



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



## Review

# The Australian Institute of Sport framework for rebooting sport in a COVID-19 environment<sup>☆</sup>



David Hughes<sup>a,b,\*</sup>, Richard Saw<sup>a</sup>, Nirmala Kanthi Panagodage Perera<sup>a,c</sup>,  
Mathew Mooney<sup>a,b</sup>, Alice Wallett<sup>a,b</sup>, Jennifer Cooke<sup>a</sup>, Nick Coatsworth<sup>d</sup>,  
Carolyn Broderick<sup>e,f</sup>

<sup>a</sup> Sports Medicine, Australian Institute of Sport, Bruce ACT, Australia

<sup>b</sup> University of Canberra Research Institute for Sport and Exercise (UCRISE), University of Canberra, Bruce ACT, Australia

<sup>c</sup> Sport Without Injury ProgrammE (SWIPE), Unit of Physiotherapy, Department of Health, Medicine and Caring Sciences (HMC), Linköping University, Linköping, Sweden

<sup>d</sup> Department of Health, Australian Government, Canberra, ACT, Australia

<sup>e</sup> School of Medical Sciences, University of New South Wales, NSW, Australia

<sup>f</sup> Children's Hospital Institute of Sports Medicine, Sydney Children's Hospital Network, Westmead NSW, Australia

## ARTICLE INFO

## Article history:

Available online 6 May 2020

## Keywords:

Sport medicine  
Injury and illness prevention  
Infectious diseases  
Global health  
Sport safety  
Physical activity  
Sport and exercise  
High performance sport  
Community sport  
Elite athlete  
Youth athletes

## ABSTRACT

Sport makes an important contribution to the physical, psychological and emotional well-being of Australians. The economic contribution of sport is equivalent to 2–3% of Gross Domestic Product (GDP). The COVID-19 pandemic has had devastating effects on communities globally, leading to significant restrictions on all sectors of society, including sport. Resumption of sport can significantly contribute to the re-establishment of normality in Australian society.

The Australian Institute of Sport (AIS), in consultation with sport partners (National Institute Network (NIN) Directors, NIN Chief Medical Officers (CMOs), National Sporting Organisation (NSO) Presidents, NSO Performance Directors and NSO CMOs), has developed a framework to inform the resumption of sport. National Principles for Resumption of Sport were used as a guide in the development of 'the AIS Framework for Rebooting Sport in a COVID-19 Environment' (the AIS Framework); and based on current best evidence, and guidelines from the Australian Federal Government, extrapolated into the sporting context by specialists in sport and exercise medicine, infectious diseases and public health.

The principles outlined in this document apply to high performance/professional, community and individual passive (non-contact) sport. The AIS Framework is a timely tool of minimum baseline of standards, for 'how' reintroduction of sport activity will occur in a cautious and methodical manner, based on the best available evidence to optimise athlete and community safety. Decisions regarding the timing of resumption (the 'when') of sporting activity **must** be made in close consultation with Federal, State/Territory and/or Local Public Health Authorities. The priority at all times must be to preserve public health, minimising the risk of community transmission.

© 2020 Published by Elsevier Ltd on behalf of Sports Medicine Australia.

## Practical implications

- The resumption of sport will be a complex process. The AIS Framework provides sport with a useful resource to guide planning and implementation (the 'how') of a safe return to high performance/professional, community and individual sport. Decisions regarding resumption of sporting activity **must** be based on

objective medical information regarding the transmission of COVID-19. Federal, State/Territory and/or Local Public Health Authorities must be closely consulted in decisions regarding the resumption of sport (the 'when').

- Three levels (Levels A, B, C) of sporting activities are recommended in the context of a COVID-19 environment. At each level recommended sporting activities, general hygiene measures, and medical servicing considerations have been outlined. These are considered minimum baseline standards required to be met by high performance/professional sport before the resumption of training and competition.

<sup>☆</sup> Rapid response papers and have not undergone the full peer review process.

\* Corresponding author.

E-mail address: [David.Hughes@ausport.gov.au](mailto:David.Hughes@ausport.gov.au) (D. Hughes).

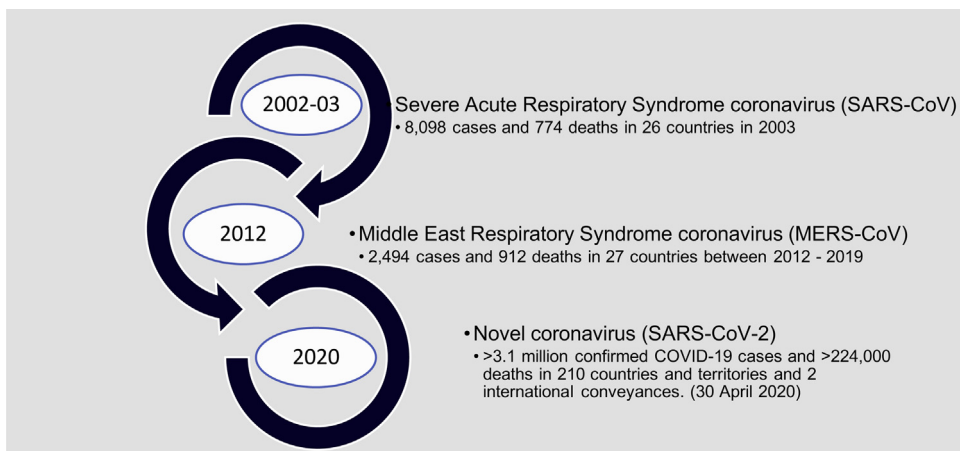


Fig. 1. History of Coronavirus epidemics over the past two decades<sup>4,7,8</sup>.

- Preparation for resumption includes education of the athletes and other personnel, assessment of the sport environment and agreement on training scheduling to accommodate social distancing. The approach to training should focus on **'get in, train, get out'**, minimising unnecessary contact in changerooms, bathrooms and communal areas. Prior to resumption, sporting organisations should have agreed protocols in place for management of illness in athletes and other personnel.
- Special consideration should be made for para-athletes and others with medical conditions as they may be more vulnerable to COVID-19 infection.
- Progression between levels of activity (A, B, C) should be based on objective epidemiological criteria of:
  - Progression from Level A to Level B will be permitted when the local effective reproduction number ( $R_t$ ) has remained  $<1$  for two incubation periods (i.e. four weeks) as determined by Public Health Authorities.
  - When sport activity has been at level B for a further two incubation cycles without an increase in  $R_t$ , progression to Level C can be considered, in consultation with Public Health Authorities. The timing of the progression from Level B to Level C may be influenced by any evidence of transmission issues within the local community or sporting cohort.
- Individuals should not return to sport if in the last 14 days they have been unwell or had contact with a known or suspected case of COVID-19. Any individual with respiratory symptoms (even if mild) should be considered a potential case and must immediately self-isolate, have COVID-19 excluded and be medically cleared by a doctor to return to the training environment.
- Athletes returning to sport after COVID-19 infection require thorough medical assessment prior to resumption of high intensity physical activity. While there is increasing research on the multi-organ nature of COVID-19 in the acute phase, there is currently limited research on medium to long-term complications. Long-term decreased exercise capacity has been noted following previous related coronavirus infections (SARS and MERS).
- Sudden increases in training load predispose to injury and a graded return should be considered.
- Resumption of sporting activity may not be linear. Increasing restrictions may be required in response to fluctuating numbers of COVID-19 cases. Sporting organisations need to be flexible to accommodate and respond to changes in community transmission rates and the associated changes in advice from Public Health Authorities.
- The overriding priority for sport is to ensure that any return to sport activity does not endanger public health.

## 1. Introduction

On 12 January 2020, the World Health Organisation (WHO) reported a cluster of 41 confirmed cases of viral severe acute respiratory syndrome in Wuhan, Hubei Province, People's Republic of China, following a novel coronavirus outbreak in December 2019.<sup>1</sup> Coronaviruses, enveloped Ribonucleic acid (RNA) viruses with surface spikes, are a group of viruses that affect both animals and humans, and several are known to cause the common cold.<sup>2</sup> Two strains of coronavirus namely Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) and Middle East Respiratory Syndrome coronavirus (MERS-CoV) have been associated with epidemics in 2002–03<sup>3</sup> and 2012<sup>4</sup> respectively (Fig. 1).<sup>5</sup> The novel coronavirus is formally named SARS-CoV-2. The clinical disease state resulting from an infection with SARS-CoV-2 is known as COVID-19. Full-length genome sequencing has shown that SARS-CoV-2 is closely related to SARS-CoV. SARS-CoV-2 has been shown to enter cells via angiotensin converting enzyme 2 (ACE2) receptors.<sup>6</sup>

From January to early February 2020, most cases occurred in the People's Republic of China. Global spread of COVID-19 led to the WHO declaring a pandemic on 11 March 2020 with 118,000 cases and over 4000 deaths reported across 114 countries.<sup>9</sup> There were >3.1 million confirmed cases and >224,000 deaths worldwide by 30 April 2020<sup>8</sup> (Fig. 2). The first case of COVID-19 to occur in Australia was confirmed on 25 January 2020, when a man who had returned from Wuhan, People's Republic of China tested positive.<sup>10</sup> At 0600 h on 30 April 2020, Australia has had 6746 cases with 90 deaths.<sup>11</sup>

## 2. Transmission

COVID-19 is highly transmissible from person-to-person and readily spreads to close contacts of infected individuals. The reproduction number ( $R_0$ ) is an indication of the transmissibility of a virus, representing the average number of new infections generated by an infectious person in a totally immunologically naïve population.

- $R_0 > 1$ : infection numbers likely to increase
- $R_0 = 1$ : infection numbers likely to remain stable
- $R_0 < 1$ : infection numbers likely to decrease

The  $R_0$  for COVID-19 is believed to be approximately 2–3, without any public health interventions.<sup>39–41</sup>

$R_t$  is a more practical measure of virus transmissibility, which uses real-life data (from diagnostic testing and/or clinical surveil-

Dec 2019	A series of pneumonia cases of unknown cause with clinical presentations resembling viral pneumonia emerged in Wuhan, Hubei Province, People's Republic of China[1, 12]
31 Dec 2019	Cluster of respiratory infections in Wuhan reported to World Health Organisation (WHO) China Country Office[1]
7 Jan 2020	Chinese authorities identified a new type of coronavirus (novel coronavirus, nCoV)[1]
9 Jan 2020	First death of COVID-19 in People's Republic of China[13]
12 Jan 2020	WHO first reported a cluster of cases in Wuhan, Hubei Province, People's Republic of China[9] People's Republic of China shared the genetic sequence of COVID-19[1]
13 Jan 2020	First case of COVID-19 outside of China (in Thailand)[14]
20 Jan 2020	Person-to-person transmission confirmed[15, 16]
20 Jan 2020	Australian Federal Government list 'human coronavirus with pandemic potential' in the Listed Human Disease under the Biosecurity Act 2015, enabling the use of enhanced border measures.[17]
23 Jan 2020	Lock down in Hubei province, People's Republic of China[18] 628 confirmed COVID-19 cases People's Republic of China and 17 deaths[19]
24 Jan 2020	Australian Federal Government increased level of travel advice for Wuhan and Hubei Province in People's Republic of China to 'level 4 – do not travel', highest travel advice level (level 4 of 4)[10]
25 Jan 2020	First case of COVID-19 in Australia (in Victoria)[10]
29 Jan 2020	Australian Federal Government advice return travellers who have been in the Hubei province, People's Republic of China must self-isolated at home for 14 days[20]
30 Jan 2020	WHO declared COVID-19 as a global health emergency[21]
1 Feb 2020	Australian Federal Government closed borders for non-citizens and non-residents arrivals from People's Republic of China[22] Global COVID-19 cases >11,900 and >250 deaths (in People's Republic of China)[23]
2 Feb 2020	First death of COVID-19 outside People's Republic of China (in Republic of the Philippines)[24]
5 Feb 2020	COVID-19 cases in the Diamond Princess cruise ship docked Yokohama, Japan[25]
11 Feb 2020	WHO named 2019nCoV disease A COVID-19[26]
1 March 2020	Global confirmed COVID-19 cases >88,500 and >3,000 deaths[8]
2 March 2020	First cases of community transmission of COVID-19 in Australia[27]
7 March 2020	Global COVID-19 cases >100,000 in 100 countries[26]
8 March 2020	French Government bans gatherings of >1,000 people[28]
11 March 2020	WHO declared COVID-19 as a global pandemic[9]
13 March 2020	Europe becomes epicenter of the COV-19 pandemic[26] Global COVID-19 cases >145,400 and >5,400 deaths[8] French Government bans gatherings of >100 people[29]
14 March 2020	New Zealand Government impose mandatory 14-day self-isolation for all returning travellers[30]
16 March 2020	Australian Federal Government impose mandatory 14-day self-isolation for all returning travellers[31] Australian Government banned international cruise ship arrivals for 30 days[32]
18 March 2020	WHO launches SOLIDARITY trial (international clinical trial to help find an effective treatment for COVID-19)[26] Australian Federal Government impose a limit of <100 people for non-essential indoor gatherings and <500 people for outdoor gatherings, and call to limit non-essential domestic travel[33]
19 March 2020	Ruby Princess cruise ship docked in Sydney Harbor[34]
20 March 2020	Australian Federal Government border closure to all non-citizens and non-residents[31]
22 March 2020	Most Australian State/Territory governments advised against non-essential interstate travel[35]
24 March 2020	Australian Federal Government impose a ban on all overseas travel 'level 4 – do not travel', highest travel advice level (level 4 of 4)[36] Global COVID-19 cases >423,100 and >19,000 deaths[8]
28 March 2020	Australian Federal Government impose mandatory 14 day supervised self-isolation at designated facilities (e.g. a hotel) for all returning international travellers[37] The United States is the new epicentre of the COVID-19[38]
3 April 2020	Global COVID-19 cases >1,117,200 and >60,600 deaths[8]
30 April 2020	Global COVID-19 cases >3,230,400 and >228,300 deaths[8]

Fig. 2. Timeline of COVID-19 pandemic<sup>1,8–10,12–22,23–38</sup>.

lance) to estimate the reproductive number for an ongoing epidemic.<sup>42</sup>

The disease can spread from person to person through small droplets from the nose or mouth which are spread when a person with COVID-19 coughs or exhales. These droplets land on objects and surfaces around the person. Other people then catch COVID-19 by touching these objects or surfaces (fomites), then touching their eyes, nose or mouth. People can also catch COVID-19 if they breathe in droplets from a person with COVID-19.<sup>43</sup> The virus can persist in the air for up to 3 h and on a variety of surfaces for up to 72 h.<sup>44</sup> Despite a small minority experiencing gastrointestinal symptoms, 67% of COVID-19 patients tested positive for SARS-CoV-2 RNA in faecal specimens.<sup>45</sup> Viral shedding continues in faeces for 6–10 days after pharyngeal swabs become negative. SARS-CoV-2 has been successfully cultured from faecal samples confirming viable viral particles,<sup>46</sup> indicating the possibility of faecal-oral route transmission.<sup>45</sup>

### 3. Pathophysiology

The clinical manifestations of COVID-19 are being regularly updated as clinicians around the world publish their clinical and laboratory findings. The initial picture of COVID-19 was that of a respiratory disease that in most people was a mild illness but had the potential to cause severe disease, acute respiratory distress syndrome (ARDS) and death due to respiratory failure. Reports of the extra-respiratory manifestations are now emerging, including the effect of COVID-19 on cardiac, neurologic, haematologic and renal functioning.<sup>12,47–50</sup>

Commonly reported symptoms in the early course of COVID-19 include fever (89%), dry cough (58%) and dyspnoea (46%).<sup>51</sup> Other reported symptoms include myalgia and fatigue,<sup>45</sup> anosmia (loss of smell) and ageusia (loss of taste).<sup>52,53</sup> Less commonly reported symptoms include headache, abdominal pain, nausea, vomiting and diarrhoea.<sup>45,50,54</sup>

In a review of clinical presentations from China, 81% of infected people have mild symptoms (no respiratory distress), 14% have severe illness (dyspnoea, tachypnoea and hypoxia) and 5% have critical illness (respiratory and other organ failure, septic shock).<sup>55</sup> The observed timeline of symptoms and pathological changes in symptomatic individuals is an influenza like illness (fever, cough and myalgia) in the first few days followed by respiratory symptoms (dyspnoea ± hypoxia) in the second week of the illness. The characteristic features on chest CT are bilateral, peripheral, multifocal ground glass opacities.<sup>56</sup> These imaging findings can also be seen in asymptomatic and pre-symptomatic individuals. The median time from onset of symptoms to intensive care unit (ICU) admission in the critically ill is 10 days.<sup>57</sup> In most instances the cause of death is respiratory failure, septic shock or myocardial injury and cardiac failure.<sup>50</sup> Hospitalisation and mortality rates increase with age.

Case fatality rates (CFR) vary from country to country and are likely to reflect the extent of testing (if only severe cases who present to hospital are tested CFR will appear higher), demographics (regions with a higher proportion of elderly will have higher CFRs) and stress on the health systems (the size of the outbreak versus the capacity to provide ventilatory support).

