

**COVID-19 and Social Isolation: A Case for Why Home-Based Resistance Training Is Needed to Maintain Musculoskeletal and Psychosocial Health for Older Adults**

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- 2 musculoskeletal and psychosocial health for older adults
- 3

## 1 ABSTRACT

2 The Coronavirus disease (COVID-19) outbreak in China has become the world's leading health headline  
3 and is causing major panic and public concerns. Public health guidelines in many countries are suggesting  
4 people stay at home to avoid human-to-human transmission of the virus, which may lead to reduced  
5 physical activity and greater feelings of isolation. Such effects may be particularly problematic in older  
6 adults, due to their reduced physical capacities and their potential for increased mental health issues such  
7 as anxiety and depression. A potential way to minimise many of these side effects of stay-at-home may be  
8 progressive home-based resistance training. A simple way to provide progressive overload in home-based  
9 resistance training may involve elastic resistance, which have been demonstrated to provide similar  
10 benefits to traditional resistance training equipment typically found in gymnasiums. Recommendations on  
11 how older adults can safely and effectively perform elastic resistance training at home is provided.

12 **Key words: coronavirus, elastic resistance training, physical activity.**

13

1 The Coronavirus disease (COVID-19) outbreak in China has become the world's leading health  
2 headline and is causing major panic and public concerns. On January 30, 2020, the World Health  
3 Organization (WHO) declared that the new coronavirus outbreak is a public health emergency of  
4 international concern (World Health Organization, n.d.). The virus has already had a direct impact on  
5 millions of people around the world, posing a health threat of unknown magnitude at the global level. As  
6 of March 26, 2020, the pandemic, one of the biggest health crises in recent years whose consequences are  
7 still unpredictable, has spread to more than 170 countries, resulting in ~470,000 cases and more than  
8 20,000 deaths. In Spain, the number of positive cases with COVID-19 exceeds 56,000, ranking it as the  
9 second highest in Europe, with only Italy having a greater number of confirmed cases. Spain is also  
10 currently ranked second in the world in terms of the number of confirmed deaths from coronavirus.  
11 Specifically, Spain has already recorded 4,145 deaths, whereas China has had 3,293 confirmed deaths so  
12 far. Italy, with at least 7,500, has already doubled the number (Ministerio de Sanidad del Gobierno de  
13 España, 2020). Currently, there is no vaccine for the prevention or treatment of the disease caused by the  
14 virus; its origins and the ultimate scope of this pandemic are unknown. The causes or mechanisms of  
15 transmission, the incubation period, risk assessments and effective treatment or intervention options for  
16 the virus are also currently poorly understood.

17 Health authorities in countries such as China, Italy, China, the United States, Australia and Spain,  
18 among others, have advised the public to reduce travel, stay home and maintain social distancing when in  
19 public as a basic means of limiting people's exposure to the virus. Unfortunately, travel restrictions and  
20 directives against participation in outdoor activities, including sport, physical activity and regular  
21 exercise, will inevitably disrupt the daily activities of tens of millions of people.

22

### 23 **Issues For Older Adults**

24 While containing the virus as quickly as possible is the urgent public health priority, there have been few  
25 public health guidelines as to what people, especially older adults can or should do in terms of  
26 maintaining their daily exercise or physical activity routines. This is a concern as a large percentage of

1 adults and older people do not meet the global recommendations for physical activity, especially  
2 resistance training needed to reduce morbidity and maintain functional capacity (Sun, Norman, & While,  
3 2013; Winett, Williams, & Davy, 2009). Arguably, staying home, while a safe measure, may have  
4 unintended negative consequences since such efforts to avoid human-to-human transmission of the virus  
5 may lead to reduced physical activity (P. Chen et al., 2020). Long hours in the home may lead to  
6 increased sedentary behaviour and inactivity or little physical activity, long periods of sitting and lying  
7 down; all of which increases the risk of developing or exacerbating chronic diseases (Owen, Sparling,  
8 Healy, Dunstan, & Matthews, 2010). Staying at home can also be socially isolating, particular for older  
9 adults who may already have a reduced network of friends than younger adults and children (Freedman &  
10 Nicolle, 2020; Santini et al., 2020). This isolation for older adults may exacerbate issues related to their  
11 mental health, with increased levels of anxiety and depression the likely result (Freedman & Nicolle,  
12 2020; Santini et al., 2020).

