



COVID-19 Epidemic: Exercise or Not to Exercise; That is the Question!

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In December 2019, a public health emergency was induced by an outbreak of novel beta coronavirus termed 2019-novel coronavirus (SARS-CoV-2) in Wuhan City, Hubei Province, China, which is going to be a worldwide epidemic with high mortality and morbidity (1, 2). In the time of writing this editorial (March 10, 2020), more than 100000 persons from more than 100 countries have been infected with more than 4000 deaths reported. Clinical manifestations of COVID-19 consist of fever, cough, dyspnea, myalgia, headache and diarrhea (3). Fatal pulmonary involvement and multi-organ failure has occurred in a portion of infected individuals (4). The virus is an enveloped RNA coronavirus which is mainly transmitted from person-to-person respiratory spread (people who are in close contact with each other or respiratory droplets produced when an infected person coughs or sneezes) and to a lesser extent from contact with contaminated surfaces or objects (1, 2). Preventive strategies may efficiently limit the rapidly expanding outbreaks of 2019-nCoV, globally (5).

The main question in the field of sports and exercise medicine is that whether physical activity is suitable during this viral respiratory tract epidemic or not.

First, let us discuss the existing evidence regarding the effects of exercises with different intensities on immune system responses. Present studies have shown that moderate intensity physical activity has positive enhancing effects on immune system responses against viral respiratory infections (6). Following moderate intensity physical activity, increase in neutrophil and natural killer (NK) cell counts is detected and salivary IgA concentrations is enhanced (6, 7). Moderate intensity physical activity increases stress hormones, which leads to reduction in excessive inflammation (7). This leads to a boost in immunity against viral infections via a change in Th1/Th2 cell responses (6). Twenty to thirty percent reduction of upper respiratory tract infections is reported in individuals performing moderate levels of physical activity in their daily

life (7). However, prolonged high intensity physical activity leads to immunosuppression (6, 8).

Experts have expressed a J-shaped connection between physical activity and respiratory tract viral infection. Moderate intensity physical activity boosts immune system and the risk of respiratory tract viral infections are reduced. However, high intensity physical activity with long durations weakens the immune system for several hours following the exercise and the risk of inspiratory tract infection are increased in this period (8).

As a conclusion, moderate-intensity (and not high-intensity) exercise may be helpful for healthy asymptomatic people and should be recommended. However, as mentioned earlier, due to high risk of spread (by person to person or contaminated surfaces), exercise in private environments (for example in home) with good ventilation and use of personal equipment may be more reasonable. A home exercise program using different safe, simple, and easily implementable exercises is suitable to avoid the airborne coronavirus and preserve fitness levels. This program may include aerobic (walking in the house), strengthening, stretching and balance exercises, or a combination of these (9).

Also, moderate intensity aerobic exercise (such as brisk walking) in outdoor environments with special attention to maintaining safe distance with others and surfaces may be a proper alternative. However, the hazards of high-intensity exercise in public gyms and crowded environments may outweigh the benefits and should be avoided.

Similarly, we have important challenges for competitive sport events. Firstly, athletes in this setting should do strenuous exercise to compete, which may be immunosuppressive. Secondly, the majority of competitive sports mandate close contact of athlete with teammates, opponents, environment (for example pool water in swimming or diving) or equipment (for example barbells in weight lifting or power lifting, javelin, shot put or discus in field sports)

which may be hazardous due to the very high contagiousness of COVID-19. Furthermore, the most organized competitions are held in big sport stadiums with a great number of spectators, which increases the risk of spread. Another concern is regarding international competitions in which asymptomatic carrier athletes (especially from the countries with high prevalence) may spread the virus to the opponents, match executives and spectators and cause an outbreak in the host country. This can accelerate the international or intercontinental transmissions. Therefore, strict 2-week isolation out of camps and matches is highly recommended to any athlete or coach with suspected or established COVID-19 disease.

Therefore, it is rational to cancel or postpone these competitions. However, when the cancellation is not possible due to the sensible reasons, the matches should be organized without spectators and with full consideration of protection and sanitary principles. Due to these considerations, a big concern exists regarding the largest mass gathering sport events (Tokyo 2020 Olympic and Paralympic Games). This event is anticipated to take place this summer with the participation of more than 200 countries, 15000 athletes and 20 million visitors and the great question for responsible authorities such as the International Olympic Committee (IOC) and World Health Organization (WHO) is whether to hold, postpone or even cancel these important games (10).

Another important question is about continuing or returning to physical activity during or following an upper respiratory tract infection. It is generally guided by the “neck check rule”. If the symptoms of upper respiratory tract infection are limited over the neck including cough, sneezing and sore throat, the individual is asked to jog for 10 minutes. If the general condition and signs are deteriorated, he or she should be prohibited from physical activity until full recovery. If the condition of the individual did not change following the 10 minutes jogging, he or she is allowed to return to low to moderate physical activity below 80% of $VO_{2\max}$. However, if the symptoms are below the neck including myalgia, fever and gastrointestinal symptoms, physical activity should be prohibited until full recovery (7, 11). In patients with pneumonia, return to physical activity is much slower and should be gradually during 4 weeks (8).

Nevertheless, it seems that the rule applies to healthy active people with intact immunity and may not be generalizable to the general population. Otherwise, due to the novel characteristics of COVID-19 and its potential negative impact on the immune system and rare cardiac complications including myocarditis, being more cautious regarding continuing exercise in symptomatic patients seems reasonable.

The proposed recommendations regarding physical activity and sport in a COVID-19 epidemic are summarized in Table 1.

Well-designed studies are warranted to determine the benefits and hazards of exercise in COVID-19 patients, especially in afebrile patients with mild symptoms over the neck.

Footnotes

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Table 1. Recommendations for Doing Physical Activity and Sport in People with Different Conditions During COVID-19 Epidemic

Condition	Low to Moderate-Intensity Exercise	High-Intensity Exercise	Competitive Sport
Healthy or asymptomatic persons	√ Exercise in private environment with good ventilation; Use of personal equipment	×	×
URI with symptoms limited to over the neck	√/× 10-minute jog test: If the general condition and signs are deteriorated: prohibit physical activity until full recovery; If not changed: allow low to moderate physical activity (< 80% of VO _{2max})	×	×
URI with symptoms below the neck (myalgia, fever and GI symptoms), or pulmonary or multi-organ involvement	×	×	×
	Physical activity should be prohibited until full recovery		

Abbreviations: GI, gastrointestinal; URI, upper respiratory tract infection.