While people of all ages can be affected by COVID-19, children tend to have a milder illness, lower rates of hospitalisation and asymptomatic carriage is not uncommon.<sup>58</sup> The proportion of infected individuals who remain asymptomatic is not known as widespread population screening has not been undertaken but reports vary from 18% to 79%.<sup>59,60</sup> The proportion of asymptomatic carriage is likely to be higher in a younger population. Unlike SARS-CoV which was most infectious approximately one week after symptom onset,<sup>61</sup> the most infectious period for SARS-CoV-2 is the 48 h prior to onset of symptoms and the day of symptom onset.<sup>62</sup> It is estimated that 44% of infections are transmitted prior to the onset of symptoms in the index case.<sup>62</sup> This has significant implications for community transmission.

Several risk factors, other than advanced age, have been found to be associated with severe disease and death. These include; male sex and co-morbidities including diabetes, cardiovascular disease, hypertension, respiratory disease and immunosuppression.<sup>50,63,64</sup> The laboratory findings associated with an increased risk of severe disease and death were; leucocytosis, lymphopenia, elevated liver enzymes, elevated inflammatory markers, elevated D-dimer, elevated troponin, eosinophilia and abnormal renal function.<sup>50</sup> It has been postulated that more severe cases of COVID-19 may be associated with hyperinflammatory syndrome characterised by a fulminant and fatal hypercytokinaemia (cytokine storm) causing multi-organ pathology.<sup>50,65</sup>

Reports of non-respiratory manifestations of COVID-19 are increasingly being described. While pneumonia is still the most fre-

quent serious manifestation, cardiomyopathy has been reported in one third of critically ill patients in the United States of America.<sup>47</sup> Approximately one third of hospitalised patients display neurological symptoms including headache, dizziness, agitation, delirium, ataxia and corticospinal tract signs.<sup>66</sup> Neurological symptoms are more common in those with severe respiratory disease.<sup>48</sup> Coagulopathies with thrombotic events and elevated phospholipid antibodies have also been described.<sup>49</sup>

To date, there are no clinical data on possible long-term complications of COVID-19. Whether individuals who have been infected and “recovered” have residual organ damage, in particular respiratory or cardiac complications, is unknown at this time. The other current unknown is whether infection confers immunity to future infection and if so, how long that immunity lasts.

#### 4. Prevention

Pre-emptive low-cost interventions such as enhanced hygiene and social distancing measures reduce numbers of cases through several mechanisms. Social distancing decreases the risk of transmission by reducing incidence of contact while enhanced hygiene reduces disease transmission, if a contact occurs.<sup>39</sup> Education of the public and enhanced medical resources have also been shown to reduce transmission.<sup>39,67,68</sup>

The Australian Governor-General declared a ‘human biosecurity emergency period’ on 18 March 2020 in response to the risks posed by COVID-19.<sup>37</sup> This empowered the Australian Government to make a series of decisions including prohibition of cruise ships, travel bans (domestic and international), limiting gatherings to two persons (with exceptions for people of the same household and other select groups), and closing a range of indoor and outdoor public facilities.<sup>41</sup> After peaking in mid to late March 2020, the number of daily new cases of COVID-19 in Australia began to drop in response to strict containment interventions (Fig. 3).

#### 5. Testing

In Australia, indications for conducting testing for COVID-19 have changed over the course of the pandemic, as case definitions have evolved, and testing kits have become more available.<sup>69,70</sup> Testing availability was initially limited to patients with relevant symptoms who were returned overseas travellers or known contacts of a COVID-19 case. Testing criteria have now broad-

ened gradually, and doctors should refer to current local health guidelines.<sup>69</sup> There are currently two main types of tests available for SARS-CoV-2:

- Nucleic acid detection tests: commonly referred to as polymerase chain reaction (PCR) tests detects SARS-CoV-2 genetic material
- Serology tests: detect antibodies produced by the patient against SARS-CoV-2.

The preferred test to confirm the diagnosis of COVID-19 is PCR testing of nasopharyngeal and/or throat swabs, combined with relevant clinical findings. Despite the potential for faecal-oral transmission,<sup>45,46</sup> the role of faecal PCR testing remains unclear.

The absence of SARS-CoV-2 on a PCR test on a single occasion is insufficient to definitively rule out COVID-19 infection. Public Health Authorities in Australia have recommended using multiple samples over multiple days in those whose symptoms are strongly suggestive of COVID-19.<sup>70,71</sup> In general, PCR tests for other respiratory viral infections tend to have a high sensitivity and specificity, although there is limited data specific to COVID-19.

Serology tests are available, including Point of Care (PoC) serology tests that can provide results from venous or finger prick samples in 15–30 min.<sup>26,69</sup> It is likely that antibodies take 5–10 days to become detectable after infection, and around 30% of patients may not produce detectable levels at all.<sup>12</sup> At present the sensitivity and specificity for serology testing is not well known. In addition to false negatives, false positives may arise from exposure to other coronavirus strains. As serology is testing for antibodies and not the presence of the virus, it does not provide clinically useful information as to whether a patient could be infectious.<sup>69</sup> It should not be assumed that the presence of antibodies confers immunity against SARS-CoV-2.<sup>72</sup>

Given asymptomatic transmission of SARS-CoV-2,<sup>73</sup> there may be a role for screening for COVID-19 with PCR in asymptomatic groups in higher risk situations, for example where social distancing measures are logistically difficult to implement.<sup>74</sup>

#### 6. Management

The aims of infectious disease management must be to optimise the health of the individual as well as to mitigate subsequent risk within the wider community. The focus for individual medical

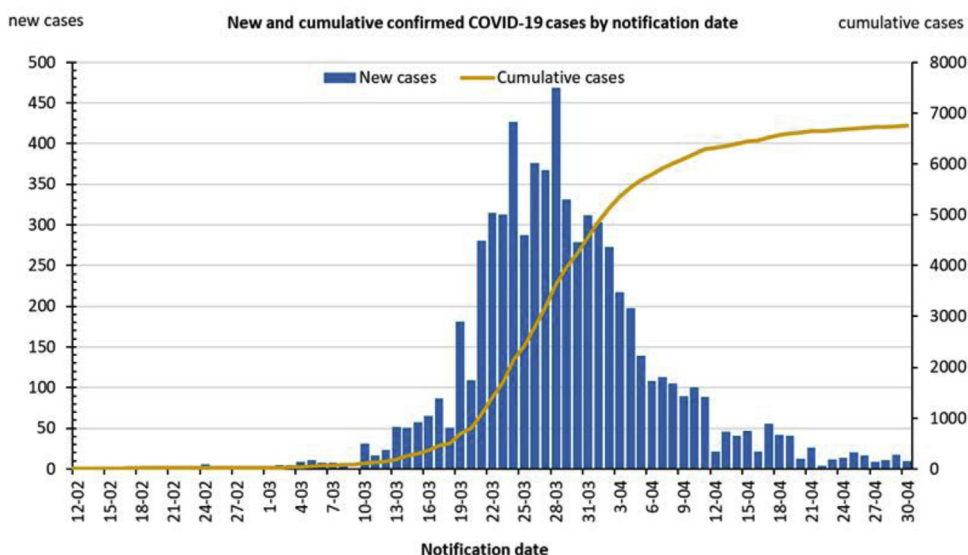


Fig. 3. New and cumulative confirmed COVID-19 cases by notification date in Australia.<sup>11</sup>

management after clinical assessment is to provide supportive care, optimise the management of any co-morbid conditions and provide regular clinical monitoring for deterioration or the development of a secondary bacterial infection. Most patients (approximately 80%) will have mild clinical symptoms. Many patients can be managed by isolation at home if they are appropriately monitored and counselled on signs/symptoms that should prompt further medical assessment, with a plan for how to seek assessment.<sup>75–77</sup> Patients should be monitored particularly closely 5–8 days post symptom onset, as this is when progression to severe illness is most common.

Patients with more severe symptoms and signs such as dyspnoea, tachypnoea, hypoxaemia, hypotension, altered mental state or extensive pulmonary infiltrates on chest imaging should be managed as an inpatient.<sup>55,75–78</sup> Inpatient management focuses on supportive care and may include measures such as supplemental oxygen and breathing manoeuvres. For severe cases with ARDS, intubation and mechanical ventilation may be indicated.<sup>76–78</sup>

Off label use of medications such as remdesivir, lopinavir/ritonavir, hydroxychloroquine, azithromycin, corticosteroids and IL-6 inhibitors have been described.<sup>79</sup> At present, these medication options should only be considered if they are part of a recognised clinical trial or after discussion with an infectious disease specialist.

Other novel therapies such as convalescent serum from recovered patients is also being actively researched.<sup>75</sup> Therapeutic use exemptions would likely be required for athletes as the provision of convalescent serum would be in breach of the World Anti-Doping Agency guidelines as it includes the administration of a blood product.

## 7. Pandemic impacts on sport

Sport is an integral part of Australian society. Annually, 3 million children and 8.4 million adults participate in sporting activities and 8 million Australians attend live sporting events every year.<sup>80</sup> Sport participation at all levels and abilities makes an important contribution to the physical, psychological and emotional well-being of individuals. At a population level, benefits of sport include direct economic benefits; healthcare benefits; educational benefits; and contribution to social capital through connectivity, resilience and creating stronger, cohesive communities. At high performance level, Australia also has an exceptional track record – in 2016, there were 25 reigning World Champions (individuals and teams).<sup>80</sup> The sport sector employs >220,000 individuals and engages >1.8 million volunteers. The economic contribution is equivalent to 2–3% of Gross Domestic Product (GDP).<sup>81</sup> Regular community-based sport participation in Australia generates an estimated \$18.7B value per annum in social capital including direct economic benefits.<sup>82</sup> Australia has enjoyed many benefits as a result of a rich sporting culture.

Preventative measures taken in Australia and other countries, while required to limit the spread of COVID-19, have impacted upon a range of work and social pursuits including sport activities. The ability to hold sporting events at both the community and professional level became increasingly untenable as a result of the necessary government restrictions and a growing community expectation that all sections of society should cease travel and contact activities for the greater good. On 24 March 2020, the International Olympic Committee, the International Paralympic Committee and the Japanese Government formally announced a rescheduling of the Tokyo 2020 Olympic and Paralympic Games (Fig. 4) “to safeguard the health of the athletes, everybody involved in the Olympic Games and the international community”.<sup>83,84</sup>

In Australia, from mid to late March 2020 there was a progressive and rapid increase in the number of COVID-19 cases (Fig. 3). There was a corresponding escalation of restrictions put in place by



Fig. 4. Timeline of COVID-19 pandemics impact on sport<sup>8,9,21,26,27,30,31,33–35,37,83,85–111</sup>.

the Federal, and State/Territory Governments. Many sport organisations (e.g. Australian Football League, Cricket Australia, Netball Australia, National Rugby League) had initially closed the door to spectators while matches continued to TV audiences only. From 22 March 2020, most State/Territory governments advised against non-essential interstate travel, which impacted several sporting bodies and codes. The Australian Institute of Sport (AIS) and the National Institutes Network (NIN) recommended the closure of all non-essential services within the National Institute Network from 24 March 2020 (Fig. 4).<sup>35</sup>

There is contested uncertainty about the likely course of the pandemic and the resulting timelines for safe return to training and competition. In professional sport, loss of revenue from sponsorship, gate-takings and broadcast deals has resulted in job losses and reappraisal of operational imperatives.<sup>112</sup> It is unclear what long-term effects there will be on other factors such as fan engagement, sport participation, employment in the sport industry and athlete/staff welfare. Global and national economic conditions will also have repercussions for sport.

## 8. The AIS framework for rebooting sport in a COVID-19 environment

The COVID-19 pandemic has impacted people in varying ways with many experiencing deteriorations in mental health.<sup>113,114</sup> Resumption of sport can significantly contribute to the re-estab-

### National principles for the resumption of sport and recreation activities

1. Resumption of sport and recreation activities can contribute many health, economic, social and cultural benefits to Australian society emerging from the COVID-19 environment.
2. Resumption of sport and recreation activities should not compromise the health of individuals or the community.
3. Resumption of sport and recreation activities will be based on objective health information to ensure they are conducted safely and do not risk increased COVID-19 local transmission rates.
4. All decisions about resumption of sport and recreation activities must take place with careful reference to these National Principles following close consultation with Federal, State/Territory and/or Local Public Health Authorities, as relevant.
5. The AIS 'Framework for Rebooting Sport in a COVID-19 Environment' provides a guide for the reintroduction of sport and recreation in Australia, including high performance sport. The AIS Framework incorporates consideration of the differences between contact and non-contact sport and indoor and outdoor activity. Whilst the three phases A, B and C of the AIS Framework provide a general guide, individual jurisdictions may provide guidance on the timing of introduction of various levels of sport participation with regard to local epidemiology, risk mitigation strategies and public health capacity.
6. International evidence to date is suggestive that outdoor activities are a lower risk setting for COVID-19 transmission. There is no good data on risks of indoor sporting activity but, at this time, the risk is assumed to be greater than for outdoor sporting activity, even with similar mitigation steps taken.
7. All individuals who participate in, and contribute to, sport and recreation will be considered in resumption plans, including those at the high performance/professional level, those at the community competitive level, and those who wish to enjoy passive (non-contact) individual sports and recreation.
8. Resumption of community sport and recreation activity should take place in a staged fashion with an initial phase of small group (<10) activities in a non-contact fashion, prior to moving on to a subsequent phase of large group (>10) activities including full contact training/competition in sport. Individual jurisdictions will determine progression through these phases, taking account of local epidemiology, risk mitigation strategies and public health capability.
  - a. This includes the resumption of children's outdoor sport with strict physical distancing measures for non-sporting attendees such as parents.
  - b. This includes the resumption of outdoor recreational activities including (but not limited to) outdoor-based personal training and boot camps, golf, fishing, bush-walking, swimming, etc.
9. Significantly enhanced risk mitigation (including avoidance and physical distancing) must be applied to all indoor activities associated with outdoor sporting codes (e.g. club rooms, training facilities, gymnasias and the like).
10. For high performance and professional sporting organisations, the regime underpinned in the AIS Framework is considered a minimum baseline standard required to be met before the resumption of training and match play, noting most sports and participants are currently operating at level A of the AIS Framework.
11. If sporting organisations are seeking specific exemptions in order to recommence activity, particularly with regard to competitions, they are required to engage with, and where necessary seek approvals from, the respective State/Territory and/or Local Public Health Authorities regarding additional measures to reduce the risk of COVID-19 spread.
12. At all times sport and recreation organisations must respond to the directives of Public Health Authorities. Localised outbreaks may require sporting organisations to again restrict activity and those organisations must be ready to respond accordingly. The detection of a positive COVID-19 case in a sporting or recreation club or organisation will result in a standard public health response, which could include quarantine of a whole team or large group, and close contacts, for the required period.
13. The risks associated with large gatherings are such that, for the foreseeable future, elite sports, if recommenced, should do so in a spectator-free environment with the minimum support staff available to support the competition. Community sport and recreation activities should limit those present to the minimum required to support the participants (e.g. one parent or carer per child if necessary).
14. The sporting environment (training and competition venues) should be assessed to ensure precautions are taken to minimise risk to those participating in sport and those attending sporting events as spectators (where and when permissible).
15. The safety and well-being of the Australian community will be the priority in any further and specific decisions about the resumption of sport, which will be considered by the COVID-19 Sports and Health Committee.

ishment of normality in society, in a COVID-19 environment. Some established norms associated with sport from sharing drink bottles, hugging and shaking hands to arenas packed with spectators are the antithesis of social distancing. Sport organisations and participants will be faced with complex decisions regarding resumption of training and competition in the current circumstances. The AIS, in consultation with sport partners (NIN Directors, NIN Chief Medical Officers (CMOs), National Sporting Organisation (NSO) Presidents, NSO Performance Directors and NSO CMOs), has developed a framework to inform the resumption of sport. National Principles for Resumption of Sport formed the foundation of 'the AIS Framework for Rebooting Sport in a COVID-19 Environment' (the AIS Framework). Given the recency of COVID-19 there is a paucity of research, particularly in athletic populations, the AIS Framework is based on current best evidence, and guidelines from the Australian Federal Government extrapolated into the sporting context by specialists in sport and exercise medicine, infectious diseases and public health. The AIS Framework will be regularly updated to reflect the evolving scientific evidence about COVID-19. The AIS

Framework is a timely tool of minimum baseline of standards, for 'how' reintroduction of sport activity will occur in a cautious and methodical manner, based on the best available evidence to optimise athlete and community safety. The principles outlined in the AIS Framework apply to high performance/professional, community and individual sport. Decisions regarding the timing of resumption (the 'when') of sporting activity **must** be made in close consultation with Federal, State/Territory and/or Local Public Health Authorities. The priority at all times must be to preserve public health, minimising the risk of community transmission.

### 9. Framework for resumption of community and individual sport

All community and individual sport participants, parents/guardians of participants, coaches, spectators, officials and volunteers (collectively termed community sport members) and sport organisations must play a role to help slow the spread of COVID-19.

