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# Physical Exercise Improves Quality of Life in Patients with Connective Tissue Disease

*Ricardo Munir Nahas, Vivianne Horsti Dos Santos  
and Silvio Lopes Alabarse*

## Abstract

Connective tissue diseases (CTDs) affect the parts of the body that connect the structures of the body components together. As the conditions involve inflammatory responses in the joints, tendons, ligaments, skin, cornea, cartilage, bones, muscles and blood vessels, which cause symptoms of rheumatism, the CTDs can also be referred to as rheumatic diseases. The symptoms include pain, swelling, redness, warmth in a joint or affected area and functional loss of motion. The medical domain for these types of disorders is called rheumatology. Among various conditions fell under the broad heading of rheumatism, the common rheumatic disorders that here we take care of are rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), scleroderma (S), systemic sclerosis (SS), polymyositis/dermatomyositis (PM/DM), spondyloarthropathies (SA) (ankylosing spondylitis (AS) and psoriatic arthritis (PsA)), juvenile idiopathic arthritis (JIA), polymyalgia rheumatica (PMR), Sjogren's syndrome, osteoarthritis, etc. When the diagnosis of CTDs is made by the rheumatologists, they oversee a treatment plan for the patients, which may include not only medications but also physical exercises. In this chapter, we will describe how the physical exercise contributes to the patients who suffered from CTDs. Furthermore, we intend to explain what type of exercise should be performed as well as its intensity, duration frequency and the benefits of those exercises to the health of those patients.

**Keywords:** connective tissue disease, exercise, intensity, lifestyle, prior participation

## 1. Introduction

Therapeutic with regular controlled exercise has been widely employed in a range of disease treatments that involves a broad range of causes and various effects on the human body. Studies show that physical activity and regular exercise in association with specific medications provide greater longevity and improve the quality in the treatment and prevention of disease when compared to groups that do not integrate exercise into their daily lifestyle. The case of CTD is no distinct. The aggressive effects of autoimmune and degenerative diseases on the connective tissue of the locomotive apparatus directly reflect on patients' ability to perform physical exercise. The physical capacity of these patients is lower when compared to sedentary individuals who do not have any type of disease. This is due to the functional limitations caused by the deformities, fixed or not, and mainly by the pain that the

movements impose on the patients. Patients with their connective tissue, affected by degenerative or autoimmune diseases, are subject to periods of acute crisis that make simple movements painful and more elaborate movements impossible. Consequently, it makes the physical activity practice a challenge [1–3].

Another important aspect to be highlighted is fatigue in these patients. This group tires more quickly, especially when they are compared to sedentary individuals without systemic diseases or other physical limitations. The more sedentary the patients with connective tissue diseases are, the less they can tolerate effort, and sooner they get fatigued. It is important to emphasize that sometimes these diseases have a differential diagnosis for pain syndromes observed in elite competitive athletes. In other words, patients are mistakenly diagnosed as having sports injuries. This error can lead to a higher period away from the practice of sport since initial treatment is not compatible with the underlying and neglected disease [2, 3].

In this sense, this chapter aims to show not only the benefits that regular exercise can have for this group of patients in terms of connective tissue but also what type of exercise should be performed and at what intensity, duration and weekly frequency. It also encourages the assisting physician to prescribe regular physical activities, which complements treating diseases of the connective tissue, being a powerful ally of essential pharmaceutical treatment. Controlled physical activity minimizes the effects of these diseases in acute crises as well as in terms of controlling the signs and symptoms involved in the chronic progression of the disease. Exercise is also a preventive method to delay the onset of connective tissue degeneration as well as to interspace acute crises, becoming less frequent [3, 4].

## **2. Specific assessment prior to participation**

A medical evaluation to identify limitations and correct deformities (whether fixed or not) is fundamental and should be performed by the assisting physician, who will prescribe the restrictions to the practice of physical activity and exercises. This step is crucial to avoid training mistakes and further progress of diseases. Once the underlying disease (autoimmune or degenerative) is determined, questions that provide information about the level of physical activity in the patient's daily life are important in order to understand how sedentary he or she is as well as the number of steps the patient takes each day. During this initial contact, the patient should state which of the joint (or joints) is (are) more affected and more painful and whether the pain is related to work, leisure activities or both. In addition, notes of the approximate interval between acute disease crises will serve as feedback for treatment involving exercise. With exercises, these crises will tend to become farther apart, and this type of information is important for patients to adhere to treatment [5].

