



## REVIEW ARTICLE

## Sports Medicine Practice during COVID-19 Pandemic - A “New Normal”

Simarpreet Singh Kalra<sup>1</sup>, Anirban Mallick<sup>2\*</sup> and Jahnvi Dande<sup>2</sup>

<sup>1</sup>Mohali, Punjab, India

<sup>2</sup>Department of Sports Medicine, Netaji Subhas National Institute of Sports, India

\*Corresponding author: Anirban Mallick, Department of Sports Medicine, Netaji Subhas National Institute of Sports, Patiala, Punjab, India



### Abstract

The COVID-19 pandemic has affected all areas of life, including sports and athletes which caused disruption to physical and psychological wellbeing leading to health impairment and loss of performance. The global sports calendar has been impacted, athletes are almost stuck indoors facing an unprecedented effect in their life. The sports medicine practitioners all over the world need to adapt to these new challenges. Resumption of training and competition while maintaining social distancing, pre participation evaluation and return to play advice for COVID positive athletes will be new task in hand. Risk assessment and mitigation measures should be in place before organizing sporting events. Because of the novel character of the virus we need to rely on recommendations based on expert opinions rather robust evidence. The aim of this paper is to highlight medical implication due to this novel disease on sports and athlete's health with emphasis on different schools of thought to guide practicing sports physicians in decision making.

### Keywords

COVID-19, Sports Medicine, Exercise and Immunity, Athlete, Mental health

### Abbreviations

SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2; COVID-19: Coronavirus Disease; WHO: World Health Organization; IOC: International Olympic Committee; URTIs: Upper Respiratory Tract Infections; ECG: Electrocardiogram; ACC: American College of Cardiology; EAPC: European Association of Preventive Cardiology; ESC: European Society of Cardiology; RTP: Return to Play; CRP: C-Reactive Protein; hgTn: High Sensitive Troponin I; CMR: Cardiac Magnetic Resonance; NSAIDs: Nonsteroidal Anti-inflammatory Drugs; MERS: Middle Eastern Respiratory Syndrome; SARS: Severe Acute Respiratory Syndrome; ACTH: Adrenocorticotrophic Hormone

### Introduction

In December 2019, Wuhan, the capital of the Hubei province of China reported a novel strain of Coronavirus, causing an epidemic of severe acute respiratory disease, referred then as the “2019-nCoV” [1,2]. The novel virus and the disease, subsequently named as the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease (COVID-19) respectively [3,4], has since spread worldwide on an unprecedented scale leading the World Health Organization (WHO) to declare it as a global pandemic on 11<sup>th</sup> March, 2020 [5].

The pandemic has upheld all areas of life, and sports is no exception; bringing a pause to the sporting calendar worldwide. All the major sports leagues and tournaments were suspended or cancelled in March 2020, after initially being held without spectators to curb the spread through close contacts among the fans [6]. For instance, The Italian Serie A was paused on 8<sup>th</sup> March, 2020 with the English Premier League also announcing the suspension of its season soon after. Similarly in a joint statement, the International Olympic Committee (IOC) and the Tokyo 2020 Organizing committee, announced on 24<sup>th</sup> March 2020, that the Olympic and Paralympic Games Tokyo 2020 would be rescheduled to a later, emphasizing the importance to safeguard the health of the athletes [7].

Athletes, being younger and having fewer comorbidities than the general population, are assumed to be at a lower risk for severe disease [6]. But it is necessary to understand the unintended impact of the current pandemic on the health and performance of athletes

and others related [8]. Distancing the athlete from the routine training in traditional facilities with an uncertain future, this pandemic can cause serious disruption to the quality and quantity of training, which may lead to physical, technical and psychological damage and eventually impairment of health and performance [9].

At the time of writing this paper, few sporting leagues worldwide have resumed or about to resume, with various countries drawing up protocols regarding return to sport as per the guidelines set by the WHO [10-16]. Various sports federations have followed suit in releasing their own protocols.

Sports physicians are faced with a unique situation regarding athlete's health in the wake of the global pandemic and must find a way to quickly adapt to this new situation. This highlights the need to focus on certain aspects in sports medicine practice, prioritizing the health of the athlete moving forward, which were reviewed in this paper based on the current evidence, expert opinion and understanding available.

