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# The Impact of the COVID-19 Pandemic on Physical Activity, Function, and Quality of Life



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## KEYWORDS

• COVID-19 • Older persons • Exercise • Physical activity • Quality of life

## KEY POINTS

- Older persons diagnosed with COVID-19 have sustained biopsychosocial problems that affect their function, independence, and quality of life.
- Physical activity may reduce the impact of COVID-19 on older people.
- It is essential that communities and governments consider policies and strategies that support older people to become physically active, particularly after recovering from COVID-19.

## INTRODUCTION

It is now more than 2 years since the beginning of the COVID-19 pandemic, which has affected people around the globe. The pandemic has directly affected the lives of the many people who contracted COVID-19; nearly 6 million people have lost their lives,<sup>1</sup> and many of those who survive will have symptoms that persist after the initial infection.<sup>2-4</sup> Although the demographics of people infected and the severity of infections have changed over time, older people remain at the highest risk of severe disease. There has also been a substantial indirect impact on people's lives. Many countries imposed restrictions to reduce the spread of infection, including lockdowns and social

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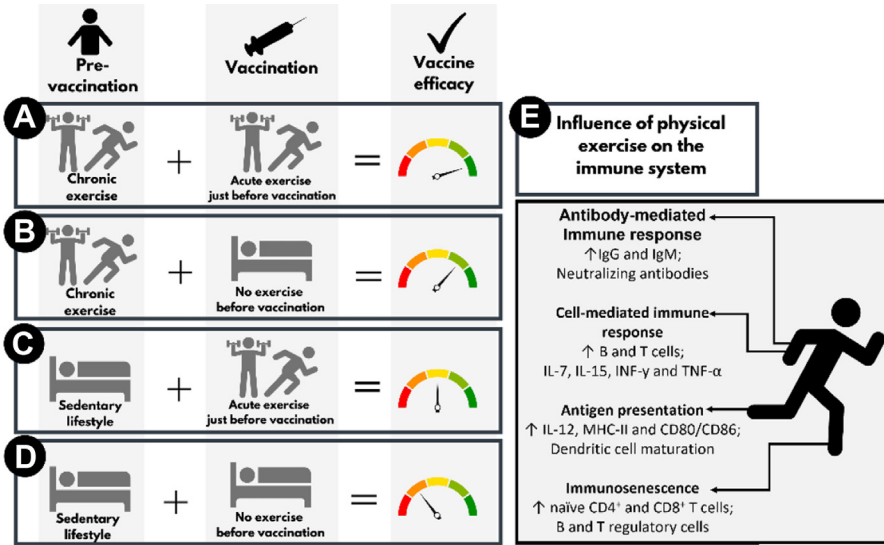
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distancing protocols, and mask mandates were common. This article focuses on the impact of the COVID-19 pandemic on physical activity in older people and subsequent effects and implications for function and quality of life.

### WHY IS PHYSICAL ACTIVITY IMPORTANT FOR OLDER PEOPLE?

There is overwhelming evidence that physical activity and exercise are critical to the health and well-being of older people. Physical activity, including exercise, is linked with functional abilities, including mobility and independence in personal and community activities of daily living, particularly in older people.<sup>5–9</sup> Reductions in functional ability and mobility are often a precursor to reduced independence and quality of life, institutionalization, and mortality. There is strong evidence that balance and strength exercises reduce the risk of falls by approximately 25%<sup>8,9</sup> and improve function, particularly in older people who are frail or have limited mobility.<sup>7</sup> Recent guidelines from the World Health Organization recognize the importance of physical activity for all older people, including those with chronic health conditions and disabilities.<sup>10,11</sup> It is *strongly recommended* that older adults over the age of 65 years should do at least 150 to 300 minutes of moderate intensity (or an equivalent combination of moderate and vigorous intensity physical activity) every week and that they should include functional balance and strength training 3 days a week to improve function and reduce falls risk. The new guidelines also highlight that even if older people do not meet the guidelines *some physical activity is better than none*. Older people with health conditions and disabilities should be as active as their condition, and abilities allow and should consult with physical activity specialists or health care professionals for advice. Physical activity is critical to maximizing health, well-being, and independence in all older people and vital to minimizing institutionalization.