Identifying the story of sports and exercises practised so far will help to prescribe the best type of motion to the patient. The memory of movement will make the difference in selecting the future route to be followed. For instance, prescribing aquatic exercises is an alternative for those patients, who have never been in a pool or who are likely to abandon treatment.

During the physical examination, the physician might have an accurate idea of how much balance and coordination the patient has even its standing and sitting posture. This can be confirmed by the axial skeleton, potential lateral and anteroposterior deviations of the spinal column, anterior and posterior scales of the scapula and pelvic ring beyond the alignment of the arms and legs, all resulting from mechanical causes (agonist and antagonist muscle imbalances). The range of motion in affected and unaffected joints should be recorded, mainly in the lower limbs. Whether it is possible, deformities must be treated prior to or alongside

therapy, in order to address pain or functional limitations [5]. The arm, forearm, thigh and leg circumference measures should be taken, and an evaluation of the secondary stability that muscular strength can offer to the joints will be useful as a parameter to measure changes in physical capacity.

Observing the gait of patients during short displacement and their ability to sit down and stand up contributes to a better understanding of essential physical needs in the routine life of patients. In relation to the subsidiary exams, which are directly relevant to an efficient orientation of the best activity to be performed, we highlight the treadmill or cycle ergometer test. The maximum effort achieved allows better determination of the heart rate interval for the practice of aerobic exercise that will be prescribed.

Clinically speaking, the evaluation of cardiovascular function in stress tests may also cause cardiac function alterations and diseases that eventually exacerbate during more intense efforts, which had been performed before. The exercise prescription will be more accurate when the values for oxygen consumption, aerobic and anaerobic thresholds and maximum consumption are obtained over the appointment with a physician.

In addition, body composition measurements are very useful for identifying the loss of muscle mass (sarcopenia), which can be expected from diseases that develop chronically. Similarly, body composition is an extremely important examination since it evaluates the quantity of stored body fat (particularly the amount of visceral fat), a measurement of the excess of weight, which directly affects joints in the legs and worsens degenerative conditions [4, 5].

### **3. What can be expected from the type of exercise for each physical quality developed?**

The type of physical activities and exercises practised can be classified according to how the energy is produced by the muscle responsible for this movement. The aerobic energy production system is the main responsible for long-duration work involving strong resistance. The anaerobic system of energy production, on the other hand, is mainly responsible for power, strength and speed, offering short bursts of energy during movement. In general, a combination of both systems of energy production is used to execute various tasks and always depends on the stimulation offered.

Here we will differentiate the types of movement and their application as an adjuvant in treating autoimmune and degenerative diseases of the connective tissue.

#### **3.1 Aerobic resistance**

Overall, the physical capacity should receive more attention from physicians and patients because of the increased benefits it provides to the sedentary and sick people, and it should be no different in patients with connective tissue diseases. This factor will require the most attention in any regular physical training programme, especially for younger and older adults. With this physical work, we seek improvement in the endothelial dysfunction caused by atherosclerosis, which is generally more significant in autoimmune diseases and degenerative arthritis than in the sedentary population. Atherosclerosis is also responsible for the increase in blood pressure, insulin intolerance and diabetes type II, and all can be aggravated by obesity, which in turn becomes more accentuated with a sedentary lifestyle [4].

Patients with connective tissue diseases have less physical capacity than sedentary individuals who do not practice regular exercise. The consequently reduced mobility aggravates their capacity to carry out tasks, even the simplest daily routines. The greater sensation of fatigue, common in patients with early onset

connective tissue diseases, decreases in trained individuals when compared to the population in general [6].

In addition, the rise in aerobic capacity has also a fundamental role in diminishing the variation in heart rate. This occurs in trained individuals and requires less effort by the cardiovascular system, with lower energy costs in carrying out the same task. The number of mitochondria in cardiac muscle fibers can be up to five times greater than those contained in the skeletal muscle, and training will yield additional benefits for cardiac function.

