

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

Keywords: coronavirus, elastic resistance training, exercise, older people

The coronavirus disease (COVID-19) outbreak in China has become the world's leading health headline and is causing major panic and public concerns. On January 30, 2020, the World Health Organization declared that the new coronavirus outbreak is a public health emergency of international concern (World Health Organization, n.d.). The virus has already had a direct impact on millions of people around the world, posing a health threat of unknown magnitude at the global level. As of March 26, 2020, the pandemic, one of the biggest health crises in recent years whose consequences are still unpredictable, has spread to more than 170 countries, resulting in ~470,000 cases and more than 20,000 deaths. In Spain, the number of positive cases of COVID-19 exceeds 56,000, ranking it as the second highest in Europe, with only Italy having a greater number of confirmed cases. Spain is also currently ranked second in the world in terms of the number of confirmed deaths from coronavirus. Specifically, Spain has already recorded 4,145 deaths, whereas China has had 3,293 confirmed deaths so far. Italy, with at least 7,500, has already doubled the number (Ministerio de Sanidad del Gobierno de España, 2020). Currently, there is no vaccine for the prevention

or treatment of the disease caused by the virus; its origins and the ultimate scope of this pandemic are unknown. The causes or mechanisms of transmission, the incubation period, risk assessments, and effective treatment or intervention options for the virus are also currently poorly understood.

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

Issues for Older Adults

While containing the virus as quickly as possible is the urgent public health priority, there have been few public health guidelines as to what people, especially older adults, can or should do in terms of maintaining their daily exercise or physical activity routines. This is a concern as a large percentage of adults and older people do not meet the global recommendations for physical activity, especially resistance training, needed to reduce morbidity and maintain functional capacity (Sun, Norman, & While, 2013; Winnett, Williams, & Davy, 2009). Arguably, staying home, while a safe measure, may have unintended negative consequences since such efforts to avoid human-to-human transmission of the virus may lead to reduced physical activity (Chen et al., 2020). Long hours in the home may lead to increased sedentary behavior and inactivity or little physical activity and long periods of sitting and lying down, all of which increase the risk of developing or exacerbating chronic diseases (Owen, Sparling, Healy, Dunstan, & Matthews, 2010). Staying at home can also be socially isolating, particularly for older adults who may already have a reduced network of friends compared with younger adults and children (Freedman & Nicolle, 2020; Santini et al., 2020). This

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isolation for older adults may exacerbate issues related to their mental health, with increased levels of anxiety and depression the likely result (Freedman & Nicolle, 2020; Santini et al., 2020).

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

Aging is associated with a progressive decrease of muscle mass and a reduced capacity of the muscles to produce strength and power that, ultimately, results in a decline in the ability to perform a range of functional tasks, including standing up from a chair or walking, particularly upstairs or while carrying additional handheld loads (Aagaard, Suetta, Caserotti, Magnusson, & Kjær, 2010; Guizelini, de Aguiar, Denadai, Caputo, & Greco, 2018). The ability of the lower extremity muscles to generate force and muscular power is a fundamental component for maintaining balance (Li et al., 2018), with the assessment of the force-velocity ratio advocated to determine the maximum capacities of older adults to produce force, speed, and power (Marcos-Pardo, González-Hernández, García-Ramos, López-Vivancos, & Jiménez-Reyes, 2019). These age-related losses of muscle mass, strength, and physical performance are now referred to as the geriatric syndrome, sarcopenia (Cruz-Jentoft et al., 2019). These sarcopenia-related changes may increase the risk of falls and fractures, which could contribute to the loss of independence and deterioration in the physical function and quality of life of older adults (Gadelha et al., 2018; Ma et al., 2018; Trombetti et al., 2016).