Physical activity may also reduce the impact of COVID-19 in older people. There is some evidence that regular physical activity improves the immune response.<sup>12–14</sup> A systematic review identified that higher levels of habitual physical activity was associated with a 31% reduction in community-acquired infections (hazard ratio 0.69, 95% confidence interval [CI] 0.61–0.78, 6 studies, N = 557,487 individuals) and 27% reduction in infection-related mortality (hazard ratio 0.64, 95% CI 0.59–0.70, 4 studies, N = 422,813 individuals), although the review did not include any studies specifically investigating the response to COVID-19.<sup>15</sup> Habitual physical activity was also associated with improvement in antibody responses,<sup>15</sup> particularly after vaccination, which are enhanced not only by the immune but also the musculoskeletal system (Fig. 1).<sup>16</sup> An exploration of associations between physical activity at the community level and COVID-19 in the United States found a negative association between physical activity rates at the county level and COVID-19 cases and deaths,<sup>17</sup> after controlling for several variables linked with overall health and COVID-19 risks and mortality, including personal demographics, health rating, employment status, income, insurance status, and rural status. The investigators acknowledge that physical activity may be an indicator of other factors that affect health behaviors and COVID-19 outcomes, such as mask-wearing. Nonetheless, the results of this study provide some evidence that communities that are more physically active have better outcomes from COVID-19. A Canadian study of 24,114 middle-aged and older adults found that low physical activity and high nutritional risk prepandemic were associated with increased odds of reporting a decline in mobility and physical function after confirmed or probable COVID-19 infection<sup>18</sup>; this provides further evidence that older people who are habitually physically active have better outcomes if infected with COVID-19. Because we are likely to continue to see new variants of COVID-19 and the



**Fig. 1.** How acute and chronic physical exercise could interfere with immune system and vaccine efficacy, based on published studies. (A) Subjects who exercise regularly and performed acute exercise just before vaccination; (B) subjects who exercise regularly and did not perform acute exercise just before vaccination; (C) subjects with a sedentary lifestyle who performed acute exercise just before vaccination; (D) subjects with a sedentary lifestyle who did not perform acute exercise just before vaccination. (E) List of main influences of physical exercise on the immune system. Pre-vaccination is defined as days or months before vaccination; vaccination is defined as the moment of injection; chronic exercise is defined as a regular physical exercise in months or years; acute exercise is defined as moderate/vigorous physical exercise a few minutes or hours before vaccination. (From Bortolini MJS, Petriz B, Mineo JR, Resende RO. Why Physical Activity Should Be Considered in Clinical Trials for COVID-19 Vaccines: A Focus on Risk Groups. *Int J Environ Res Public Health*. 2022;19(3):1853. Published 2022 Feb 7. <https://doi.org/10.3390/ijerph19031853>; open access under CC BY 4.0)

long-term effectiveness of vaccines is unknown, strategies to increase physical activity in older people must be included in future campaigns to reduce risk and improve outcomes of COVID-19 infection.

**PHYSICAL ACTIVITY IN OLDER PEOPLE INFECTED WITH COVID-19**

Undoubtedly, the group of people most affected by COVID-19 are those who contracted it. It is currently estimated that more than 440 million people globally have been infected with COVID-19.<sup>1</sup> An unprecedented number of people infected with COVID-19 have required management in intensive care units (ICU) and are at risk for developing postintensive care syndrome (PICS).<sup>19,20</sup> Furthermore, it is recognized that many people diagnosed with COVID-19 have sustained biopsychosocial problems, recognized by the World Health Organization as postacute COVID-19 condition (PACC).<sup>21</sup> Both these groups will have a range of issues that will affect physical activity in both the long and short term.

It is well recognized that survivors of prolonged stays in ICU can experience ongoing morbidity and disability and reduced quality of life, irrespective of their primary admission diagnosis. PICS encompasses physical, psychological, and cognitive domains

and includes new or worsening neuromuscular weakness, reduced independence in activities of daily living, anxiety, depression, posttraumatic stress disorder, and cognitive dysfunction,<sup>22</sup> and the risks for developing PICS increase with increasing age.<sup>23</sup> Emerging evidence indicates that people with COVID-19 who require ICU admission are at high risk of developing PICS.<sup>19,20</sup> It is increasingly recognized that this cohort is likely to require ongoing multidisciplinary rehabilitation, including specialized exercise prescription, to optimize function and maximize long-term health outcomes.<sup>24</sup>

