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Resistance Training in Rheumatic Diseases: a Systematic Review of Evidence and Guidelines for Improving Patient Functionality

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Abstract

Background: Rheumatic conditions like rheumatoid arthritis, osteoarthritis and ankylosing spondylitis cause chronic pain, joint stiffness and muscle loss (rheumatoid cachexia). These issues severely limit physical capacity and quality of life. In the past, doctors avoided prescribing resistance training, fearing it would worsen joint damage and inflammation. Modern clinical studies prove this traditional view is wrong.

Aim: This review summarizes recent scientific data on the safety, mechanisms and outcomes of strength exercises to provide practical guidelines for improving patient independence.

Material and Methods: We searched PubMed, Scopus and the Cochrane Library for peer-reviewed papers from 2015 to the present. We selected randomized controlled trials, systematic reviews and meta-analyses investigating structured weight training protocols.

Results: Evidence confirms progressive resistance training is highly safe and effective for rehabilitation. It does not induce inflammatory flares or cartilage erosion. Instead, it builds muscle strength, stabilizes joints and reduces fatigue. Resistance exercises counteract cachexia by expanding muscle volume and improving body composition. Patients show better functional performance, including faster walking speeds, sharper balance and easier chair rising. Successful programs use 2 or 3 weekly sessions at 60% - 80% 1RM, leading to high patient compliance and clear psychological benefits.

Conclusions: Weight training should be a standard part of modern rheumatology, not only an optional activity. Combining exercise physiology with standard pharmacological care is necessary to help patients regain physical autonomy and long-term quality of life in both daily life and sports culture.

Keywords: resistance training, rheumatic diseases, functional capacity, quality of life, exercise prescription, muscle strength.

1. Introduction

Rheumatic diseases include a wide range of chronic, immune-mediated and degenerative conditions that affect the joints and muscles. The most frequent examples are rheumatoid arthritis, osteoarthritis and ankylosing spondylitis. These conditions are a major cause of physical disability worldwide. Patients must live with constant joint pain, morning stiffness, systemic inflammation and the gradual destruction of joint structures (1). However, these diseases do not only damage the cartilage. They also harm the neuromuscular system and often lead to a serious muscle-wasting condition known as rheumatoid cachexia. This rapid loss of skeletal muscle mass happens because pro-inflammatory cytokines accelerate metabolism and it is usually accompanied by an increase in body fat (2). Consequently, patients experience a large drop in muscle strength, poor balance and a smaller capacity to move around easily. This physical decline creates a negative cycle where patients become sedentary, which further damages their daily quality of life.

In the history of medicine, clinical guidelines for these conditions focused heavily on protecting the joints. Doctors usually recommended long periods of rest and complete immobilization. They were afraid that physical activity, especially lifting weights, would increase the inflammation inside the joints, accelerate the destruction of cartilage and cause painful relapses. Fortunately, in recent years, there has been a major change in thinking in both medicine and sports science. Many clinical studies have proven that exercise does not harm arthritic joints if it is done correctly. On the contrary, avoiding physical activity is now recognized as a dangerous risk factor by itself, because it damages metabolic health, increases heart problems and accelerates general physical decline (3). Today, structured exercise is accepted as a safe and necessary non-drug element of patient care.

Aerobic activities like walking or swimming are good for the cardiovascular system, but resistance training is a uniquely powerful method to fix neuromuscular problems in RDs (4). Working against resistance or lifting weights stimulates muscle protein synthesis, which directly fights rheumatoid cachexia and helps rebuild muscle volume. Also, the mechanical stress from strength exercises stimulates the bones, which reduces the risk of secondary osteoporosis and strengthens the tendons around the joints to improve stability. At the molecular level, when skeletal muscles contract during exercise, they release special anti-

inflammatory proteins into the blood. These proteins help to lower the low-grade systemic inflammation. By improving muscle strength and power, resistance training changes how patients perform daily tasks, leading to faster walking speeds, better balance and less fatigue. This physical independence is directly related to the concept of quality in sport and recreation, because it gives patients the capacity to move from rehabilitation back into active lifestyle choices.

Although scientific evidence supporting strength training is strong, a clear gap still exists when trying to use these findings in daily medical practice. There still is some concern amongst doctors and patients when it comes to resistance training. One of the problems might be kinesiophobia, which is the strong fear that movement will cause more pain. Therefore, this review article aims to summarize the recent scientific data about the safety and real-world results of strength training in major rheumatic diseases. This review aims to provide practical guidelines for exercise prescription, connecting sports science with medical clinics to achieve better physical function and long-term well-being for patients.

2. Material and Methods

This review was designed as a narrative synthesis of the scientific literature concerning progressive resistance training (RT) in rheumatic diseases (RDs) and related functional outcomes. A structured search of PubMed, Scopus and the Cochrane Library was performed for publications from 2015 up to 2026, using the following keywords: resistance training, progressive overload, strength training, rheumatoid arthritis, osteoarthritis and axial spondyloarthritis. Additional publications were identified by reviewing reference lists of key articles. Only articles published in English were considered.