13  
14 As many older adults are already highly concerned about contracting COVID-19 and the serious adverse  
15 events or even death that may result from contracting the virus, such self- isolation has the potential to  
16 cause a host of psychosocial and physical harm. Aging is a complex process characterized by structural  
17 and physiological changes in various systems of the human body that can compromise anthropometric  
18 (e.g. muscle mass, regional adiposity) and neurovascular (muscle strength, motor control) variables, and  
19 reduce the physical independence of the older adults (Chodzko-Zajko et al., 2009).

20  
21 Aging is associated with a progressive decrease of muscle mass and a reduced capacity of the muscles to  
22 produce strength and power, that ultimately result in a decline in the ability to perform a range of  
23 functional tasks including standing up from a chair or walking, particularly upstairs or while carrying  
24 additional handheld loads (Aagaard, Suetta, Caserotti, Magnusson, & Kjær, 2010; Guizelini, de Aguiar,  
25 Denadai, Caputo, & Greco, 2018). The ability of the lower extremity muscles to generate force and  
26 muscular power is a fundamental component for maintaining balance (Li et al., 2018), with the

1 assessment of the force-velocity ratio advocated to determine the maximum capacities of older adults to  
2 produce force, speed and power (Marcos-Pardo, González-Hernández, García-Ramos, López-Vivancos,  
3 & Jiménez-Reyes, 2019). These age-related losses of muscle mass, strength and physical performance is  
4 now referred to as the geriatric syndrome, sarcopenia (Cruz-Jentoft et al., 2019). These sarcopenia-related  
5 changes may increase the risk of falls and fractures, which could contribute to the loss of independence  
6 and the deterioration in the physical function and quality of life of older adults (Gadelha et al., 2018; Ma  
7 et al., 2018; Trombetti et al., 2016).

8  
9 This relative disability and increase in falls and falls related fracture may require additional healthcare  
10 services and costs, with the available health care services and funding already stretched due to the  
11 COVID-19 pandemic. In particular, public health programs need to ensure older adults can maintain their  
12 levels of muscular strength so to minimize these major healthcare cost implications. Specifically, Pinedo-  
13 Villanueva and colleagues, reported that each older adult with muscle weakness (defined as having  
14 handgrip strength < 26 kg for men or < 16 kg for women) cost the UK healthcare system an additional  
15 US\$ 3,372 at current exchange rates per year (Pinedo-Villanueva et al., 2019).

16

### 17 **Exercise Benefits For Older Adults**

18 One way to counteract the potential psychosocial and physical deterioration as well as increased  
19 healthcare costs that may be associated with the reduced level of physical activity that may occur with  
20 social distancing and stay-at-home policies currently being advocated by many governments is exercise  
21 (Hetherington et al., 2019; Raafs et al., 2019), although in the current climate it is recommended that such  
22 exercise is home-based. Exercise at home using various safe, simple, and easily implementable exercises  
23 is well suited to avoid the airborne coronavirus and maintain fitness levels. Such forms of exercise may  
24 include, but are not limited to, strengthening (resistance training) exercises, activities for balance and  
25 control, cardiovascular, stretching exercises, or a combination of these (P. Chen et al., 2020).

26

1 Resistance training is widely recommended to slow down the negative effects of aging in sarcopenia-  
2 related decline because it is considered the most effective method for improving muscle mass, strength  
3 and power which are key to counteract disability in older adults (Cadore et al., 2014; Chodzko-zajko,  
4 2014; Marcos-Pardo, Orquin-Castrillón, et al., 2019). In addition, individuals undertaking resistance  
5 training demonstrate an increased motivation and adherence to training (Kekäläinen et al., 2018; Marcos-  
6 Pardo, Martínez-Rodríguez & Gil-Arias, 2018). Due to the confined state of adults and older people, safe  
7 and effective strategies for resistance training at home are needed.

8  
9 Home resistance training with minimal supervision is a safe, effective and low-cost exercise  
10 option for increasing muscle strength and functional capacity in healthy older adults, as well as  
11 older subjects with a variety of health conditions that can overcome some of the common barriers to  
12 exercise (Henwood et al., 2019). It is an attractive, viable and, from a public health perspective, a feasible  
13 alternative to supervised resistance training in gymnasiums (Kis et al., 2019), which are now largely  
14 unavailable due to the risk of spreading the virus to vulnerable older adults. Training with small overload  
15 materials such as bottles or dumbbells available at home, as well as elastic resistance training are effective  
16 resistance training materials and easy to use for this age group (Andersen et al., 2011; Jensen et al., 2014).  
17 Elastic resistance exercises are often used during unsupervised home training, where the exercise  
18 professional or instructional web-based video provides the patient with initial instruction on how to  
19 perform the exercise. These instructions may focus on exercise prescription variables including loading,  
20 range of motion, number of repetitions, sets, pauses between exercises, and proper starting position (Faber  
21 et al., 2015).

