# Ricerca e Riflessioni su Istruzione, Tecnologie e Benessere Psicofisico durante la pandemia da Covid-19

## Research and Reflections on Education, Technologies and Psychophysical Well-Being during the Covid-19 Pandemy

A cura di
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# CORONAVIRUS DISEASE 2019 (COVID-19): CONSIDERATIONS ON PHYSICAL ACTIVITY, SPORT, EXERCISE AND PHYSICAL EDUCATION AT SCHOOL

# MALATTIA DA CORONAVIRUS (COVID-19): CONSIDERAZIONI PER L'ATTIVITÀ FISICA, LO SPORT, L'ESERCIZIO FISICO E L'EDUCAZIONE FISICA A SCUOLA

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## Abstract

Could physical activity and sport constitute health itineraries at the time of Covid-19?
This study, analyzing the scientific literature, aims to address this question from three points of view: the role of physical activity as a stimulator of the immune system; the fallout that the prolonged detention has had and will have on sports, professionals or amateurs; the role of physical education at school, as an element of physical and emotional "restructuring" of pupils, and how it can be rethought for the school year to become.

L'attività fisica e lo Sport possono costituire degli itinerari di salute ai tempi del Covid-19?
Questo studio, con l'analisi della letteratura scientifica, si propone di affrontare tale quesito sotto tre punti di vista: il ruolo dell'attività fisica come stimolatore del sistema immunitario; la ricaduta che il fermo prolungato ha avuto e avrà sui praticanti sport, professionisti o amatori; il ruolo dell'educazione fisica a scuola, quale elemento di "ristrutturazione" fisica ed emotiva degli alunni, ed il modo in cui essa possa essere ripensata per l'anno scolastico a divenire.

## Keywords

Covid-19; Physical Activity; Sports Activity; Physical Education; Lifestyles; Health
Covid-19; Attività Fisica; Attività Sportiva; Educazione Fisica; Stili di Vita; Salute

## Introduction

The pandemic caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), the virus responsible for the new Coronavirus 2019 (COVID-19), today represents a serious threat to human life: first of all for the direct pathological consequences triggered by the virus; but also for the indirect consequences, in particular with respect to lifestyle changes. The more or less long period of lockdown has forced a large portion of the world's populations to a forced physical inactivity; and the social distancing that will follow our daily actions in the near future will necessarily entail limitations in the performance of motor and sport activities. This will probably also result in not very virtuous behaviors with respect to motor practice, compromising the proven ability of physical activity to be a primary and secondary prevention factor for many diseases.

Since the beginning of this epidemic, COVID-19 has obviously been the subject of numerous scientific research. But the pathogenetic mechanisms are still unclear; the short and long-term consequences in general health are still poorly understood.

The first results show that the immune response consequent to COVID-19 materializes, mainly but not exclusively, in a lowering of the blood values of Natural Killer (NK) cells. In severe cases, an over production of pro-inflammatory cytokines has emerged, including tumor necrosis factor (TNF) -α, interleukin (IL) -6, IL-1β, IL-8, IL-17 and IL-2 , which are responsible for multiple failure in organs such as the heart, liver, kidneys and, above all, the lungs (Feng et al., 2020).

It is in fact an established fact that the practice of exercise determines a positive immune response in our body, since, in specific doses and modalities, it has a positive effect on (Glesson et al., 2011; Alack et al., 2019).

Some studies have therefore hypothesized, with reference to COVID-19, a particular beneficial role that exercise could play by stimulating the production of NK cells (Chen et al., 2020) and promoting the increase in blood levels of secreted Il-6 from muscle (Leandro et al., 2020).

The purpose of the following work, starting from a critical reflection on the scientific literature regarding the relationship between COVID-19 and physical activity, will try to understand what type of physical activity can activate virtuous immune- and neuro-mediated mechanisms, and then hypothesize the relapses that physical inactivity may have on lifestyles in adults and children, also with respect to the practice of motor and sport activities in the school context.

