - (iii) Cases where there is any uncertainty about recovery following concussion
- (e) Entry into a graded loading program requires careful monitoring for recurrence of symptoms. It is important that the player is honest with themselves, the team and the team medical/coaching staff about symptoms.
- (f) If any symptoms return while exercising, the player should go back to the previous symptom free step and seek medical advice.
- (g) In following these guidelines, the **focus must be on ensuring that players pass through each of the steps safely** (i.e. rest, recovery and a graded return).

- (h) ***Any concussed player must not be allowed to return to competitive contact sport (including full contact training sessions) before having a medical clearance.***



4.5 Return to School

- (a) Concussion may impact a child's ability to learn at school. This must be considered, and medical clearance is strongly recommended before the child may return to school.
- (b) It is reasonable for a child to miss a day or two of school after concussion, but extended absence from school is uncommon.
- (c) The child's doctor should help them get back to school after a few days.
- (d) In some children, a graduated return to school programme will need to be developed for the child. Additional management by a paediatric neuropsychologist may assist in more difficult cases.
- (e) The child will progress through the return to school programme provided that there is no worsening of their concussion-related symptoms. If any particular activity worsens symptoms (including computers and internet), the child should abstain from that activity until this no longer occurs.
- (f) This program should include communication between the parents, teachers, and health professionals and will vary from child to child.
- (g) The return to school programme should consider:

- (i) Extra time to complete assignments/tests
 - (ii) Quiet room to complete assignments/tests
 - (iii) Avoidance of noisy areas such as cafeterias, assembly halls, sporting events, music class
 - (iv) Frequent breaks during class, homework and tests
 - (v) No more than one exam per day
 - (vi) Shorter assignments
 - (vii) Repetition/memory cues
 - (viii) Use of peer helper/tutor
 - (ix) Reassurance from teachers that the child will be supported through the recovery process through accommodations, workload reduction and alternate forms of testing
 - (x) Later start times, half-days and only attending certain classes
- (h) All schools are encouraged to have a concussion policy that includes education on sport-related concussion prevention and management for teachers, staff, students and parents, and should offer appropriate academic accommodations and support to children recovering from sport-related concussion.
- (i) The child is not to return to football or other sport, until he/she has successfully returned to school/learning, is symptom-free, completed the graded recovery process and has received medical clearance. However early introduction of limited physical activity is appropriate, as long as symptoms do not worsen.
- (j) If there are any doubts, the child should be referred to a qualified health practitioner who is an expert in the management of concussion in children.

5. ROLE OF PROTECTIVE EQUIPMENT IN AUSTRALIAN FOOTBALL

5.1 Helmets

- (a) There is no definitive evidence that helmets prevent concussion or other brain injuries in Australian Football.
- (b) Helmets may have a role in the protection of players on return to play following specific injuries (e.g. face or skull fractures).
- (c) Overall, however, there is insufficient evidence to make a recommendation for the use of helmets for the prevention of concussion in Australian Football.

5.2 Mouthguards

- (a) Mouthguards have a definite role in preventing injuries to the teeth and face and for this reason they are **strongly recommended** at all levels of football. Mouthguards should be worn for all matches and contact training sessions.
- (b) Dentally fitted laminated mouthguards offer the best protection. 'Boil and bite' type mouthguards are not recommended for any level of play as they can dislodge during play and block the airway.
- (c) There is some preliminary scientific evidence that mouthguards may prevent concussion or other brain injuries in Australian Football.