The safe reintroduction of community and individual sport requires thorough planning and safe implementation.

### 9.1. Preparation for community and individual sport resumption

Prior to the resumption of community sport, it is important for sports clubs/groups to safely prepare the sporting environment. A thorough risk assessment must be carried out and preparation will be specific to the sporting environment. A resumption of sport activity should not occur until appropriate measures are implemented to ensure safety of community sport members.

#### 9.1.1. Education

Education of community sport members about COVID-19 risk mitigation strategies is crucial. Education will help to promote and set expectations for the required behaviours prior to recommencing activities. Improved health literacy including awareness of self-monitoring of respiratory symptoms (even if mild). Community sports may benefit from consulting with Local Government and Public Health Authorities on education materials and options available.

Possible education measures include:

- Provide education material for community sport members to promote required behaviours (e.g. regular and thorough handwashing, covering mouth and nose with a tissue or sleeve during coughing/sneezing). Suggested Australian Government and WHO resources:
  - Good hygiene for coronavirus (COVID-19)
  - Hand washing guidance
  - Keep that cough under cover
  - Self-isolation (self-quarantine) for coronavirus (COVID-19)
  - Advice for people at risk of coronavirus (COVID-19)
  - Coronavirus (COVID-19) resources
- Display appropriate education material within sporting environments and facilities. Suggested Australian Government and WHO resources:
  - Good hygiene practices poster for businesses
  - Good hygiene is in your hands
  - Hand washing guidance
  - Keep that cough under cover
- Education of community sport members on hygiene practices and promote required behaviours relevant to their sport and environment.
  - No sharing of drink bottles and towels
  - No sharing of mats, or equipment without an appropriate cleaning protocol, in between training sessions
- Recommend community sport members download the Australian Government COVID-19 contact tracing app (COVIDSafe).

#### 9.1.2. Preparation of training/competition environments

The specific considerations for a safe resumption of community sport will be dependent on the sport and environment. Considerations include:

- Anticipated number of community sport members
  - What training can still be adequately be done from home?
  - How can training be staggered to minimise numbers and reduce contact?
  - How can the numbers at training and competitions be managed to maintain some social distancing?
  - Modifying training and competition times so that there are less people present at one time
- Cleaning
  - What sporting equipment will athletes be sharing?

»e.g. gymnastics apparatus, balls, training equipment such as skipping ropes, weights, mats

–What are the shared facilities?

»e.g. bathrooms/change rooms, recovery areas, medical and physical therapy beds and equipment, and swimming pools

»What is the protocol and frequency of cleaning shared facilities?

»Suggested Government resources for environmental cleaning and disinfection principles

(1) In a healthcare setting

(2) Routine household cleaning

- Handwashing facilities

–Are there any facilities to regularly wash hands?

–How many sanitising hand rub dispensers are required in prominent places around the facility/event?

»How often should they be refilled?

- **'Get in, train and get out'**. Strategies to limit time and person-to-person contact on site should be implemented

–Arrive dressed and ready to train

–Minimise use of change rooms, bathrooms and communal areas

–Where possible, community sport members showering at home instead of at training venues

–Community sport members should eat off site

–Between training efforts, maintain at least 1.5 m apart (e.g. in the gym, pool, between sets or efforts)

–Any tasks that can be done at home, should be done at home (e.g. recovery sessions, online meetings)

- Organisation of community sporting activities

– What spaces can be used for isolation if an athlete/other personnel becomes unwell?

– What is the strategy to ensure that social distancing of at least 1.5 m is maintained by community sport members attending training or competition?

– What strategies can be used to communicate/inform community sport members of preventive actions?

– What is the strategy to reduce in-person contact between athletes and other personnel?

– What is the strategy to manage increased levels of staff/volunteer absences?

– What is the strategy to reduce risk to vulnerable groups?

### 9.2. Proposed criteria for resumption of sporting activity

Initial resumption of community and individual sport will be governed by public health policy and Federal, State/Territory Government directives. It is worth noting that different States/Territories may permit the resumption of some sporting activities at different times, dependent on local COVID-19 transmission, resources and other variables influencing local policy. Even within a State/Territory there could be geographical variability. All community sporting organisations must ensure that the activities undertaken in training and competition are consistent with the applicable guidance from Local Public Health Authorities. Resumption of sporting activity may not be linear. Relaxing/increasing restrictions may be required in response to fluctuating numbers of COVID-19 cases.

An initial resumption of sporting activity is dependent on several factors:

- A sustained decrease in COVID-19 transmission
- Healthcare system capacity
- Community sport clubs/groups and individuals making their own risk assessment guided by their Local Public Health Authorities (i.e. community sports clubs and individuals cannot restart sport before permitted by Local Public Health Authorities but may



decide to delay a restart due to their own circumstances/risk assessment).

Three levels (Levels A, B, C) of sporting activities are recommended in the context of a COVID-19 environment (Table 1). For each level, permitted activities, general hygiene measures, and spectators, considerations for additional personnel are provided as recommendations before the resumption of community or individual sport. Sport-specific activities has been developed in conjunction with CMOs and other staff working within sport (Table 1).

Progression from Level A to Level B sporting activities will be considered when the local effective reproduction number ( $R_t$ ) has remained  $<1$  for two incubation periods (i.e. four weeks) as determined by Public Health Authorities.<sup>36,115</sup> When sport activity has been at level B for a further two incubation cycles without an increase in  $R_t$ , progression to Level C sporting activities can be considered, as determined by with Public Health Authorities. The timing of the progression from Level B to Level C may be influenced by any evidence of transmission issues within the sporting cohort.

#### General considerations:

- Change rooms, surfaces and objects in other relevant spaces should be cleaned between exercise sessions/matches with disinfectant
- **'Get in, train and get out'**. Athletes should prepare for exercise at home, to minimise need to congregate in change rooms/sporting facilities. Athletes should get dressed to train/compete at home and shower at home on completion
- Any tasks that can be done at home, should be done at home (e.g. recovery sessions, online meetings)
- When practical, athletes and other personnel should maintain social distancing of at least 1.5 m (e.g. between training drills/efforts)
- There should be no unnecessary body contact (e.g. hand shaking, high fives)
- Community sport organisations should minimise unnecessary huddles of spectators. Spectators should be encouraged or directed to spread out and maintain social distance
- Consideration should be given as to whether it is appropriate to serve food and drink at community events, as this will likely encourage spectators to come into close proximity with each other
- Hand hygiene stations should be placed in high traffic areas and entry/exit points.

### 9.3. Return to community and individual sport

Community sport members and individuals should not return to sport if in the last 14 days they have been unwell or had close contact with a known or suspected case of COVID-19. In an environment of community transmission of COVID-19, any individual with respiratory symptoms (cough, sore throat, fever or shortness of breath), even if mild, should be considered a possible case of COVID-19. All community sport members must be made aware not to attend sport environments if they are unwell and should use a cautious approach. Anyone who is unwell should be referred to a doctor in accordance with Local Public Health Authority guidelines. An athlete with a possible case of COVID-19 should refrain from training (even at home) until they have been cleared to do so by a doctor, given the potential for worsening illness.

It should also be considered that anyone returning to sport and exercise after a period of social isolation and not exercising regularly may be at an increased risk of injury. Clubs and individuals should apply a graded return to mitigate injury risk, understanding that a sudden increase in training load will predispose to injury.<sup>116</sup>

#### 9.3.1. Vulnerable groups

Vulnerable groups such as para-athletes and others with medical conditions may be at increased risk. Those with concomitant medical conditions need individualised management in consultation with their regular treating doctor(s) prior to return to training environments. Considerations include increased susceptibility to respiratory infections, unique equipment (e.g. wheelchairs) that requires cleaning, accessibility of medical resources, risk of medical sequelae from COVID-19, and access to alternate training options.

Athletes/other personnel with concurrent medical conditions including; respiratory or cardiac disease, hypertension, diabetes,<sup>117,118</sup> obesity<sup>54</sup> and immunosuppression due to disease or medication may be at increased risk. Other groups that require special consideration include; individuals over 70 years of age, carers for or a household contact of a vulnerable person, athletes with suboptimal access to medical care (e.g. remote) and Aboriginal and Torres Strait Islander Communities.

Potential interventions for vulnerable athletes/other personnel include:

- Delaying a return to sport
- Training scheduled at designated 'lower risk' times (i.e. with no one else around)
- Staff working off-site where possible
- Maintaining social distancing measures
- Exclusion of 'high risk' athletes/other personnel from the training environment.

#### 9.3.2. Returning to sport after recovering from COVID-19

There are two separate points to consider for athletes/other personnel who have been infected with COVID-19, prior to returning to sport:

- Ensure they no longer pose any infection risk to their community and
- Ensure they have sufficiently recovered to safely participate in exercise (specifically for athletes/other personnel undertaking physical roles).

In both instances, clearance from their doctor is required.

Athletes and other personnel who have recovered from COVID-19 must satisfy the Communicable Disease Network of Australia (CDNA) criteria to ensure they are no longer infectious.<sup>70</sup>

While there is increasing research on the multi-organ nature of COVID-19 in the acute phase, there is currently limited research on medium to long-term complications. Long-term decreased exercise capacity has been noted following previous coronavirus infections (SARS and MERS).<sup>119</sup> Athletes and volunteers/officials with physical roles may be at increased risk of health complications after COVID-19 and warrant multidisciplinary specialist medical assessment before resuming high exertion activities.<sup>120,121</sup> They should be instructed to see their local doctor for a full medical review. An outline of the recommended assessment process following a COVID-19 case is illustrated in Table 2.

## 10. 'Return to Work' framework for high performance/professional athletes

High performance/professional athletes are 'returning to work' and safe resumption of sport in a COVID-19 environment will

**Table 1**

Description of recommendations for Level A, B, C activities in community and individual sport. Please note that it has not been possible to include every sport in this table. For sports that are not listed in the table, please base your sport activities on the recommendations made for a similar sport.

Community/individual sports	Level A	Level B	Level C
General description	Activity that can be conducted by a solo athlete or by pairs where at least 1.5 m can always be maintained between participants. No contact between athletes and/or other personnel. Examples for all sports – general fitness aerobic and anaerobic (e.g. running, cycling sprints, hills). Strength and sport-specific training permitted if no equipment required, or have access to own equipment (e.g. ergometer, weights). Online coaching and resources (e.g. videos, play books).	As per Level A plus: Indoor/outdoor activity that can be conducted in small groups (not more than 10 athletes and/or other personnel in total) and with adequate spacing (1 person per 4m <sup>2</sup> ). Some sharing of sporting equipment permitted such as kicking a football, hitting a tennis ball, use of a skipping rope, weights, mats. Non-contact skills training. Accidental contact may occur but no deliberate body contact drills. No wrestling, holding, tackling or binding. Commercial gyms, bootcamps, yoga, Pilates, dance classes (e.g. barre, ballet, hip hop, not partnered), cycling 'spin' classes permitted if other measures (above) are met. Communal facilities can be used after a sport-specific structured risk assessment and mitigation process is undertaken. <b>'Get in, train and get out'</b> – be prepared for training prior to arrival at venue (minimise need to use/gather in change rooms, bathrooms). Minimise use of communal facilities (e.g. gym, court) with limited numbers (not more than 10 athletes/staff in total). Have cleaning protocols in place for equipment and facilities. Hand hygiene (hand sanitisers) on entry and exit to venues, as well as pre, post and during training. Thorough full body shower with soap before and after training (preferably at home). Where possible maintain distance of at least 1.5 m while training. No socialising or group meals. Do not share drink bottles or towels. Do not attend training if unwell (contact doctor). Spitting and clearing of nasal/respiratory secretions on ovals or other sport settings must be strongly discouraged.	As per Level B plus: Full sporting activity that can be conducted in groups of any size including full contact (competition, tournaments, matches). Wrestling, holding, tackling and/or binding (e.g. rugby scrums) permitted. For larger team sports, consider maintaining some small group separation at training. For some athletes full training will be restricted by commercial operation of facilities.
General hygiene measures	No sharing of exercise equipment or communal facilities. Apply personal hygiene measures even when training away from group facilities – hand hygiene regularly during training (hand sanitisers) plus strictly pre and post training. Do not share drink bottles or towels. Do not attend training if unwell (contact doctor). Spitting and clearing of nasal/respiratory secretions on ovals or other sport settings must be strongly discouraged.	Communal facilities can be used after a sport-specific structured risk assessment and mitigation process is undertaken. <b>'Get in, train and get out'</b> – be prepared for training prior to arrival at venue (minimise need to use/gather in change rooms, bathrooms). Minimise use of communal facilities (e.g. gym, court) with limited numbers (not more than 10 athletes/staff in total). Have cleaning protocols in place for equipment and facilities. Hand hygiene (hand sanitisers) on entry and exit to venues, as well as pre, post and during training. Thorough full body shower with soap before and after training (preferably at home). Where possible maintain distance of at least 1.5 m while training. No socialising or group meals. Do not share drink bottles or towels. Do not attend training if unwell (contact doctor). Spitting and clearing of nasal/respiratory secretions on ovals or other sport settings must be strongly discouraged.	Return to full use of sporting facilities. Continue hygiene and cleaning measures as per Level B. If any massage beds being used, hygiene practises to include no bed linen except single use towels. Cleaning of treatment beds and key surfaces should occur before and after each athlete treatment. Appropriate hand hygiene before and after each treatment. Limit unnecessary social gatherings. Do not share drink bottles or towels. Do not attend training/competition if unwell (contact doctor). Spitting and clearing of nasal/respiratory secretions on ovals or other sport settings must be strongly discouraged.
Spectators, additional personnel	No spectators unless required (e.g. parent or carer).	Separate spectators from athletes. Spectators should maintain social distancing of at least 1.5 m.	Minimum contact of non-essential surfaces to occur and hands on treatment should be kept to essential only. Non-essential personnel should be discouraged from entering change rooms.
American Football	Running, resistance training (solo), skills training (solo).	Passing, kicking, catching drills. No tackling or grappling. Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Archery	Outdoor range and solo only.	Full training indoor or outdoor range, with limited numbers/appropriate distancing between athletes.	Full training and competition.
Artistic Swimming	Solo training drills only- land based, in own pool or open-water. General fitness, strength work.	Swimming (own lane). In pool solo technical drills or group technical drills without physical contact. No lifting, holding.	Full training and competition.
Athletics	Outdoor training sessions on own, with coach, or with 1 training partner (no sharing of equipment e.g. javelin, discus, high-jump mats, pole vault, shot put, hammer, starting blocks).	Full training. Avoid running in slipstream of others.	Full training and competition. Competition- Multi Event rooms remain a risk and time spent here should be minimised with adequate space/separation. Similarly, call rooms pre event will need to be restructured.

Table 1 (Continued)

Community/individual sports	Level A	Level B	Level C
Australian Rules Football	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) including kicking, handballing, ball handling skills (e.g. handball against wall, bouncing, ball recovery work).	Controlled kicking, marking and handball drills. No tackling/wresting, contact, body on body drills. Small groups (not more than 10 athletes/staff in total) for both education and training.	Full training and competition. Consider maintaining some small group separation (e.g. mids, forwards and backs).
Badminton	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Full training on court, singles or doubles.	Full training and competition.
Baseball	Running/aerobic training (solo), resistance training (solo), skills training (solo).	Full training with small numbers (not more than 10 athletes/staff in total).	Full training and competition.
Basketball	Running/aerobic/agility training (solo), resistance training (solo), skills training and shooting drills (solo) at home or outdoor (no indoor sporting facility access allowed).	Non-contact skills using basketball – passing, shooting, defending, screens and team structure (offence and defence). Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Boccia	No ball handling drills with others. Essential for all athletes to have clearance by their individual specialist medical team prior to any return to training, acknowledging increased vulnerability in many athletes. Specific attention to increased cleaning of equipment, social distancing (where possible) and consideration of delay of return to sport.		
Boxing	Running/aerobic/agility training (solo), resistance training (solo), technical training (solo). Bag work if access to own equipment, without anyone else present.	Shadow sparring allowed. Non-contact technical work with coach, including using bag, speedball, pads, paddles, shields. No contact or sparring.	Full training and competition.
Canoeing	Running/aerobic training (solo), resistance training (solo), on-water training (solo).	Full training and competition. No contact. No team boat training. One person per boat	Full training and competition.
Cricket	Running/aerobic training (solo), resistance training (solo), skills training (solo).	Nets – batters facing bowlers. Limit bowlers per net. Fielding sessions- unrestricted. No warm up drills involving unnecessary person to person contact. No shining cricket ball with sweat/saliva during training.	Full training and competition. No ball shining with sweat/saliva.
Cycling	Solo outdoor cycling or trainer, resistance training (solo).	Avoid cycling in slipstream of others- maintain 10 m from cyclist in front. Avoid packs of greater than 2 (including motorcycle derny).	Full training and competition.
Diving	On-land training only (solo).	Full training, with 1 athlete per board/platform (or 2 if synchro training).	Full training and competition.
Equestrian	Solo/pairs training only.	Full training and competition.	Full training and competition.
Fencing	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo). No bouts with others. Solo footwork practice (steps, lunges, fleshes). Pointwork – using cushion/board to practice fine motor skills of point work with sword.	Full training and competition. Ensure no shared masks. No shaking hands post bout.	Full training and competition.
Field Hockey	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) if access to appropriate surface available.	Non-contact skills training drills in small groups (not more than 10 athletes/staff in total).	Full training and competition.
Football (Soccer)	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo).	Non-contact skill training drills – passing, shooting, headers. Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Goalball	Solo aerobic and resistance training at home or outdoors.	Non-contact passing/technical skills and other training in small groups (not more than 10 athletes/staff in total)	Full training and competition.
Golf	Solo or pairs only (if permitted by local Government). Maintain at least 1.5m between players.	Full training and competition. Maintain at least 1.5m between players.	Full training and competition. Maintain at least 1.5m between players where possible.
Gymnastics	Resistance training, skills training solo and outside of gym only. Rhythmic – skills at home. Trampoline – off apparatus skills, drills at home only.	Small groups only – 1 gymnast per apparatus (including rhythmic and trampoline). Disinfecting high touch surfaces as per the manufacturer's guidelines.	Full training and competition.