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

Exercise Benefits for Older Adults

One way to counteract the potential psychosocial and physical deterioration as well as increased health care costs that may be associated with the reduced level of physical activity that may occur with social distancing and stay-at-home policies currently being advocated by many governments is exercise (Hetherington et al., 2019; Raafs et al., 2019); although, in the current climate, it is recommended that such exercise be home based. Exercise at home using various safe, simple, and easily implementable exercises is well suited to avoid the airborne coronavirus and maintain fitness levels. Such forms of exercise may include, but are not limited to, strengthening (resistance training) exercises,

activities for balance and control, cardiovascular activity, stretching exercises, or a combination of these (Chen et al., 2020).

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

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

The use of elastic resistance training during confinement has multiple advantages for training at home; the elastic bands are easy to use, can be adjusted to different loads, and are less expensive and do not take up as much space as dumbbells or specialized resistance training machines. Multiple studies have compared elastic band training with traditional free weights-based resistance training (e.g., dumbbells) in terms of the muscle activation levels (Andersen et al., 2010; Colado et al., 2010; Melchiorri & Rainoldi, 2011). These studies generally demonstrated that exercise training with elastic resistance activates the agonists at a similar level to that achieved with dumbbells or weight machines, suggesting that bands can be as effective in improving strength and reducing muscle loss as more traditional resistance training tools. Such a viewpoint is supported by a number of training studies demonstrating similarity in training-related adaptations to elastic and traditional resistance training in middle-aged to older healthy adults (Lima et al., 2018; Mikesky, Topp, Wigglesworth, Harsha, & Edwards, 1994; Yasuda, Fukumura, Tomaru, & Nakajima, 2016).

Psychosocial Benefits of Resistance Exercise for Older Adults

The National Strength and Conditioning Association has recently released a position statement (Fragala et al., 2019) outlining the

physical and psychosocial benefits of resistance training for older adults. A major psychosocial benefit is improved quality of life, which can be defined as the subjective view of an individual about their general well-being and ability to participate in enjoyable life events (Dionigi, 2007; Kekäläinen, Kokko, Sipilä, & Walker, 2018; Pedersen et al., 2017). These improvements in older adults' quality of life with resistance training may reflect a range of other psychosocial benefits, including improved self-esteem/confidence (O'Connor, Herring, & Carvalho, 2010), sense of coherence (Kekäläinen, Kokko, Sipilä, & Walker, 2018), and sleep quality (O'Connor et al., 2010) as well as a reduction in depression and/or anxiety (O'Connor et al., 2010; Tsutsumi, Don, Zaichkowsky, & Delizonna, 1997). It has even been reported that the improvements in depression that may be observed with resistance training are similar in magnitude to standard pharmacotherapy interventions for older adults with depression (Singh et al., 2005). Furthermore, there is even evidence that some forms of resistance training improve older adults' cognitive function, with enhancements in executive function accompanied by functional changes in the frontal lobe (Herold, Törpel, Schega, & Müller, 2019). Such improvements in cognitive function may even have the potential to offset some of the behavioral issues associated with advanced age dementia (Chen, Kuo, Chang, Huang, & Cheng, 2017).

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

Home Elastic Resistance Training Recommendations

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

The muscle groups and movements to be trained should focus on movements that replicate many common activities of daily living and involve the major trunk and limb muscle groups. These exercises should seek to improve lower body muscle mass, strength, and power as well as balance so that the older adult can minimize their fall risk and maintain their independence in performing common activities such as the sit-to-stand movement and walking, particularly up or down stairs or carrying additional loads, such as groceries. Older adults also need to maintain or improve upper body strength so that they can continue to hold loads in their hands, lift objects from lower to higher

positions, such as onto shelves, and so that they are able to get off the floor if they experience a fall. Each elastic resistance training session should consist of a warm-up at the beginning and general stretching at the end. In particular, we would recommend that the following movements be performed with adequate resistance: (a) elbow curl, (b) squat, (c) elbow extension, (d) knee extension, (e) chest press, (f) leg press, (g) shoulder overhead press, (h) knee curl, and (i) shoulder seated row. An example of the execution of the elastic resistance training can be seen in Figure 1.