## Exercise and Immunity

There is a general consensus that moderate intensity exercise (60-80% of maximal capacity), in recreational and sub elite athletes, leads to a 40-50% reduction in the incidence of Upper Respiratory Tract Infections (URTIs), including influenza and pneumonia, whereas prolonged high intensity exercise leads to a 2-6 fold increase in the infection incidence, showing a J curve relationship. However, this relationship does not necessarily apply to elite athletes on the highest level, where high training loads are not associated with an increased risk of illness (S-shaped curve) [17,18]. Also regular exercise training has an overall anti-inflammatory and antioxidant effect, mediated through multiple pathways including decreased levels of inflammatory biomarkers, circulation surge in cells of the innate immune system, which, over time, shows a summation effect helping maintain and boost immunity and modulating non-communicable disease processes [17].

Exercise is especially beneficial for older adults who are more susceptible to infection in general and have also been identified as a particularly vulnerable population during this COVID-19 outbreak. Although there is no data regarding the effect of exercise on the coronavirus, it is very important that we try to maintain our activity levels as per recommended guidelines.

Nutritional strategies to boost immune system should be incorporated. For instance, increased intake of carbohydrates and polyphenols. Carbohydrate intake during prolonged and intense exercise is associated with reduced stress hormones, diminished blood levels of neutrophils and monocytes, and dampened inflammation; whereas polyphenols exert a variety of antiviral, anti-inflammatory, anti-oxidative, and immune cell signaling effects. Also, as athletes these days are in home

confinement, with disruption in high intensity training, they should reduce excess calorie consumption with reduction in macronutrient portion sizes, increase protein intake, incorporate foods to boost the immune system, with adequate sources of Vitamin C, B12, Iron, and Zinc, reduce the use of dietary supplements, and avoid processed foods [10,19].

## Pre-participation Examination in Athletes Recovering from COVID-19

It is important to note that exercise may contribute to complications in infected individuals with underlying cardiac pathology and exercising with an infection can increase viral replication, and injury to the heart leading to permanent damage or even sudden cardiac death [20]. Exercise recommendations following COVID-19 has been the topic of concern, especially due to the COVID-19 associated myocarditis. It is very difficult to diagnose COVID associated myocarditis in athletes, due to its nonspecific symptoms misinterpreted often as overtraining/training related exhaustion, and the alterations in Electrocardiogram (ECG) and elevated cardiac biomarkers (troponin, creatine kinase) being interpreted as long term training adaptations and effects of acute exercise respectively [21]. Various guidelines based on expert opinion for management of athletes with myocarditis have been proposed by the American College of Cardiology (ACC) [22], the European Association of Preventive Cardiology (EAPC) [23], and also published in European heart journal by European Society of Cardiology (ESC); while evidence based recommendations with respect to COVID-19 associated myocarditis in athletes are limited.

Athletes who have symptoms suggestive of COVID-19, but are negative on COVID-19 testing, should be managed as a coryzal illness and can resume sports without any limitation, with strict adherence to social guidelines and close monitoring for development of further symptoms and repeat COVID-19 testing if necessary [21,24].

Asymptomatic COVID-19 positive athletes, according to ESC guidelines, can train but refrain from intense or competitive training for 2 weeks, following which are made eligible to return to sport without any restriction only if they remain symptom free and have a normal resting ECG [21]; whereas EAPC recommends 7 day rest followed by a graduated Return To Play (RTP) [20]; with ACC recommending 2 weeks rest followed by slow resumption of activity with no ECG or cardiac evaluation [24].

For symptomatic COVID-19 positive athletes, ESC recommends sports restrictions for 2-4 weeks followed by a thorough cardiological examination including resting and exercise ECG and an echocardiography before resuming training for evidence of myocarditis [21]. EAPC suggests self-isolation for 7-14 days followed by 7 day

convalescence without exercise with gradual training resumption for 7 days after clinical evaluation including C-Reactive Protein (CRP) and high sensitive Troponin I (hgTn) test followed by return to full training/play after another 7 days. If troponin levels are raised, further cardiac evaluation should be done with ECG, echocardiography and Cardiac Magnetic Resonance (CMR) imaging to confirm myocarditis [20]. According to ACC, athletes, who are COVID-19 positive with mild symptoms and not hospitalized, should rest and not train till symptoms subside. They should refrain from training for 2 weeks following symptom resolution following which a clinical cardiac evaluation is recommended, including a combination of symptom guided testing, cardiac biomarkers (hgTn), ECG and echocardiography. Slow resumption of training is advised once there are no symptoms and no objective evidence of myocarditis.