After determining the maximum oxygen consumption capacity in this population, the start of training can be planned as well as its evolution, which should be slow and progressive. More intense stimuli for expanding energy gains (and greater benefits) should always be offered when the body reaches a state of balance at a new level. Increasing loads also interest patients who wish to participate in sports and competitions. In controlling disease, these loads are sometimes eliminated as soon as the autonomy of movement and disease control is shown to be effective [6].

Alongside the improved physical capacity obtained with regular exercise, the pain, so far, presented in the life of these patients will diminish. Joint swelling and sensitivity in the affected regions also decrease as a result of improved venous return and better peripheral circulation. The direct impact on better quality of life is remarkable. Mood variations that come from improved self-esteem and better quality of sleep (which is more relaxing and restorative) can also be perceived in patients who practice regular exercise. These encourage patients to adhere to exercise and sports [7].

Regarding the intensity of aerobic exercise, the World Health Organization recommends that aerobic training should be performed at moderate intensity, with heart rate oscillating between the aerobic and anaerobic thresholds (roughly represents around 60 and 80% of the aerobic exercise intensity maximal heart rate), which has direct relation to maximal oxygen consumption ( $VO_{2max}$ ). The physiological objective of this type of training is not only to raise maximum oxygen consumption ( $VO_{2max}$ ) levels (increasing maximum work capacity) but also to expand the thresholds and consequently promote greater efficiency during the aerobic resistance exercise. Consequently, it will be reflected in the improvement in health as a whole and, in particular, for connective tissue disease in particular. For patients with a low aerobic capacity due to years of inactivity and sedentary lifestyles, who have been affected by disease symptoms, beginning a programme of regular physical activity may seem impossible. These patients often prefer not to leave their homes and become dependent on their relatives or friends, requiring assistance in all activities [8, 9].

These patients must take on the challenges of their day to day as the beginning of their recovery for independence. Simple tasks such as leaving the house on foot to purchase groceries, taking the stairs to the next floor and walking greater distances to access transport (even slowly and even if this means walking to the patient's own car in a parking area) trigger initial effects and can help stimulate the practice of exercise in the near future.

In some cases, patients may require constant monitoring by specialized staff and daily stimuli to maintain minimal levels of activity. Even if this is done remotely, through messages or phone calls, regular exercise should be encouraged; and the patient will feel obliged to carry out the assigned task. Although they may be less frequent, acute crises may occur. At these times, the intensity of training should be reduced. Movements should be adapted temporarily, and equipment may even be changed (replacing running with bicycling, for example) in order to stop the patient from becoming sedentary once again [9].

### 3.1.1 Equipment for aerobic resistance training

Once the intensity and cardiac frequency range for the patient's training has been determined, the type of resistance should be chosen. In other words, the type of equipment that will be used should be established. Walking and/or running (either outdoors or on the treadmill), cycling on a stationary or traditional bicycle, swimming and rowing are the most frequent methods chosen for aerobic resistance training.

Since the different movements and specificity (which are important in sports) are not the objective of the training, varying the type of movement is interesting because it moves different muscle groups, making exercise less routine. This may occur when swimming is replaced with running, for instance. For some types of exercises, the memory of movement is essential. These exercises require more advanced coordination and balance than others. It is often difficult for an adult to learn to ride a bicycle, even if it is stationary, which makes prescribing this exercise unfeasible. This is even more difficult when swimming is chosen as the exercise [9].

The easiest and most natural exercise for all patients is walking and/or running. The limitations of this mode are excess body weight and the conditions of the cartilage in the leg joints bearing this burden as well as the ability to work the muscle groups in these limbs which may be weakened from disuse. The natural alternative for overweight patients (or even those who are not) and joints that cannot support them is cycling. A stationary bicycle is better because it allows us to efficiently control the speed that will be constant (approximately 30 km/h or 70 revolutions per minute) and a load that is compatible with the desired proportional heart rate and oxygen consumption.

Cycling provides the best gateway to starting a regular aerobic physical activity when there is a need to compensate the reduced muscle resistance in supporting and carrying body weight (and frequently, excessive body weight). The benefits will be felt quickly. Like all equipment, bicycle requires some care in its use. The height of the saddle must be correctly positioned between the perineal region and the ground, avoiding unnecessary stress (particularly on the knees). Handlebars should be correctly positioned with the patient sitting comfortably in the saddle and should allow the rider to gaze towards the horizon. This arrangement will not lead to unwanted stress on lordosis and kyphosis when the line of the axial skeleton is abnormally positioned [10].