Table 1 (Continued)

Community/individual sports	Level A	Level B	Level C
Handball	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Skill drills – passing, shooting, defending. No contact drills. Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Judo	Running/aerobic/agility training (solo), resistance training (solo), technical training (solo) – e.g. mirror work.	No contact/bouts. Non-contact shadow training. Non-contact technical work with coach.	Full training and competition.
Karate	Running/aerobic/agility training (solo), resistance training (solo), technical training (solo) – e.g. mirror work.	No contact/bouts. Shadow sparring. Non-contact technical work with coach, including using pads, paddles.	Full training and competition.
Karting	Organised social karting – recreational karting and on-track practice. Individual pit tents in the paddock to be spread out – minimum of 2m between pits. No sharing of karts, pits, tools or apparel. Social distancing and density requirements to be observed at all times. On-track activity to be organised by the Club with restrictions on the number of karts on track at the same time.	Organised social karting and small scale club level competition. Racing with reduced competitor numbers. Social distancing and density requirements to be observed at all times with requirements the same as Level A.	Full training and competition. Increase to two additional persons per driver. Social distancing and density requirements to be observed at all times.
Lawn bowls	A maximum of 2 people are allowed per green at any one time. All players are to use separate mats and jacks (or ensure that the same player on each rink places mats or places/rolls jacks). Other bowls equipment cannot be shared between players (e.g. bowls, cloths, measures). Coaching should be limited to no more than a coach and one other person at the time and all practicing physical distancing of 1.5 m during the coaching session. No barefoot bowls activity.	A maximum of 10 persons is allowed per green at any one time. Maintain at least 1.5m between players on green. Bowling Clubs may need to have a booking system in place to facilitate (Levels A and B). Bowling Clubs with more than one green need to ensure that compliance is achieved in respect to social gathering restrictions.	Coaching is permitted. Resume normal activities and player numbers but maintain at least 1.5 m between players on green. Barefoot bowls permitted.
Modern Pentathlon	Running/aerobic training (solo), resistance training (solo), skills training (solo). In-water training – open water or own pool only. Solo laser shooting practice at home or shooting technique. Solo laser run practise using at home range with run conducted on property/nearby streets. Horse riding, if horse on own property. Participate in 'virtual' laser shooting and laser run competitions.	Swimming – Use of communal pool with limited numbers, 1 athlete per lane. Laser run practice in small groups, respecting distance on shooting bench.	Full training and competition.
Motorcycling	Recreational motorcycling, limited practice. Individual pit tents in the paddock to be spread out – minimum of 2m between pits. No sharing of bikes, pits, tools or apparel. Social distancing and density requirements to be observed at all times. On-track activity to be organised by the Club with restrictions on the number of riders on track at the same time.	Limited club level competition. Increased spacing on grids/gates. Social distancing and density requirements to be observed at all times with requirements the same as Level A.	Full training and competition. Increase to three additional support persons per rider. Social distancing and density requirements to be observed at all times.
Motor Sports	Limited practice and private testing. Significantly reduced category numbers. Social distancing and hygiene strictly maintained. Minimum of 2m between temporary pit areas, no sharing of pits. No sharing of vehicles, equipment or apparel. Frequent cleaning of tools and touched surfaces.	Competition with reduced numbers per category. Maintain social distancing and hygiene as per Level A.	Full training and competition. Maximum of five person per vehicle team. Maintain social distancing and hygiene as per Level A.

Table 1 (Continued)

Community/individual sports	Level A	Level B	Level C
Netball	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo), including shooting (outdoor or own ring only) or ball skills (e.g. against a wall to self).	Skills using netball passing, shooting, defending. Small group training (not more than 10 athletes/staff in total) based on skills with set drill, but no close contact/defending/attacking/match play drills.	Full training including match play.
Para- Athletes Sports (General)	Para-athletes require individualised consideration and assessment through all Levels (A, B, C) of a return to sport. Some para-athletes will have medical conditions that will require detailed planning and consultation with their regular treating medical team prior to a return to formal training, or progression through Levels A, B, C. Specific para-athlete equipment (e.g. wheelchairs, prostheses) will require regular cleaning (for all levels). For more sport specific guidelines for Levels A, B, C, refer to the relevant sport heading in this document.		
Rowing	Ergometer if access to own at home. Cycling (solo), running (solo), resistance training (solo). On-water single.	Group resistance training sessions and outdoor group ergometer training placed >1.5 m apart (not more than 10 athletes/staff in total). Groups of single sculls.	Full training and competition.
Rugby League	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) including kicking, passing, ball skills (e.g. against wall to self).	Skill drills using a ball, kicking and passing. No tackling/wrestling. Small group (not more than 10 athletes/staff in total) sessions.	Full training and competition.
Rugby Sevens	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) including kicking, passing, ball skills (e.g. against wall to self).	Non-contact skill drills using a ball, kicking and passing. No rucks, mauls, lineouts or scrums, no tackling/wrestling. Non-contact skill drills using a ball, kicking and passing. Small groups (not more than 10 athletes/staff in total) only.ng	Full training and competition.
Rugby Union	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) including kicking, passing, ball skills (e.g. against wall to self).	Skill drills using a ball, kicking and passing. No rucks, mauls, lineouts or scrums, no tackling/wrestling. Small group (not more than 10 athletes/staff in total) sessions.	Full training and competition.
Sailing	Solo or double handlers (if allowed by State/Territory regulations) only.	Full training.	Full training and competition.
Shooting	Training on an outdoor field of play and an indoor firing line for up to two people, while observing appropriate social distancing practices.	Training and competition on an outdoor field of play and an indoor firing line for up to 10 people, while observing appropriate social distancing practices.	Full training and competition.
Skateboarding	Outdoor and solo only, or indoor only if have own facilities.	Full training with appropriate distancing between athletes.	Full training and competition.
Softball	Running/aerobic training (solo), resistance training (solo), skills training (solo).	Small group (not more than 10 athletes/staff in total) skills training.	Full training and competition.
Sport Climbing	Restricted training. Aerobic and resistance training (solo). Climbing on home wall and equipment. Outdoor climbing (if allowed by local government).	Full training. Use of hand sanitiser prior and after the use of each climb/belay station. Use of liquid chalk only. Daily cleaning of floor equipment including bouldering mats.	Full training and competition.
Squash	Solo training drills only - running/aerobic/agility training, resistance training, skills training at home, outdoor or closed courts (not open to others).	Full training on court – singles only. Limited number of players in centre (2 per court).	Full training (with doubles) and competition
Surfing	Solo or with 1 training partner only.	Full training.	Full training and competition.
Swimming	In-water training (solo) in own pool or open-water.	Use of communal pool with limited numbers maintaining social distancing requirements.	Full training and competition.
Table Tennis	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Full training on court, singles or doubles.	Full training and competition.
Taekwondo	Running/aerobic/agility training (solo), resistance training (solo), technical training (solo).	Non-contact technical work with coach, including using pads, paddles, shields. No physical contact or grappling. No kicking of chest guards.	Full training and competition.
Tennis	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) – e.g. serving only, hitting with ball machine.	Full training on court, singles or doubles.	Full training and competition.

Table 1 (Continued)

Community/individual sports	Level A	Level B	Level C
Touch Football	Running/aerobic/agility training/resistance training on own, with coach, or with 1 training partner (no sharing of equipment). Skills training (solo) including ball handling skills (e.g. roll ball, scooping), passing (e.g. against wall to self).	Small group training (not more than 10 athletes/ coaches/parents in total) based on skills with no contact/ defending/attacking/match play drills. No social gatherings and maintain social distancing where possible.	Full training (with doubles) and competition.
Triathlon	Solo or in pairs only. Consider remote programming. In pool water training if access to own pool (consider using swim tether) or open-water only. Consider use of wind trainer and treadmill for those in quarantine (who are medically well).	Avoid cycling in slipstream of others- maintain 10 m from cyclist in front. Avoid packs of >2. Avoid packs of >2 running. Maintain social distancing while running. Use of communal pool with limited numbers, 1 athlete per lane, consider 1 lane between athletes.	Full training and competition.
Volleyball	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Small group (not more than 10 athletes/staff in total) skill sessions only. No matches.	Full training and competition.
Water Polo	In-water training (solo) if access to own pool only, or open-water.	Use of communal pool with limited numbers and distance maintained. Swimming, throwing (passing/shooting) drills. No full contact/defending drills, wrestling.	Full training and competition.
Weightlifting	Resistance training, technical work at home (no indoor sporting facility/gym access allowed).	Full training with limited numbers to avoid congestion.	Full training and competition.
Wheelchair Basketball	Aerobic training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Non-contact shooting, dribbling drills. Other non-contact technical/skill drills. Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Wheelchair Rugby	Aerobic training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Non-contact passing drills on court. Other non-contact technical/skill drills. Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Winter Sports	Running/aerobic/agility training (solo), resistance training (solo), balance training (solo).	Use of institute gym facilities and indoor ice surfaces in small groups (not more than 10 athletes/support staff). Use of acrobatic facilities such as trampoline, bungee and water ramp in small groups with 1 athlete at a time and at least 1.5m distancing to support staff. Limited on snow training dependent on travel restrictions. Small groups widely spaced, no communal living.	Full training and competition dependent on commercial operation of mountain facilities.
Wrestling	Running/aerobic/agility training (solo), resistance training (solo), technical training (solo).	Non-contact skills training. Resistance training in gym, solo mat-based drills (e.g. weighted bags).	Full training and competition.

be a complex process. For high performance/professional sporting organisations, the AIS Framework is considered a minimum baseline of standards required to be met before the resumption of training and competition.

The AIS Framework provide minimum baseline of standards for 'how' high performance/professional sport activities can be reintroduced based on the best available evidence to ensure the safety of athletes/other personnel and the wider community (Fig. 5). If sporting organisations are seeking special exemption to recommence activity, they are required to demonstrate to the respective State/Territory and/or Local Public Health Authorities that they meet the AIS Framework requirements and are also taking additional measures to prevent the spread of COVID-19. Federal, State/Territory and/or Local Public Health Authorities **must** be closely consulted in decisions regarding the resumption of ('when') high performance/professional sport activities. All individuals and sport organisations **must** follow directions of the Local Public Health Authorities.

### 10.1. Preparation for sports resumption

Prior to a resumption of formal training activity, individual sport organisations and CMOs should begin preparing athletes, other personnel, and the sporting environment for a safe return. A thorough risk assessment must be carried out. A resumption of formal training should not occur until appropriate measures are implemented. The required measures will be specific to the sport and the training environment.

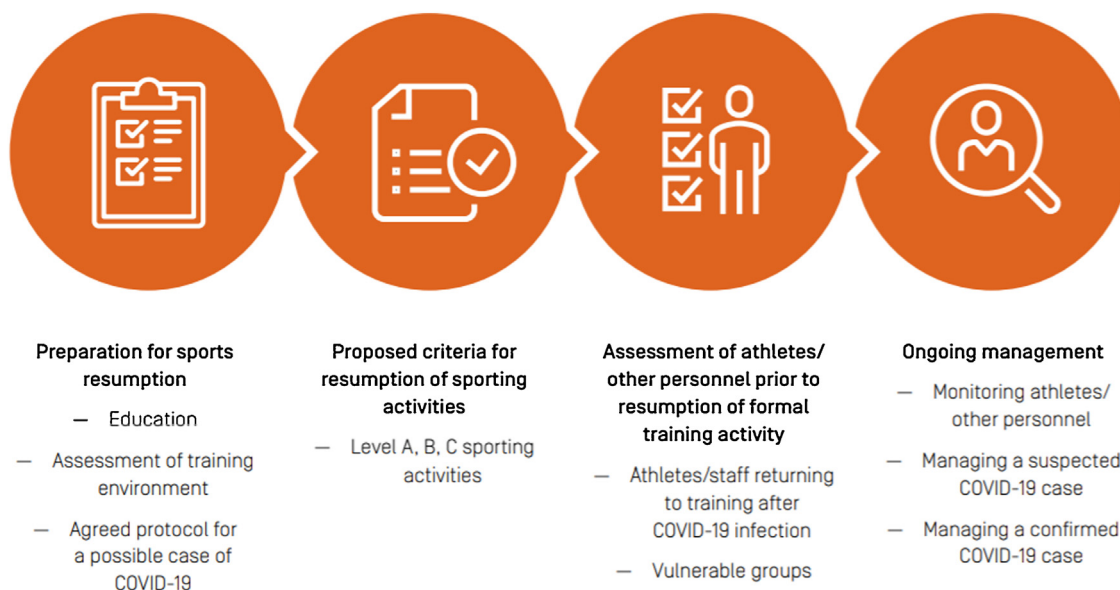
#### 10.1.1. Education

To reduce the risk of COVID-19, education of athletes and other personnel about risk mitigation strategies is crucial. It should not be presumed that athletes and other personnel have an accurate appreciation of the health risks. Education will help to promote and set expectations for the required behaviours prior to recommencing activities. A structured process to improve health literacy around COVID-19.

Possible education measures include:

**Table 2**  
Organ systems affected by COVID-19 in the acute phase and recommended assessment considerations for athlete and other personnel returning to sport environment.

Organ system	Acute complications associated with COVID-19	Potential implications for returning athletes/other personnel	Assessment and investigation considerations
Respiratory	Pneumonia- Lung abnormalities have been seen on CT chest of symptomatic and asymptomatic cases <sup>57,122,123</sup> ARDS <sup>124</sup>	Reduced aerobic capacity and increased respiratory distress Potential persisting restrictive lung patterns and reduced diffusion capacity These long-term respiratory complications been reported follow previous coronavirus epidemics (SARS, MERS) in non-athlete populations <sup>119</sup>	Clinical assessment Graded exercise testing, VO <sub>2</sub> max testing FBE, CRP, spirometry, lung ultrasound, chest X-ray, CT chest Respiratory review
Cardiovascular	Cardiomyopathy <sup>47</sup> Myocarditis <sup>125</sup> Pericardial effusion <sup>126</sup> Arrhythmias <sup>45,125</sup> Autoimmune mimicry of vasculitis and thrombosis <sup>49,127</sup>	A return to exercise with underlying cardiac complications could be contraindicated for some <sup>120</sup> Return to contact sports/trauma could be contraindicated for some Persisting inflammatory states	Clinical assessment 12-lead ECG, troponins, coagulation profile, CRP, echocardiogram, cardiac MRI D-dimer, ferritin, C-reactive protein, erythrocyte sedimentary rate Cardiology review
Neurological	Multiple symptoms and signs have been described <sup>66</sup> Guillain-Barré syndrome <sup>128</sup> Elevated D-dimer <sup>129,130</sup> Stroke <sup>131</sup> Encephalopathy <sup>132</sup>	Currently unclear as the neurological sequelae from mild to moderate cases is yet to be elucidated Post intensive care syndrome	Clinical assessment FBE, D-dimer, MRI brain Neurology review
Gastrointestinal/hepatic	Deranged liver function tests (LFTs) <sup>133</sup> Some acute COVID-19 cases present with gastrointestinal and respiratory symptoms	Consider COVID-19 in patients presenting with combined respiratory and gastrointestinal symptoms <sup>133</sup> Increased risk from hepatically excreted medications	Clinical assessment LFTs Gastroenterology review
Renal	Acute renal impairment <sup>134</sup>	Persistent subclinical renal impairment could be a risk on returning to high intensity training.	Clinical assessment UECs, urine dipstick/specific gravity Renal review
Fatigue	Commonly associated with viraemia	Post-viral fatigue is known to occur following other viral infections <sup>135</sup> and may occur with COVID-19	Monitoring of self-report measures, fatigue symptoms and training loads
Mental health	Symptoms of depression and anxiety <sup>114</sup> Both were more common in patients with less social support <sup>113</sup>	Potential increased risk of post-traumatic stress disorder (PTSD), depression, anxiety <sup>120</sup> Persistent depression and anxiety have been reported following previous coronavirus epidemics in non-athletic populations	Clinical assessment Screening questionnaires Psychology review and psychiatrist review



**Fig. 5.** Framework for resumption of sport in a COVID-19 environment.

- Mandatory completion of Australian Government COVID-19 infection control training module for all medical staff. This module is designed for doctors, nurses and allied health personnel working in a medical/health setting
  - The module completion certificate should be a requirement for relevant support staff before returning on site to training facilities
- Provide education material for athletes and other personnel to promote required behaviours (e.g. regular and thorough hand-washing, covering mouth and nose with a tissue or sleeve during coughing/sneezing). Suggested Australian Government and WHO resources:
  - Good hygiene for coronavirus (COVID-19)
  - Hand washing guidance

- Keep that cough under cover
- Self-isolation (self-quarantine) for coronavirus (COVID-19)
- Advice for people at risk of coronavirus (COVID-19)
- Coronavirus (COVID-19) resources
- Display appropriate education material within sporting environments and facilities. Suggested Australian Government and WHO resources:
  - Good hygiene practices poster for businesses
  - Good hygiene is in your hands
  - Hand washing guidance
  - Keep that cough under cover
- Education of high performance/professional athletes and other personnel on hygiene practices and promote required behaviours relevant to their sport and environment
  - No sharing of drink bottles and towels
  - No sharing of mats, or equipment without an appropriate cleaning protocol, in between training sessions
- Recommend high performance/professional athletes and other personnel download the Australian Government COVID-19 contact tracking app (COVIDSafe), to reduce the risk of COVID-19 spread to the community and/or sport.