## Physical activity and Covid-19

The spread of the SARS-CoV-2 virus has induced numerous scientific studies to investigate the etiopathogenesis of COVID-19, in particular the biomolecular mechanism that underlies the inflammatory state to which, in turn, a response of the vascular epithelia follows. In this case, in the most severe clinical cases, an excessive immune response represented by the so-called cytokine storm, that is to say the continuous and uncontrolled release of pro-inflammatory cytokines, almost always responsible for a serious clinical picture and a poor prognosis. In general, in Covid-19 infection the NK cells are reduced, in particular in cases with a serious or worsening clinical picture, while the number of leukocytes is higher and the neutrophil-lymphocyte ratio (NLR) is higher than normal values, as well as the blood values of IL-6 (Feng et al., 2020; Zhang et al., 2020a). Considering the high expression of blood IL-6 in Covid-19 patients, it has been hypothesized that blocking the IL-6 signal transduction pathway could be a way to treat the disease and its progression. This hypothesis followed up the use of Il-6 receptor blocking drugs that can effectively block the signal transduction pathway thus reducing the processes that promote inflammation (Bennardo et al., 2020; Zhang et al., 2020b).

IL-6, secreted by T cells and macrophages, has been classified for years as a cytokine with pro-inflammatory activity. Only later it was described that skeletal muscle, in its function as

an endocrine organ, secretes IL-6 (Xing et al., 1998). The latter, classified as myokine, has anti-inflammatory properties instead. The gene that codes for IL-6 is silent in resting muscles, its activation is contraction-dependent: muscular IL-6 is produced in response to exercise and its action on the immune system is realized both by doing as an activator of powerful anti-inflammatory cytokines, such as IL-1*ra* and IL-10, as an inhibitor of TNF-α and IL-1β, which are the first cytokines of the inflammatory cascade. It is so clear that the cytokine storm following exercise is different from that resulting from bacterial or viral infections.

This close relationship between the immune system, in particular with the myokine IL-6, and physical exercise has led to the hypothesis that the latter could constitute a valid element to trigger the "virtuous" cytokine storm and that for this reason it could constitute a prevention primary factor for Covid-19 (Leandro et al., 2020). Actually, the emergence of the IL-6 myokine in the circulation precedes that of the other cytokines and it is by far the most marked. Its level increases exponentially (up to 100 times) in response to exercise and decreases in the post-exercise period; this response to acute exercise is related to the intensity of the exercise, its duration, the mass of the muscle recruited as well as its resistance. The increasing in IL-6 is accompanied by a temporary improvement of the immune parameters (neutrophils, number of circulating lymphocytes, NK cells). In addition, training with chronic exercises has been shown to increase the activity of resting NK cells (Petersen & Pedersen, 2006). These elements lead us to say that probably this "virtuous" response is possible only when physical activity is regular and of moderate intensity, so as not to cause muscle damage. On the other hand, it must be pointed out that during the pandemic period, athletes and people who are still habitual to physical activity were also affected by the Covid-19 virus. In these athletes, the symptomatological expressions seems to have been milder; but no study has analyzed this data to date.

**Sport, Exercise and Covid-19**

During the Covid-19 pandemic, a large part of the population suffered personal and social repercussions such as to limit, and in some cases completely compromise, the performance of normal work activities. Many people were able to change their working methods by facing only some difficulties and with a spirit of adaptation; others, on the other hand, have had to drastically interrupt their activities, with serious economic repercussions. This is even more true for the sports and exercise sector. All over the world, athletes, sports clubs and associations, fitness centers, had to face, at first, a moment of sudden stop: even the Tokyo 2020 Olympic Games suffered a postponement to 2021. Subsequently, in the so-called Phase 2, the resumption of activities had to be reorganized, where times, spaces and methods had to be remodeled in compliance with the safety regulations dictated by the individual States. In Italy, the Presidency of the Council of Ministers has from time to time issued general provisions (D.P.C.M. 26-04-2020; D.P.C.M. 17-05-2020; D.P.C.M.16-06-2020) implemented by the Ministry of Sport with specific Guidelines which are gradually bringing the activities of professional and amateur athletes, sports centers and fitness centers back to the regular course of business. Of course, the Ministerial Guidelines, issued to regulate the different types of motor and sport activities, cross with the opinions of the Technical Scientific Committee (CTS), the National Olympic Committee (CONI), the Conference of Regions and autonomous Provinces, so that the individual National Sports Federations involved could be able to formulate discipline for the specific activity. As for the Sports Centers and the Fitness Centers, each one had to draw up specific protocols, in compliance with the standards indicated, so as to describe in detail the remodeling of the places and spaces and their use, and the consequent behaviors of each user / athlete.