If for any reason, the patient cannot cycle, walk or run regularly, walking in the water can be an option. The greater density of water makes the body lighter, while offers resistance to achieve the desired training. The only requirement is to control heart rate and to use floats in order to allow the patient to reproduce the natural movement practised over an entire lifetime. It is always necessary to be careful with fatigue, which appears more quickly in this group of arthritic patients. The lower muscle mass of the arm muscles (in comparison with the legs) yields less efficiency in training for aerobic resistance. This makes this alternative an exception.

When incapacitating mechanical alterations make arm exercises the only option, rowing seems to be the best alternative to exercising. This modality requires specific coordination but is easier to perform than swimming, for instance. This can be done traditionally on the water or on equipment that simulates this activity and allows the intensity of the exercise to be controlled. Because it combines leg and arm movements, swimming is a good alternative; nonetheless, specific conditions are required for this to be part of efficient training. Because of the horizontal position of the patient and the fact that water is denser than air, the maximum heart rate achieved in water is lower than in tests performed on the ground. For sedentary patients, you must deduct 13 beats per minute from the values obtained during these tests or from the  $VO_{2max}$  determined mathematically [7, 8].

Swimming requires knowledge (movement memory), and this style of exercise may be chosen as a function of biomechanical limitations that may be present in the

arms as well as the legs. It may be necessary for the exercise sessions to take place in a location where immediate assistance can be provided and where the staff is trained to work with a population that has limitations imposed by disease in order to prevent accidents. The monitoring of progress during training is more difficult, particularly in terms of exercise intensity. This applies equally to the patient and to those supervising the patient. Remember that this group fatigues earlier than the population in general and that supervision should be attentive and constant.

Because of the adversities involved in the exercises mentioned up to this point, the natural choice is walking or running, since it is more practical and easier to implement and monitor and does not require special or sophisticated equipment. It is universal and can be done indoors or outdoors, and it is the most commonly practised individual sport around the world. It is important to mention that all aerobic work should be done individually. Groups that form around the activity should be social in nature. The intensity of work will always be obtained and applied individually.

Calculations of heart rate, at the beginning of the training (for patients who were sedentary or who had clinical complications interrupt the practice of exercise), should establish a heart rate for oxygen consumption of approximately 50% of maximum capacity ( $VO_{2max}$ ), which is a lower level than the levels to sedentary people without degenerative diseases. It is explained by the fact that these patients fatigue earlier [9, 10].

In order to maintain the ideal weekly volume of training and considering a lower and more comfortable intensity to the exercises, the session length can be increased, or more sessions can be added per week. The time for each session can be divided and carried out over the space of the same day. As clinical conditions permit and conditioning increases tolerance to fatigue, higher levels of oxygen consumption (higher  $VO_{2max}$  percentages) will be offered as a stimulus, always remaining in the moderate activity range between the anaerobic and aerobic thresholds obtained directly or via mathematical calculations. Outdoor exercise makes this activity more playful and should be encouraged, especially when the weather conditions are favorable. Training should begin on soft and flat terrain with few curves. Participants should change direction regularly.

The heart rate controls the pace of intensity during the activity. This may be reflected in a speed that only allows walking during the entire course.

As the patient improves, walking will gradually alternate with small periods of jogging and running, until the patient jogs or runs the entire trajectory. These characteristics make outdoor exercise more individualized. Groups can gather at the beginning and the end of training during warm-up and cool-down activities, but not during the workout. Competitive practices may be indicated for those patients who need individual limits to surpass. It is important that they always be aware of their limitations and tendency towards earlier fatigue [8–10].

### *3.1.2 Duration and frequency of aerobic exercise*

In order to obtain the weekly volume of exercise to be practised by the patient, the intensity of the aerobic resistance training should be added to the time it is performed per session and the number of sessions that will be repeated over the space of a week. It is essential that the pace of each workout be reached gradually and slowly until the desired heart rate is reached (warm-up). At this intensity, start marking time without worrying about the distance traveled. The World Health Organization and the American College of Sports Medicine suggest practising moderate aerobic exercise for an average of 150 minutes per week. These same organizations suggest reducing this time for the week by 50% if the exercise is vigorous. This more intense

training should be avoided, especially during periods of connective tissue disease crisis. For more advanced patients, however, this might be an alternative.

