Sports Medicine

Chapter 2

# Physical Activity: A Natural Allies to Prevent Impending Adverse Effects due to the Increase of Isolation and Physical Inactivity in COVID-19 era

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## Abstract

The COVID-19 pandemic created an unprecedented situation for most of humanity, affecting almost all areas of life. Physical activity (PA) was no exception, and relevant studies conducted in many different countries reported alarming results demonstrating the deleterious impact of lockdown on PA. It seems that the benefits of PA in building a defense against the virus and the development of non-communicable diseases (NCDs) have been ignored or underestimated by the community, and the prevalence of physical inactivity has been posing several major challenges to health authorities. In this chapter, we briefly remind and underline the beneficial effect of a physically active life and regular exercise training on public health, even more so for the most vulnerable groups, in the presence of COVID-19. In this respect, the role of PA and non-exhaustive exercise as a countermeasure and an indirect therapeutic agent against the virus, as well as against NCDs and mental health disorders resulting from the COVID-19 crisis, should not be underestimated.

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## 1. Introduction



The COVID-19 pandemic created an unprecedented situation which affected most of humanity, and almost all areas of life. Physical activity (PA) was no exception. In a series of very recent studies by our department we clearly demonstrated the impact of the COVID-19 lockdown on PA [1–3]. In the aforementioned studies the restrictive orders to stay at home and avoid wider socialization were clearly associated with an overall negative change in PA. Moreover, similarly alarming results were reported in other relevant studies [4–9]. In other words, it would seem that the well-documented benefits of PA, i.e. protection against the virus and against the development of non-communicable diseases (NCDs: cardiovascular diseases, cancers, chronic respiratory diseases and diabetes) [10], were largely ignored or underestimated by the public and the new radical policies that have propagated a significant level of inactivity. For this reason, organizations with a global reach immediately rushed to remind the community of the value of PA and to highlight pre-existing exercise guidelines for a physically active life. That was also necessary during lockdown so that society could avoid impending adverse effects due to the increase of isolation and physical inactivity. In any case, through this unparalleled scenario (during and post-lockdown), the prevalence of physical inactivity is posing several major challenges to health and sport authorities, medical staff and clinicians. On the one hand, it is obvious that PA and exercise training during this period is essential for athletes who have to counteract the physiological effects of detraining and safely return to a normal daily training routine. On the other hand, a physically active life and exercise training are indispensable tools in the battle against the prevalence of NCDs, for strengthening the immune system and at the same time improving mental health [10–12]. For these reasons, we would like to remind and emphasize the benefit of a physically active life and regular exercise training (not vigorous or exhaustive) for public health, even more so for the most vulnerable groups (with severe underlying health conditions such as cardiovascular disease, hypertension, diabetes, cancer, chronic lung disease, age ≥65yr, excess body fat) [12], in the COVID-19 presence.

## 2. Lockdown and Physical Inactivity

In Greece, among other countries, the isolation measures were of the most restrictive and proactive in the Western Hemisphere, slowing down the spread of COVID-19 and keeping the number of deaths among the lowest in Europe. Nevertheless, the quarantine PA change was negative (**Figure 1**), which also seems to be the case in a number of other European countries, Australia, Egypt, China and Saudi Arabia [1–9]. Moreover, this was particularly true **(Figure 2)** for the cohort of highly physically active and male subgroups in Greece [2,3]. Therefore, official public health authorities in many different countries obviously failed to promote PA sufficiently during the COVID-19 pandemic. Given that the PA decline suggests possible long-

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term consequences on the evolution rate of NCDs, as well as ramifications for the general public health and healthcare systems, and in fear of the upcoming waves of the pandemic, there is definitely cause for further concern.

