

# Physical activity for health and use of face masks in the COVID-19 pandemic

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## INTRODUCTION

Since the appearance in December 2019 in the city of Wuhan, China, the new coronavirus (COVID-19) has been growing exponentially worldwide, to the point where the World Health Organization (WHO) declared in January 2020 that the outbreak of the disease constituted a public health emergency of international importance — the highest level of alert in the organization, as provided for in international health regulations<sup>1</sup>.

On March 11, 2020, COVID-19 was characterized by WHO as a pandemic. The high infectivity of its etiological agent, the new coronavirus, combined with the activity of the attenuated immune system in many individuals and the lack of a vaccine, made the number of cases grow exponentially<sup>2</sup>. Worldwide, by December 10, 2020, 68,165,877 cases of COVID-19 have been confirmed, with 1,557,385 deaths<sup>1</sup>. This situation has led several agencies and governments around the world to publish documents and decrees proposing social isolation, the closure of several commercial and leisure spaces, including in many cities, spaces for physical activity. In addition to these measures, care with personal hygiene such as constant hand washing, use of gel alcohol and more recently the use of masks, even for non-infected people, has become the new routine for a large part of the world population<sup>2</sup>.

Until the discovery of a vaccine for COVID-19, and also as a protective factor for future pandemics, it seems to be very important to maintain habits that strengthen the immune system and mental health. In this regard, physical activity stands

out and its broad scientific evidence shows its effectiveness in the prevention and treatment of cardiovascular, metabolic, and psychological events. Physical activity has an inverse association with blood pressure levels, diabetes, lipid changes, and risk of coronary artery disease and other cardiovascular events<sup>3,4</sup>.

Another point observed concerns the impacts on mental health. People who, even in quarantine, remained physically active showed a protective factor for self-esteem, resilience to stress and depression<sup>5</sup>.

According to this new reality, the practice of physical activity should undergo some adaptations, including the use of face protection masks outside the home environment. This situation raises questions about the safety, comfort, and efficiency of facial masks during the practice of physical activity. Physical exercise with face masks can reduce the available oxygen and increase air retention, preventing an efficient exchange of carbon dioxide, especially in higher intensity activities<sup>6</sup>.

Thus, the objectives of this point of view are to highlight the importance of physical activity in strengthening the immune system and mental health, in addition to analyzing the necessary adaptations to its practice, taking into account the use of face protection masks during the pandemic COVID-19.

## Benefits of physical activity and use of face masks during your practice

Regular practice of physical activities and/or physical exercises is an extremely important factor for maintaining or improving the structure and functionality of various organs and bodily

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systems, such as brain, inducing neuroplasticity<sup>7</sup> and neurogenesis<sup>8</sup>, heart (modifying its phenotype, promoting hypertrophy beneficial eccentric, concentric or mixed, depending on the type of physical exercise)<sup>9,10</sup> and modulation of several genes that work to improve the cardiovascular, metabolic, neuroendocrine, respiratory, immune systems, among others<sup>11</sup>.

Although several scientific pieces of evidence demonstrate the importance of physical activity and/or physical exercise as a protective factor for human health in general, there is still no evidence about its role in individuals infected with COVID-19. However, researchers point to the need to remain physically active and reduce sedentary behavior<sup>12</sup>, in addition to suggesting that physical activity is recognized as essential during the pandemic period<sup>13</sup>. Thus, physical exercise becomes a potential therapy to combat physical and mental consequences of social isolation<sup>14</sup>, as well as inhibit other comorbidities and diseases associated with physical inactivity, for example, overweight and obesity<sup>15</sup>.

Thus, it is evident that the maintenance of regular practice of physical activities can be considered essential for asymptomatic individuals in this quarantine period, however, new conducts and precautions must be adopted to perform these activities<sup>16</sup>, especially outdoors, such as hygiene of hands and use of facial masks<sup>2</sup>.

The use of facial masks can be extremely unpleasant during physical activities or physical exercises, given that during the practice of these, oxygen consumption and gas exchange are increased, with the use of the mask, which can hinder these processes<sup>17</sup>. In this context, some doubts arose about the possible physiological changes that can occur in the human body during physical exercises using the face mask.