For hospitalized athletes with significant symptoms, ACC recommends a more comprehensive cardiac evaluation including cardiac imaging preferably during hospitalization or, if not done, during convalescence to diagnose myocarditis or any cardiac abnormality. For any evidence of myocarditis, all the guidelines recommend to treat and return to play after a disqualification from sport for 3-6 months [23,24].

## Resumption of Sports

As many countries are now gradually lifting lockdown restrictions in a strategic and a stepwise fashion, it is imperative professional sports will return sooner than later. Therefore, many countries globally have now come up with their framework for return to training. A strategic phased manner has been recommended, with phase 1 recommending 1-2 people exercise, maintaining at least 1.5 meters distance, no indoor exercise and no sharing of equipment. Phase 2 allows a small group of up to 10 athletes, who are asymptomatic for last 14 days and currently well, with some sharing of regularly and thoroughly cleaned equipment (e.g., tennis ball, football etc.), with no deliberate contact, and minimizing the time spent in common areas following a 'get in, train and get out' principle. This is followed by phase 3, which permits full return to contact training (like tackling) and return to full competition/match play. It should be emphasized that even in phase 3 it is critical to follow social distancing wherever possible along with adequate hygiene and risk mitigation measures [16]. Although social distancing in sports is advised, the exact probability of virus spread and risk of athletes being infected during sport is still unknown, highlighted in a study in football which observed that a player may be positioned within an exposure zone (of 1.5 meters) for 87.8 seconds during a 90 minute match, if one player on the pitch is infected [25].

The WHO recommends that for a sporting event to take place, assessment of risk should be undertaken with measures put into place to ensure risks from the event

don't outweigh the benefits. It highlights five factors in determining risk which include- Event held in single or multiple venues/countries; Event in a country with active community spread of COVID-19; Participation of international athletes from countries with community spread of COVID-19; Event with significant number of people at a higher risk of severe COVID-19 disease (people with underlying comorbidities or over the age of 65 years); Events in sports that are considered at higher risk of spread for COVID-19 (e.g., contact sports). After risk assessment, mitigations measures should be put in place such as enhanced hygiene standards/hand washing, social distancing where practical, athlete and staff education, personnel entry-exit strategy, minimizing number of persons on sight (zoning), organizing event behind closed doors, location with low community spread of virus, minimizing travel, ability to test and contact tracing, quarantine and isolation for positive cases to name a few [10-13]. Zoning guidelines include, dividing the stadium premises into different zones with specific number of personnel to be employed in each zone on a game day, including dynamic personnel planning with rotating shifts at different time slots of the day to limit staffing.

As many national health systems across the globe are facing a huge battle with their resources being stretched by the demands of COVID-19 cases, return to sport decision should be made with maximal caution as it may put at risk the health of the athletes which can further increase the burden on the healthcare system [26], therefore close cooperation between sporting federations, public health authorities and local or national governments is necessary.

## Nonsteroidal Anti-inflammatory Drugs and COVID- 19

Ibuprofen, other Nonsteroidal Anti-Inflammatory Drugs (NSAIDs), and intra-articular steroids are widely used by sports medicine practitioners in routine practice. But recently a theoretical concern appears that the use of these drugs may worsen COVID-19 infection. Ibuprofen, Indomethacin, Aspirin, Naproxen and Paracetamol are found to reduce antibody production, but Ibuprofen has the greatest effect, therefore it has been recommended to use Paracetamol as the drug of choice in patients with COVID-19, and that Ibuprofen should be used cautiously. The WHO currently does not recommend against using NSAIDs when clinically indicated in the treatment of a COVID-19 infection, as there is no published literature till date that NSAIDs or Paracetamol are associated with adverse outcomes due to their potential reduction in immune response [27,28].

The WHO does not recommend the use of corticosteroids in patients with COVID-19 pneumonia as corticosteroids are associated with an increased risk of complications in patients with influenza, Middle Eastern Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) [27,29,30]. It was observed that meth-



ylprednisolone, and triamcinolone injections resulted in hypothalamic pituitary axis suppression of Adrenocorticotropic hormone (ACTH) and Cortisol in 41% of patients at 3 weeks, with effect not observed with Betamethasone [31]. Therefore, it is recommended that, if there is a need for a corticosteroid injection, consider the use of Betamethasone, or other management options or to delay the injection until the risk associated with COVID-19 has declined [27].

