



Physical activity and coronavirus disease 2019 (COVID-19): specific recommendations for home-based physical training

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ABSTRACT

The novel coronavirus disease 2019 (COVID-19) seems to be having a major impact on physical activity behaviours globally. The pandemic has forced many people around the world to stay at home and self-isolate for a period of time. WHO recommends 60 min/day of moderate-to-vigorous physical activity for 6–17-yr-olds, and 75 min/wk of vigorous or 150 min/wk of moderate physical activity for adults and elderly, including 3 and 2 days/wk, respectively, with muscle and bone strengthening. Practical recommendations for staying active at home, with aerobic exercise training on a bike or rowing ergometer, bodyweight training, dance and active video gaming, can aid to counteract the detrimental physical and mental side-effects of the COVID-19 protective lifestyle regulations. This commentary provides useful information on home-based physical activity for sedentary people across the lifespan, including children and adolescence, that can be undertaken during the present pandemic or other outbreaks of infectious disease.

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Introduction

Coronaviruses are a large family of viruses that are phenotypically and genotypically diverse. The outbreak of COVID-19 began in December 2019 in Wuhan, China. As of 17 March 2020, the widespread human-to-human transmission had resulted in 179,111 confirmed cases and 7,426 deaths (WHO Situation reports; Zhu et al., 2020). As the COVID-19 pandemic continues to develop in almost all territories and regions, various protective measures have been introduced by the authorities, including the closing of schools and universities, and

bans on travel, cultural and sporting events, and social gatherings (Parnell et al., 2020). People have been ordered or advised to stay at home, and several countries have requested all returning travellers to self-isolate for a fourth-night. All these actions are intended as an effective strategy for preventing the virus spreading and for managing those who do contract the virus. Many people are duly heeding the official advice to self-isolate and stay at home, but these actions will negatively affect people's physical activity behaviours, with more time spent sitting watching screens and a subsequent impact on physical health, well-

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being, sleeping patterns and quality of life. The beneficial effects of regular physical activity on many health outcomes are well established (Pedersen & Saltin, 2015; Powell et al., 2011). Research has demonstrated specific benefits such as improved physical and physiological health parameters and positive health outcomes in areas of mental health and well-being (Chekroud et al., 2018; Mathieu et al., 2012). For these reasons, implementing an adapted physical training programme at home during the period of the pandemic, which may well extend from weeks to months, will decrease the negative physiological and psychological impact of sedentary behaviours. This article focuses on practical applications and recommendations for specific home-based physical activity in sedentary people across the lifespan.

Home-based physical activity

There is likely to be very limited opportunity to practise physical activity outdoors during this period, with most people forced to stay at home or adopt isolation protocols to prevent transmission of the virus. It is thus recommended that people should stay active by exercising at home. For this purpose, multiple exercise modes can be applied, including aerobic exercise using stationary bikes or rowing ergometers, bodyweight strength training, dance-based exercise and active gaming.

Aerobic exercise training is defined as training that elicits a low, moderate or high cardiovascular strain. Such exercise sessions can be carried out on stationary bikes, rowing ergometers and treadmills, or as several types of dance and gymnastics, and are highly recommendable. For children and youth (5–17 yrs), WHO recommends 60 min of daily physical activity with moderate to vigorous aerobic intensity, with muscle and bone strengthening thrice weekly (WHO, 2010). For adults and elderly (>17 yrs), WHO recommends physical activity

for 75 min/wk with vigorous aerobic exercise intensity or 150 min/wk of moderate aerobic intensity, with muscle and bone strengthening twice weekly (WHO, 2010). The aerobic training categories are described in Table 1 for trained and untrained individuals across the lifespan, with specific intensity clues related to heart rate, rating of perceived exertion (RPE) as well as intensity clues related to the degree of breathlessness during exercise (Bangsbo et al., 2006; Fox et al., 1971; Garber et al., 2011; Tanaka et al., 2001).

Zumba dancing, audio-visual-directed gymnastics and aerobic exercise training can be recommended for maintenance of cardiovascular, metabolic and musculoskeletal fitness (Barene et al., 2014, 2016; Connolly et al., 2020) and for reducing the severity of symptoms of depression (Norouzi et al., 2019). Dance-based exercise involves the use of body movements and expressions and many physical and mental health benefits can be achieved through dancing, which may directly or indirectly affect quality of life (Alpert, 2011; Hernandez et al., 2018). Thus, dance can induce positive functional adaptations in elderly, especially related to balance, and the combined effects of dance on well-being and physical health markers makes it a valuable exercise intervention in ageing individuals (Hofgaard et al., 2019; Rodrigues-Krause et al., 2019).

Stationary bikes, rowing ergometers and other home-based facilities suitable for aerobic training, can be used for time-efficient training to achieve cardiovascular and metabolic health effects. This type of training ensures moderate-to-vigorous aerobic training that can be controlled with heart rate monitors or power output loading programme (Garber et al., 2011), but also when organised as high-intensity self-paced training (Connolly et al., 2017). Those living close to a field, beach, park, yard or mountains, which can be accessed safely and in solitude can, and are recommended to, use these to carry out moderate-to-high intensity aerobic exercise.

Table 1. Intensity categories of home-based aerobic exercise training for various target groups.