Even people who do not require admission to intensive care can have substantial long-term problems post-COVID. PACC is a multisystem disorder that affects function and quality of life. Common features include cough, shortness of breath, headache, fatigue, chest pain, joint pain, depression, and insomnia<sup>25</sup>; however, a recent systematic review identified 55 distinct long-term suboptimal health outcomes for people with COVID-19.<sup>26</sup> There is evidence that even people who do not require hospitalization may have deficits in mobility and physical function. A large study of 24,114 middle-aged and older adults found those who had confirmed or probable COVID-19 (93.3% not hospitalized) had nearly double the odds of reporting a decline in mobility and physical function, compared with people who had not had COVID-19.<sup>18</sup> Although there is currently limited evidence for the management of PACC, there is increasing international recognition that rehabilitation, including specialized exercise prescription, is likely to be a key component of care for this condition.<sup>24,27-29</sup>

There are some key challenges around prescribing exercise and physical activity to people post-COVID-19 infection, particularly those with more severe disease. Some of the complications of COVID-19 include cardiac and autonomic dysfunction and desaturation on exercise. Muscle weakness seems to be common in people with severe COVID-19 infections. It is beyond the scope of this article to provide detailed guidance on exercise and physical activity for this population; however, readers are advised to refer to the many excellent reviews and guidelines in this area (eg, <sup>30-32</sup>). Although little is known about the impact of COVID-19 infection on physical activity in older people, it is likely to be reduced. A survey of physical activity in younger people (younger than 56 years) recovering from COVID-19 found self-reported walking time remained less than pre-COVID levels at both 3 and 6 months, although it should be noted that there are limitations with self-reported physical activity.<sup>33</sup> Nonetheless, clinicians should assess physical activity and function in all older people diagnosed with COVID-19. Performance-based measures, such as the Short Physical Performance Battery or Timed Up and Go, can be administered quickly. However, if these tests cannot be administered, questioning about ability to perform functional tasks such as getting up from a chair, walking up a flight of stairs, concerns regarding balance, or walking several blocks outdoors should be conducted. Referral to exercise specialists should be considered if any persistent reduction in physical activity or function is observed.

## PHYSICAL ACTIVITY IN OLDER PEOPLE NOT INFECTED WITH COVID-19

It is now well documented that there have been multiple negative sequelae because of the lockdown restrictions and social distancing requirements necessitated to reduce the spread of COVID-19. Delays in accessing health care for both acute and chronic problems are well documented worldwide.<sup>34</sup> These restrictions have also affected physical activity levels, both via limiting participation in structured exercise and physical activities such as exercise classes, golf, and bowls and via limiting social activities, thus limiting incidental exercise. A systematic review of 25 studies that examined physical activity levels in people older than 60 years found a significant reduction in physical activity during periods of restriction during the pandemic.<sup>35</sup> Although there

are limitations with this review, as many studies relied on questionnaires, studies using objective measures such as accelerometry reported reduced step count. The review also noted that reductions in physical activity were greater in countries with more stringent restrictions, whereas studies conducted in countries such as Sweden, which had fewer government-imposed restrictions, did not demonstrate reductions in activity. Furthermore, reduction in physical activity during periods of restriction has also been noted in people with disabilities and chronic conditions<sup>13,36</sup> and people with dementia.<sup>37</sup> Increases in sedentary lifestyle have also been reported.<sup>35,38</sup>

Although consequences of reduced physical activity and increasing sedentary lifestyle may not manifest for some time, there will undoubtedly be an impact on health and function in older people. A systemic review identified a decline in physical fitness of older adults has been observed.<sup>35</sup> A systematic review on the detraining effects after cessation of balance and fall prevention interventions showed a reduction in balance outcomes 4 to 8 weeks after training ceased.<sup>39</sup> Although the review conclusions are limited by the small number of studies included ( $n = 9$ ), findings indicate older people may be at increased fall risk postpandemic. Several studies have demonstrated links between physical activity, mental health, quality of life, and well-being during the pandemic.<sup>38,40,41</sup> Although these studies do not necessarily prove causation, people who had higher physical activity levels reported better mental health.

