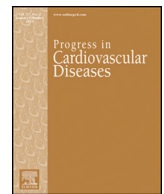




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## Vaccine and physical activity in the era of COVID-19 pandemic



To the Editor:

COVID-19, as one of the biggest infectious respiratory health crises,<sup>1</sup> has become a global public health emergency and is more transmissible than influenza.<sup>2</sup> Older people and individuals with underlying chronic diseases (e.g. cardiovascular disease, diabetes, respiratory problems) are at high risk of responding worse to the viral infection and death from severe acute respiratory syndrome coronavirus 2 (SARS CoV-2).<sup>2,3</sup> Indeed, immune response (immunosenescence) and immunization against influenza were influenced with age and showed weak effects. Thus, healthy active lifestyle is very important for the health of the overall population but, especially for those with additional risk factors and older people<sup>2,4</sup> and might improve the effect of vaccines on the immune system in these vulnerable populations.

In addition to social/physical distancing, isolation, and confinement, specific vaccines against SARS-CoV-2 and/or effective therapies for COVID-19 are developed and may prevent or delay the decline of immunocompetence. The production of safe, effective, and deployable SARS-CoV-2 vaccines is urgent to mitigate the harmful impacts of the pandemic and prevent future outbreaks.<sup>5</sup> However, global efforts seek to produce COVID-19 vaccines and recently specific antiviral treatment or vaccine for SARS-COV-2 have been approved by the Food and Drug Administration (FDA). The first COVID-19 vaccine that received regulatory approval was Pfizer/BioNTech. Traditionally, the development of vaccine progresses from preclinical to clinical phases, getting vaccine licensure, and ending with production. Nonetheless, the timeline to the develop COVID-19 vaccines is shortened and the stages are compressed and overlapped in order to speed up the results in a short time frame.<sup>5</sup>

In the context of the pandemic, questions regarding the potential role of vaccine as immune function treatment to mitigate risk of communicable disease (e.g., bacterial and viral infections) have increased appreciably. Understanding of COVID-19 vaccination responses is needed to improve vaccine effectiveness and ultimately reduce the incidence of virus infection.

COVID-19 vaccination may have local and systemic side effects, such as fatigue, headache, fever, localized pain and tenderness at the vaccination site which can last several days. To the best of our knowledge, there are no published data on the duration of the vaccine' side effects. Thus, the impact of side effects on the ability to perform physical activity (PA) is yet undetermined. Moreover, the effects of COVID-19 vaccine associated to PA/exercise are also unknown.

Exercise strategies and increasing vaccine research that may provide positive effects to prevent disease is clinically important. Accordingly, a consensus across the exercise immunology literature suggested that PA/exercise training as an immune function adjuvant to reduce risk of communicable disease,<sup>6</sup> can enhance immunity after vaccination<sup>7</sup> and long-duration moderate aerobic exercise may help reduce the risk of

influenza-related infection, potentially improving the immune responses to influenza and pneumonia vaccination in older adults.<sup>8</sup> However, little is known about modalities and doses of PA (intensity and duration of effort and type of exercise) which may be most beneficial.

Since COVID-19 is a recent pandemic and the clinical studies on its vaccine is in the early phase, the questions remain of whether exercise can effectively restore immune function over PA, could improve aspects of the immunity (e.g., immune competency) and limit immune cellular changes that contribute to immunosenescence. The first COVID-19 vaccines might not be the most effective for immunizing all populations, and second generation vaccines might be more effective.<sup>9</sup> The availability of COVID-19 vaccine may help PA mitigate the effects of the pandemic and facilitate the practice of PA during the pandemic and reduce the severity of strict public policies to make the population more physically active. It is also important to highlight that the type of COVID-19 vaccine must be taken into account. Possible future enquiries would be investigated if we return to the new normal after confinement or we have to be confined again because of COVID-19 resurgence or the futile of vaccine. In addition, clinicians should be familiarized with vaccines types, efficacy, and side effects and aware how to set up vaccinations protocols for the general population, especially vulnerable individuals.

In conclusion, vaccination is the best and most cost-effective strategy with the greatest preventative benefit. Increased knowledge on the immunogenicity of COVID-19 vaccines is important and may increase the compliance towards vaccination. Vaccine-induced protection from infection is beneficial for those who are asymptomatic or experiencing mild and moderate symptoms and for vulnerable populations and is important to ensure sustained PA and training. PA as a drug-free treatment for the prevention and treatment of chronic diseases and for the overall maintenance of physical and mental health and wellbeing will help counteract the negative effects of isolation and confinement stress on immune competency and enhance response to vaccination. Until COVID-19 vaccines become more widely available and efficient, people should be aware with the danger of this pandemic, adhere to health control protocols, avoid gathering, and stay fit. Future studies that deepen the relationship between PA and COVID-19 vaccine will certainly be relevant in view of the probable benefits already mentioned. Therefore, because of the safety concerns, we consider that vaccination decisions and practice PA before or after vaccination should be given very carefully during the pandemic until further data become available.

### Declaration of competing interest

None.

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