

## LETTER TO THE EDITOR

## Physical activity: Benefits and challenges during the COVID-19 pandemic

The coronavirus disease 2019 (COVID-19) is a pandemic viral disease that had its first cases in the city of Wuhan, China, during December 2019. As of May 5, 2020, 3 665 912 patients have tested positive worldwide; of these, 257 337 died.<sup>1</sup> Similar to other coronaviruses, COVID-19 infects the host's cells using a spike protein that links to the angiotensin-converting enzyme 2 (ACE2) receptors expressed on various human cells such as the epithelial cells of the lung.<sup>2</sup> The role of potential triggers that favor the expression of ACE2 receptors, such as cigarette smoking or use of certain anti-hypertensive medications, is under investigation and not yet supported by robust data. It is known that fragile populations, such as the elderly or patients who are immunosuppressed or present multiple comorbidities, are more exposed to severe COVID-19. In Italy, a case fatality rate of 4.47 times higher was reported among people aged between 80 and 89 years compared to those aged between 60 and 69 years.<sup>3</sup> Diabetes, hypertension, and cardiovascular diseases were reported as the most frequent comorbidities among patients with COVID-19 requiring hospitalization.<sup>4</sup>

Physical activity (PA) has proven to be beneficial in improving the clinical conditions that are most frequently associated with severe COVID-19.

Physical activity contributes to the reduction of overall cardiovascular risks, lowering both systolic and diastolic blood pressure and remodeling left ventricular hypertrophy.<sup>5</sup> PA has also well-known positive effects on metabolic syndrome and insulin sensitivity.<sup>6</sup> Therefore, one can assume that active individuals compared to sedentary people should have better control on high-risk comorbidities that increase susceptibility to severe COVID-19. There are still, however, open questions regarding PA and COVID-19 predisposition. Firstly, some reports highlighted that, while moderate-intensity exercise is beneficial for the immune system, single bouts of prolonged exercise can lead to immune suppression (eg, impairment of type I and II cytokine balance) in the hours and days following exercise, which may lead to higher infection risk.<sup>7</sup> These views have been recently challenged by others, suggesting that PA, including high-intensity training, may also be beneficial and does not lead to clinically relevant immune suppression.<sup>8,9</sup> Secondly, PA effect on ACE2

receptor modulation is reported, especially in animal studies; clinical consequences on angiotensin-related pathways, however, are still unclear in humans.<sup>10,11</sup>

Generally speaking, it is universally accepted that sport exercisers at all levels should try and exercise as much as they can at home, without changing their exercise routine if they are healthy.<sup>12</sup>

Nevertheless, there are important exercise prescription considerations to be made, especially now with the COVID-19 spreading worldwide, forcing policymakers to provide answers and direction to people into isolation. In many countries, fitness centers are closed and athletes' training and competitions at all levels have been suspended. Prolonged (eg, over two weeks) self-quarantine poses a significant challenge for remaining physically active and may impact people's quality of life. During previous coronavirus outbreaks, increased stress and depression were reported following social distancing.<sup>13</sup>

In this context, home-based exercise should be implemented. Home-based exercise is not a novel topic, and its positive impact has been reported on both physical and psychological variables in various clinical populations.<sup>14,15</sup> Nevertheless, there are currently no specific guidelines documents or peer-reviewed publications specifically addressing the type and amount of PA recommended for home training during the COVID-19 pandemic.

We have reviewed the available web sources addressing PA on April 24, 2020 during the COVID-19 using the keywords "COVID-19," "coronavirus," "physical activity," "exercise," "home-based," and "training." Various documents from institutions and governing bodies of 6 countries were retrieved (Table 1). Figure 1 summarizes the useful features to address for PA during the current COVID-19 pandemic and the level of prioritization from the main available sources.

WHO guidance and other academic sources report some easy-to-perform suggestions to remain close to the WHO global recommendations of 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity (or a combination of both) PA per week while exercising in limited space.<sup>16,17</sup> The suggestions are based on practical tips such as taking short active breaks and following online classes. Furthermore, exercise practitioners are

**TABLE 1** Government and sport society-related sources for exercising at home and other recommendations during COVID-19-related restrictions on physical activity

