

Commentary

## Physical activity recommendations during the coronavirus disease-2019 virus outbreak

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Physical activity (PA) significantly reduces the risk of viral infections<sup>1,2</sup> and levels of anxiety.<sup>3,4</sup> In addition to its short-term benefits, regular PA lowers one's risk of suffering from chronic health conditions (e.g., diabetes, coronary heart disease, and hypertension), which are cited as the most frequent comorbidities in recent studies of coronavirus disease (COVID-19).<sup>5</sup> Because of the COVID-19 pandemic that has become a global problem, many will face the necessity of requiring hundreds of millions of people to voluntarily self-confine themselves in their own homes, or even be “locked down” in a quarantined community. Confinement affects most aspects of human physiology considerably. The psychological stress of remaining in a confined space causes endocrinological changes that, in turn, affect immune status<sup>6</sup> and have other negative psychological effects, including post-traumatic stress symptoms, confusion, and anger.<sup>7</sup> Even a relatively short, 10-day confinement can cause the markers of lymphocyte expression to be reduced and alterations in natural killer cell profiles can occur.<sup>8</sup> On the opposite side, after a period of longer confinement the number of circulating neutrophils and lymphocytes rapidly increases.<sup>9</sup> In certain environments, people in isolation will encounter an exceptional situation where they will be exposed to both a hypoxic and a confined environment (e.g., living at high altitude such as Denver, Mexico City, Kathmandu, or La Paz). The combined effect of hypoxia and inactivity causes the most negative psychological profiles to appear as confinement continues.<sup>10</sup> During these exceptional circumstances, people are experiencing various health problems related to confinement and prolonged periods of inactivity, as well as acutely high levels of stress, depression, and anxiety. To decrease those health problems, exercise professionals

should encourage organizations, local authorities, and governments to promote PA during this period of mass quarantine, whether it is performed in the safety of people's homes or, if it is safe and allowed by authorities, in nature.<sup>11</sup> The simplest mean for reducing the psychological stress of confinement is regular PA.<sup>12</sup> Data from a recent meta-analysis conclude that dose responses for both the intensity and duration of exercise show large benefits to mental health from even short engagements in green spaces.<sup>13</sup> The existing evidence shows that natural environments have the most effective restorative effects for psychological fatigue<sup>14</sup> and that green spaces increase feelings of contentment, reduce depression, reduce feelings of anger, and diminish anxiety.<sup>15</sup> However, when outdoor exercise is unavailable, exercising indoors is the next best option providing improvement of general health<sup>16</sup> as well as mental health.<sup>17,18</sup>

The logistical issues governing all aspects of daily life that hundreds of millions of people are now confronted with during the current COVID-19 outbreak are unprecedented. It is critical that all persons take collective responsibility of their actions as never before. During this rapid and evolving pandemic crisis, everyone is searching for the best practice medical advice on how to maintain a (somewhat) normal daily life, while still attempting to curtail this most serious viral outbreak and follow social distancing and shelter-in-place or self-isolation guidelines.<sup>19</sup> With this in mind, sport science researchers, medical professionals, and environmental physiologists from the Faculty of Sport at the University of Ljubljana have developed a set of PA recommendations for the people of the Republic of Slovenia specifically that we believe could be of some help for global community and other exercise professionals. These recommendations consider accumulated knowledge communicated in PA position stands from World Health Organization,<sup>20</sup> American College of Sports Medicine,<sup>21</sup> and compelling research from various space agencies (e.g., the National Aeronautics and

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Space Administration<sup>22</sup> or the European Space Agency<sup>23</sup>), on the physiologic effects of confinement on the human body. The guidance presented here is intended for people without any symptoms or diagnosis of acute respiratory illness, who find themselves in a self-quarantine situation for days (or weeks) at a time. The guidelines do not replace medical guidance from your healthcare provider. Considering this, we suggest emphasizing the following points for promoting PA during times of social distancing and isolation.