In this complex regulatory hurdle, which we will not deal with, it seems that the social (community) value of Sport has been lost, together with the emotional value that underlies the practice of every motor and sport activity, as well as the state of health (and non-healthcare) of practitioners. Participation in motor and sport activities, in all their forms, is clearly a fun-

damental component of maintaining a healthy lifestyle and is undoubtedly an important public health message for those who have suffered isolation.

For amateur sports, the scientific literature has just reflected on the regulations, with particular regard to any consequences related to criminal liability of the sports clubs and associations in the implementation of measures to contain the risk of contagion in the resumption of activities. As far as professional sport is concerned, however, the scientific literature has not been very detailed, probably also because the indications coming from the State authorities have still not allowed an objective, critical and scientific interpretation of the situation. In addition to the mere analysis of the regulatory situation, only a few studies have directed reflections towards the athlete.

Hull et al. (2020) proposed a moment of reflection on the respiratory health of professional athletes, in particular on the potential effect of intense exercise on susceptibility to infections and the need for guidance on the return to play, following the Covid-19. In fact, respiratory diseases are a key issue for athletes' medical services. The same authors also posed the problem of the state of detention and the return to activities of the cohorts of athletes and para-athletes with a greater susceptibility to viral infections of the respiratory tract and those affected by known chronic medical conditions of the airways, such as example asthmatic conditions, observed in about 20% of endurance athletes. Acute respiratory tract infection is the main cause of non-accident medical consultation and is associated with a significant loss in both training and competition time, for this reason following the Covid-19 pandemic it would be appropriate to identify and monitor these athletes by setting ad hoc protocols.

Timpka (2020) rather highlighted the importance of immediate communication between sports organizations and athletes: the former should develop a pandemic response strategy that meets the needs of its athletes and coaches, in compliance with regulations and recommendations issued by the government and the national public health agency; the latter, on the other hand, must place full trust in the organizations and implement all the good health practices required with extreme rigor. Athletes, in particular team sports, have promiscuity opportunities that expose them more to contagion. Although there are no clinical studies of Covid-19 in sport yet, as far as individual athletes are concerned, this work summarizes good practices: we know that the risk of developing Covid-19 can be reduced by regular sleep, a balanced diet and good hydration; 7–8 servings per day of fruits and vegetables support immune function as they contain polyphenols and flavonoids; in case of contagion, in general at least 10 days of complete rest from physical exercise or rest for at least 7 days from the moment in which the symptoms stop and the return to sports must be gradual, proportionate to the severity of the disease and followed by a careful clinical evaluation (Timpka, 2020).

The considerations of some authors (Yanguas et al., 2020; Lodi et al., 2020; Toresdahl & Asif, 2020) were interesting regarding the importance of considering the greater exposure to injury after a long period of mandatory athletic stop. The lockdown, in fact, has not only imposed a break from activities but has forced a large part of the population to reduce general mobility or to train in confined spaces and in ways that do not conform to the habits of the athletes, such as the workouts offered online. All protocols for returning to motor and sport activities should consequently take into account the greater risk of injury to athletes and provide for regular assessments during the entire competitive season. The first data from the reopening of professional football competitions showed an increase in the injury rate per game compared to the same before the lockdown (Yanguas et al., 2020).

These data should make us consider a gradual and controlled return to training through load monitoring, implementation and the use of questionnaires on the state of well-being and a reorganized management of pauses or player rotation during the games. Furthermore, systemic monitoring of the incidence of injuries should be envisaged. In this context, sports medical doctors, working in close collaboration with coaches and athletic trainers, will play an important role in the management of athletes' health through careful monitoring and daily follow-up, with control of symptoms, with identification of signs of early complications and also with the

specific assessment of the individual risk factors relating to injuries. In this direction, the Italian Sports Medical Federation (FMSI) has published a detailed description of the methods of intervention (Lodi et al., 2020).