Intensity	Trained/Active		Sedentary		Patients/Elderly		Additional intensity clues
	% of HRmax	RPE (0–10)	% of HRmax	RPE (0–10)	% of HRmax	RPE (0–10)	
Low	65 (50–80%)	2 (1–3)	60 (50–75%)	2 (1–3)	60 (50–70%)	2 (1–3)	Easy, breath is moderate
Moderate	80 (70–90%)	4 (3–5)	75 (70–85%)	4 (3–5)	70 (65–80%)	3 (2–4)	Somewhat hard, breath quickens, talking is possible, but not singing
High	90 (85–100%)	6 (5–10)	85 (80–95%)	5 (4–8)	80 (70–90%)	5 (3–7)	Challenging, breath is deep and rapid, only few words can be said without pausing for breath

Note: Heart rate in percentage of maximal heart rate (HRmax) and rating of perceived exertion (RPE) during aerobic training with low, moderate and high intensity exercise for trained/active (Bangsbo et al., 2006) as well as sedentary individuals and patients/elderly (Garber et al., 2011). The session RPE 0–10 scale relates to the following intensity anchors; 0: Rest, 2: Easy, 3: Moderate, 5: Hard, 7: Very Hard, 10: Maximal (Foster et al., 2001). Please note that the intensity categories are described as mean values as well as ranges. HRmax can be estimated as 220 minus age (Fox et al., 1971) or 208 minus 0.7 multiplied by age (Tanaka et al., 2001).

Bodyweight training, simply stated, is any exercise that involves using the body as a means of resistance to perform work against gravity (Harrison, 2010). Examples of bodyweight exercises for the upper and lower body include push-ups, pull-ups, squats, lunges, box jumps, jump roping, burpees, etc. (Table 2). The benefits of bodyweight training for musculoskeletal health and functional capacity are well documented for untrained adults, elderly and a wide range of patients (Jönhagen et al., 2009; Pedersen & Saltin, 2015). For example, it has been shown that plyometric exercise as well as resistance exercise with slow movements can improve physical function in the elderly (Kikuchi & Nakazato, 2017; Watanabe

et al., 2015). Moreover, 10 weeks of bodyweight training improved selected elements of body composition and components of physical fitness, including strength, flexibility and aerobic capacity, in sedentary 21–23-yr-old women (Lipecki & Rutowicz, 2015).

UNESCO has reported that about 861.7 million students are out of school due to COVID-19. It is likely that this pandemic will trigger mental health problems in some children and adolescents. Thus, motivating physical activity modes can be an efficient strategy to keep young people active at home. *Active video gaming* is very popular, and some games involving movement may increase physical activity levels sufficiently to impact the health

Table 2. Examples of home-based bodyweight training exercises.

Exercise	Frequency	Benefits
Active dynamic warm-up		
High-knee Skips – Butt Kicks – High Kicks – Lateral Shuffles		
Bodyweight squats	1–2 sets of 10 reps – beginner 2–3 sets of 20 reps – advanced	Lower-body strength and power Functional outcomes
Push-ups	1–2 sets of 10 reps – beginner 2–3 sets of 20 reps – advanced	Upper-body strength and endurance
Walking lunges	1–2 sets of 5 reps – beginner 2–3 sets of 10 reps – advanced	Hamstring strength and running speed
Planks	1–2 sets of 20 sec – beginner 2–4 sets of 40 sec – advanced	Body posture, upper- and lower-body isometric strength
Jumping jacks	1–2 sets of 15 reps – beginner 2–4 sets of 20 reps – advanced	Endurance and core strength
Sit-ups	1–2 sets of 15 reps – beginner 2–4 sets of 20 reps – advanced	Abdominal and core strength
Cool-down		
Static stretching and flexibility exercises		

Reps = Repetitions.

and fitness of young people (Barnett et al., 2011). Video games can facilitate enjoyment, which has been shown to be linked to increased physical activity in girls. It has been demonstrated that energy expenditure during active video gaming is comparable to moderate-intensity walking, and for children who spend a considerable amount of time playing electronic screen games for entertainment, physically active games seem to be a safe, fun and valuable means of promoting energy expenditure (Graf et al., 2009). Studies of active video games have included those primarily focusing on the lower body, incorporating for instance stepping and running, e.g. Dance Dance Revolution with low and high difficulty levels (Graf et al., 2009; Lanningham-Foster et al., 2006), and those primarily focusing on the upper body, incorporating for instance swinging and stretching, e.g. XaviX Bowling (Mellecker & McManus, 2008), Wii Bowling (Graf et al., 2009) and Wii Tennis (Graves et al., 2008), although it should be emphasised that these activities elicit lower intensities than traditional PE activities, such as gymnastics or small-sided ball game activity (Bendiksen et al., 2014).

Conclusion

Home-based activities provide an opportunity for people to stay fit and healthy by practising simple movements while staying at home. Many countries have now implemented lockdowns, forcing people to stay at home and only go out in the event of an emergency. These decisions will affect peoples' mental and physical health, especially those who are used to regular outdoor physical activities. We are all aware of the importance of our mental health and the need to improve our immune system, which is extremely important for fighting sickness. Staying at home can lead to a lot of stress, anxiety and mental distress. The best way to overcome these problems is to replace outdoors activities with home-based activities, such as bodyweight training and

dance-based aerobic exercise, and if possible, aerobic high-intensity exercise using stationary bikes or rowing ergometers, also with self-paced protocols. These activities can be combined with, but not substituted by, stretching and active gaming. The great importance of a healthy diet during this self-isolation period also cannot be underestimated.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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