Revista Portuguesa de Cardiologia 40 (2021) 965–967

Revista Portuguesa de
Cardiologia
Portuguese Journal of Cardiology
www.revportcardiol.org

EDITORIAL COMMENT

Face masks and exercise: Novel insights into a contemporary conundrum

Máscaras faciais e exercício: novas perspetivas numa questão contemporânea

Eduardo M. Vilela[a,*], **Ricardo Fontes-Carvalho**[a,b]

[a] *Cardiology Department, Centro Hospitalar de Vila Nova de Gaia/Espinho, Portugal*
[b] *Cardiovascular Research Center (UniC), Faculty of Medicine, University of Porto, Porto, Portugal*

Available online 27 October 2021

Physical activity plays a pivotal role across the cardiovascular continuum, and is associated with several benefits in both healthy individuals and those with different diseases.[1] Given this background, regular exercise has been recommended as an integral part of a healthy lifestyle, while also comprising one of the core components of contemporary cardiac rehabilitation (CR) programmes.[1] Although the myriad physiological effects of exercise on the cardiovascular system have been extensively reviewed, showcasing their importance in primary and secondary prevention, the recent COVID-19 (SARS-CoV-2 associated disease) pandemic has provided novel challenges concerning its application.[1–3] Indeed, although the substantial worldwide impact of the COVID-19 pandemic on healthcare systems has been widely recognized, its toll on both physical activity levels and CR programs should also be pondered with.[2–5] Since the start of the pandemic several measures have been advocated to mitigate the risk of infection and of spreading the virus, some of which have included social distancing (with different countries also undertaking periods of lockdown) and the use of personal protective equipment, including face masks of varying types.[2,5] While there are data supporting the utilization of face masks, with these being currently commonplace in different contexts, there has also been interest in assessing their potential impact in individuals performing exercise, as these could be associated with detrimental effects.[2–4,6]

In the current issue of the Journal, Pimenta et al. provide interesting data on the cardiorespiratory impact of the use of face masks (a surgical disposable three-layer mask and a KN95 respirator) in a group of twelve healthcare workers.[7] In this study, individuals randomly performed three standard exercise stress tests on a treadmill: one without a mask and two with different face masks, respectively. Beyond test duration, this study provides insights in terms of some physiological parameters (such as blood pressure, heart rate and peripheral oxygen saturation) as well as ratios of perceived exertion and dyspnea (according to the Borg scales of perceived exertion and dyspnea, respectively). The current report further categorized each test according to the percentage of total time as 25, 50, 75 or 100% (to account for the fact that fewer observations were present in later stages of the protocol).

In this study, comprising a relatively young (mean age 29.8 years-old) healthy population including mostly male and active individuals (58.3% of which had moderate to high levels of physical activity), using a face mask was associated with a shorter duration of the exercise test, whereas no difference was noted when comparing the different types of masks. Of note, although mean values of peripheral oxy-

DOI of original article: https://doi.org/10.1016/j.repc.2021.01.017
* Corresponding author.
E-mail address: eduardomvilela@gmail.com (E.M. Vilela).

https://doi.org/10.1016/j.repc.2021.10.001

gen saturation differed at the end of the test (94.5% when without a mask, 92.5% and 91.3% when using a surgical mask or a respirator), when comparing mean differences according to test subcategories, significant reductions were only described when comparing no mask utilization to respirator use at test completion. Moreover, no differences were noted in terms of heart rate or mean systolic final blood pressure. Also, interestingly, although effort and dyspnea perception differed among the three groups, being greater in those with face masks when compared to those without, when analyzing mean differences at the pre-specified categories, no significant differences were present when comparing both types of masks. It is worthy of mention, and as described by the authors, these scales diverged at different timepoints when comparing those without masks to those using them.

The use of face masks has been adopted progressively over the course of the pandemic, with different reports advocating their use in the setting of CR programmes.[2,3] As such, a comprehensive assessment of the possible overall impact of their use is of great relevance, as it enables both adequate counselling of individuals undergoing exercise training as well as the tailoring of their programmes.[4,7,8] Furthermore, it may be hypothesized that differences in functional parameters might need to be accounted for when analyzing results of exercise interventions (especially in terms of benchmarking results, when compared to timepoints in which no face masks were used). In this regard, and as explored by Pimenta et al., several studies have been undertaken to try to address this issue.[3,4,6–8] Notably, however, and as discussed in the current report, there has been some divergence of results on the impact of face masks in individuals doing exercise.[3,7–9] Although some studies have shown differences in terms of ventilatory parameters and exercise capacity, [4,6] a review by Hopkins et al. showed that while the use of face masks during exercise may be associated with increased levels of dyspnea and effort perception, its effects in physiological parameters such as blood gases and work of breathing tended to be relatively small.[8] This point has also been suggested in another recent review.[3] Some of the mechanisms that have been proposed as candidates for explaining these findings range from increases in resistance, dead space ventilation and derangements in thermal regulation to psychological aspects.[3–8] As described by Haraf et al., these latter points may be of importance to the interindividual subjective response to the use of face masks while exercising, though other factors (as mentioned above) should remain under consideration.[3,9]