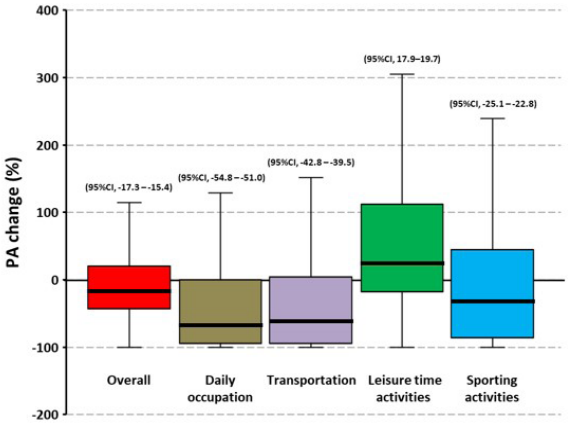


**Figure 1:** Change in overall PA change (%, from the pre to COVID-19 1st lockdown conditions) on a weekly basis in Greek adults (n=8495),grouped by activities (daily occupation, transportation to and from daily occupation, leisure time activities, and regular sporting activities) [3]. Abbreviations: CI, confidence interval PA, physical activity.

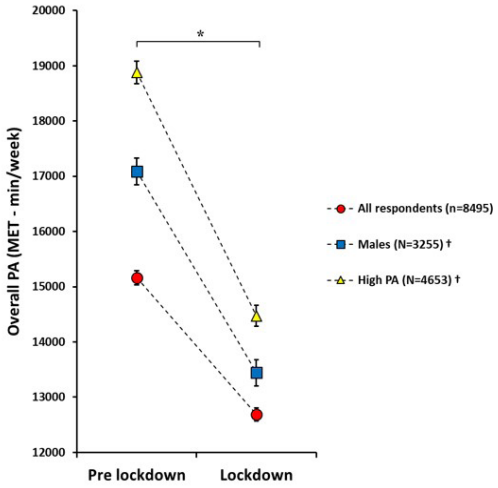


**Figure 2:** Overall PA (daily occupation, transportation to and from daily occupation, leisure time activities, and regular sporting activities) pre-and during COVID-19 1st lockdown conditions in Greek adults [3]. Data are presented as mean ± SE. * $p<0.05$, significant difference in all groups between conditions. † $p<0.05$, significant interaction effect of lockdown on the PA subgroups (males and High PA). Abbreviations: MET, metabolic equivalent task (=3.5 $mLO_2$/kg/min); PA, physical activity.

## 3. The Beneficial Effect of Physical Activity

Physical distancing and self-isolation measures were applied in most countries worldwide in order to minimize the risk of COVID-19 spread in the community. Ironically, home confinement and drastic restriction of the citizens' free movement and contact exacerbated behavioral routines that lead to physical inactivity [1–3], potentially contributing to anxiety, depression and the development of other NCDs [10–12]. Conversely, to maintain an adequate health status and reverse the sedentary lifestyle, PA and regular daily exercise training are undoubtedly strategically important [10]. Moreover, a physically active lifestyle, leisure sport activities and exercise could also be a powerful combination to overcome the public health consequences of the COVID-19 crisis, particularly for the most vulnerable groups [12].

Physical activity improved quality of life and associated negatively to occurrence of diseases or their consequences and mortality. More specifically, PA improves the immune system and function, either in chronic systemic inflammation or after vaccination, in various diseases [13–15]. A mild to moderate intensity exercise routine releases millions of immune cells (T cells, macrophages) and proteins (cytokines), which in turn help the immune system to function in conditions of inflammation and stress [13,16]. Physical activity is effective in both preventing and treating NCDs, all of which increase the risk of morbidity and mortality among those infected with the COVID-19 [10,12]. On the contrary, the lack of PA and a reduced daily energy expenditure may lead to a significant increase of body fat, further loss and reduction of mitochondrial function, increased chronic oxidative stress and inflammation, aggravating the condition of muscles, blood vessels and bones [17,18]. A reduction in PA will also degrade the already depleted cardiorespiratory reserves and immunity function of vulnerable groups [12]. Moreover, inactivity *per se* is one of the primary causes of preventable death worldwide [19].

Symptoms of psychological stress increase as the pandemic COVID-19 outbreak continues [11], triggering imbalances between cortisol and other hormones, which adversely affect the biological response to inflammation and the immune system itself [20]. On the contrary, a PA lifestyle has important mental health benefits: it reduces depression and anxiety symptoms to COVID-19 pandemic stress, and restores cortisol equilibrium [21]. In addition, regularly PA and daily exercise in ≥65 year-old individuals has beneficial effects against aging and associated disorders, improves cognitive function and self-esteem, limits the risk of falling, helps to prevent sarcopenia and dynapenia, and finally helps to avoid frailty [16].