## Mental Health Impact

Recent evidence suggests that the COVID-19 pandemic is associated with mental health problems with self-reported stress being the common presentation [32]. Athletes also, have been known to have many mental health symptoms ranging from sleep disorders, depression, anxiety, eating disorders, and substance abuse disorders to behavior problems. Major negative life events, periods of inactivity, disruption of normal training routine, isolation from athletic teams, distance from the athletic community, less qualified interactions with athletic coaches, and lack of social support have also been shown to cause emotional distress in athletes [33-35], which may thus effect personal and sporting life. This can then lead to performance issues and in turn increase their injury risk, leading to a vicious cycle of injuries, mental health issues, adverse behavior and performance impairment. Therefore, ensuring mental health and wellbeing is key and continuing training is an important component to protect mental health, particularly to reduce the risk of anxiety and depression [36]. Sports medicine practitioners should anticipate the requirement for additional mental health support for athletes, including, periodic psychological stresses monitoring, developing coping strategies and encouraging social interactions with friends, family and teammates [6].

Also, research has been done to highlight chronic emotional labor among sports medicine practitioners working in elite sports, the way it manifests in daily practice, how it influences personal and professional outcomes and affects mental health, thereby stressing the need for strong support mechanisms to be implemented for sports medicine practitioners [37]. Similarly, the current pandemic has highlighted reports of vicarious traumatization in general public and health care providers both front line and non-front line. High workload, racism, intermittent lack of protective gear and fear of infecting loved ones has also contributed to high psychological stress on health care providers [38]. The additional professional sporting demands despite various constraints to clinical sports medicine practice due to this pandemic impacts the emotional wellbeing of the sports physicians. Therefore, emphasis should be given to reduce the emotional burden on sports medicine practitioners during these times.

## COVID- 19 Prevention in Athletes

The current pandemic presents an extraordinary

public health challenge. Since athletes are also a part of the wider community, they should be educated about their role in the complex social system in tackling the pandemic. Prevention here is larger than individual athletes alone [8]. The physician has an uphill task to replace the age old practices in an athlete by improving hand hygiene measures, social distancing, use of face mask, limiting hand to face contact, minimizing pathogen exposure by avoiding close contact with infected individuals in crowded, enclosed spaces, not sharing equipment, including use of personal drinking bottles, avoiding exercise sessions in poorly ventilated facilities [6,18]. With the possibility of an anticipated quick return to competition after relaxation of restrictions and a shortened preparatory phase of the training cycle, emphasis should be to prevent injury and enhancing recovery strategies after return to normal sporting calendar [9].

## Technology/Telemedicine

With lockdown strategies in place and athletes in home confinement the routine sports medicine practice has been disrupted. In this context, telemedicine, video consultations, were promoted and scaled up to very high levels that it has now become a main component of routine practice. Telemedicine has shown to be helpful in previous outbreaks, including former coronavirus outbreaks such as SARS and MERS. A framework was also established based on the literature present [39], which were later revised during the current COVID-19 pandemic [40]. Various telemedicine guidelines and algorithms have since been suggested in the field of sports medicine. Practitioners should adapt quickly to the new communication platforms available, following existing communication guidelines recommended by the respective regulatory bodies in their countries, also staying updated with the technological advances in the field of communication [41].

## Conclusion

Professional sport, as well as its resumption, is a secondary concern in the context of the COVID-19 pandemic globally. The fact needs to be reiterated that sports should occur at a time when all health, social and economic benefits outweigh the risks of infection. Moreover, sports have been classified based on their contact nature and strict social distancing norms definitely curtail the amount of exercise done for both amateur and elite athletes. Athletes should be treated more as a community rather than a commodity. No doubt new norms need to be followed, new methods to be adopted which could impact sports medicine practice. Training to curtail infection spread, implementing modified RTP protocol, assessing risk, formulating mitigation strategies for sporting events, organizing events behind closed doors without fans, creating best practice guidelines all will be the new normal. With the dearth of literature and novel

nature of the virus most of our current strategies are based on recommendations and expert advice which could well be redesigned in the coming near future.

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