Masks may have also affected the amount and types of activities people participated in, particularly older people. Although there is limited evidence on the relationship between masks and activities specifically in older people, a systematic review of 22 studies ( $n = 1573$  participants, mean age  $35.6 \text{ years} \pm 15.2 \text{ years}$ ) found that although masks did not affect exercise performance, masks did increase ratings of perceived exertion and dyspnea and led to slight increases in end tidal  $\text{CO}_2$  and heart rate. Although the impact of mask-wearing on exercise performance in older people and those with chronic conditions is not known, it is possible that increases in perceived exertion and dyspnea lead to reduced intensity or duration of physical activity. In addition, masks limit peripheral vision, particularly the lower visual field.<sup>42,43</sup> This may place older people at increased risk of trips and falls, particularly those with gait or balance impairments or visual impairments such as age-related maculopathy, which increase the reliance on peripheral vision. This may have made some older people feel more hesitant when walking outdoors, particularly on uneven surfaces, also leading to restrictions in physical activity.

Reduced levels of physical activity during the pandemic were also likely in people living in residential care.<sup>44,45</sup> Residential care facilities worldwide imposed strict lockdown procedures to minimize infection risk and protect the most vulnerable people. Residents were often restricted from leaving their facilities and, in some cases, confined to their rooms, staff workload was increased, health care workers deemed “nonessential,” and volunteers and caregivers were often prevented from attending. Reduced physical activity, alongside the accompanying social isolation, has undoubtedly had a substantial impact on the health and well-being of this vulnerable population.

## PHYSICAL ACTIVITY FOR OLDER PEOPLE AND THE FUTURE

We need to recognize that many older people may have reduced their physical activity over the last 2 years. Older people may also have developed new health conditions or have existing health conditions that may not have been optimally managed. Some older people may have become socially isolated, and mental health issues such as

depression or anxiety may have developed or emerged. As a consequence, function and mobility may have reduced in some older people; for older people who were already prefrail or frail, these changes may be catastrophic. It is essential that reductions in function are not simply dismissed as “part of growing old” and that we recognize many changes are preventable and reversible. Although there are many barriers to physical activity in older people, we know that health professional recommendations to be active increase the likelihood of people being physically active. To achieve maximum benefit, physical activity must be sustained over the long term, thus behavior change strategies to support formations of new habits must be incorporated. In addition, as communities and health systems rebuild postpandemic, we must consider how we can best support older people at all levels of function to become physically active and optimize their health, function, and quality of life. A summary of recommendations to support older people become more physically active is provided as Clinical Care Points.

The pandemic resulted in a major disruption in the way older people accessed health care and led to many innovative approaches such as the use of technology. There has been a substantial increase in the uptake of telehealth; although it cannot always replace face-to-face exercise prescription, for many older people, it makes it easier to access appropriate care. People can access care in their own home, and the costs and burden of travel are reduced. Additional benefits of telehealth include increased accessibility to specialist services, increased choice for patients, and improved health literacy and health behaviors.<sup>46</sup> Evidence for the effectiveness of exercise or physical activity interventions delivered via telehealth is evolving rapidly. Care delivered via telehealth shows similar outcomes to traditional pulmonary rehabilitation.<sup>47</sup> Evidence for other groups such as stroke is more limited<sup>48,49</sup>; however, a large number of trials have evaluated the feasibility of using telehealth to deliver exercise, with more underway.<sup>50–54</sup> It is essential that mechanisms to support the delivery of physical activity interventions via telehealth to older people are considered and that the effectiveness of telehealth interventions are rigorously evaluated.

Technology has also been used to provide older people at various levels of function with low-cost, accessible, and scalable options to support exercise and physical activity during periods of lockdown. One of the major challenges during the pandemic was that access to individualized assessment and tailoring physical activity and exercise programs was not available. Several online resources were developed, and existing resources promoted, which provided older adults with a variety of physical activity and exercise options tailored to different levels of function and assisted people to make decisions about which options were appropriate for them.<sup>55,56</sup> The Later Life Training group developed “Make Movement Your Mission,” releasing 10- to 15-minute movement “snacks” 3 times a day on Facebook and YouTube, which people could either complete in real time or at a time convenient to them.<sup>57</sup> These videos were developed specifically for older people and included options for people at various functional levels. The BBC in the United Kingdom also released a series of videos with examples of physical activities that older people could perform in their homes. More sophisticated digital options, such as the *StandingTall* program, have been used in clinical trials and have the potential to be scalable.<sup>58–61</sup> The *StandingTall* program is delivered via an app and provides high doses of individually tailored exercise that can be safely progressed over time without supervision. Commercial and bespoke devices such as Wii, Xbox, and so forth have been successfully used to increase physical activity in older people. Increasing access to activity monitors via mobile phones and smartwatches makes it easy for people to monitor daily activity, track

