

Recommendations for sports and exercise medicine physicians:

Resumption of regular sports activity after COVID-19 pandemic

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Introduction

The SARS- Coronavirus-2 (COVID-19) pandemic led to a disruption of organised sport. Sports activities have now been allowed, as individual sports under certain hygienic conditions and a distance of at least 2 meters is recommended. However, sports in some sports facilities including Gyms has not yet been allowed. Competitive and recreational athletes have now been allowed to engage in outdoor activities as individuals if they keep a safe distance from other people for a limited time in accordance with their national regulations. The restrictions and requirements vary from country to country and region to region (1,2,3,4).

Now that the strict ban on contact has been relaxed, some areas are permitting, with conditions, team games like football as ghost games without spectators or 'behind closed doors'. The term behind closed doors was used initially in association with football, to describe matches played where spectators are not allowed in the stadium. However, hygiene standards such as keeping appropriate distance, wearing face masks and using hand disinfection should be practised. This will not always be possible (e.g. football) (4). Also, playing intensive sports with masks and mouth protection is not possible because they impede mouth breathing.

With regard to the resumption of sport ("return to play"), the concern is the risk of infection both by a player passing on the COVID-19 virus to others or by becoming infected themselves through physical contact where proximity to other athletes is unavoidable.

It must be clarified, on the one hand, which groups require a sports medical examination before resuming sport and what that examination should include, and on the other hand what precautionary measures must be taken with regard to the examinations and the examination equipment.

The aim of this statement is to provide practical recommendations based on the current evidence. These recommendations could be considered as a foundation for further evidence-based guidelines as the knowledge regarding COVID-19 advances.

Resumption of sport ("*Return to play*")

All athletes should undergo a coronavirus screening questionnaire and be tested for SARS-CoV 2.

The limits of the tests must be understood before resuming the sport. Recently many SARS-COVID 2 diagnostic tests kits have become available. Some of them can be administered at the point-of-care with a turnaround time of 24 hours. The PCR- test (oral or nasopharyngeal smear) is considered as the standard, but can give false negative results depending on the test procedure; in which case a repeat test is necessary. Serological assays, looking for specific antibodies, also have moderate sensitivity to date. These tests can be negative, more often between 2 and 3 days. They are not always sufficiently reliable, depending on the manufacturer. A reliability of 99.9 % is stated for a newer method. The diagnosis of a case of suspected infection is still based on a the typical symptomatology, verifiable contact with already infected person(s) and/or being in a high-risk environment (5).

Groups of athletes

For the resumption of sport, the following groups must be distinguished:

- 1a. Leisure time athletes or competitive athletes without symptoms and signs.
- 1b. Leisure time athletes or competitive athletes without symptoms and without proven infection when tested within the previous 24 - 48 hours with a PCR test.
- 2. Persons with a positive test (here only PCR tests are considered) without any symptoms, possible detection or missing detection of antibodies* or antigens.
- 3. Persons who have experienced COVID-19 infection with mild symptoms, who only needed outpatient treatment and quarantine for 14 days.
- 4. Persons with mild symptoms but who needed inpatient treatment.
- 5. Persons with severe symptoms, inpatient treatment, including intensive care without artificial respiration, and
- 6. Persons with severe symptoms, inpatient treatment in intensive care with artificial respiration.

The sports medical examination should be carried out in cooperation with a respiratory physician and/or cardiologist. "Persons" means leisure time athletes and competitive athletes or people who have recently started regular physical activities.

* Antibody testing has a limited validity and significance at the moment but will become increasingly important. Testing for antigens will be more valid but is not yet available on the market. Shortly, there will be point of care (POC) tests for COVID-19 available, giving results within minutes. In addition, the results of tests depend on the moment when carried out.

Recommendations for the individual groups

1a: Before resuming sport without any past medical history, risk stratification has to be evaluated. Especially a history of close contact with people with positive tests or contact with people of high risk or in so called hotspots. (5) If the history is negative, the person /athlete can be declared to be free of any symptoms. This must be documented.

Exercise testing, if done, must be performed considering all hygiene regulations. Unprotected breathing must be avoided. Use a face mask or better still a pneumotachograph with a bacterial filter (see below). *Sport is possible.*

1b: Before resuming sport without any past medical history evidence and a negative test, risk stratification has been done. If there are any doubts or uncertainties, further tests (e.g. PCR or validated POC) should be carried out. If these are negative, "team sports" as well as sports in sports facilities can be permitted, provided that the hygiene requirements are fulfilled. *Sport is possible.*

2: Resumption after 14 days quarantine and at least 2 negative PCR tests are required. Examinations depending on symptoms: History, physical examination, 12-lead ECG, and if necessary, pulmonary function, echocardiography and stress test. Exclude myocarditis if symptoms occur. An ECG at rest should be mandatory. (1,2,6,7), *Sport possible with normal findings.*

3: Resumption after a quarantine period of 2 weeks and contact ban for another 2 weeks and at least 2 negative PCR tests.

A medical examination by a sports medicine physician is strongly recommended with a history, physical examination, and if possible, a blood test (CRP, hsTn, NP), resting ECG (looking for changes of Q-wave, ST-stretch, T-wave). Also, after pulmonary examination, a pulmonary function test is required, and if necessary, a stress test with ECG and if possible, with blood gas analysis. If there is significant symptomatology, spiroergometry should be added. (7) If performing cardiopulmonary exercise Testing (CPET, including Borg scale and dyspnoea assessment), hygienic conditions must be adhered to.