#### 10.1.2. Assessment of training environment

The specific considerations for a safe resumption of formal training will be dependent on the sport and the environment. Considerations are:

- Number of athletes and other personnel
  - What training can still be adequately be done from home?
  - How can training be staggered to minimise numbers and reduce contact?
  - What staff can continue to work from home?
- Cleaning
  - What sporting equipment will athletes be sharing?
    - »e.g. gymnastics apparatus, balls, training equipment such as skipping ropes, weights, mats
  - What are the shared facilities?
    - »e.g. bathrooms/change rooms, recovery areas, medical and physical therapy beds and equipment, and swimming pools
    - »What is the protocol and frequency of cleaning shared facilities?
    - »Suggested Australian Government resources for environmental cleaning and disinfection principles in a healthcare setting
      - (1) In a health care setting
      - (2) Routine household cleaning
- Handwashing facilities
  - Are there any facilities to regularly wash hands?
  - How many sanitising hand rub dispensers are required in prominent places around the facility/event?
    - »How often should they be refilled?
- **'Get in, train and get out'**. Strategies to limit time and person-to-person contact on site should be implemented
  - Arrive dressed and ready to train
  - Minimise use of change rooms, bathrooms and communal areas
  - Where possible, athletes showering at home instead of at training venues
  - Athletes/other personnel should eat off site
  - Between training efforts, maintain at least 1.5 m apart (e.g. in the gym, pool, between sets or efforts)
  - Any tasks that can be done at home, should be done at home (e.g. recovery sessions, online meetings)
- Organisation of high performance/professional sporting activities
  - What spaces can be used for isolation if athlete/other personnel becomes unwell?

- What is the strategy to ensure that social distancing of at least 1.5 m is maintained by athletes and other personnel attending training or competition?
- What strategies can be used to communicate/inform athletes and other personnel of preventive actions?
- What is the strategy to reduce in-person contact between athletes and other personnel?
- What is the strategy to manage increased levels of staff absences?
- What is the strategy to reduce risk to vulnerable groups?

#### 10.1.3. Agreed protocol for a possible case of COVID-19

In an environment of community transmission of COVID-19, any individual with respiratory symptoms should be considered a possible case of COVID-19. Sporting organisations must have a clear protocol for managing unwell athlete/other personnel as a potential COVID-19 case until COVID-19 has been excluded and they have been medically cleared by a doctor to return to the training environment. All athletes/other personnel must be made aware not to attend sport environments if they are unwell with any of the following symptoms, even if only mild:

- Cough
- Sore throat
- Fever (e.g. night sweats or chills)
- Shortness of breath.

Sport organisations should refer to local State/Territory guidelines on the assessment process for a possible case. A doctor must make decisions about investigations, treatment, and management. Unwell athletes/other personnel must always call ahead before attending for assessment. Importantly, an athlete with a possible respiratory tract infection should refrain from training (even at home) until they have been cleared to do so by a doctor, given the potential for worsening illness. Successful implementation of the management plan includes effective communication to ensure athletes/other personnel understand the importance and implications.

#### 10.2. Proposed criteria for resumption of sporting activity

Initial resumption of sporting activity will be governed by public health policy and Federal, State/Territory Government directives. It is worth noting that different States/Territories may permit the resumption of some sporting activities at different times, dependent on local COVID-19 transmission, resources and other variables influencing local policy. Even within a State/Territory there could be geographical variability. Outbreaks or clusters may result in a local shutdown (e.g. ring fence). Resumption of sporting activity may not be linear. Relaxing/increasing restrictions may be required in response to fluctuating numbers of COVID-19 cases.

An initial resumption of sporting activity is dependent on several factors:

- A sustained decrease in COVID-19 transmission
- Healthcare system capacity
- Individual circumstances of sports organisation and risk assessment.

Three levels (Levels A, B, C) of sporting activities are recommended in the context of a COVID-19 environment (Table 3). For each level, permitted activities, general hygiene measures, and medical servicing considerations are provided as minimum baseline of standards required to be met by high performance/professional sport before the resumption of training and competition. Sport-specific activities has been developed in conjunction with CMOs and other staff working within sport (Table 3).



**Table 3**  
Description of minimum baseline of standards for Level A, B, C activities for high performance/professional sport. Please note that it has not been possible to include every sport in this table. For sports that are not listed in the table, please base your sport activities on the recommendations made for a similar sport.

High performance sports	Level A	Level B	Level C
General description	<p>Activity that can be conducted by a solo athlete or by pairs where at least 1.5 m can always be maintained between participants.</p> <p>No contact between athletes and/or other personnel.</p> <p>Examples for all sports – general fitness aerobic and anaerobic (e.g. running, cycling sprints, hills).</p> <p>Strength and sport-specific training permitted if no equipment required, or have access to own equipment (e.g. ergometer, weights).</p> <p>Online coaching and resources (e.g. videos, play books).</p>	<p>As per Level A plus:</p> <p>Indoor/outdoor activity that can be conducted in small groups (not more than 10 athletes and/or other personnel in total) and with adequate spacing (1 person per 4m<sup>2</sup>).</p> <p>Some sharing of sporting equipment permitted such as kicking a football, hitting a tennis ball, use of a skipping rope, weights, mats.</p> <p>Non-contact skills training. Accidental contact may occur but no deliberate body-contact drills. No wrestling, holding, tackling or binding.</p>	<p>As per Level B plus:</p> <p>Full sporting activity that can be conducted in groups of any size including full contact (competition, tournaments, matches). Wrestling, holding, tackling and/or binding (e.g. rugby scrums) permitted.</p> <p>For larger team sports, consider maintaining some small group separation at training.</p> <p>For some athletes full training will be restricted by commercial operation of facilities and access to international travel.</p>
General hygiene measures	<p>No sharing of exercise equipment or communal facilities.</p> <p>Apply personal hygiene measures even when training away from group facilities – hand hygiene regularly during training (hand sanitisers) plus strictly pre and post training.</p> <p>Do not share drink bottles or towels.</p> <p>Do not attend training if unwell (contact doctor).</p> <p>Spitting and clearing of nasal/respiratory secretions on ovals or other sport settings must be strongly discouraged.</p>	<p>Communal facilities can be used after a sport-specific structured risk assessment and mitigation process is undertaken.</p> <p><b>'Get in, train and get out'</b> – be prepared for training prior to arrival at venue (minimise need to use/gather in change rooms, bathrooms). Minimise use of communal facilities (e.g. gym, court) with limited numbers (not more than 10 athletes and other personnel in total). Have cleaning protocols in place for equipment and facilities.</p> <p>Hand hygiene (hand sanitisers) on entry and exit to venues, as well as pre, post and during training. Thorough full body shower with soap before and after training (preferably at home). Where possible maintain distance of at least 1.5 m while training.</p> <p>No socialising or group meals.</p> <p>Do not share drink bottles or towels.</p> <p>Do not attend training if unwell (contact doctor).</p> <p>Spitting and clearing of nasal/respiratory secretions on ovals or other sport settings must be strongly discouraged.</p>	<p>Return to full use of training facilities. Continue hygiene and cleaning measures as per Level B.</p> <p>Limit unnecessary social gatherings.</p> <p>Do not share drink bottles or towels.</p> <p>Do not attend training if unwell (contact doctor).</p> <p>Spitting and clearing of nasal/respiratory secretions on ovals or other sport settings must be strongly discouraged.</p>
Medical Servicing	<p>All consultations undertaken via telehealth unless face to face is considered urgent. Avoid all routine and non-essential manual therapy.</p> <p>Five Moments for Hand Hygiene must be used to minimise the risk of transmission between health professionals and patients.</p> <p>Hygiene practises to include no bed linen except single use towels, cleaning treatment beds and key surfaces after each athlete. Minimum contact of non-essential surfaces to occur and hands on treatment should be kept to essential only.</p>	<p>History taking, or full consultations should be conducted via telehealth if practical. Face to face consults should be conducted from at least 1.5 m apart when possible, and hands on treatment should be for essential conditions only. A single source therapist is recommended.</p> <p>Hygiene practises to include no bed linen except single use towels, cleaning treatment beds and key surfaces after each athlete.</p> <p>Five Moments for Hand Hygiene must be used to minimise the risk of transmission between health professionals and patients.</p> <p>During any essential manual therapy, it is recommended that the athlete and practitioner wear a face mask. All non-essential athletes and other personnel should avoid the treatment area, and the number of people in treatment areas should be kept to a minimum, following social distancing guidelines.</p>	<p>Full manual therapy services can be conducted. Non-essential athletes and other personnel should continue to avoid treatment areas. Enhanced hygiene measures and social distancing should be maintained.</p>
Archery	Outdoor range and solo only.	Full training indoor or outdoor range, with limited numbers/appropriate distancing between athletes.	Full training and competition.
Artistic Swimming	Solo training drills only- land based, in own pool or open-water. General fitness, strength work.	Swimming (own lane). In pool solo technical drills or group technical drills without physical contact. No lifting, holding.	Full training and competition.
Athletics	Outdoor training sessions on own, with coach, or with 1 training partner (no sharing of equipment e.g. javelin, discus, high-jump mats, pole vault, shot put, hammer, starting blocks).	Full training and competition. Avoid running in slipstream of others.	Full training and competition. Competition – Multi Event rooms remain a risk and time spent here should be minimised with adequate space/separation. Similarly, call rooms pre event will need to be restructured.

Table 3 (Continued)

High performance sports	Level A	Level B	Level C
Badminton	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Full training on court, singles or doubles.	Full training and competition.
Basketball	Running/aerobic/agility training (solo), resistance training (solo), skills training and shooting drills (solo) at home or outdoor (no indoor sporting facility access allowed). No ball handling drills with others.	Non-contact skills using basketball – passing, shooting, defending, screens and team structure (offence and defence). Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Boccia	Essential for all athletes to have clearance by their individual specialist medical team prior to any return to training, acknowledging increased vulnerability in many athletes. Specific attention to increased cleaning of equipment, social distancing (where possible) and consideration of delay of return to sport.		
Boxing	Running/aerobic/agility training (solo), resistance training (solo), technical training (solo). Bag work if access to own equipment, without anyone else present.	Shadow sparring allowed. Non-contact technical work with coach, including using bag, speedball, pads, paddles, shields. No contact or sparring.	Full training and competition.
Canoeing	Running/aerobic training (solo), resistance training (solo), on-water training (solo).	No contact. No team boat training. 1 person per boat	Full training and competition.
Cycling	Solo outdoor cycling or trainer, resistance training (solo).	Avoid cycling in slipstream of others- maintain 10 m from cyclist in front. Avoid packs of greater than two (including motorcycle deryn). Full training, with 1 athlete per board/platform (or 2 if synchro training).	Full training and competition.
Diving	On-land training only (solo).	Full training.	Full training and competition.
Equestrian	Solo/pairs training only.	Full training.	Full training and competition.
Fencing	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo). No bouts with others. Solo footwork practice (steps, lunges, fleshes). Pointwork – using cushion/board to practice fine motor skills of point work with sword.	Full training. Ensure no shared masks. No shaking hands post bout.	Full training and competition.
Field Hockey	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) if access to appropriate surface available.	Non-contact skills training drills in small groups (not more than 10 athletes/staff in total).	Full training and competition.
Football (Soccer)	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo).	Non-contact skill training drills – passing, shooting, headers. Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Goalball	Solo aerobic and resistance training at home or outdoors.	Non-contact passing/technical skills and other training in small groups (not more than 10 athletes/staff in total).	Full training and competition.
Golf	Solo or pairs only (if permitted by local Government). Maintain at least 1.5m between players.	Full training. Maintain at least 1.5m between players.	Full training and competition. Maintain at least 1.5m between players where possible.
Gymnastics	Resistance training, skills training solo and outside of gym only. Rhythmic – skills at home. Trampoline – off apparatus skills, drills at home only.	Small groups only – 1 gymnast per apparatus (including rhythmic and trampoline). Disinfecting high touch surfaces as per the manufacturer's guidelines.	Full training and competition.
Handball	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Skill drills – passing, shooting, defending. No contact drills. Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Judo	Running/aerobic/agility training (solo), resistance training (solo), technical training (solo)- e.g. mirror work.	No contact/bouts. Non-contact shadow training.	Full training and competition.
Karate	Running/aerobic/agility training (solo), resistance training (solo), technical training (solo)- e.g. mirror work.	Non-contact technical work with coach. No contact/bouts. Shadow sparring. Non-contact technical work with coach, including using pads, paddles.	Full training and competition.

Table 3 (Continued)

High performance sports	Level A	Level B	Level C
Karting	Organised social karting – recreational karting and on-track practice. Individual pit tents in the paddock to be spread out – minimum of 2m between pits. No sharing of karts, pits, tools or apparel. Social distancing and density requirements to be observed at all times. On-track activity to be organised by the Club with restrictions on the number of karts on track at the same time.	Organised social karting and small scale club level competition. Racing with reduced competitor numbers. Social distancing and density requirements to be observed at all times with requirements the same as Level A.	Full training and competition. Increase to two additional persons per driver. Social distancing and density requirements to be observed at all times.
Lawn bowls	A maximum of 2 people are allowed per green at any one time. All players are to use separate mats and jacks (or ensure that the same player on each rink places mats or places/rolls jacks). Other bowls equipment cannot be shared between players (e.g. bowls, cloths, measures). Coaching should be limited to no more than a coach and 1 other person at the time and all practicing physical distancing of 1.5 m during the coaching session. No barefoot bowls activity.	A maximum of 10 persons is allowed per green at any one time. Maintain at least 1.5m between players on green. Bowling Clubs may need to have a booking system in place to facilitate (Levels A and B). Bowling Clubs with more than 1 green need to ensure that compliance is achieved in respect to social gathering restrictions.	Coaching is permitted. Resume normal activities and player numbers (including competition) but maintain at least 1.5 m between players on green. Barefoot bowls permitted.
Modern Pentathlon	Running/aerobic training (solo), resistance training (solo), skills training (solo). In-water training – open water or own pool only. Solo laser shooting practice at home or shooting technique. Solo laser run practise using at home range with run conducted on property/nearby streets. Horse riding, if horse on own property. Participate in 'virtual' laser shooting and laser run competitions.	Swimming – use of communal pool with limited numbers, 1 athlete per lane. Laser run practice in small groups, respecting distance on shooting bench.	Full training and competition.
Para-Athletes Sports (General)	Para-athletes require individualised consideration and assessment through all Levels (A, B, C) of a return to sport. Some para-athletes will have medical conditions that will require detailed planning and consultation with their regular treating medical team prior to a return to formal training, or progression through Levels A, B, C. Specific para-athlete equipment (e.g. wheelchairs, prostheses) will require regular cleaning (for all levels). For more sport specific guidelines for Levels A, B, C, refer to the relevant sport heading in this document.		
Rowing	Ergometer if access to own at home. Cycling (solo), running (solo), resistance training (solo). On-water single.	Group resistance training sessions and outdoor group ergometer training placed at least 1.5 m apart (not more than 10 athletes/staff in total). Groups of single sculls.	Full training and competition.
Rugby Sevens	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) including kicking, passing, ball skills (e.g. against wall to self).	Non-contact skill drills using a ball, kicking and passing. No rucks, mauls, lineouts or scrums, no tackling/wresting. Small groups (not more than 10 athletes/staff in total) only.	Full training and competition.
Sailing	Solo or double handlers (if allowed by State/Territory regulations) only.	Full training.	Full training and competition.
Shooting	Aerobic/resistance training (solo), technical skills (solo)- e.g. standing/holding and dry firing. Mental skills training- e.g. concentration/reaction time, visualisation, arousal control). Live fire on home ranges only (no club range access).	Continuation of athlete-led preparation at home. Coach-led training including live fire in small groups at authorised venues (i.e. clubs/ranges).	Full training and competition.
Skateboarding	Outdoor and solo only, or indoor only if have own facilities.	Full training with appropriate distancing between athletes.	Full training and competition.
Softball	Running/aerobic training (solo), resistance training (solo), skills training (solo).	Small group (not more than 10 athletes/staff in total) skills training.	Full training and competition.