progress and set goals, and have been shown to increase physical activity.<sup>62,63</sup> However, although technology has the potential to increase accessibility to physical activity support, inequities remain. The use of technology to support health care is influenced by a range of socioeconomic, personal, and cultural factors.<sup>64,65</sup> Moving forward, we must embrace technology to increase physical activity and exercise options, while exploring avenues to reduce inequities in access and tailoring technological solutions to ensure their applicability for use by older people.

There are also a range of exercise programs available, which older people at various levels of function can complete independently in their home, in hospital, or in residential care following an initial assessment of function. For example, the Otago Exercise Program provides tailored strengthening and balance exercises for older people living in the community and has been shown to reduce falls.<sup>66,67</sup> Various programs that use decision trees to guide selection of an appropriate exercise program have been developed and trialed in community, hospital, and long-term care settings.<sup>44,68</sup> The VIVIF-RAIL program has been designed by experts in physical exercise and frailty and provides a range of exercise programs tailored to specific functional levels.<sup>69</sup> It has been shown to prevent functional decline during hospitalization and improve functional capacity in community-dwelling frail/prefrail older adults with mild cognitive impairment.<sup>70,71</sup> Although these programs require some input from health professionals, they do not require intensive supervision. Chair-based exercise programs may also be an option for when exercise programs cannot be completed in standing; although they may not provide the balance challenge of standing programs, they have been shown to lead to improvements in strength.<sup>72</sup>

It is also essential that communities and governments consider policies and strategies that support older people to become physically active and are applicable to their local context. The World Health Organization has made several specific policy recommendations to increase physical activity.<sup>73</sup> Policies must support clear messaging on the importance of physical activity, creation of environments that support physical activity, and provision of opportunities and services that support people to be physically active. The pandemic saw an unprecedented global public media campaign; during the varying levels of restrictions worldwide, exercise was often recognized as one of the few reasons people were allowed to leave their homes.<sup>74</sup> One of the positive consequences of the pandemic is that cycling and walking infrastructure around the world were expanded as people sought alternatives to public transport systems.<sup>75</sup> Other innovative environmental changes that can support physical activity in older people include the creation of Seniors Exercise Parks, with multimodal exercise equipment specifically designed for the older person to improve balance, strength, and functional movement.<sup>76</sup> However, we know many older people, particularly those with health conditions or disability, will require support from appropriately qualified professionals to maximize physical activity. Mechanisms and funding to ensure equitable access to this support are essential. We must continue to build on the activities and learnings from the pandemic as we consider how best to support older people in communities.

## SUMMARY

Physical activity is critical for the health and well-being of older people. The pandemic has resulted in a major disruption to the way our communities and health systems function and deliver care. As we move forward, we must consider how to support older people, whose function has deteriorated due to the pandemic, become physically



active and how to better support and engage older people in physical activity in the future.

### CLINICS CARE POINTS (BASED ON PHYSICAL ACTIVITY RECOMMENDATIONS FROM WOLD HEALTH ORGANIZATION (REFS. 8,10,73))

#### Physical activity recommendations for older people

- Adults older than 65 years should do at least 150 to 300 minutes of moderate intensity activity (or an equivalent combination of moderate and vigorous intensity physical activity) each week.
- They should include functional balance and strength training 3 days a week.
- Some physical activity is better than none. Even if someone is unable to meet the physical activity guidelines, they should be encouraged to increase their physical activity.
- Older people with chronic health conditions, a disability, a history of falls, or who have concerns about their balance should consult with an exercise specialist for assessment and a program tailored to their needs.
- Function and physical activity should be assessed in older people diagnosed with COVID-19.
- Health professionals should discuss the benefits of regular physical activity with older people.
- Strategies to support behavior change and habit formation should be used.
- Innovative technologies (including online resources, telehealth, apps, activity trackers) may be helpful for increasing physical activity in older people.
- Communities should consider strategies to increase physical activity that are specific to their local context and minimize inequity.

### DISCLOSURE

C.M. Said and F. Batchelor were involved in developing the Safe Exercise at Home Web site. The Web site is freely available, and they do not receive any financial compensation from the Web site.

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