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

One way to perform the resistance training program that may also provide some cardiovascular health benefit, which is also important because of the potential for reduced opportunities for cardiovascular exercise, such as walking, during self-isolation, is to perform the resistance training exercises in a circuit training format (Fritz et al., 2018; Souza et al., 2019). The following recommendations for how the elastic resistance training exercises may be performed, progressed, and incorporated into a circuit format for older adults are based on the literature (Colado et al., 2020; de Alencar Silva et al., 2018; de Oliveira, Pereira Moro, Polito, Helena de Jesus, & de Souza Bezerra, 2020; Fritz et al., 2018; Krause et al., 2019; Osuka et al., 2019; Rieping et al., 2019; Souza et al., 2019). An older adult with little resistance training experience may initially perform one to two series of the circuit with a load that allows 12–15 repetitions per set at a low to moderate level effort on the RISE. As each repetition should be performed under control with a 2-s concentric (lifting the weight) and 2-s eccentric (lowering the weight) phase, each set of an exercise may last up to 60 s. The older adult can increase the intensity of the exercises as assessed by the RISE, increasing toward a perception of hard level effort between the second and fourth week. After 4 weeks of training, it is advisable to progressively increase the number of training series, ultimately looking to perform three or four series of the exercise circuit. As the weeks go by, and the older adult adapts to the load, he or she should, optionally, increase the repetitions or increase the load, in this case changing to another elastic of greater resistance. Older adults with some resistance training experience can start with a moderate intensity level with a higher resistance elastic and perform 10–12 repetitions per series with a hard level of effort perception by performing three or four sets of training, progressing up to 3–4 days a week.

Where possible, we recommend older adults seek some supervision from an exercise specialist with experience in working with older adults. Nowadays, a host of telehealth/video conferences can