The distribution per session must include periods of recovery that integrate the benefits of physical activity and tissue renewal. With this in mind, we suggest dividing the 150 minutes into up to 6 sessions per week and the 75 minutes into up to 5 sessions per week for the determined intensities. For beginners, we suggest training on alternate days and at moderate intensity. We must account for earlier fatigue and muscular hypotrophy, which may require adaptations. Alternating between light and moderate effort can be an interesting option.

If the patient continues to have problems on tolerating exercise, dividing the session into morning and evening activities on the same day can be an interesting alternative (30 minutes broken down into two 15-minute periods, for example). Warm-up and cool-down periods are required for each one of these training periods [10].

### **3.2 Localized exercises**

Muscle loss does not seem to be directly correlated with degenerative and autoimmune diseases, nonetheless, with the progressive inactivity developed over years of disease crisis and its impact on joint function, in addition to disabling pain. To better monitor physical development in patients performing localized exercises and test the efficiency of their training, it is important to quantify the amount of muscle tissue. The results of body composition calculations are often shocking.

Depending on the degree of muscular involvement (when sarcopenia is diagnosed), physical rehabilitation through localized resistance exercises and muscle strength may need to precede the initiation of a broader programme of regular physical activity, such as the aerobic training proposed in the previous item, for example. This step requires the supervision of a professional in the area of rehabilitation.

#### *3.2.1 Localized muscle exercises*

Independent work boosts localized muscular strength and endurance while it completes aerobic exercise in an attempt to provide a better quality of life for these patients. The anti-gravitational muscle groups are the focus since they involve large amounts of muscle tissue and are secondary joint stabilizers that keep the body in an orthostatic position. To do so, the gluteal, ischiotibial (“hamstrings”), quadriceps and triceps surae muscles should be assessed and prepared to sustain body weight during essential movement activities, whether these are walking, running, swimming or cycling [11].

Starting the programme with isometric muscle exercises can provide benefits in terms of gains in strength and endurance, with lower overload in the joint affected by connective tissue diseases. As strength and muscle resistance are worked, gains can even be seen in balance and coordination for movement and tasks in everyday life. And as the patient gains autonomy and strength, localized muscular resistance exercises will replace isometric ones.

Regardless of the modality, resistance exercises must be performed in a closed kinetic chain, allowing greater control and coordination of the patient over the movement, which is to be performed. Because of the limitations of the disease itself, each series will contain more repetitions, and less weight will be used for resistance in comparison with programmes that are recommended for beginners without chronic diseases. Encouraging regular exercise of arms, paravertebral muscles and abdominal cavities help in daily tasks and posture during work and leisure [12].

### 3.2.2 Flexibility exercises

When exercises are performed three times per week, they complement the localized exercise programme. These exercises allow the increase on mobility in a range of joints, not only those affected by connective tissue diseases. Because of the adverse clinical conditions, the movements should provide increased joint range, however, without forcing, in a steady manner. Instead of repetitions, the patient will hold the position for 15 seconds. There is no need to repeat each exercise more than five times for each position because this yields no significant gain.

The improved flexibility benefits the load distribution on the joint cartilage, while the increased range of motion encourages nutrition of the cartilage, an effect that occurs mainly in the synovial joints because of improved circulation and distribution of the synovial fluid. This increased mobility brings patients' independence in their daily lives and can inspire other activities such as dance, yoga and tai chi, for example [11, 12].

## 4. Coordination, balance and proprioception exercises

Although it is fundamental to health, coordination is not addressed in specific programmes, except in situations in which the disease worsens and rehabilitation requires it. The patient will have more strength and flexibility to coordinate movements, which previously was difficult and was abandoned or even avoided. Skill and specific coordination can be trained simultaneously with more complex exercises to train strength and flexibility, for example. Exercises that involve balance, coordination and proprioception prevent falls, which can be disastrous in this group of patients [13].

## 5. Speed

In general, in the treatment of degenerative diseases with exercises, the speed that movements and activities are executed will emerge as a direct consequence of advances in the physical capacity for exercise.