3. Physiological Mechanisms of Resistance Training in Rheumatology

Using progressive strength exercises for patients with rheumatic conditions works by causing important biological adaptations that directly target chronic inflammation. Lifting weights does much more than just change muscle structure; it influences the whole body by altering cellular metabolism, tuning immune responses and improving joint mechanics. A clear understanding

of these internal biological processes is necessary for coaches and clinicians to build safe, effective programs for this group of patients, which aligns with international guidelines that recommend regular exercise (5). In addition, the latest clinical guidelines state that incorporating structured exercise into multidisciplinary treatment paths is the best way to reduce functional gaps and protect patients from physical decline (6).

3.1. Counteracting Rheumatoid Cachexia

Muscle loss, or rheumatoid cachexia, is a frequent but often ignored complication of chronic inflammatory conditions like RA. It causes a progressive, involuntary loss of lean muscle tissue, while body fat stays the same or increases. This destructive process is driven by the constant production of pro-inflammatory cytokines like tumor necrosis factor-alpha and interleukin-1 beta, which put the body in a hypermetabolic state and accelerate the breakdown of muscle proteins (2). This internal muscle breakdown quickly causes external problems, leading to metabolic issues, lower physical stamina and sudden weight changes that harm the patient's general health (7).

Resistance exercises are the most effective non-drug method to stop this muscle breakdown. The mechanical tension on muscle fibers during contraction activates special receptors in the cell membrane, which turns on the important mTOR pathway. This cellular pathway controls protein synthesis, telling the body to create new muscle tissue and halt the wasting process (8). By causing hypertrophy, especially in the fast-twitch type II muscle fibers that shrink first when a person is inactive, progressive strength training rebuilds structural reserves, changes body composition safely and restores physical power (9,10).

3.2. Impact on Systemic Inflammation

For a long time, standard medical opinion believed that the heavy loads in weight training would irritate inflamed joints and increase systemic swelling. Modern exercise physiology has proven that this fear is incorrect, showing that structured resistance training provides excellent anti-inflammatory benefits without causing joint damage or flare-ups. When muscles contract

against a load, they act like an endocrine organ, creating and releasing helpful proteins called myokines directly into the blood circulation (11).

Interleukin-6 plays a double-sided role in this mechanism. While chronic high levels of IL-6 are connected to disease progression, the brief and sharp increase caused by an intense workout acts differently as a strong anti-inflammatory signal. This post-exercise peak of IL-6 sends a signal to produce large amounts of natural anti-inflammatory mediators, specifically IL-1ra and interleukin-10. These protective molecules actively stop inflammatory pathways in target tissues and inhibit the production of harmful tumor necrosis factor-alpha (11). Over the long term, regular training lowers baseline resting markers of inflammation like C-reactive protein, which reduces the clinical severity of the condition.

3.3. Joint Mechanics and Bone Mineral Density

Cartilage destruction, bone erosion and joint deformities are the main reasons why arthritic patients lose their independence and suffer from severe pain. Strength exercises provide a good solution by creating dynamic joint stabilization and changing tissue metabolism (12). Strengthening the muscle groups around a damaged joint—like building up the quadriceps to support an osteoarthritic knee—helps distribute daily physical forces better. These strong muscles work like built-in shock absorbers, protecting fragile joint surfaces from high compression forces and dangerous shifting during movement (13). Moreover, moving under load helps the joints secrete fresh synovial fluid, which lubricates and nourishes cartilage cells without causing bad friction on structural surfaces (14). At the same time, load-bearing exercise works as a strong shield against secondary osteoporosis, which is a frequent complication made worse by long-term steroid treatments (15). According to Wolff's law, bone tissue changes its structure based on the physical demands placed upon it. The compression forces and tendon pulls during a strength training session signal osteoblasts to lay down new bone minerals, increasing bone mineral density and providing lifelong protection against painful fractures (16,17).

4. Clinical Evidence Across Specific Rheumatic Diseases

The evidence supporting strength training in rheumatology has moved past small, isolated studies into high-quality, multi-center clinical trials. These recent studies provide solid proof that progressive weight training is safe, well-tolerated and effective across different diseases. Instead of giving generic fitness advice, modern research emphasizes that specialists must look at how specific diseases adapt to loading to achieve the best functional recovery.

4.1. Rheumatoid Arthritis (RA)

In Rheumatoid Arthritis, the main goal of resistance training is rebuilding damaged neuromuscular capacity and reversing the functional decline caused by muscle wasting and joint changes. Long-term studies show that progressive overload leads to great improvements in muscle performance without increasing joint pain scores or activating inflammatory markers (18). Furthermore, meta-analyses confirm that structured resistance training causes significant gains in upper and lower body power, making it easier for patients to perform standard mobility tests like the Timed Up and Go or rising from a chair (19,20). Additionally, specific hand and forearm exercises protect grip strength, helping patients stay independent during basic household tasks.