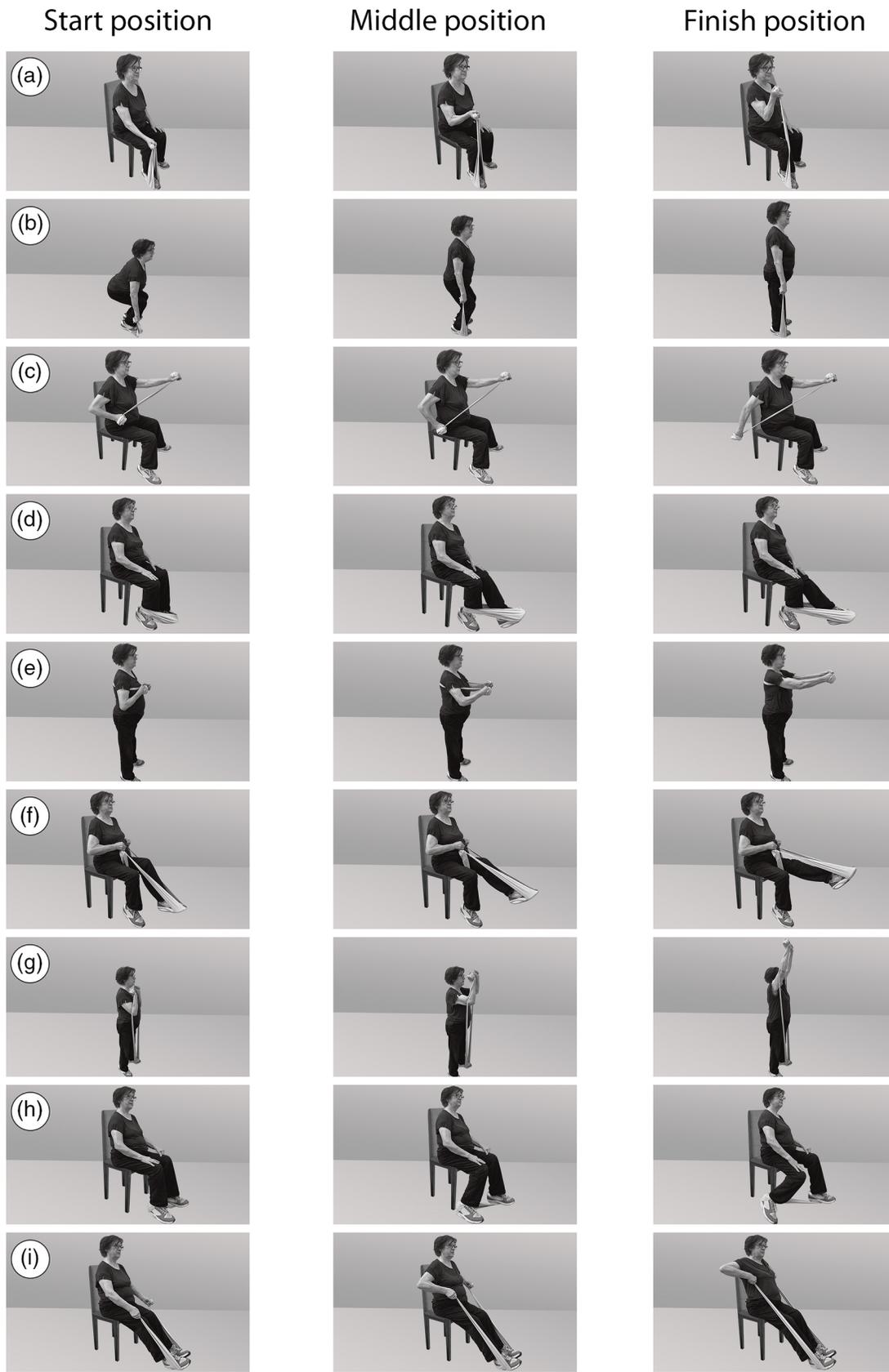


Figure 1 — Home elastic resistance training exercises. *Note.* (a) Elbow curl, (b) squat, (c) elbow extension, (d) knee extension, (e) chest press, (f) leg press, (g) shoulder overhead press, (h) knee curl, and (i) shoulder seated row.

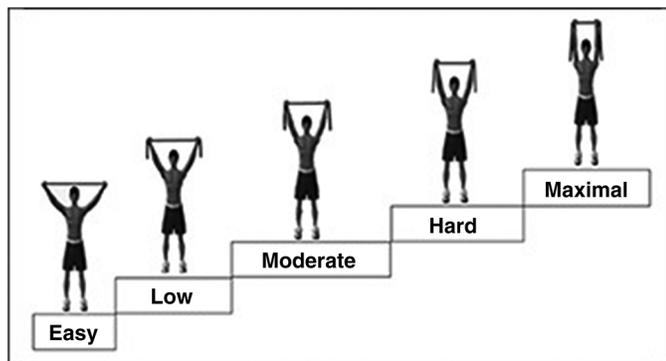


Figure 2 — RISE in older people (Colado et al., 2020). *Note.* This pictorial demonstrates how the intensity of the exercise can be increased from easy to maximal by placing the hands closer together on the exercise band. In order to standardize this progressive increase in intensity, it is recommended to mark set distances on the bands. When the required number of repetitions and sets are performed with a given intensity, progression of the exercise can be achieved by placing the hands on the next closer marked distance. RISE = Resistance Intensity Scale for Exercise. Reprinted from *Journal of Sports Science & Medicine*, Vol. 19, Colado, J.C., Furtado, G.E., Teixeira, A.M., Flandez, J., & Naclerio, F., “Concurrent and Construct Validation of a New Scale of Rating Perceived Exertion During Elastic Resistance Training in the Elderly,” 175–186, Copyright (2020), with permission from the *JOURNAL OF SPORTS SCIENCE AND MEDICINE*.

be incorporated whereby these exercise specialists can help older adults to safely and effectively perform these home-based progressive resistance training sessions.

Conclusions

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

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