Table 3 (Continued)

High performance sports	Level A	Level B	Level C
Sport Climbing	Restricted training. Aerobic and resistance training (solo). Climbing on home wall and equipment. Outdoor climbing (if allowed by local government).	Full training. Use of hand sanitiser prior and after the use of each climb/belay station. Use of liquid chalk only. Daily cleaning of floor equipment including bouldering mats.	Full training and competition.
Squash	Solo training drills only - running/aerobic/agility training, resistance training, skills training at home, outdoor or closed courts (not open to others).	Full training on court – singles only. Limited number of players in centre (2 per court).	Full training (with doubles) and competition.
Surfing	Solo or with 1 training partner only.	Full training.	Full training and competition.
Swimming	In-water training (solo) in own pool or open-water.	Use of communal pool with limited numbers maintaining social distancing requirements.	Full training and competition.
Table Tennis	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Full training on court, singles or doubles.	Full training and competition.
Taekwondo	Running/aerobic/agility training (solo), resistance training (solo), technical training (solo).	Non-contact technical work with coach, including using pads, paddles, shields. No physical contact or grappling. No kicking of chest guards.	Full training and competition.
Tennis	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) e.g. serving only, hitting with ball machine.	Full training on court, singles or doubles.	Full training and competition.
Triathlon	Solo or in pairs only. Consider remote programming. In pool water training if access to own pool (consider using swim tether) or open- water only. Consider use of wind trainer and treadmill for those in quarantine (who are medically well).	Avoid cycling in slipstream of others- maintain 10 m from cyclist in front Avoid packs of >2. Avoid packs of >2 running. Maintain social distancing while running. Use of communal pool with limited numbers, 1 athlete per lane, consider 1 lane between athletes.	Full training and competition.
Volleyball	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Small group (not more than 10 athletes/staff in total) skill sessions only. No matches.	Full training and competition.
Water Polo	In-water training (solo) if access to own pool only, or open-water.	Use of communal pool with limited numbers and distance maintained. Swimming, throwing (passing/shooting) drills. No full contact/defending drills, wrestling.	Full training and competition.
Weightlifting	Resistance training, technical work at home (no indoor sporting facility/gym access allowed).	Full training with limited numbers to avoid congestion.	Full training and competition.
Wheelchair Basketball	Aerobic training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Non-contact shooting, dribbling drills. Other non- contact technical/skill drills. Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Wheelchair Rugby	Aerobic training (solo), resistance training (solo), skills training (solo) at home or outdoor (no indoor sporting facility access allowed).	Non-contact passing drills on court. Other non-contact technical/skill drills. Small groups (not more than 10 athletes/staff in total).	Full training and competition.
Winter Sports	Running/aerobic/agility training (solo), resistance training (solo), balance training (solo).	Use of institute gym facilities and indoor ice surfaces in small groups (not more than 10 athletes/support staff). Use of acrobatic facilities such as trampoline, bungee and water ramp in small groups with 1 athlete at a time and at least 1.5 m distancing to support staff. Limited on snow training dependent on travel restrictions. Small groups widely spaced, no communal living.	Full training dependent on commercial operation of mountain facilities and access to international travel.
Wrestling	Running/aerobic/agility training (solo), resistance training (solo), technical training (solo).	Non-contact skills training. Resistance training in gym, solo mat-based drills (e.g. weighted bags).	Full training and competition.
<b>Professional Sports (unless exemptions granted by relevant Public Health Authorities)</b>			
American Football	Running, resistance training (solo), skills training (solo).	Passing, kicking, catching drills. No tackling or grappling. Small groups (not more than 10 athletes/staff in total).	Full training and competition.

Table 3 (Continued)

High performance sports	Level A	Level B	Level C
Australian Rules Football	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) including kicking, handballing, ball handling skills (e.g. handball against wall, bouncing, ball recovery work).	Controlled kicking, marking and handball drills. No tackling/wrestling, contact, body on body drills. Small groups (not more than 10 athletes/staff in total) for both education and training.	Full training and competition. Consider maintaining some small group separation (e.g. mids, forwards and backs).
Baseball	Running/aerobic training (solo), resistance training (solo), skills training (solo).	Full training with small numbers (not more than 10 athletes/staff in total).	Full training and competition.
Cricket	Running/aerobic training (solo), resistance training (solo), skills training (solo).	Nets – batters facing bowlers. Limit bowlers per net. Fielding sessions-unrestricted. No warm up drills involving unnecessary person to person contact. No shining cricket ball with sweat/saliva during training.	Full training and competition. No ball shining with sweat/saliva in training.
Motorcycling	Recreational motorcycling, limited practice. Individual pit tents in the paddock to be spread out – minimum of 2m between pits. No sharing of bikes, pits, tools or apparel. Social distancing and density requirements to be observed at all times. On-track activity to be organised by the club with restrictions on the number of riders on track at the same time.	Limited club level competition. Increased spacing on grids/gates. Social distancing and density requirements to be observed at all times with requirements the same as Level A.	Full training and competition. Increase to three additional support persons per rider. Social distancing and density requirements to be observed at all times.
Motor Sports	Limited practice and private testing. Significantly reduced category numbers. Social distancing and hygiene strictly maintained. Minimum of 2m between temporary pit areas, no sharing of pits. No sharing of vehicles, equipment or apparel. Frequent cleaning of tools and touched surfaces.	Competition with reduced numbers per category. Maintain social distancing and hygiene as per Level A.	Full training and competition. Maximum of five person per vehicle team. Maintain social distancing and hygiene as per Level A.
Netball	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo), including shooting (outdoor or own ring only) or ball skills (e.g. against a wall to self).	Skills using netball passing, shooting, defending. Small group training (not more than 10 athletes/staff in total) based on skills with set drill, but no close contact/defending/attacking/match play drills.	Full training including match play.
Rugby League	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) including kicking, passing, ball skills (e.g. against wall to self).	Skill drills using a ball, kicking and passing. No tackling/wrestling. Small group (not more than 10 athletes/staff in total) sessions.	Full training and competition.
Rugby Union	Running/aerobic/agility training (solo), resistance training (solo), skills training (solo) including kicking, passing, ball skills (e.g. against wall to self).	Skill drills using a ball, kicking and passing. No rucks, mauls, lineouts or scrums, no tackling/wrestling. Small group (not more than 10 athletes/staff in total) sessions.	Full training and competition.

### 10.3. Recommended assessment of athletes/staff prior to resumption of formal training

An athlete/staff member must not join the training environment if in the last 14 days they have been unwell or had contact with a known or suspected case of COVID-19. Sport organisations must be proactive and ensure all athletes/staff have been medically cleared prior to return to the training environment (Fig. 6). Clearance and management procedures for those affected by COVID-19 must at all times comply and be aligned with the advice of Federal, State/Territory and/or Local Public Health Authorities. Any special arrangements for deviation from standard clearance and management procedures must be prospectively agreed to by relevant Federal, State/Territory and/or Local Public Health Authorities.

Progression from Level A to Level B sporting activities will be permitted when the local effective reproduction number ( $R_t$ ) has remained  $<1$  for two incubation periods (i.e. four weeks) as determined by Public Health Authorities.<sup>36,115</sup> When sport activity has been at level B for a further two incubation cycles without an increase in  $R_t$ , progression to Level C sporting activities can be considered, in consultation with Public Health Authorities. The timing of the progression from Level B to Level C may be influenced by any evidence of transmission issues within the sporting cohort.

The assessment process will depend on multiple factors including medical resources, athlete risk factors and sport-specific risk factors. It may be appropriate for an initial screening to be

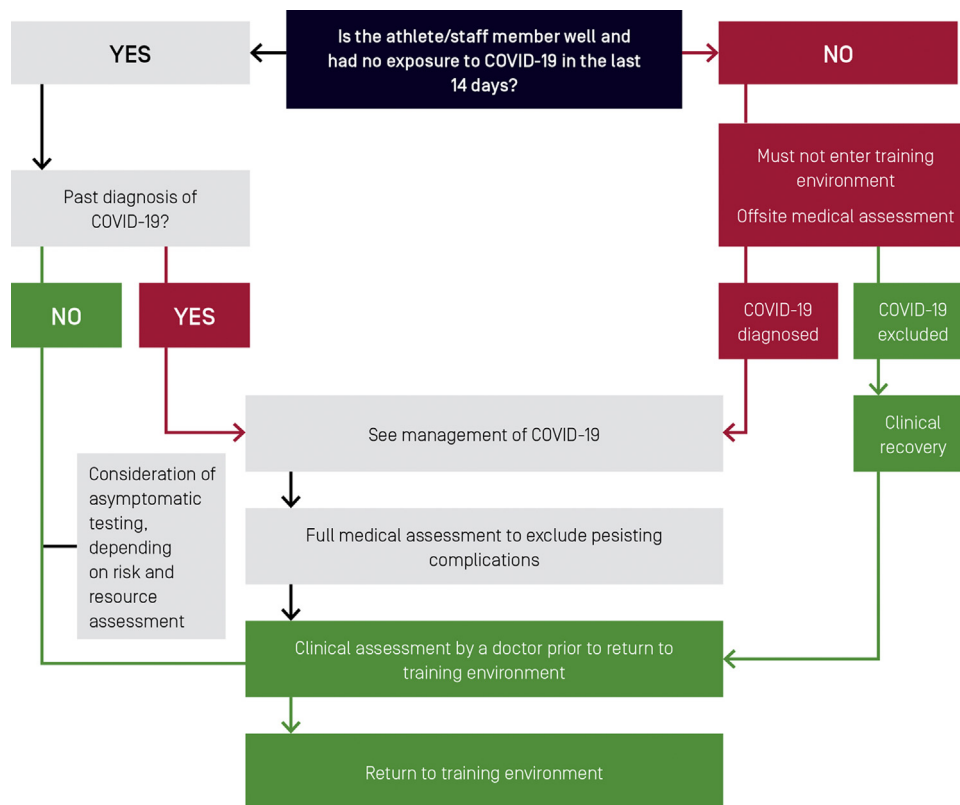


Fig. 6. The recommended process for medical clearance of athletes/staff.

conducted via telehealth, with follow up examination and investigations as required. Clinical assessment could include:

- Clinical history to confirm absence of respiratory symptoms and relevant risk factors (e.g. exposure to known COVID-19 case)
- Physical examination including vital signs and systems review
- Blood tests including, but not limited to full blood examination (FBE), C-reactive protein (CRP) and ferritin
- PCR and/or antibody testing used as a screening tool in otherwise well individuals without any known risk factors will have extremely low yield in an environment of low COVID-19 prevalence
- In exceptional circumstances, sporting organisations could give consideration to PCR testing to detect asymptomatic carriage or antibody testing to identify prior exposure to SARS-CoV-2
- No PoC testing for COVID-19 (PCR or antibody) should be conducted without prior approval of the relevant Public Health Authority
- There is currently no evidence that people who have recovered from COVID-19 and have antibodies are protected from a second infection<sup>72</sup>
- A general musculoskeletal review, and counselling on the risk of injury if they have not been able to train during the social isolation period, given the known risk of injuries associated with sudden increase in training loads.<sup>116</sup>

### 10.3.1. Vulnerable groups

Vulnerable groups such as para-athletes and others with medical conditions may be at increased risk. Those with concomitant medical conditions need individualised management in consultation with their regular treating doctor(s) prior to return to training environments. Considerations include increased susceptibility to respiratory infections, unique equipment (e.g. wheelchairs) that

requires cleaning, accessibility of medical resources, risk of medical sequelae from COVID-19, and access to alternate training options.

Athletes/other personnel with concurrent medical conditions including; respiratory or cardiac disease, hypertension, diabetes,<sup>117,118</sup> obesity<sup>54</sup> and immunosuppression due to disease or medication may be at increased risk. Other groups that require special consideration include; individuals over 70 years of age, carers for or a household contact of a vulnerable person, athletes with suboptimal access to medical care (e.g. remote) and Aboriginal and Torres Strait Islander Communities.

Potential interventions for vulnerable athletes/other personnel include:

- Delaying a return to sport
- Training scheduled at designated 'lower risk' times (i.e. with no one else around)
- Staff working off-site where possible
- Maintaining social distancing measures
- Exclusion of 'high risk' athletes/other personnel from the training environment.

### 10.3.2. Athletes/staff returning to sport after COVID-19 infection

There will be athletes/other personnel who have been infected with COVID-19 wanting to return to the sport environment. Some individuals may have been infected and not be aware (asymptomatic or minimally symptomatic cases that did not meet testing criteria at the time of illness). Athletes/other personnel who have recovered from COVID-19 must satisfy the Communicable Disease Network of Australia (CDNA) criteria.<sup>70</sup>

While there is growing research on the organ systems affected by COVID-19 in the acute phase, there is currently limited research on medium to long-term complications. Long-term decreased exercise capacity has been noted following previous coronavirus infections (SARS and MERS).<sup>119</sup> Athletes and other personnel with

physical roles may be at increased risk of health complications after COVID-19 and warrant multidisciplinary specialist medical assessment before resuming high exertion activities.<sup>120,121</sup> Medical clearance of staff may be conducted by the sport, or by external doctors, depending on the individual sport organisation resources and policies. An outline of the recommended assessment process following a COVID-19 case is illustrated in Table 2.

#### 10.4. Ongoing management

Once training has resumed, it is important that a structured monitoring process is in place to ensure early detection of illness within the training group.

##### 10.4.1. Monitoring of athletes/other personnel

Athletes/other personnel should be educated regarding early reporting of respiratory symptoms.

- For sports utilising daily wellness monitoring, adding a respiratory symptoms checklist, with automated follow up of reported symptoms, should be considered.
- If medical resources are available, regular screening (brief symptom check, resting heart rate and temperature) of athletes should be considered.

##### 10.4.2. Managing a suspected COVID-19 case

In Australia, currently most respiratory tract infections will be tested for COVID-19. If an individual is being tested for COVID-19:

- They must immediately self-isolate and discontinue training until COVID-19 has been excluded and they have been medically cleared by a doctor to return to the sport environment
- Isolation of close contacts will be a decision for medical staff, based on case specific details.

Definition of close contacts:

- “Face-to-face contact in any setting with a confirmed or probable case, for greater than 15 min cumulative over the course of a week, in the period extending from 48 h before onset of symptoms in the confirmed or probable case, or
- Sharing of a closed space with a confirmed or probable case for a prolonged period (e.g. more than 2 h) in the period extending from 48 h before onset of symptoms in the confirmed or probable case
- Contact is considered to have occurred within the period extending 48 h before onset of symptoms in the patient, until the patient is classified as no longer infectious by the treating team (usually 24 h after the resolution of symptoms)”.<sup>70</sup>

##### 10.4.3. Managing a confirmed COVID-19 case

COVID-19 is a notifiable disease and Local Public Health Authorities must be informed. Training facilities may be closed on the instruction of the Local Public Health Authority or the CMO. Re-opening of the training facility should only occur after close consultation with the Local Public Health Authority.

#### 10.5. Medical servicing considerations

General principles for the provision of medical services should consider:

- All non-essential athletes and other personnel should avoid treatment areas, and the number of people in treatment areas should

be kept to a minimum in accordance with the social distance guidelines

- Five moments of hand hygiene must be used to minimise the risk of transmission between health professionals and patients<sup>136</sup>
- Hygiene practices should include no bed linen except single use towels, cleaning treatment beds and key surfaces before/after every patient
- For manual therapy treatment or massage, it is recommended that the athlete and therapist wear a face mask. The therapist must wash their hands before and after treatment, and the athlete should shower before and after treatment
- If unwell, practitioners must not attend work/treat an athlete. Practitioners with respiratory symptoms/illness must be tested for COVID-19 and cleared by a doctor.
- Unwell athletes should be instructed to see a doctor and must not receive any other type of medical servicing such as assessment for injury (unless urgent) or manual therapy until cleared to do so.

Detailed description of medical service considerations pertaining to Level A, B, C sporting activity is illustrated in Table 3. Core principles:

- During Level A sporting activity
  - Medical or Allied Health consultations should be conducted via telehealth unless face-to-face consultation is considered essential
  - Avoid all routine and non-essential manual therapy
- During Level B sport activity
  - If possible, history taking, or full consultations should be conducted via telehealth
  - Face to face consults should be conducted from 1.5 m apart when possible, and hands on treatment should be for essential conditions only
  - A single source of therapist is recommended
  - During any essential manual therapy, it is recommended that the athlete and practitioner wear a face mask
- During Level C sporting activity
  - Routine hygiene measures must be maintained.