Nevertheless, several limitations to the current data on this topic should be noted. Firstly, most of the reports in the literature relate to healthy (or presumably healthy) individuals.[8] As such, large studies designed specifically for individuals with cardiovascular or respiratory disease should be the focus of further research, as even small differences in physiologic parameters such as those in end-tidal carbon dioxide could be of relevance in these subgroups.[4,6,8] Secondly, studies mostly addressed the impact of the use of face masks after an acute bout of exercise.[4,6,7,9] As such, data on the impact of the prolonged use of face masks would be of relevance, given potential adaptations in terms of cardiorespiratory and hematological parameters.[9] Beyond this, improper mask utilization could also be a hinderance in real-world settings.[9] Finally, the role of face masks in different contexts and subgroups of individuals should also be further ascertained as vaccination progresses.[6,9] As the evidence-base for different aspects concerning COVID-19 management progressively and rapidly expands, these concepts should be further appraised.

The COVID-19 pandemic has provided manifold multidimensional challenges to cardiovascular medicine in general, and specifically to exercise training and CR.[5] Meanwhile, advances in modalities such as telerehabilitation, with the inclusion of hybrid models as well as novel technological ancillary tools, should also be acknowledged.[2,5] These, in association with risk mitigation strategies, have allowed for continuity of care in the complex cardiovascular patient.[2,3,5] Importantly, beyond the pandemic phase, concepts developed and refined should be integrated into the contemporary body of knowledge on preventive cardiology, as these could further help in reducing some of the longstanding asymmetries and barriers in this field.[5] On the one hand, telerehabilitation could, beyond this phase, allow improvements in CR uptake (an area in need of improvement, even before the current phase), whereas the incorporation of remote monitoring could yield relevant information on functional and physiological parameters with which to tailor preventive strategies.[2,5] On the other hand, knowledge of the cardiopulmonary response to the use of face masks may maintain its relevance even after the pandemic curve recedes. In this regard, reports have consistently and robustly provided data on the negative impact of particulate matter air pollution in terms of cardiovascular disease.[10] Of note, some studies have highlighted the potential usefulness of face masks in improving certain surrogates such as blood pressure, in these settings.[10] While, as described in a scientific statement by the American Heart Association, data concerning the overall role of face masks in the presence of high levels of particulate matter air pollution is still elusive, novel insights into this issue, some of which were serendipitously brought about by the pandemic, may lead to improved personal protective strategies.[10]

The COVID-19 pandemic has tested current paradigms on cardiovascular prevention, stressing the evolving need for further improvements in comprehensive patient management, while reinforcing the paramount role of a translational outlook. While current knowledge on some facets of COVID-19 (and cardiovascular disease) management is still not fully understood, as illustrated by the current report, the advances made over this complex time are central to a personalized view and should also lead to further reflections on the many challenges which still lie ahead.

Conflicts of interest

The authors have no conflicts of interest to declare.

References

1. Pelliccia A, Sharma S, Gati S, et al. 2020 ESC guidelines on sports cardiology and exercise in patients with cardiovascular disease. Eur Heart J. 2021;42:17–96.

2. Van Iterson EH, Laffin LJ, Crawford M, et al. Cardiac rehabilitation is essential in the COVID-19 era: delivering uninterrupted heart care based on the Cleveland clinic experience. J Cardiopulm Rehabil Prev. 2021;41:88–92.
3. Haraf RH, Faghy MA, Carlin B, et al. The physiological impact of masking is insignificant and should not preclude routine use during daily activities exercise, and rehabilitation. J Cardiopulm Rehabil Prev. 2021;41:1–5.
4. Epstein D, Korytny A, Isenberg Y, et al. Return to training in the COVID-19 era: the physiological effects of face masks during exercise. Scand J Med Sci Sports. 2021;31:70–5.
5. Scherrenberg M, Wilhelm M, Hansen D, et al. The future is now: a call for action for cardiac telerehabilitation in the COVID-19 pandemic from the secondary prevention and rehabilitation section of the European Association of Preventive Cardiology. Eur J Prev Cardiol. 2020;(July). Epub ahead of print.
6. Fikenzer S, Uhe T, Lavall D, et al. Effects of surgical and FFP2/N95 face masks on cardiopulmonary exercise capacity. Clin Res Cardiol. 2020;109:1522–30.
7. Pimenta T, Tavares H, Ramos J, et al. Facemasks during aerobic exercise: implications for cardiac rehabilitation programs during the COVID-19 pandemic. Rev Port Cardiol. 2021;40:957–64.
8. Hopkins SR, Dominelli PB, Davis CK, et al. Face masks and the cardiorespiratory response to physical activity in health and disease. Ann Am Thorac Soc. 2021;18:399–407.
9. Lakicevic N, D'Antona G, Paoli A, et al. Behind the mask: rethinking the use of face masks while exercising. Sci Sports. 2021;(April). Epub ahead of print.
10. Rajagopalan S, Brauer M, Bhatnagar A, et al. Personal-level protective actions against particulate matter air pollution exposure: a scientific statement from the American Heart Association. Circulation. 2020;142:e411–31.