## 6. Method preferred by the author, according to the literature

The sequence of exercises presented below was designed and used to treat degenerative arthritis of the knee after trauma with impairment of the articular cartilage, which required surgical treatment. After the postoperative period was complete and physical therapy was administered for rehabilitation (while pain and functional disability were still present), patients have begun to be part of the study group for this research [14, 15].

To all patients, pain decreased with the use of hyaluronic acid in an intra-articular infusion. Assessment by a doctor of sports medicine has determined the appropriate thresholds for intensity, duration, frequency and type of exercise. In the following example, the patient was able to perform all of the suggested activities in the weekly volume presented.

The aerobic training involved walks four times per week in 30-minute sessions at an intensity determined by stress tests by the ability to chat or hum or by the heart rate determined by the attending physician through mathematical formulas, always corresponding to 50% of  $VO_{2max}$ . The walks were to always take place on flat terrain

with only a few gentle curves. The direction of walking was to be reversed (clockwise to counterclockwise and vice versa) every 10 minutes.

## 6.1 Suggested exercises

Once the patient was warmed up (through aerobic activity or independently), the exercises described below were performed three times per week, with at least 1 day between sessions for better recovery and utilization.

### 6.1.1 Lying on your back (*supine position*)

With one leg bent and the other extended, place a strap on the foot and lift the leg, keeping the knee extended and the ankle at 90°. Hold the position still for 15 seconds (without forcing), and return to the resting position for 5 seconds. Next, repeat the same motion with the other leg. Perform five repetitions for each leg, at intervals of 15 seconds of exercise and 5 seconds of recovery (**Figure 1**).

### 6.1.2 Lying on your belly (*prone position*)

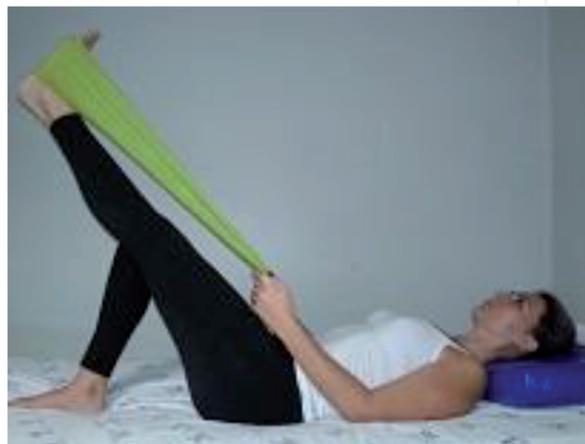
Bend one of your knees, and keep the other extended. Holding the ankle and leg with the knee bent, count 15 seconds and then relax, returning to the rest position (**Figure 2**). In some cases, the joint may not permit full flexion; use a strap to maintain a lesser degree of knee flexion while the position is maintained (**Figure 3**). Perform five repetitions for each leg, at intervals of 15 seconds of exercise and 5 seconds of recovery.

### 6.1.3 Lying on your back (*supine position*)

Bend one leg at the knee, and support the foot. The other leg should be extended with a soft support under the other knee (a rolled towel or foam pad). Force this extended knee down, pressing against the ground, holding for 20 seconds in isometric contraction. Then, relax for 5 seconds. Repeat 10 times for each leg in two sets totalling 20 repetitions (**Figure 4**).

### 6.1.4 Lying on your back (*supine position*)

Bend one leg at the knee, and extend the other leg. The same support used in the previous exercise will be placed under the heel of the extended leg, maintaining



**Figure 1.**  
*Stretching back muscles.*



**Figure 2.**  
*Stretching previous muscles.*



**Figure 3.**  
*Strengthening of anterior muscles.*



**Figure 4.**  
*Isometric contraction for thigh.*



**Figure 5.**  
*Isometric contraction for leg.*



**Figure 6.**  
*Abdomen strengthening.*



**Figure 7.**  
*Exercise for simple body balance.*



**Figure 8.**  
*Exercise for advanced body balance.*

pressure against the ground for 20 seconds in isometric contraction. Relax for 5 seconds and repeat the movement with the other leg (**Figure 5**).

