

**Wear a mask to reduce COVID-19 transmission while exercising at the gym: belief or evidence-based?**

**O uso obrigatório de máscara para reduzir a transmissão de COVID-19 durante a prática de exercício em academia: crença ou evidência?**

**El uso obligatorio de una máscara para reducir la transmisión del COVID-19 durante el ejercicio en gimnasio: ¿creencia o evidencia?**

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**Anderson Luiz Bezerra Silveira**

ORCID: <https://orcid.org/0000-0002-0862-5094>

Universidade Federal Rural do Rio de Janeiro, Brasil

E-mail: [andersonsilveira@ufrj.br](mailto:andersonsilveira@ufrj.br)

**Lucas Monteiro Carvalho**

ORCID: <https://orcid.org/0000-0001-8398-919X>

Universidade Federal Rural do Rio de Janeiro, Brasil

E-mail: [lucas.monteirodc@gmail.com](mailto:lucas.monteirodc@gmail.com)

**Fernando Azevedo Cruz Seara**

ORCID: <https://orcid.org/0000-0003-4772-5618>

Universidade Federal Rural do Rio de Janeiro, Brasil

E-mail: [searafac@gmail.com](mailto:searafac@gmail.com)

**Emerson Lopes Olivares**

ORCID: <https://orcid.org/0000-0003-1123-0672>

Universidade Federal Rural do Rio de Janeiro, Brasil

E-mail: [olivares.el@gmail.com](mailto:olivares.el@gmail.com)

**Abstract**

Introduction: After the spread of new coronavirus (COVID-19) around the world, some sanitary measures were adopted to reduce the transmission rate. Social distancing and the use of masks are one of them. Therefore, after months of pandemic situation, levels of infection and mortality began to decline in some regions of Brazil. As a result, some states and municipalities started to relax their quarantines allowing access to some community places like gyms. To access these places is obligatory the use of masks. However, there is a lack of knowledge about the efficiency of the use of masks in closed environments, particularly in

situations with increased production of body fluid, like in physical exercise. Objective: To overview the use of masks and the inefficiency in reducing the transmission risk of new coronavirus during physical activity practice at gyms. Conclusion: Despite the extreme necessity of using masks to reduce the risk of COVID-19 transmission, there is no evidence of its efficacy in closed environments during physical exercise so far. In addition, the use of masks negatively affect the performance of physical activity. The only plausible requirement in the current pandemic context would be to present the COVID-19 test result to practice activity indoors.

**Keywords:** Coronavirus; Infection; Physical exercise; Transmission; Sweat.

### **Resumo**

Introdução: Após a disseminação do novo coronavírus (COVID-19) pelo mundo, algumas medidas sanitárias foram adotadas para reduzir a taxa de transmissão. O distanciamento social e o uso de máscaras são algumas delas. Portanto, após meses de situação pandêmica, os níveis de infecção e mortalidade começaram a diminuir em algumas regiões do Brasil. Como resultado, alguns estados e municípios começaram a relaxar suas quarentenas permitindo o acesso a alguns espaços comunitários, como academias de ginástica. No entanto, para acessar esses locais é obrigatório o uso de máscaras. Porém, há um desconhecimento sobre a eficácia do uso de máscaras em ambientes fechados, principalmente em situações onde acontece aumento da produção de fluidos corporais, como no exercício físico. Objetivo: Traçar um panorama sobre o uso de máscaras e a sua ineficiência na redução do risco de transmissão de novo coronavírus durante a prática de atividade física em academias. Conclusão: Apesar da extrema necessidade do uso de máscaras para reduzir o risco de transmissão do COVID-19, não há evidências de sua eficácia em ambientes fechados durante o exercício físico. Além de afetar negativamente o desempenho da atividade física. O único requisito plausível no atual contexto de pandemia seria apresentar o resultado do teste COVID-19 para praticar atividade em ambientes fechados.