## 4. Return to Physical Activity/ Training In COVID-19 Age

As public health authorities begin to allow resumption of recreational and competitive sports [22–26], individuals who were infected with COVID-19 and recovered are also medically capable of returning to a physical active life style. For post-infected individuals who showed significant symptoms and were hospitalized, the slow return to a regular physical activity routine under close clinical deterioration control and guidance is permissible only after two weeks of convalescence and clinical re-evaluation [27]. For non-hospitalized infected individuals who develop only mild or moderate symptoms, at least two weeks' abstention from any physical or training activity is recommended [27]. Positive COVID-19 antigen but otherwise asymptomatic individuals are advised to impose self-isolation and pause any sports training for a minimum of two weeks after the detection date; if they still remain asymptomatic they could gradually return to exercise training but under medical supervision [27]. For individuals who are COVID-19 negative, asymptomatic and detrained, gradual resumption of exercise training is strongly advisable. Nonetheless, assuming that lockdown, with its exercise restriction for >4 weeks (~20-40% workload of normal exercise routine), has caused a great decline in physical fitness

[28], the recommended return time to physical training of normal intensity and volume, with a minimal risk ratio of non-contact injury, is estimated to be 3–5 weeks [29].

However, as new COVID-19 cases continue to emerge in the world, many healthy individuals are being requested to stay at home in self-quarantine. For individuals in self-quarantine without any symptoms or diagnosis of acute respiratory illness, 150 min of physical activity of moderate intensity, or 75 min of physical activity of vigorous intensity, or a combination of both, is recommended per week [25,26]. These recommendations can even be carried out at home, with no special equipment and in limited space **(Table 1)**.

**Table 1:** Simple tips for achieving the goal of 150 minutes of physical activity * of moderate intensity, or ** 75 minutes of physical activity of vigorous-intensity or *** per week during self-quarantine [25,26,30].

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|---|
| • Stand up. Reduce your sedentary time by standing up whenever possible. Ideally, try to interrupt sitting and reclining time every 30 minutes. |
| • Take short active breaks during the day. Short bouts of physical activity add up to the weekly recommendations. |
| • Walk. Even in small spaces, walking around or walking on the spot can help you remain active. |
| • Set up a regular routine to be active every day. |
| • Follow an online exercise class. Take advantage of the wealth of online exercise classes. |
| • Set yourself and your family Be Active goals, by choosing a specific type of activity, time of day and/or number of minutes you will do every day. |
| • Relax. Meditation and deep breaths can help you remain calm. |
| • For optimal health, it is also important to remember to eat healthily and stay hydrated. |
| • Always remember that any physical activity is better than none. Start with small amounts and gradually increase duration, frequency and intensity over time. |
| * Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure – including activities undertaken while working, playing, carrying out household chores, travelling, and engaging in recreational pursuits [30]. |
| ** On an absolute scale, moderate intensity refers to activity that is performed at 3.0–5.9 times the intensity of rest. On a scale relative to an individual's personal capacity, moderate-intensity physical activity is usually a 5 or 6 on a scale of 0–10 [18]. |
| *** On an absolute scale, vigorous intensity refers to activity that is performed at 6.0 or more times the intensity of rest for adults and typically 7.0 or more times for children and youth. On a scale relative to an individual's personal capacity, vigorous intensity physical activity is usually a 7 or 8 on a scale of 0–10 [18]. |