## 11. Conclusions

COVID-19 has had devastating effects on communities globally, leading to significant restrictions on all sectors of society, including sport. In a COVID-19 environment, sport has an important role to play in restoring normality. Sport Organisations and athletes will be faced with complex decisions regarding resumption of training activities in the current circumstances. ‘The AIS Framework for Rebooting Sport in a COVID-19 Environment’ is based on current available evidence, extrapolated into the sporting context by specialists in sport and exercise medicine, infectious diseases and public health. The AIS Framework provides a timely tool for sport organisations to guide the cautious and methodical resumption of sport activity (the ‘**how**’). Decisions regarding resumption of sporting activity must be based on objective medical information regarding the transmission of COVID-19. Federal, State/Territory and/or Local Public Health Authorities must be closely consulted in decisions regarding the timing of resumption of sport (the ‘**when**’). The AIS Framework will be updated to reflect the evolving evidence regarding COVID-19. While navigating the return to sport, organisations must ensure that the health and wellbeing of athletes and other personnel informs decision making. The overriding priority for sport must ensure that any return to activity does not endanger public health.

## Financial support

No external funding received to complete this work.

## Contributorship

All authors contributed to all items in the ICMJE contributorship guidelines.

## Acknowledgments

The authors wish to acknowledge the Prof Brendan Murphy, Chief Medical Officer, Australian Government Department of Health and Prof Paul Kelly, Deputy Chief Medical Officer, Australian Government Department of Health. Prof Gordon Waddington (Professor of Sports Medicine, AIS - University of Canberra) Thank you to the following for their contributions to this document.

Dr Peter Harcourt (Medical Director, Australian Football League; CMO, Basketball),

Dr Roslyn Carbon (CMO, Artistic Swimming),

Dr Paul Blackman (CMO, Athletics),

Peter Brown (High Performance and Pathways Manager, Bowls Australia),

Andrew Pratley (Combat Sports Manager, AIS - Boxing and Karate),

Dr Matt Hislop (CMO, Paddle Australia),

Dr John Orchard (CMO, Cricket Australia),

Dr Mark Fisher (CMO, Cycling),

Dr Mark Young (CMO, Diving),

Alison Alcock (Performance Support Manager, Equestrian Australia),

Dr James Ilic (Australian Women's Team Doctor, Football),

Kitty Chiller (CEO Gymnastics Australia; Chair Modern Pentathlon),

Dr Corey Cunningham (CMO, Golf; Medical Director, New South Wales Institute of Sport),

Dr Kathy Yu (CMO Gymnastics Australia, Sailing),

Dr Peter Steele (CMO, Hockey Australia),

Dr Susan White (CMO, Netball; Victorian Institute of Sport),

Dr Lisa Elkington (CMO, Rowing Australia),

Dr Warren McDonald (CMO, Rugby Australia), – Adam Sachs (High Performance Director, Shooting Australia),

Chris O'Brien (Performance Solutions Consultant AIS/Skateboarding),

Romain Thevenot (Director, Sport Climbing Australia) Duncan Brown (Coaching Director, Sport Climbing Australia) Richard Vaughan (CEO, Squash Australia),

Dr Luke Eggleston (Australian Dolphins Team Doctor and QAS Swimming CMO, Swimming),

Nick Sanders (Performance Support Consultant, Taekwondo),

Dr Carolyn Broderick (CMO, Tennis Australia),

Dr Stacey Compton (CMO, Triathlon Australia),

Phil Borgeaud (National Technical Director, Volleyball Australia),

Dr Rachel Harris (CMO, Water Polo Australia; CMO, Paralympics Australia).

## References

- World Health Organisation. *Novel Coronavirus – China*. 2020, 2020. Available at: <https://www.who.int/csr/don/12-january-2020-novel-coronavirus-china/en/>.
- Wilson M, Chen L. Travellers give wings to novel coronavirus (2019-nCoV). *J Travel Med* 2020; 27(2).
- World Health Organisation. *International travel health: SARS (severe acute respiratory syndrome)*, 2020. Available at: <https://www.who.int/ith/diseases/sars/en/>.
- European Centre for Disease Prevention and Control. *MERS- CoV worldwide overview 2020* [updated 6 December 2020; cited 2020 18 April]. Available from: <https://www.ecdc.europa.eu/en/middle-east-respiratory-syndrome-coronavirus-mers-cov-situation-update>.
- Cheng A, Williamson D. An outbreak of COVID-19 caused by a new coronavirus: what we know so far. *Med J Aust* 2020.
- Guo Y, Cao Q, Hong Z et al. The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak – an update on the status. *Mil Med Res* 2020; 7(1):11.
- Centres for Disease Control, Prevention. *Severe acute respiratory syndrome (SARS): SARS basics fact sheet*, 2017. Available at: <https://www.cdc.gov/sars/about/fs-sars.html>.
- Worldometer. *COVID-19 coronavirus pandemic*, 2020. Available at: <https://www.worldometers.info/coronavirus/?from=groupmessage&isappinstalled=0&nsukey=p1w469df%2F1ob1ztfiqs0fd0uwgrm58a9vpc%2Bg6puh4aacckqdpw2f63en9zke1tya4iygprjf5lesqdkxvfeupybzb3vqu3o9pvyu%2F3rqa7ehb6x4rvhusskalvs4erqyw%2Fs9he8kbt6ssmn49ad5ptlrzrd4fk4a7kesqkv7dglhpa%2Bu4zm5xpo7cus4ttu5wr6iovimj%2Fbomoeauaww%3D%3D>.
- World Health Organisation. *WHO director-general's opening remarks at the media briefing on COVID-19*, 2020. Available at: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19-11-march-2020>.
- Australian Government Department of Health. *First confirmed case of novel coronavirus in Australia*, 2020. Available at: <https://www.health.gov.au/ministers/the-hon-greg-hunt-mp/media/first-confirmed-case-of-novel-coronavirus-in-australia>.
- Australian Government Department of Health. *Coronavirus (COVID-19) current situation and case numbers*, 2020. Available at: <https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-current-situation-and-case-numbers>.
- Wu F, Wang A, Liu M et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020; 395(10223):497–506.
- Qui A, Hernandez J. *China reports first death from new virus*, 2020. Available at: <https://www.nytimes.com/2020/01/10/world/asia/china-virus-wuhan-death.html>.
- World Health Organisation. *WHO timeline – COVID-19*, 2020. Available at: <https://www.who.int/news-room/detail/08-04-2020-who-timeline-covid-19>.
- Hernández J, Ramzy A. *China confirms new coronavirus spreads from humans to humans*, 2020. Available at: <https://www.nytimes.com/2020/01/20/world/asia/coronavirus-china-symptoms.html>.
- World Health Organisation. *Mission summary: WHO field visit to Wuhan, China 20–21 January 2020*, 2020. Available at: <https://www.who.int/china/news/detail/22-01-2020-field-visit-wuhan-china-jan-2020>.
- Karp P. *Timeline: how Australia responded to the coronavirus outbreak*, 2020. Available at: <https://www.theguardian.com/world/2020/feb/03/timeline-how-australia-responded-to-the-coronavirus-outbreak>.
- BBC News. *China Coronavirus: lockdown measures rise across Hubei province*, 2020. Available at: <https://www.bbc.com/news/world-asia-china-51217455>.
- Wikipedia. *Timeline of the 2019–20 coronavirus pandemic from November 2019 to January 2020*, 2020. Available at: [https://en.wikipedia.org/wiki/Timeline\\_of\\_the\\_2019%E2%80%9320\\_coronavirus\\_pandemic\\_from\\_November\\_2019\\_to\\_January\\_2020](https://en.wikipedia.org/wiki/Timeline_of_the_2019%E2%80%9320_coronavirus_pandemic_from_November_2019_to_January_2020).
- Australian Government Department of Health. In: *Press conference at parliament house about novel coronavirus*, 2020. Available at: <https://www.health.gov.au/ministers/the-hon-greg-hunt-mp/media/press-conference-at-parliament-house-about-novel-coronavirus>.
- World Health Organisation. *Statement on the second meeting of the international health regulations (2005) emergency committee regarding the outbreak of novel coronavirus (2019-nCoV)*, 2020. Available at: [https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/30-01-2020-statement-on-the-second-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov)).
- SBS News. *Australia to deny entry to travellers from Mainland China unless they're Australian citizens*, 2020. Available at: <https://www.sbs.com.au/news/australia-to-deny-entry-to-travellers-from-mainland-china-unless-they-re-australian-citizens>.
- World Health Organisation. *Novel coronavirus (2019-nCoV) situation report – 12*, 2020. Available at: [https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200201-sitrep-12-ncov.pdf?sfvrsn=273c5d35\\_2](https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200201-sitrep-12-ncov.pdf?sfvrsn=273c5d35_2).
- Luna F. *First confirmed nCoV death outside China is in Philippines*, 2020. Available at: <https://www.philstar.com/headlines/2020/02/02/1989762/doh-confirms-second-case-novel-coronavirus-philippines>.
- Nakazawa E, Ino H, Akabayashi A. *Chronology of COVID-19 cases on the diamond princess cruise ship and ethical considerations: a report from Japan*. *Disaster Med Public Health Prep* 2020:1–8.



26. World Health Organisation. *Rolling updates on coronavirus disease (COVID-19)*, 2020. Available at: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>.
27. Australian Government Department of Health. *Update on COVID-19 in Australia – community transmission*, 2020. Available at: <https://www.health.gov.au/ministers/the-hon-greg-hunt-mp/media/update-on-covid-19-in-australia-community-transmission>.
28. France 24 News. *France bans gatherings of more than 1,000 people to contain coronavirus*, 2020. Available at: <https://www.france24.com/en/20200308-france-bans-gatherings-of-more-than-1-000-people-to-contain-coronavirus>.
29. Keslassy E. *French government bans gatherings of more than 100 people*, 2020. Available at: <https://variety.com/2020/film/news/french-government-bans-gatherings-for-more-than-100-people-1203533414/>.
30. Nguyen K, Miller B. *Jacinda arden reveals 'unprecedented' travel restrictions to combat coronavirus, all travellers to New Zealand to self-isolate*, 2020. Available at: <https://www.abc.net.au/news/2020-03-14/jacinda-ardern-new-zealand-travel-restrictions-coronavirus/12056754>.
31. Prime Minister of Australia. *Border restrictions*, 2020. Available at: <https://www.pm.gov.au/media/border-restrictions>.
32. Parliament of Australia. *Coronavirus measures endorsed by national cabinet*, 2020. Available at: <https://www.abc.net.au/news/2020-03-14/jacinda-ardern-new-zealand-travel-restrictions-coronavirus/12056754>.
33. Australian Government Department of Health. *Latest statement on coronavirus (COVID-19) from the Prime Minister*, 2020. Available at: <https://www.health.gov.au/news/latest-statement-on-coronavirus-covid-19-from-the-prime-minister>.
34. Brown V. *Covid 19 coronavirus: ruby princess mistake caused infection cases to explode*, 2020. Available at: <https://www.nzherald.co.nz/world/news/article.cfm?c.id=2&objectid=12321712>.
35. Australian Institute of Sport. *COVID-19 and Sporting Activity: Statement on NIN Closedown 24 March 2020*; Available at: this link should be [https://ais.gov.au/\\_data/assets/pdf\\_file/0010/727489/NIN\\_Covid19-Comms\\_24032020\\_FINAL.pdf](https://ais.gov.au/_data/assets/pdf_file/0010/727489/NIN_Covid19-Comms_24032020_FINAL.pdf).
36. Prime Minister of Australia. *Media statement: update on coronavirus measures*, 2020. Available at: <https://www.pm.gov.au/media/update-coronavirus-measures-160420>.
37. Smart Traveller Australia. *Coronavirus (COVID-19) – information for Australian travellers*, 2020. Available at: <https://www.smarttraveller.gov.au/COVID-19-australian-travellers>.
38. Udale-Smith A, Garcia C. *Coronavirus: how the US is becoming the new epicentre of the COVID-19 pandemic*, 2020. Available at: <https://news.sky.com/story/coronavirus-how-the-us-is-becoming-the-new-epicentre-of-the-covid-19-pandemic-11964550>.
39. Dalton C, Corbett S, Katelaris A. *Pre-emptive low cost social distancing and enhanced hygiene implemented before local COVID-19 transmission could decrease the number and severity of cases*. *Med J Aust* 2020.
40. Liu Y, Gayle A, Wilder-Smith A et al. *The reproductive number of COVID-19 is higher compared to SARS coronavirus*. *J Travel Med* 2020.
41. World Health Organisation. *Report of the WHO-China joint mission on coronavirus disease 2019 (COVID-19)*, 2020.
42. Kwok K, Lai F, Wei Wl et al. *Herd immunity – estimating the level required to halt the COVID-19 epidemics in affected countries*. *J Infect* 2020.
43. World Health Organisation. *Q&A on coronaviruses (COVID-19)*, 2020. Available at: <https://www.who.int/news-room/q-a-detail/q-a-coronaviruses>.
44. van Doremalen N, Bushmaker T, Morris D et al. *Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1*. *N Engl J Med* 2020; 382(16):1564–1567.
45. Wang D, Hu B, Hu C et al. *Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China*. *JAMA* 2020; 323(11):1061–1069.
46. Wang W, Xu Y, Gao R, et al., *Detection of SARS-CoV-2 in Different Types of Clinical Specimens*.
47. Arentz M, Yim E, Klaff L et al. *Characteristics and outcomes of 21 critically ill patients with COVID-19 in Washington State*. *JAMA* 2020.
48. Mao L, Jin H, Wang M et al. *Neurologic manifestations of hospitalized patients with coronavirus disease 2019 in Wuhan, China*. *JAMA Neurol* 2020.
49. Zhang Y, Xiao M, Zhang S et al. *Coagulopathy and antiphospholipid antibodies in patients with Covid-19*. *N Engl J Med* 2020.
50. Chen T, Wu D, Chen H et al. *Clinical characteristics of 113 deceased patients with coronavirus disease 2019: retrospective study*. *BMJ* 2020; 368.
51. Rodriguez-Morales A, Cardona-Ospina J, Gutiérrez-Ocampo E et al. *Clinical, laboratory and imaging features of COVID-19: a systematic review and meta-analysis*. *Travel Med Infect Dis* 2020; 101623.
52. Giacomelli A, Pezzati L, Conti F et al. *Self-reported olfactory and taste disorders in SARS-CoV-2 patients: a cross-sectional study*. *Clin Infect Dis* 2020; 70.
53. Lechien J, Chiesa-Estomba C, De Siati D et al. *Olfactory and gustatory dysfunctions as a clinical presentation of mild-to-moderate forms of the coronavirus disease (COVID-19): a multicenter European study*. *Eur Arch Oto-Rhino-Laryngol* 2020; 1.
54. Goyal P, Choi J, Pinheiro L et al. *Clinical characteristics of Covid-19 in New York City*. *N Engl J Med* 2020.
55. Wu Z, McGoogan J. *Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: summary of a report of 72 314 cases from the Chinese Center for Disease Control and Prevention*. *JAMA* 2020.
56. Shi H, Han X, Jiang N et al. *Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study*. *Lancet Infect Dis* 2020.
57. Yang X, Yu Y, Xu J et al. *Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study*. *Lancet Respir Med* 2020.
58. Lu X, Zhang L, Du H et al. *SARS-CoV-2 infection in children*. *N Engl J Med* 2020.
59. Mizumoto K, Kagaya K, Zarebski A et al. *Estimating the asymptomatic proportion of coronavirus disease 2019 (COVID-19) cases on board the Diamond Princess cruise ship, Yokohama, Japan, 2020*. *Eurosurveillance* 2020; 25(10):2000180.
60. Sutton D, Fuchs K, D'Alton M et al. *Universal screening for SARS-CoV-2 in women admitted for delivery*. *N Engl J Med* 2020.
61. Peiris J, Chu C, Cheng V et al. *Clinical progression and viral load in a community outbreak of coronavirus-associated SARS pneumonia: a prospective study*. *Lancet* 2003; 361(9371):1767–1772.
62. He X, Lau E, Wu P et al. *Temporal dynamics in viral shedding and transmissibility of COVID-19*. *Nat Med* 2020.
63. Grasselli G, Zangrillo A, Zanella A et al. *Baseline characteristics and outcomes of 1591 patients infected with SARS-CoV-2 admitted to ICUs of the Lombardy Region, Italy*. *JAMA* 2020.
64. Xie J, Tong Z, Guan X et al. *Clinical characteristics of patients who died of coronavirus disease 2019 in China*. *JAMA Netw Open* 2020; 3(4):e205619.
65. Mehta P, McAuley D, Brown M et al. *COVID-19: consider cytokine storm syndromes and immunosuppression*. *Lancet* 2020; 395(10229):1033–1034.
66. Helms J, Kremer S, Merdji H et al. *Neurologic features in severe SARS-CoV-2 infection*. *N Engl J Med* 2020.
67. Zhang J, Litvinova M, Wang W et al. *Evolution epidemiology and transmission dynamics of coronavirus disease 2019 outside Hubei province, China: a descriptive and modelling study*. *Lancet Infect Dis* 2020.
68. Pan A, Liu L, Wang C et al. *Association of public health interventions with the epidemiology of the COVID-19 outbreak in Wuhan, China*. *JAMA* 2020.
69. Australian Government Therapeutic Goods Administration. *COVID-19 testing in Australia – information for health professionals 2020* [updated 27 March 2020; cited 2020 18 April]. Available from: <https://www.tga.gov.au/covid-19-testing-australia-information-health-professionals>.
70. Australian Government Department of Health. *Coronavirus Disease 2019 (COVID-19) CDNA National Guidelines for Public Health Units 2020* [updated 17 April 2020; cited 2020 20 April]. Available from: [https://www1.health.gov.au/internet/main/publishing.nsf/Content/7A8654A8CB144F5FCA2584F8001F91E2/\\$File/interim-COVID-19-SoNG-v2.6.pdf](https://www1.health.gov.au/internet/main/publishing.nsf/Content/7A8654A8CB144F5FCA2584F8001F91E2/$File/interim-COVID-19-SoNG-v2.6.pdf).
71. Caruso D, Zerunian M, Polici M et al. *Chest CT Features of COVID-19 in Rome, Italy*. *Radiology* 2020;201237.
72. World Health Organisation. *"Immunity passports" in the context of COVID-19* 2020 [updated 24 April 2020 26 April]. Available from: <https://www.who.int/news-room/commentaries/detail/immunity-passports-in-the-context-of-covid-19>.
73. Bai Y, Yao L, Wei T et al. *Presumed Asymptomatic Carrier Transmission of COVID-19*. *Jama* 2020.
74. Toresdahl B, Asif IM. *Coronavirus Disease 2019 (COVID-19): Considerations for the Competitive Athlete*. *Sports Health* 2020, 1941738120918876.
75. National COVID-19 Clinical Evidence Taskforce. *Caring for people with COVID-19 2020* [updated 16 April cited 2020 18 April]. Available from: <https://covid19evidence.net.au/>.
76. Australasian Society for Infectious Diseases. *Interim guidelines for the clinical management of COVID-19 in children and adolescents 2020* [cited 2020 18 April]. Available from: <https://www.asid.net.au/documents/item/1897>.
77. World Health Organisation. *Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected*. 2020.
78. Thevarajan I, Buising KL, Cowie B. *Clinical presentation and management of COVID-19*. *Medical Journal of Australia* 2020.
79. Sanders J, Monogue M, Jodlowski T et al. *Pharmacologic Treatments for Coronavirus Disease (COVID-19): A Review*. *JAMA* 2020.
80. The Boston Consulting Group. *Intergenerational Review of Australian Sport 2017 Sport Australia 2017* [cited 2020 26 April]. Available from: [https://www.sportaus.gov.au/\\_data/assets/pdf\\_file/0011/660395/Intergenerational\\_Review\\_of\\_Australian\\_Sport\\_2017.pdf](https://www.sportaus.gov.au/_data/assets/pdf_file/0011/660395/Intergenerational_Review_of_Australian_Sport_2017.pdf).
81. Australian Bureau of Statistics. *MEDIA RELEASE: Sport scores goals for Aussie economy 2013* [updated 24 October 2013; cited 2020 26 April]. Available from: <https://www.abs.gov.au/ausstats/abs@.nsf/latestProducts/4156.0.55.002Media%20Release12013>.
82. May C, Murphy G. *Sport Participation in Australia Clearinghouse for Sport and Physical Activity 2020* [updated 30 January 2020 26 April]. Available from: [https://www.clearinghouseforsport.gov.au/knowledge\\_base/sport\\_participation/community\\_participation/sport\\_participation\\_in\\_australia](https://www.clearinghouseforsport.gov.au/knowledge_base/sport_participation/community_participation/sport_participation_in_australia).
83. International Olympic Committee. *Joint statement from the international olympic committee and the tokyo 2020 organising committee 2020* [updated 24 March 2020; cited 2020 18 April]. Available from: <https://www.olympic.org/news/joint-statement-from-the-international-olympic-committee-and-the-tokyo-2020-organising-committee>.
84. Parsons A. *Paralympic Games. Tokyo 2020 Paralympic Games Postponed 2020* [updated 24 March 2020; cited 2020 20 April]. Available from: <https://www.youtube.com/watch?v=239k750aw8A>.
85. Hassanzadeh-Rad A, Halabchi F. *Stadiums as Possible Hot Spots for COVID-19 Spread*. *Asian J Sports Med* 2020; 11(2).