**Physical Education at School and Covid-19**

*"For physical education activities, if carried out indoors (e.g. gyms), adequate ventilation and an interpersonal distance of at least 2 meters must be guaranteed (in accordance to what is regulated in Annex 17 of the Prime Minister's Decree of 17 May 2020). In the early stages of reopening of schools, team games and group sports are not recommended, while individual sporting physical activities that allow physical distancing are to be preferred ";* it is also specified that for these activities, the use of the mask has been dispensed (D.P.C.M. 17-05-2020).

These are the latest Guidelines of the Ministry of Education, governing the return to physical education activities at school for the new school year and, if reported and read faithfully, surely leave teachers of physical education perplexed and in general all operators in the sector. Surely, and it seems obvious, each school will have to modulate the resumption of activities according to the practices dictated by current legislation and with respect to the space / students ratio to be managed. But physical education at school is not only this. The dimension of sociality and corporeity meet each other in sharing (meeting) and in agonism (clash) typical of the motor and sport event, even more if lived in school. Physical and sport science teachers, who have always been the custodians of the students' goodwill, will have a different but equally fundamental role in managing the new school dimension, they will have to propose motor activities that redesign the *dimension of distance*. The hour of Physical Education will have to be designed to become even more that privileged place where each student has the opportunity to redefine the perimeter and design his new sphere of health, made of mental, emotional and physical well-being, according to a bio- psycho-social approach.

In the school dimension, in particular for disciplines with greater emotional prominence and / or greater demand for body mediation, all the consequences of prolonged social isolation will fall. The latter has limited the spread of the virus but will have a series of repercussions on public health, in particular of children and adolescents, on which many countries are already wondering (Margaritis et al., 2020). Staying indoors can also be associated with numerous side effects, especially when the blockade is continued for months, thus interrupting social habits and compromising personal health. Due to the severe restrictions during lockdown among adolescents, the level of overall physical activity has drastically decreased and sedentary lifestyle and unhealthy behaviors have increased. In addition, the closure of the school and the use of *Distance Teaching* involved the children in sedentary activities which forced them to a different sociality and sharing. Considering that many families have not yet reached the pre-existing level of emotional tranquility and trust for outdoor activities and are still in a spontaneous self-restriction regime, it is easy to understand how students have reached unusual levels of sedentary lifestyle, and are therefore exposed to the notorious consequences of insufficient physical activity: weight gain, addictive behavioral disorders, insufficient exposure to sunlight (Lippi et al., 2020).

Despite the high level of uncertainty about what to do, the teachers of motor and sport sciences will find themselves having to redesign the teaching of the new school year in a radical way and according to what is described.

This can be accompanied by the same reflection made previously for athletes, in relation to the increase in the level of exposure to injury also in school motor activities. In recent years, there was already a drastic deterioration in the general motor skills of children: an evident increase in reports of school-aged children with motor coordination problems (Spittle et al., 2018) is accompanied by a drastic increase in accidental injuries incurred in school (and not only in motor activities), whose causes are attributable to slipping, tripping, uncoordinated movements

or missteps, elements that, in most cases, cause bruises and fractures in the hands and wrists or dislocations of the ankles (INAIL, 2019). What will happen now? In Europe, France and Spain have already prepared models for pupil monitoring (Balanzá-Martínez et al., 2020; Margaritis et al., 2020)

## Conclusions

The pandemic caused by SARS-CoV-2 has had important repercussions, not only economic, also on the world of motor and sport activities. The immune-mediated anti-inflammatory response resulting from moderate and chronic levels of physical activity could play a key role in the primary prevention of infection; this will require in-depth scientific studies and planning of specifically designed motor activities. Professional and amateur athletes, sports and fitness centers and physical education at school must be the protagonists of an important *design change*. And if this change will have to follow the directives issued by each National Government with regard to the redefinition of times, spaces and methods, it will then be the task of each sector operator (coach, athletic trainer, physical education teacher, instructor) to redefine their *educational planning*.

The world of motor and sport activities is called to play, as never before, a key role in the redefinition of the "motor worlds" of each of us; specific attention should be paid in particular to children and adolescents, less susceptible to Covid-19 infection but much more exposed to the negative effects of unhealthy lifestyles. Further scientific studies, together with the commitment of Government Institutions, are necessary in order to better understand the potential of motor and sport activities but also to better preserve the health of athletes and all amateur practitioners.

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