22  
23 The use of elastic resistance training during confinement has multiple advantages for training at home;  
24 they are easy to use, can be adjusted to different loads, are less expensive and do not take up as much  
25 space as dumbbells or specialized resistance training machines. Multiple studies have compared elastic  
26 bands training to traditional free weights (e.g. dumbbells) based resistance training in terms of the muscle

1 activation levels (Andersen et al., 2010; Colado et al., 2010; Melchiorri & Rainoldi, 2011). These studies  
2 generally demonstrated that exercise training with elastic resistance activates the agonists at a similar  
3 level to that achieved with dumbbells or weight machines, suggesting that bands can be as effective in  
4 improving strength and reducing muscle loss as more traditional resistance training tools. Such a is  
5 viewpoint is supported by a number of training studies demonstrating similarity in training related  
6 adaptations in middle-aged to older healthy adults to elastic and traditional resistance training (Lima et  
7 al., 2018; Mikesky, Topp, Wigglesworth, Harsha, & Edwards, 1994; Yasuda, Fukumura, Tomaru, &  
8 Nakajima, 2016).

### 9 **Phychosocial Benefits of Resistance Exercise for Older Adults**

10 The National Strength and Conditioning Association have recently released a Position Statement (Fragala  
11 et al., 2019) outlining the physical and psychosocial benefits of resistance training for older adults. A  
12 major psychosocial benefit is improved quality of life, which can be defined as the subjective view of an  
13 individual about their general well-being and ability to participate in enjoyable life events (Dionigi, 2007;  
14 Kekäläinen, Kokko, Sipilä, & Walker, 2018; Pedersen et al., 2017). These improvements in older adults  
15 quality of life with resistance training may reflect a range of other psychosocial benefits including  
16 improved self-esteem/confidence (O'Connor, Herring, & Caravalho, 2010), sense of coherence  
17 (Kekäläinen, Kokko, Sipilä, et al., 2018) and sleep quality (O'Connor et al., 2010) as well as a reduction  
18 in depression and/or anxiety (O'Connor et al., 2010; Tsutsumi, Don, Zaichkowsky, & Delizonna, 1997).  
19 It has even been reported that the improvements in depression that may be observed with resistance  
20 training are similar in magnitude to standard pharmacotherapy interventions for older adults with  
21 depression (Singh et al., 2005). Further, there is even evidence for some forms of resistance training to  
22 improve older adults' cognitive function, with enhancements in executive function accompanied by  
23 functional changes in the frontal lobe (Herold, Törpel, Schega, & Müller, 2019). Such improvements in  
24 cognitive function may even have the potential to offset some of the behavioural issues associated with  
25 advanced age dementia (K. M. Chen, Kuo, Chang, Huang, & Cheng, 2017).



1 Therefore, exercise during quarantine can help to combat many of the physical and mental negative  
2 consequences of the social isolation policies adopted in many countries due to the Covid-19 pandemic  
3 (Jiménez-Pavón, Carbonell-Baeza, & Lavie, 2020). The participation of older people in resistance training  
4 programs can serve as a prophylactic to delay or prevent the appearance of biological aging. The physical  
5 and psychological benefits have been demonstrated if we use a minimum dose of two days a week and 60  
6 minutes of training (Fisher, Steele, Gentil, Giessing, & Westcott, 2017).

7

### 8 **Home Elastic Resistance Training Recommendations**

9 Consistent with exercise guidelines for older adults (Fragala et al., 2019), it would be recommended that  
10 older people perform elastic resistance training 2 to 3 days a week, with such sessions perhaps starting off  
11 with a duration of 15 or 20 minutes, but progressing up to 45-60 minutes. In the first few training  
12 sessions, the older adult should become familiar with the different movements, how the use of elastics or  
13 other forms of resistance (e.g. additional household objects) increases the difficulty of the exercise and  
14 become comfortable with the potential delayed onset muscle soreness that may occur for a few days post  
15 exercise.