86. Azzoni T, Dampf A. 'Game Zero?' Soccer Game Attended by 40,000 Fans Likely Made This Italian City a Coronavirus Epicenter 2020 [updated 25 March 23 April]. Available from: <https://time.com/5809848/game-zero-soccer-game-italy/>.
87. Snowdon D. Canberra Capitals move one step closer toward WNBL title with thrilling Game 1 win over Southside Flyers Fox Sports2020 [updated 2 March 2023 April]. Available from: <https://www.foxsports.com.au/basketball/wnbl/canberra-capitals-move-one-step-closer-toward-wnbl-title-with-thrilling-game-1-win-over-southside-flyers/news-story/916e02a9f42bff8d8f6c3cc697b25ebb>.
88. Ramsey A. Crowd record in sight as CA boss eyes next big step Cricket.com.au2020 [updated 7 March 23 April]. Available from: <https://www.cricket.com.au/news/kevin-roberts-world-record-crowd-t20-world-cup-final-australia-india-womens-ipl-prizemoney-ahmedabad/2020-03-07>.
89. National Basketball Association. Official Release: NBA to suspend season following Wednesday's games 2020 [updated 11 March 2023 April]. Available from: <https://www.nba.com/article/2020/03/11/nba-suspend-season-following-wednesdays-games>.
90. Richards G. Formula One's Australian Grand Prix cancelled amid coronavirus fears The Guardian2020 [updated 13 March 2023 April]. Available from: <https://www.theguardian.com/sport/2020/mar/13/formula-one-australian-grand-prix-melbourne-coronavirus>.
91. The Guardian. Fans shut out from Australia's ODI series with New Zealand due to Covid-19 2020 [updated 13 March 2023 April]. Available from: <https://www.theguardian.com/sport/2020/mar/13/fans-shut-out-from-australias-odi-series-with-new-zealand-due-to-covid-19>.
92. Bakowski G, Goodwin S, Fisher B. Premier League and British football shuts down until April due to coronavirus – as it happened The Guardian2020 [updated 14 March 2023 April]. Available from: <https://www.theguardian.com/football/live/2020/mar/13/premier-league-and-british-football-set-for-shutdown-due-to-coronavirus-live>.
93. Moonda F. Australia Women's tour of South Africa postponed because of coronavirus ESPNcricinfo2020 [updated 12 March 2023 April]. Available from: [https://www.espncricinfo.com/story/\\_/id/28892663/australia-women-tour-south-africa-scheduled-coronavirus](https://www.espncricinfo.com/story/_/id/28892663/australia-women-tour-south-africa-scheduled-coronavirus).
94. ABC News. New Zealand cricket team to return home, postponing ODI series with Australia 2020 [updated 14 March 2023 April]. Available from: <https://www.abc.net.au/news/2020-03-14/new-zealand-postpones-odi-cricket-series-australia-coronavirus/12056746>.
95. Greenwood E. Super Rugby suspended due to coronavirus, Jaguares-Highlanders cancelled Rugby.com.au2020 [updated 15 March 2023 April]. Available from: <https://www.rugby.com.au/news/2020/03/14/super-rugby-nz-coronavirus>.
96. Middleton D. Shield final in doubt after final round cancelled Cricket.com.au2020 [updated 15 March 2023 April]. Available from: <https://www.cricket.com.au/news/sheffield-shield-coronavirus-covid-19-cancellation-final-options-nsw-blues-victoria/2020-03-15>.
97. Football Federation Australia. Update on COVID-19: Hyundai A-League to play matches behind closed doors A-League.com.au2020 [updated 16 March 2023 April]. Available from: <https://www.a-league.com.au/news/update-covid-19-impact-football>.
98. Larkin S. A-League to end quickly behind closed doors Thewomensgame.com2020 [updated 16 March 2023 April]. Available from: <https://thewomensgame.com/news/a-league-to-end-quickly-behind-closed-doors-539369>.
99. Hurst L. Football: Euros and Copa America moved to 2021 due to coronavirus chao Euronews.com2020 [updated 18 March 2023 April]. Available from: <https://www.euronews.com/2020/03/17/coronavirus-uefa-moves-euro-2020-to-2021-due-to-covid-19-chaos>.
100. Netball Australia. Community Netball on hold 2020 [updated 18 March 2023 April]. Available from: <https://netball.com.au/news/community-netball-on-hold>.
101. National Basketball League. Statement: Remaining NBL Grand Final Series Games Cancelled 2020 [updated 17 March 2023 April]. Available from: <https://nbl.com.au/news/remaining-nbl-grand-final-series-games-cancelled>.
102. Australian Football League. AFL statement on postponement of 2020 season 2020 [updated 22 March 2023 April]. Available from: <https://afl.com.au/news/389309/afl-statement-on-postponement-of-2020-season>.
103. Australian Olympic Committee. AOC plans for postponed Olympic Games 2020 [updated 23 March 2023 April]. Available from: <https://www.olympics.com.au/news/aoc-plans-for-postponed-olympic-games/>.
104. Football Federation Australia. FFA to postpone remaining matches in the Hyundai A-League season due to COVID-19 2020 [updated 24 March 2023 April]. Available from: <https://www.a-league.com.au/news/ffa-postpone-remaining-matches-hyundai-a-league-season-covid-19>.
105. Walsh D, Newton A., NRL suspends competition due to coronavirus pandemic 2020 [updated 23 March 2023 April]. Available from: <https://www.nrl.com/news/2020/03/23/nrl-suspends-competition-due-to-coronavirus-pandemic/>.
106. Rugby Australia. Rugby Australia Coronavirus | COVID-19 ongoing updates: Rugby.com.au2020 [updated 3 April 2023 April]. Available from: <https://australia.rugby/news/2020/03/18/covid-rugbyau-update-ongoing>.
107. International Olympic Committee. IOC, IPC, Tokyo 2020 organising committee and Tokyo Metropolitan Government announce new dates for the Olympic and Paralympic Games Tokyo 2020 2020 [updated 30 March 2023 April]. Available from: <https://www.olympic.org/news/ioc-ipc-tokyo-2020-organising-committee-and-tokyo-metropolitan-government-announce-new-dates-for-the-olympic-and-paralympic-games-tokyo-2020>.
108. Battett D. UPDATE: Pay cut deal ensures 'certainty' in AFL industry: AFLPA AFL.com.au2020 [updated 28 March 2023 April]. Available from: <https://www.afl.com.au/news/390229/done-deal-players-agree-to-pay-cuts-after-intense-negotiations>.
109. Klau S. Super Netball players agree to 70 percent pay cut 2020 [updated 28 March 2023 April]. Available from: [https://www.espn.com.au/netball/story/\\_/id/28964412/super-netball-players-agree-70-percent-pay-cut](https://www.espn.com.au/netball/story/_/id/28964412/super-netball-players-agree-70-percent-pay-cut).
110. ABC News. NRL players lose five months' pay as part of new deal during coronavirus pandemic 2020 [updated 3 April 2023 April]. Available from: <https://www.abc.net.au/news/2020-04-02/coronavirus-nrl-players-reach-pay-agreement/12110344>.
111. Ramsey A. CA announces staff cutbacks due to coronavirus Cricket.com.au2020 [updated 16 April 2023 April]. Available from: <https://www.cricket.com.au/news/cricket-australia-staff-stood-down-coronavirus-covid19-impact/2020-04-16>.
112. Tuffley W. Article: A wake up call: the effects of Coronavirus on the sports industry 2020 [updated 30 March 2020; cited 20 20 April]. Available from: <https://www.bdo.com.au/en-au/insights/tourism-hospitality/article/a-wake-up-call-the-effects-of-coronavirus-on-the-sports-industry>.
113. Zhang J, Lu H, Zeng H et al. The differential psychological distress of populations affected by the COVID -19 pandemic. *Brain Behav Immun* 2020.
114. Kong X, Zheng K, Tang M et al. Prevalence and Factors Associated with Depression and Anxiety of Hospitalized Patients with COVID-19. *medRxiv* 2020; 24, 2020.03.24.20043075.
115. Liu Y, Gayle AA, Wilder-Smith A et al. The reproductive number of COVID-19 is higher compared to SARS coronavirus. *Journal of Travel Medicine* 2020; 27(2).
116. Schwellnus M, Soligard T, Alonso J-M et al. How much is too much? (Part 2) International Olympic Committee consensus statement on load in sport and risk of illness. *Br J Sports Med* 2016; 50(17):1043–1052.
117. Fang L, Karakioulakis G, Roth M. Are patients with hypertension and diabetes mellitus at increased risk for COVID-19 infection? *The Lancet Respiratory Medicine* 2020; 8(4):e21.
118. Hartmann-Boyce J, Morris E, Goyder C, et al. Diabetes and risks from COVID-19 2020 [updated 8 April 2020; cited 20 20 April]. Available from: <https://www.cebm.net/covid-19/diabetes-and-risks-from-covid-19/>.
119. Ahmed H, Patel K, Greenwood D et al. Long-term clinical outcomes in survivors of coronavirus outbreaks after hospitalisation or icu admission: A systematic review and meta-analysis of follow-up studies. *medRxiv* 2020, 2020.04.16.20067975.
120. Hull J, Loosemore M, Schwellnus M. Respiratory health in athletes: facing the COVID -19 challenge. *The Lancet Infectious Diseases* 2020.
121. Baggish A, Drezner J, Kim J, et al. The resurgence of sport in the wake of COVID-19: cardiac considerations in competitive athletes Blog | British Journal of Sports Medicine2020 [updated 24 April 202028 April]. Available from: <https://blogs.bmj.com/bjbm/2020/04/24/the-resurgence-of-sport-in-the-wake-of-covid-19-cardiac-considerations-in-competitive-athletes/>.
122. Hu Z, Song C, Xu C et al. Clinical characteristics of 24 asymptomatic infections with COVID -19 screened among close contacts in Nanjing, China. *Sci China Life Sci* 2020.
123. Buonsenso D, Pata D, Chiaretti A. COVID -19 outbreak: less stethoscope, more ultrasound. *Lancet Respir Med* 2020.
124. Peng Q-Y, Wang X-T, Zhang L-N et al. Findings of lung ultrasonography of novel corona virus pneumonia during the 2019-2020 epidemic. *Intensive Care Medicine* 2020.
125. Driggins E, Madhavan M, Bikdeli B et al. Cardiovascular Considerations for Patients, Health Care Workers, and Health Systems During the Coronavirus Disease (COVID -19) Pandemic. *J Am Coll Cardiol* 2019;2020.
126. Bao C, Liu X, Zhang H et al. Coronavirus Disease (COVID-19) CT Findings: A Systematic Review and Meta-analysis. *J Am Coll Radiol* 2019;2020.
127. Zhang W, Zhao Y, Zhang F et al. The use of anti-inflammatory drugs in the treatment of people with severe coronavirus disease 2019 (COVID-19): The Perspectives of clinical immunologists from China. *Clin Immunol* 2020; 214:108393.
128. Toscano G, Palmerini F, Ravaglia S et al. Guillain-Barré Syndrome Associated with SARS-CoV-2. *New England Journal of Medicine* 2020.
129. Wang Y, Wang Y, Chen Y et al. Unique epidemiological and clinical features of the emerging novel coronavirus pneumonia (COVID-19) implicate special control measures. *J Med Virol* 2020.
130. Wu Y, Xu X, Chen Z et al. Nervous system involvement after infection with COVID -19 and other coronaviruses. *Brain Behav Immun* 2020.
131. Oxley T, Mocco J, Majidi S et al. Large-Vessel Stroke as a Presenting Feature of Covid-19 in the Young. *New Eng J Med* 2020:e60.
132. Poyiadji N, Shahin G, Noutjain D et al. COVID-19-associated Acute Hemorrhagic Necrotizing Encephalopathy: CT and MRI Features. *Radiology* 2011; 0(0):201187.
133. Tay S, Teh K, Wang L et al. Impact of COVID 19: perspectives from gastroenterology. *Singapore Medical Journal* 2020.
134. Cheng Y, Luo R, Wang K et al. Kidney disease is associated with in-hospital death of patients with COVID-19. *Kidney International* 2020; 97(5):829–838.
135. Wessley S, David A, Butler S et al. Management of chronic (post-viral) fatigue syndrome. *J. Royal College Gen Pract* 1989; 39(321):171–173.
136. Hand Hygiene Australia. 5 Moments For Hand Hygiene 2020 [cited 2028 April]. Available from: <https://www.hha.org.au/hand-hygiene/5-moments-for-hand-hygiene>.