#### *6.1.5 Sit in a chair with your back (lumbar region)*

Supported and knees flexed at 90° and feet fully supported by the ground or on a support. In this position, flex your muscles as if it was to move the chair forwards (without actually moving the chair forwards), and hold this position for 20 seconds; then relax for 5 seconds. Next, move your muscles as if it was to move the chair backwards (again, without actually moving the chair), and hold this position for 20 seconds, again followed by a rest period of 5 seconds. Perform 10 repetitions for the combined “chair movements” (**Figure 6**).

#### *6.1.6 Standing on a cushion (or foam support)*

Try to balance yourself on only one leg; stay close to a wall or some means of support, in case you lose your balance. Flex and extend your hips, knees and ankles to a small extent without losing the position, and keep your eyes fixed on the horizon. This exercise should be performed for a full minute, one leg each minute (**Figure 7**). When you feel safe with regard to balance and executing the movements described above, repeat for another minute, but this time throw a ball against the wall or support, always maintaining your posture and your gaze at the horizon (**Figure 8**).

## 7. Discussion

We live in an era in which sedentarism has become one of the leading causes of morbidity and mortality. For patients with CDH, such as RA, PM, DM, and SS, phobia due to the pain associated with these diseases may lead to greater immobility, more pain, greater body weight (obesity) leading to more immobility and so on. Entering this vicious circle, patients with CTD will have their activities compromised, such as getting up from a chair, going up and down stairs, shorter walks and difficulty in doing housework. Once the limitations that go beyond the underlying disease are established, patients are dependent on family members or specialized professionals, which makes their lives totally dependent [16].

Regular aerobic exercises and muscle strengthening exercises mainly in the affected joints may interrupt the pain cycle in patients with RA. The review promoted by Hurkmans [9, 17] showed that this association can improve the pain and functional capacity of the locomotor system. It has also been shown that the adaptations occur rapidly and that there is no additional damage to the joints and other tissues affected by the CTD [17]. The review shows that there is sufficient evidence in the literature to state that the medium in which the exercises are performed does not interfere with the beneficial result obtained. Thus, practising the solo or aquatic exercises did not show differences that justify the choice of one of the two for the patients with CTD [17]. Regular exercises of strength and localized muscular resistance and aerobic exercises have been shown to be ancillary to muscular diseases such as PM and DM when practised in moderate intensity, although they do not present sufficient evidence to support clinical observations. It can be affirmed, however, that the practice occurs totally free of physical damages to the practising patients, the fact that counts on evidence that allows reaching that conclusion [18].

Strength training and aerobic resistance training should include proprioception exercises (balance) alone or not. There is evidence in the literature to conclude about its efficiency in patients with CTD, especially in RA and OA knees, contrary to what was demonstrated. Clinical experience points in the direction that the practice of balance exercises should be part of regular training programmes. Takacs et al. have demonstrated that after training for 10 weeks there is an improvement in pain, function and especially the loss of fear of movement when balancing exercises are performed in isolation. However, the lack of further studies still leaves evidence of its benefits not very well-defined [19–21].

The benefits of regular physical activity and the harm of sedentary lifestyle and its consequences are well demonstrated in the review by Pinto et al. on autoimmune diseases. The advice to sit less and move more (sit less and move more) is also applied to CTA patients. The review definitely shows the benefits that regular physical activity brings to people with autoimmune rheumatic diseases. As to the intensity of the work performed, it was noted that it need not necessarily be intense. Mild exercises can also help these patients. Most of the studies cited, however, advocate on even increasing intensities for those who demonstrate adaptation to the stimulus offered [22].

Additional benefits can be realized in patients with CTD. In their experiment, Stavropoulos-Kalinoglou et al. demonstrated that aerobic and localized muscular endurance exercises reduce the risk of cardiovascular diseases in patients with RA besides increasing their physical work capacity. It also showed that when the prescriptions are individualized, works at lower intensities produce a protective effect as well as those of greater intensity in those who had restrictions for such [23].

## 8. Conclusion

Regular physical activity yields countless benefits to patients with degenerative diseases of the connective tissue, both in terms of prevention and in association with a treatment regimen.

The intensity, duration, frequency and type of exercises should be determined by each clinical condition of the patient, and it should be studied on a case-by-case basis for individualized recommendations.

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