Intensive sport is possible after 4 weeks with normal findings.

4: Same procedure as for 3, but obligatory ergometry with blood gas analysis and/or spiroergometry, if necessary. X-ray examination of the thoracic organs depending on the findings during the inpatient stay, in special cases HR-CT of the thoracic organs, in consultation with a respiratory physician. Cardiac examinations depending on history, symptoms and signs, cardio-MRI imaging after consultation with cardiologist.

Intensive sport possible after 6 - 8 weeks with normal findings.

5 and 6: A complete pulmonary and cardiological examination is necessary, "Cardiac markers" like hsTn, NP), ECG, pulmonary function test, if necessary, echocardiography, stress test with ECG and blood gas analysis. Depending on previous findings, HR CT of the thoracic organs and cardiac magnetic resonance imaging looking for myocardial damage in consultation with a respiratory physician and/or cardiologist. A final sports medical statement is mandatory. *Resumption of sport depend on the results of the examination.* COVID –19 tests should be performed several times, if possible 24 - 48 hours before start of sport at POC with a short-standardized history.

Note: The cost of COVID-19 testing varies from country to country. In Germany, health insurance companies cover the costs of the necessary tests. However, it is recommended that you consult your health insurance company.

Ambient and apparatus examination conditions

Recommendations for sports examinations in case of unknown infection status and after infection. Measures to be taken to avoid or reduce the risk of droplets production during interventions and activities

-- Appointments should only be booked every 1- 2 hours according to the lab setting, to ensure sufficient time for disinfection and to avoid contact with other athletes.

A combined detergent/disinfectant solution (ACTICHLOR) is to be used for cleaning all medical areas at a dilution rate of 1,000 parts per million of available chlorine.

- At Arrival on site, athletes are to use hand disinfectant and to wear a fluid resistant surgical mask (FRSM), with or without eye protection to minimise the dispersal of respiratory droplets. At the consultation the examiner should wear a FFP2 masks, ideally with Üplexis glass panes.

- Devices should be cleaned between athlete use, as required and during regular daily cleaning routines. Do not wipe devices with disinfectant immediately but wait 20-30 minutes for the aerosol effect to settle.

- Ensure ventilation of the room for approx. 20-30 minutes after the end of the examination.

- According to information provided, there is no additional change required with regard to disinfection of the spiroergometry device parts.

- Pulmonary function with disposable filter (MikrogardII) and disposable or sterilised clamp.

- Athlete wears a tracksuit, changing rooms are risky, even showers are a problem between examinations.

Further advice

Spiroergometry/ergometry only if PCR test is negative 24-48h before the examination, The physician/employee should wear an FFP II mask to prevent transmission.

Comparable strict hygienic measures are required for cardiological examinations, including ECG and heart ultrasound examinations (2,3,6,7).

Note: Lung function and spirometry: According to the manufacturers, pneumotachographs have a bacterial and viral filter, which must be changed before the examination of every patient/athlete and this also applies to spirometry. The filter efficiency is 99.999% according to the manufacturer's information. The COVID-19 virus has a particle size 80-160 nm significantly larger than the previously tested viruses, so that filter efficiency should exist, but special virus-related (COVID-19) tests are not available (information Fa.Vyair, Höchberg).

Recommendations on behalf of the German Respiratory Society (DGP e.V.) (modified) for patients and athletes:
(F.J.Meyer, pers.comm.)

- Pulmonary function tests at rest and under stress regularly require maximum, forced breathing manoeuvres. This can result in the release of an increased amount of aerosol containing the virus.
- For body plethysmography, a separate mouthpiece with filter (disposable material) has long been used for each patient. According to the manufacturer's instructions, this filter is also suitable for use against viruses (see above).
- Employees in the pulmonary function laboratory wear FFP2 masks throughout, as long as patients or athletes are in the examination rooms (e.g. for BGA measurement of oxygen titration) or in the waiting area in front of them.
- Pulmonary function tests at rest and under stress (incl. spirometry) are only carried out on patients with a negative smear (< 72 h) (for outpatients and inpatients of our own and other departments!)

Summary

Detailed information with a scientific background can be found in the special literature (shown below). References to prevention in sport and "toolkits" for the procedure can be found in particular in the blog of Carmody et al.(5) and Steinacker et al.(8) An assessment of the resumption of sporting activity is always a case-by-case decision that must take into account the individual situation of the athlete, the type of sport and the risk of infection from other athletes, e.g. in the case of contact sports. The recommendation to return to play thus depends on the results of the examination and individual assessment as well as on the cooperation of the sports physician with a specialist in pulmonary medicine and sport cardiology. In Germany, doctors from the public health department can also play a decisive role.

All sports physicians should provide a general recommendation on sports after the end of a contact ban according to the national and regional guidelines. After a longer pause due to the illness, the recommendation is to start moderately and gradually increase the amount of sport ("start low, go slow").

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To rapidly communicate information on the clinical effort against COVID-19, this recommendation offers teaching points and recommendations for diagnostics in subjects without or with suspicion of COVID-19 infection or after survived disease. In the interest of timeliness, these recommendations have been external reviewed.

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