Country	Source	Type of document	Reference provided	Website
Australia	Australian Institute of Sport (AIS)	Website statements on PA as an important part of physical and mental health; suggests continuing to train for those who are well; athletes should discuss training strategies with their national sporting organizations and coaching staff	Framework on sport in a COVID-19 environment with references provided	<a href="https://ais.gov.au/health-wellbeing/covid-19#covid-19_and_sport_faq">https://ais.gov.au/health-wellbeing/covid-19#covid-19_and_sport_faq</a>
	Exercise and Sport Science Australia (ESSA)	Reinforces the association between PA and improved immunity Provides downloadable posters about exercising at home	Links to peer-reviewed articles are provided	<a href="https://exerciseright.com.au/exercise-home/">https://exerciseright.com.au/exercise-home/</a> <a href="https://www.essa.org.au/Public/News_Room/Media_Releases/1/2020/Exercise%20Right%20at%20Home.aspx">https://www.essa.org.au/Public/News_Room/Media_Releases/1/2020/Exercise%20Right%20at%20Home.aspx</a>
Canada	Canadian Society for Exercise Physiology (CSEP)	PDF document on maintaining healthy movement behaviors during COVID-19	Refers to age-related, national guidelines for PA, sleep, and sedentary time	<a href="https://csep.ca/Movement_Behaviours_and_COVID-19_%20CSEP_Members%202.pdf">https://csep.ca/Movement_Behaviours_and_COVID-19_%20CSEP_Members%202.pdf</a>
WHO	WHO	Document “Stay physically active during self-quarantine” with vignettes providing examples of exercises	Reference to WHO recommendation (eg, 150 min of moderate-intensity or 75 min of vigorous-intensity physical activity per week, or a combination of both)	<a href="https://www.who.int/news-room/q-a-detail/be-active-during-covid-19">https://www.who.int/news-room/q-a-detail/be-active-during-covid-19</a>
Europe				
New Zealand	NZ Government	Brief advice on exercise safely.	No specific references	<a href="https://covid19.govt.nz/individuals-and-households/health-and-wellbeing/exercising-safely/">https://covid19.govt.nz/individuals-and-households/health-and-wellbeing/exercising-safely/</a>
Singapore	Department of Physiotherapy and LIFE Centre at Singapore General Hospital	Does not specifically refer to COVID-19; website page “Exercising at Home: Workout Essentials and Tips to Stay Safe” Provides a brief list of exercises and useful items to use; refers as a target of 150 min of moderate-intensity aerobic activity per wk	No specific references	<a href="https://www.healthxchange.sg/fitness-exercise/exercise-tips/exercising-home-workout-essentials-tips-stay-safe">https://www.healthxchange.sg/fitness-exercise/exercise-tips/exercising-home-workout-essentials-tips-stay-safe</a>
UK	National Health Service (NHS)	Guidance on looking after physical and mental well-being for the community Provides links to 1. Public health England 10-minute home workout (cardio, strengthening, stretching) with videos; 2. NHS Fitness studio with exercise videos	Reference to NHS recommendations provided	<a href="https://www.gov.uk/government/publications/covid-19-guidance-for-the-public-on-mental-health-and-wellbeing/guidance-for-the-public-on-the-mental-health-and-wellbeing-aspects-of-coronavirus-covid-19">https://www.gov.uk/government/publications/covid-19-guidance-for-the-public-on-mental-health-and-wellbeing/guidance-for-the-public-on-the-mental-health-and-wellbeing-aspects-of-coronavirus-covid-19</a>
United States	American College of Sports Medicine (ACSM)	PDF document with recommendation on performing regular moderate-intensity PA to maintain better immune function and to reduce stress and anxiety Provides 1-page practical examples for aerobic activity and strength training	Refers to Physical Activity Guidelines for Americans (150–300 min/wk of moderate-intensity aerobic PA and 2 sessions/wk of muscle strength training) Provides link to CDC website for COVID-19 updates	<a href="https://www.exercisemedicine.org/assets/page_documents/EIM_Rx%20for%20Health_%20Staying%20Active%20During%20Coronavirus%20Pandemic.pdf">https://www.exercisemedicine.org/assets/page_documents/EIM_Rx%20for%20Health_%20Staying%20Active%20During%20Coronavirus%20Pandemic.pdf</a> <a href="https://www.cdc.gov/coronavirus/2019-ncov/about/index.html">https://www.cdc.gov/coronavirus/2019-ncov/about/index.html</a>

Abbreviations: PA, physical activity; Wk, week.

Features	World Health Organisation	National Sport Societies	Government sources	Online platforms and social media
References to published guidelines	++	+	+	-
Based on level of expertise or fitness	+	++	+	+
Age-related	+	++	+	+/-
Explanation of expected effects	++	++	+	+/-
Practical exercises included	+++	++	++	+++
Providing follow-up	+/-	+/-	+/-	+
Figures included	+++	++	++	+
Video available	-	+/-	+/-	+++
Interactive	-	+/-	-	++
Psychological aspects covered	++	+	++	+/-
Clinical status considered	+/-	++	+	+/-
Easy to perform	+++	++	+++	++


**FIGURE 1** Prioritization of various features in the main available sources addressing PA during the current COVID-19 pandemic

advertising and promoting home-based exercise on electronic platforms such as YouTube, Facebook, Twitter, exercise apps for phone or tablet, and video conference type software to show how vigorous home activity can be set up, obviously not without limitations due to the lack of space and specialized training equipment. Use of modern technology to advertise and promote PA interactively as well as to record physical parameters that may indicate the level of fitness (eg, pedometers and other wearable devices) are promising tools to enhance and measure home-based workouts, although specific recommendations on their use and associated goals remain scarce.

In conclusion, provided that social distancing is respected, PA is suggested during the COVID-19 pandemic due to its multiple benefits on physical and mental health. Personalized training according to age, clinical conditions, and level of fitness is paramount; therefore, specific recommendations to address home-based training during this time are highly needed.

#### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

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