- Do exercise outdoors wherever possible and perform your choice of low-to-moderate intensity PA daily, either alone or with your family unit. It is critical to stress here that all persons must follow the suggested guidelines of their authorities. Whenever possible, use the largest possible distance from others while outside (even more than the typically suggested 1.5 m). PA (exercise as well as active commuting) from home door to home door without directly contacting others is highly recommended.
- Do not socialize or play group sports with people outside your household. Parents, avoid having your children interacting directly with other children. In particular, explain in age-appropriate language the risks of virus transmission that can occur with socializing in group or team sport situations.
- Do not allow children to climb on park equipment, slides, and other features (especially metal and plastic), including outdoor fitness equipment, since they provide a surface for virus transmission.
- Do engage in a variety of exercises in your home and with your family—climb stairs, hop, skip jump, and dance with children and other household members; perform strength exercises or even active video-gaming in short bursts of activity to increase heart rate, blood flow, and circulation periodically throughout the day; improvise on exercise equipment with rope, broom, bottles, and so on; if you have a balcony or terrace, exercise there.
- Do incorporate stretching and breathing deeply each day. Take at least 10 min each day to slowly move arms and legs throughout their range of motion comfortably.
- Do follow online exercise classes, or post photos/videos on social media of yourself doing exercise at home if that keeps you motivated and connected to others.
- If you suspect you may have contracted a contagious disease, or are feeling ill in any way, limit your PA to within your home and contact your medical professional. Always call first to receive further instructions before going to a medical facility in person.
- It is critical that older adults remain physically active during this time, since they are the ones most likely to experience dramatic structural and functional changes to their muscles and bones after prolonged confinement and low levels of mobility. We want to avoid an increased risk of falls in the elderly overburdening health care services.
- Be aware of the cumulative screen and sedentary time—break up sitting times with PA, standing up, and stretching. For example, for every 60 min seated or recumbent throughout the day, perform 5–10 min of structured

movement. This advice is especially important for those with impaired circulation, diabetes, and other vascular issues.

- Avoid screen viewing of all kinds after 8:00 p.m. to promote proper sleep quality, as increased stress and low PA each exacerbate poor nocturnal sleep patterns.
- Stay hydrated; choose water over sugary drinks or alcohol. Some indoor environments can be dry and may exacerbate those who suffer with breathing difficulties.
- Avoid prolonged, vigorous-intensity exercise; this type of exercise can reduce the body's resistance to viral and other infections in the short term.
- Most important—do what is comfortable and right for you and your family! Regular PA is meant to be fun and reduce stress. It boosts cognitive function and attention, and reduces anxiety in children, who will be particularly affected by extended periods of time spent indoors. Be sure to avoid doing activities that have a higher risk of injury in order to avoid over-burdening the health system, and putting yourself at increased risk of exposure to the novel COVID-19 or other illnesses.
- Bottom line: avoid inactivity throughout the day and be aware that any activity you do is better than no activity at all. All persons (who are physically able), should try to accumulate at least 60 min (but preferably more) of low-to-moderate intensity PA each day, but as stated before every minute counts. At least 15 min of this activity should take place outside, in natural light, whenever possible. If there is no other option due to political, health risk, or other constraints, use a balcony or exercise by an open window. Some activities should be of longer duration (e.g., walking or cycling outside for 30 min), and other activities should incorporate strength and flexibility, ideally performed with family members.

Finally, the exercise, sports medicine, and public health professionals, public health organizations, and national and local public health agencies should all work together to facilitate promotion of safe PA during this public health emergency crisis in which many are infected with COVID-19, but many more affected by the life in quarantine which poses a challenge to maintaining physical and mental well-being.

#### Authors' contributions

GS drafted, wrote sections, revised, and edited the manuscript; GJ conceived the recommendations, drafted, and wrote sections of the manuscript; SAM edited and wrote sections of the manuscript; BL, MK, VH, JV, and PT helped writing the manuscript. All authors have read and approved the final version of the manuscript, and agree with the order of the presentation of the authors.

#### Competing interests

The authors declare that they have no competing interests.

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