**Palavras-chave:** Corona vírus; Infecção; Atividade física; Transmissão; Suor.

### **Resumen**

Introducción: Luego de la propagación del nuevo coronavirus (COVID-19) en todo el mundo, se tomaron algunas medidas sanitarias para reducir la tasa de transmisión. La distancia social y el uso de máscaras son algunos de ellos. Por lo tanto, luego de meses de situación pandémica, los niveles de infección y mortalidad comenzaron a disminuir en algunas regiones

de Brasil. Como resultado, algunos estados y municipios comenzaron a relejar sus cuarentenas, permitiendo el acceso a algunos espacios comunitarios, como gimnasios. Sin embargo, las máscaras son obligatorias para acceder a estas ubicaciones. Sin embargo, existe un desconocimiento sobre la efectividad del uso de mascarillas en ambientes cerrados, especialmente en situaciones en las que existe un aumento en la producción de fluidos corporales, como el ejercicio físico. **Objetivo:** Proporcionar una visión general del uso de mascarillas y su ineficacia para reducir el riesgo de transmisión de nuevos coronavirus durante la actividad física en gimnasios. **Conclusión:** A pesar de la extrema necesidad de utilizar mascarillas para reducir el riesgo de transmisión de COVID-19, no hay evidencia de su efectividad en ambientes cerrados durante el ejercicio físico. Además de afectar negativamente el desempeño de la actividad física. El único requisito plausible en el contexto de la pandemia actual sería presentar el resultado de la prueba COVID-19 para practicar en interiores.

**Palabras clave:** Coronavirus; Infección; Actividad física; Transmisión; Sudor.

## 1. Introduction

In December of 2019, a new coronavirus (SARS-CoV-2), also popularly known as COVID-19, was identified in Wuhan, China. This virus has an elevated transmission rate and, therefore, that virus rapidly spread throughout the world. In addition to the elevated transmission rate, the new coronavirus causes a severe acute respiratory syndrome, septic shock, coagulation dysfunction, gastrointestinal dysfunctions, and other severe symptoms (Chen et al., 2020). At August 2020, the new coronavirus has infected approximately 18.354.342 person, with 696.147 deaths (Culp, 2020) and most deaths occurred in the young and elderly patients with pre-existing comorbidities, such as hypertension, diabetes, and obesity (Kass, Duggal, & Cingolani, 2020; Qiu et al., 2020).

The high SARS-CoV-2 transmission rate and the absence of immunity by the population contributed to the exponential growth of mortality rate since the virus outbreak (Kucharski et al., 2020). Thus, international scientific and political organizations needed to fight together against COVID-19 (World Health Organisation, 2020). The World Health Organization (WHO) and the Brazilian Ministry of Health have adopted some strategies based on scientific pieces of evidence to reduce the risk of transmission and mortality caused by COVID-19, such as lockdown, use of masks in public places, frequent hand sanitization with Isopropyl 70% or ethyl alcohol 70%; and social distance (World Health

Organization, 2020a). However, despite these preventive measures, the virus continues to spread throughout the world (Culp, 2020)

Brazil has continental dimensions and presents a huge population, cultural and geographic diversity. When coupled to the lack of hard actions for social isolation, the absence of specific vaccine as well as effective evidence for treatment and prevention of COVID-19 transmission, makes the problem even more complex to date (Chen et al., 2020; World Health Organisation, 2020; Souza et al., 2020)

The epidemiological patterns of COVID-19 between the 27 federative units and the 5,570 Brazilian municipalities also reflect this heterogeneity, which needs different actions to face it. Therefore, some states and cities with stable or falling COVID-19 levels of infection and death adopted the mandatory use of masks to practice physical activity outdoor (e.g. parks) or indoor (e.g. fitness centers), as a way to attenuate the quarantine, though based on empirical evidence. However, scientific evidence suggests that this measure is controversial. Therefore, this commentary aims to provide an overview of the use of masks during exercise practicing and COVID-19 transmission risks.

## **2. Methodology**

This study consists in an opinion article with a qualitative analysis of scientific studies (Pereira et al., 2018), to discuss and provide an overview about the use of masks, physical exercise and COVID-19 transmission risks.

The inclusion criteria adopted was scientific studies, commentaries and topics published by National and World health organizations, which discusses about the theme of this opinion article. The search terms used were: “COVID-19”, “Coronavirus” “Sweat fluids”, “Pandemic”, “Exercise”, “Body fluids”, “Skeletal muscle”, “Energy”.

## **3. Sweating During Exercise Practice vs. Covid-19 Transmission**

During exercise, several adaptations occur in all physiological systems, such as increased respiratory rate (hyperventilation) (Fikenzer et al., 2020), the production and release of sweat, and increased body temperature (Li et al., 2005), which allow the body to be able to maintain rapid production of high energy levels (ATP) (Hargreaves & Spriet, 2020; Propper, 2020). These adaptations also increase body fluids droplets secretion into the air.