16

17 The muscle groups and movements to be trained should focus on movements that replicate many common  
18 activities of daily living and involve the major trunk and limb muscle groups. These exercises should seek  
19 to improve lower body muscle mass, strength and power as well as balance so that the older adult can  
20 minimize their falls risk and maintain their independence in performing common activities such as the sit  
21 to stand and walking, particularly up or down stairs or carrying additional loads such as groceries. Older  
22 adults also need to maintain or improve upper body strength so that they can to continue to hold loads in  
23 their hands, lift objects from lower to higher positions such as shelves and are able to get off the floor if  
24 they experience a fall. Each elastic resistance training session should consist of a warm-up at the  
25 beginning and general stretching at the end. In particular, we would recommend that the following  
26 movements are performed with adequate resistance, elbow curl (A), squat (B), elbow extension (C), knee

1 extension (D), chest press (E), leg press (F), shoulder overhead press (G), knee curl (H) and shoulder  
2 seated row (I). An example of the execution of the elastic resistance training can be seen in Figure 1.

3

4 Insert Figure 1 about here

5

6 The resistance of the elastics training varies from brand to brand and differs in color. Each color offers a  
7 different level of resistance to the practitioner. It is very important that for the safety and effectiveness of  
8 the training, the practitioner must be familiar with the load (strength of the band), the range of motion  
9 (ROM) including the starting and finish position, the number of repetitions per set, and the optimal speed  
10 of execution. To control the intensity of exercise with elastic bands, it is advisable to use the Resistance  
11 Intensity Scale for Exercise; RISE in older people (Colado, Furtado, Teixeira, Flandez, & Naclerio,  
12 2020). The RISE scale (see Figure 2) is a valid method for assessing the perceived exertion during  
13 resistance exercises performed with elastic bands in older people that better discriminates between  
14 medium and low intensities than the Exercise Scale of Perceived Exertion (OMNI-RES) scale in older  
15 adults (Colado et al., 2012, 2018).

16

17 Insert Figure 2 about here

18

19 One way to perform the resistance training program that may also provide some cardiovascular health  
20 benefit, which is also important with the potential for reduced opportunities for cardiovascular exercise  
21 such as walking, is to perform the resistance training exercises in a circuit training format (Fritz et al.,  
22 2018; Souza et al., 2019), The following recommendations for how the elastic resistance training  
23 exercises may be performed, progressed and incorporated into a circuit format for older adults are based  
24 on the literature (Colado et al., 2020; de Oliveira, Pereira Moro, Polito, Helena de Jesus, & de Souza  
25 Bezerra, 2020; Fritz et al., 2018; Krause et al., 2019; Osuka et al., 2019; Rieping et al., 2019; Silva et al.,  
26 2018; Souza et al., 2019). An older adult with little resistance training experience may initially perform 1-

1 2 series of the circuit, with a load that allows 12 to 15 repetitions per set at a low to moderate level effort  
2 on the RISE. As each repetition should be performed under control, with a two second concentric (lifting  
3 the weight) and two second eccentric (lowering the weight) phase, each set of an exercise may last up to  
4 60 seconds. The older adult can increase the intensity of the exercises as assessed by the RISE increasing  
5 towards a perception of hard level effort between the second and fourth week. After four weeks of  
6 training, it is advisable to progressively increase the number of training series, ultimately looking to  
7 perform three or four series of the exercise circuit. As the weeks go by, and the older adult adapts to the  
8 load, he or she should optionally increase the repetitions or increase the load, in this case changing to  
9 another elastic of greater resistance. For older adults with some resistance training experience, they can  
10 start with a moderate intensity level, with a higher resistance elastic and perform 10 to 12 repetitions per  
11 series, with a hard level of effort perception by performing three or four sets of training, progressing up to  
12 three to four days a week.

13

14 Where possible, we recommend older adults seek some supervision from an exercise specialist, with  
15 experience in working with older adults. Nowadays, a host of telehealth/video conferences can be  
16 incorporated whereby these exercise specialists can support older adults safely and effectively perform  
17 this home-based progressive resistance training sessions.

18

## 19 **Conclusions**

20 Following these recommendations can help during the confinement period to reduce the loss of muscle  
21 mass and strength, control and/or reduce body weight, avoid the accumulation of fatty tissue and combat  
22 the occurrence of or reduce existing chronic diseases in adults and older people. Home resistance training  
23 using elastic materials is a beneficial and necessary option for the maintenance of musculoskeletal and  
24 psychosocial health.

25

## 26 **Statement of conflict of interest**

1 There is no conflict of interest of any of the listed authors.

2

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8

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13

14

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