In this sense, for some time, and regardless of the current pandemic, some studies showed that the use of facial masks is beneficial for cardiovascular and pulmonary health during physical activity, since they reduce exposure to air pollution<sup>18</sup>, although they also report that masks reduce human performance during physical effort, impairing breathing, thermal balance, among other psychological factors<sup>19</sup>. In these studies, highly efficient face mask filters were used (dust respirator 8812, 3M, St Paul USA18), while in the review study<sup>19</sup> different types of filtration masks, quarter masks, full mask, respirators with an air-purifying filter, respirators with air supply, air-purifying respirators powered by a blower and self-contained breathing apparatus were used.

Researchers identified that performing aerobic physical exercise in light to moderate intensity, using the N95 type surgical face mask, does not increase the subjective perception of effort and neither the perception of heat in the group

of individuals who were using the mask compared to a group without a mask, however, demonstrated that heart rate, respiratory rate, and transcutaneous carbon dioxide increased slightly in the group of individuals who performed exercises with the mask, and also observed a decrease in the temperature of the facial skin in the uncovered area, while the area covered by the mask showed an increase in temperature. Thus, the authors concluded that wearing a mask in low- to moderate-intensity physical activity is not associated with a clinically significant physiological impact or with significant subjective perceptions of effort or heat<sup>20</sup>.

In another study, researchers compared a group of individuals who underwent strength training with an airflow restriction face mask and another group without a mask. In this study, it was evidenced that the use of the facial mask reduces muscular performance and increases the levels of perceived effort<sup>21</sup>.

Therefore, despite being an indispensable material to minimize the risks of infection and transmission of COVID-19 more studies are needed to assess the impact of using facial masks during physical activities and/or physical exercises on neurological, psychological, cardiovascular, respiratory, and metabolic parameters.

### Possible physiological responses to the use of facial masks during physical activity

With the scarcity of studies on the physiological effects of wearing a facial mask during physical activity, some hypotheses are suggested in this context. For example, the use of a face mask can induce a hypoxia environment [inadequate exchange of oxygen (O<sub>2</sub>) and carbon dioxide (CO<sub>2</sub>)], especially in higher intensity physical activities. In addition, this environment can become more acidic, both at the alveolar level and in the blood vessels, inducing numerous physiological changes, impairing muscle metabolism, cardiorespiratory, excretory system, modifying mechanisms of the immune system and the nervous system<sup>6</sup>.

The face mask forms a closed circuit for inspired and exhaled air, although not completely airtight. The rebreathing of exhaled air would probably increase arterial CO<sub>2</sub> concentrations, increasing acidity in the environment. As a consequence, discomfort, fatigue, dizziness, headache, shortness of breath, muscle weakness and drowsiness can be generated<sup>6</sup>.

The resistance offered to inspiratory and expiratory flow, for prolonged periods, can result in respiratory alkalosis, increased lactate levels, and early fatigue. In addition, there can also be an exponential increase in heart rate and blood pressure, with a consequent increase in aortic pressure and left ventricular pressure, causing an increase in cardiac overload and coronary demand. It is important to note that all of these hypotheses are more specifically related to higher intensity physical activity<sup>6</sup>.

## Recommendations for physical activity with the use of masks

Considering that the face mask is recognized as an important element to avoid contagion by COVID-19, it is suggested that physical activity outdoors or in any environment outside the home should be maintained, preferably at mild and moderate intensities, and with the use of masks, in addition to respect of social distance. It is noteworthy that low to moderate-intensity physical activity would be the most recommended to reduce the possible adverse effects of breathing with a mask. In addition, considering that there are several types of masks, it is suggested to use a model that is more comfortable considering, even, that double-sided masks cause greater difficulty in breathing. It is also suggested to change the mask whenever it is wet due to the practice of physical activity. When experiencing symptoms of dizziness, imbalance, excessive fatigue, and shortness of breath, it is advisable to stop or reduce the intensity of physical activity until the symptoms subside. In addition, it is recommended

that people with heart disease choose to perform physical activity at home during the pandemic period.

## CONCLUSIONS

According to the various articles that supported this point of view, the use of facial masks during a physical activity at light or moderate intensity, and when performed outdoors or in any environment outside the home seems to be an important strategy to avoid contagion by COVID-19.

## AUTHORS' CONTRIBUTIONS

**FJGP:** Data curation, Supervision, Writing – original draft. Writing – review & editing. **MPB:** Data curation, Writing – original draft. **MSS:** Data curation, Writing – original draft. **JMG:** Data curation, Writing – original draft. **RAJ:** Supervision. **CFAA:** Supervision. **ACIC:** Data curation, Supervision, Writing – original draft. Writing – review & editing.

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