So far, some studies show the presence of the virus in body fluids (e.g. saliva, blood) and sweat glands (Hendekli, 2020; Mohseni, Taghinezhad-S, Xu, Xu, & Fu, 2020; Propper, 2020). This means that there is a risk of transmission by sweat (Hendekli, 2020; Mohseni et al., 2020; Propper, 2020). In such a case, the indirect virus transmission may occur via skin-to-mucosa or skin-to-object-to-mucosa contact, although there is no clear evidence of direct COVID-19 transmission through sweat (Ding et al., 2004). Then, during exercise, the practitioner could spread the virus throughout the gym, either by touching the surface of objects (e.g. dumbbell, treadmill, and bicycle) or by simply dropping beads of sweat on them.

Therefore, the safe distance between people during exercise practicing would be approximately 16 to 18 meters (Propper, 2020), to efficiently reduce the risk of COVID-19 transmission in fitness centers or gyms. This would be unfeasible for a gym, due to the high cost of maintenance to serve a small number of persons per hour.

Also, practitioners should wear appropriate clothing to prevent exposure of the skin, and releasing sweat in the environment (World Health Organization, 2020b). On the other hand, covering the skin during physical activity would be an inappropriate action to exercise, increasing the risk of dehydration and hyperthermia, since during exercise the skin needs to be cooled (Gavin, 2003), especially on days with a high temperature.

#### **4. The use of Masks During Exercise Practice vs. Covid-19 Transmission**

The use of a conventional mask (e.g. surgical, cloth) or professional (n-95) is a sanitary measure to reduce transmission of new coronavirus (BRASIL, 2020; Garcia, World Health Organization, 2020a). Nevertheless, during physical exercise practice, its efficiency has not been supported by scientific evidence published by researchers around the world.

The conventional masks (e.g. surgical) can reduce 85% the risk of virus transmission (Craig, 2020). However, this capacity significantly declines within 15 minutes of exercise (Nieß et al., 2020), especially due to effort-induced hyperventilation (Nicolò, Girardi, Bazzucchi, Felici, & Sacchetti, 2018) which is followed by an increase in the risk of transmission by body fluid droplets (BRASIL, 2020). Therefore, during physical exercise, conventional masks would need to be changed every 15 minutes to assure the efficiency of reduction in COVID-19 transmission.

Although most Brazilians wear cloth masks, these have 97% more particle penetration compared to surgical masks (Szarpak et al., 2020). This means that the lifespan of cloth masks during physical exercise would be significantly less than surgical masks (Szarpak, Smereka,

Filipiak, Ladny, & Jaguszewski, 2020). However, although the use of masks to practice physical exercise indoor is mandatory, there is no obligation on the maximum time to change masks within fitness centers or gyms, even if it is completely wet with sweat.

Physical exercise inevitably promotes physiological adaptations previously described (e.g. hyperventilation, body temperature increase, and sweating), which are higher regardless of the mask type. After some time of exercise, hyperventilation and sweating leave the masks completely wet, and this can restrict airflow at the time of the greatest oxygen demand. Consequently, there is an increase in tidal volume compared to the same intensity without a mask. The exercise-related tidal volume increase makes the respiratory movements deeper, which can transform the mask, at the same time, into an asphyxiating and particle dispersing membrane to the air. Therefore, there is still a lack of knowledge about the efficiency of masks to reducing transmission risk in community places like gyms (World Health Organization, 2020b)

## **5. Conclusion**

The pieces of evidence lead us to conclude that despite the efficiency of wearing mask in reducing the dispersion of the coronavirus is well established, there is no report evidencing the same efficiency during exercise so far. In fact, COVID-19 transmission risk during physical exercise may be even greater, since the masks could work as a virus dispersion tool due to body fluids and droplets released during physical exercise, especially indoor at fitness centers or gyms. Additionally, the physical performance is impaired, while the risk of health issues is increased by the use of masks during physical activities. Therefore, the most effective way to contain the virus would be to keep gyms and fitness centers closed. Alternatively, COVID19 test results (blood or PCR) should be regularly required by the establishments to allow the practice activities indoors. Further research will be necessary to understand the lifetime of small sweat droplets released by exercise at closed environmental and to understand if the sweat at closed environmental can be a route for covid-19 transmission.

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**Percentage of contribution of each author in the manuscript**

Anderson Luiz Bezerra Silveira – 25%

Lucas Monteiro Carvalho – 25%

Fernando Azevedo Cruz Seara – 25%

Emerson Lopes Olivares – 25%