Being active during the COVID-19 pandemic crisis is a challenge for everyone (**Table 2**). At the same time, all national public health directives and general hygiene rules must be respected. However, the World Health Organization has detailed recommendations on the amount of PA individuals should do to achieve their cardiovascular and metabolic health effects [18,26]. Infants (≤1 yr) need to be physically active several times a day [31]. Children (≤5 yr)

should spend at least 180 min a day in physical activities, with 3-4 year-olds being moderately or vigorously active for an hour a day [31]. Children and adolescents (5-17 yr) should have at least 60 min a day of moderate-to-vigorous-intensity physical activity, including activities that strengthen muscle and bone, at least 3 days per week [18]. Adults (≥18 yr) should have a total of at least 150 min of moderate-intensity physical activity throughout the week, or at least 75 min of vigorous-intensity physical activity throughout the week, including muscle-strengthening activities 2 or more days per week [18]. Older adults (≥60 yr) with poor mobility should have physical activity 3 or more days per week in order to enhance balance and prevent falls [18]. Additionally, bodyweight training, like simple exercise that involves the body as a means of resistance to perform work against gravity (push-ups, pull-ups, squats, lunges, box jumps, jump roping, burpees, etc.) and stretching exercises could be used for musculoskeletal health and functional capacity [32–34].

People living close to a beach, open field, park, mountain etc. or have some home-based sport facility suitable for aerobic training (stationary bikes, rowing ergometers etc.) may find it easier to organize their self-paced aerobic training. However, for more PA ideas and time-efficient training to benefit health and wellbeing (suitable for children of all ages and adults of all fitness levels and abilities), the use of audio-visual directed gymnastics and aerobic exercise training, internet search platforms and checking out of social media for valid suggestions is recommended [26,35].

**Table 2:** Simple tips to stay safe while exercising in the COVID-19 age [26,36].

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| • Do not exercise if you have a fever, cough or difficulty breathing. Stay home and rest, seek medical attention and call in advance. Follow the directions of your local health authority. |
| • If you are able to go for a walk or bicycle ride always practice physical distancing and wash your hands with water and soap before you leave, when you get to where you are going, and as soon as you return home. If water and soap are not immediately available, use alcohol-based hand rub. |
| • If you go to a park or public open space to walk, run or exercise always practice physical distancing and wash your hands with water and soap, before you leave, when you get to where you are going, and as soon as you return home. If water and soap are not immediately available, use alcohol-based hand rub. Follow the directions of your local health authority in regards to any restrictions on the number of people with you and/or restrictions on the use of public outdoor play or exercise equipment. |
| • If you are not regularly active start slowly and with low intensity activities, like walking and low impact exercises. Start with shorter periods, like 5-10 minutes, and gradually build up to 30 minutes or more continuously over a few weeks. It is better and safer to be active for short periods more frequently than to try and be active for long periods when you are not used to it. |
| • Choose the right activity so that you reduce the risk of injury and that you enjoy the activity. Choose the right intensity according to your health status and fitness level. You should be able to breathe comfortably and hold a conversation while you do light- and moderate-intensity physical activity. |

## 5. Perspective

The lack of PA *per se* is one of the leading causes of preventable death worldwide [10,30,37–39]. Recent evidence reveals the effects of exercise as an adjuvant therapeutic agent against NCDs [33,40], positively associated to reduced mortality and improved quality of life and negatively associated to the occurrence of diseases or their consequences [41,42]. Therefore, maintaining regular exercise and PA in a safe home environment should be a priority for a healthy life during the COVID-19 era.

Though intensive efforts have been made worldwide to find a pharmaceutical agent and vaccine to combat COVID-19, the importance of PA and non-exhaustive exercise as countermeasures and adjuvant therapeutic agents against the virus, NCDs and mental health disorders resulting from the COVID-19 crisis should not be underestimated. Consequently, regular PA and exercise in a safe environment for a healthy life during the COVID-19 pandemic is out of the question. Nonetheless, it is understood that in the presence of COVID-19 in society (or in any future similar condition): i) there is an imperative need of specific guidelines to be developed for applied exercise or PA prescriptions, during and post-lockdown, taking into consideration the respective decrease of overall PA due to restriction measures, especially for the most affected and vulnerable groups, ii) an efficient strategy against inactivity is absolutely necessary, aiming at overcoming pandemic barriers through individual behavioral change and maintaining sensitivity to the individual's financial status, regardless of the availability of specific equipment, sport facilities and/or engagement in sport groups/classes; and iii) there is an urgent need to reboot PA upon safe return to regular daily life, or perhaps with the more ambitious long-term goal to increase PA and meet the WHO Member States' voluntary global target [19].

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