SCHEDULE 1: MANAGEMENT OF CONCUSSION ON THE DAY OF INJURY

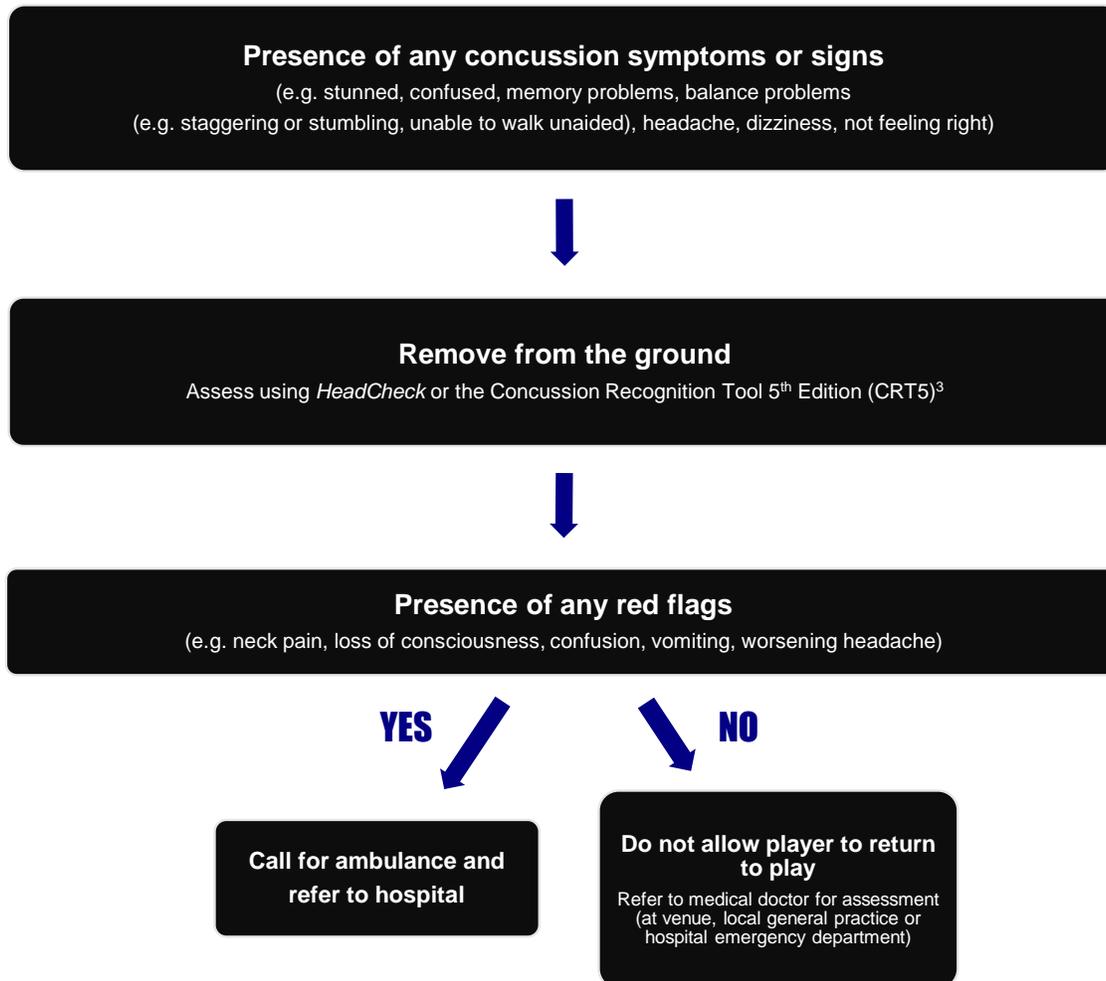


Figure 1. Summary of the management of concussion in Australian Football.

Note: For any player with loss of consciousness, basic first aid principles should be used (i.e. airways, breathing, CPR). Care must also be taken with the player's neck, which may have also been injured in the collision. The unconscious player must not be moved by anyone other than a medical professional or ambulance officer. An ambulance should be called, and these players transported to hospital immediately for further assessment and management.

SCHEDULE 2: PHASES OF REST, RECOVERY AND RETURN TO PLAY FOLLOWING CONCUSSION

Focus	Goal	Requirements to move to next stage
Rest		
Rest	<ul style="list-style-type: none"> • Help speed up recovery 	<ul style="list-style-type: none"> • Complete physical and cognitive rest in the first 24 – 48 hours
Recovery		
Symptom limited activity	<ul style="list-style-type: none"> • Two days of activities that do not provoke symptoms 	<ul style="list-style-type: none"> • No concussion-related symptoms at rest or with physical or brain activity for at least 1 day and the player has successfully returned to work/school • The player should also have a medical clearance (e.g. physiotherapist, sports trainer, first aider) to confirm that the player has had no concussion-related symptoms for at least 1 day
Graded Loading – individual program		
Light / moderate aerobic exercise	<ul style="list-style-type: none"> • Light / moderate aerobic exercise (e.g. walking, jogging, cycling at slow to medium pace) • No resistance training 	<ul style="list-style-type: none"> • Remain completely free of any concussion-related symptoms
Recovery day		
Sport-specific exercise	<ul style="list-style-type: none"> • Increased intensity (e.g. running at an increased heart rate) and duration of activity • Add sports specific drills (e.g. goal kick, stationary handball) • Commence light resistance training 	<ul style="list-style-type: none"> • Remain completely free of any concussion-related symptoms • The player should also have a medical clearance (e.g. physiotherapist, sports trainer, first aider) to confirm that the player has had no concussion-related symptoms for at least 1 day
Recovery day		
Graded Loading – full team training		
Limited contact training	<ul style="list-style-type: none"> • Return to full team training – non-contact except drills with incidental contact (incl. tackling) 	<ul style="list-style-type: none"> • Remain completely free of any concussion-related symptoms • Player confident to return to full contact training
Recovery day		
Clearance by a medical doctor is required before returning to the final full contact training session and competitive contact sport		
Full contact training	<ul style="list-style-type: none"> • Full team training 	<ul style="list-style-type: none"> • Remain completely free of any concussion-related symptoms • Player confident to participate in a match
Recovery day		
Return to Play		

Note: Schedule 2 outlines the minimum process to follow in returning to play following a concussion. The earliest that a player may return to play (once they have successfully completed a graded loading program and they have obtained medical clearance) is on the 12th day after the day on which the concussion was suffered.

A more conservative approach is required if there is a lack of baseline testing and active medical practitioner oversight of each stage of the graded return to football. Section 4.4 of these guidelines also outlines the importance of a more conservative approach in certain situations including for children and adolescents, players with a history of concussion and where there is a recurrence of symptoms at any stage during the return to play program.



ANNEXURE 5
ARTICLES REFERRED TO BY ASSOCIATE PROFESSOR McCrORY

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