4.2. Osteoarthritis (OA)

In Osteoarthritis—especially when it affects large weight-bearing joints like the knees and hips—clinical evidence shows that strength exercises are a central part of non-surgical orthopedic care. Building up the main muscle groups around the joint, like the quadriceps, creates an important buffer that dampens impact forces, providing a pain-relieving effect similar to standard anti-inflammatory drugs (21). Network meta-analyses comparing multiple rehab options show that progressive loading works better than low-impact, non-weight-bearing exercises for reducing stiffness and improving walking posture (22). This physical adaptation is very important because weak muscles let joints slip and grind during daily movement, which

accelerates cartilage erosion. Ultimately, a good lifting program delays joint breakdown, reduces the need for pain medication and keeps joints working for a longer time (23).

4.3. Ankylosing Spondylitis (AS) and Axial Spondylarthritis

For patients with ankylosing spondylitis and axial spondyloarthritis, targeted exercise programs are essential. These clinical plans aim to delay spinal fusion, correct posture and reduce severe morning stiffness. Incorporating progressive strength training into these regimens yields measurable benefits. Specifically, patients achieve a significant increase in both spinal mobility and chest expansion dimensions, which actively preserves healthy respiratory mechanics (22). Clinical trials also show that combining high-intensity conditioning with resistance workouts results in a substantial reduction of general disease activity scores (23). This muscular reinforcement is vital. Keeping the trunk muscles strong prevents the severe forward hunching and the loss of natural lower back curves that characterize advanced spinal pathology. These clear clinical outcomes demonstrate that the axial skeleton safely tolerates and positively adapts to progressive mechanical stress (24).

5. Practical Guidelines for Resistance Training Prescription

Translating basic laboratory data into safe and reproducible exercise protocols requires a systematic method for training design. Due to the fluctuating and unpredictable nature of rheumatic symptoms, standardized universal routines are usually ineffective for these patients. Instead, exercise prescription must integrate the principles of sports science with a detailed comprehension of joint pathology to optimize physical functionality while maintaining complete articular safety.

5.1. Pre-Exercise Screening and Safety Measures

It is crucial to provide a multidisciplinary check-up for hidden joint damage and rule out health risks before patients start using a weight machine or a resistance band. Current disease activity must be carefully checked, identifying whether a patient is in a stable phase or dealing with an

acute flare-up. Exercising with heavy weights during an active flare can increase intra-articular pressure and make joint pain worse. In addition, this check-up must analyse physical joint alignment, ligament health and the presence of severe erosive changes, especially in the small hand joints or the delicate cervical spine structures seen in advanced cases (25). Furthermore, since chronic inflammatory conditions raise long-term cardiovascular risks, getting a cardiorespiratory clearance ensures that the patient's heart can safely manage the brief blood pressure spikes that happen during intense lifting (3).

5.2. Training Variables (The FITT Principle)

It is important to remember about the limitations of arthritic tissues when designing a resistance training program and adapting the classic FITT variables for patients with arthritis (4).

FITT component	Evidence-based recommendation	Physiological rationale	Expected clinical outcome	Key references
Frequency	2–3 non-consecutive sessions per week for each major muscle group	Allows adequate recovery while maintaining regular anabolic stimulation and minimizing symptom exacerbation	Improved adherence, muscle recovery and long-term exercise participation	(5,29)
Intensity	Begin at 40–50% 1RM during familiarization, progressing gradually to 60–80% 1RM	Promotes muscle hypertrophy, neuromuscular adaptation and strength gains without excessive joint loading	Increased muscle strength, improved physical performance and reversal of rheumatoid cachexia	(27,29, 34)
Time (Volume)	1–3 sets of 8–12 repetitions with 2–3 min rest between sets	Optimizes neuromuscular adaptations while limiting excessive fatigue and cardiovascular strain	Improved muscular endurance, reduced fatigue and better functional capacity	(29,34)
Type	Initially prioritize selectorized machines, resistance bands and	Enhances movement control, joint stability	Reduced pain, improved joint mechanics and	(21,29)

	bodyweight exercises, progressing to free weights when appropriate	and safe load distribution	greater confidence during exercise	
Progression	Apply individualized progressive overload according to symptom tolerance and functional improvement	Ensures continuous physiological adaptation while minimizing the risk of disease flare-ups	Sustainable improvements in strength, mobility and exercise adherence	(5,34)
Monitoring	Modify exercise intensity and volume during disease flares or increased pain; reassess functional status regularly	Supports safe exercise participation despite fluctuating disease activity	Greater safety, reduced risk of symptom exacerbation and improved long-term compliance	(5,25,34)

Table 1. Evidence-based recommendations for resistance training prescription in patients with rheumatic diseases according to the FITT principle. *FITT*—Frequency, Intensity, Time and Type; *1RM*—one-repetition maximum.

5.3. Periodization and Progressive Overload

To ensure steady physical progress without causing painful relapses, adjustments to the training load should follow flexible periodization models. Traditional linear periodization, which demands a rigid, week-by-week increase in weight, usually does not work well for rheumatic patients because their fatigue and pain levels change unpredictably (30). A much better choice is an undulating periodization strategy. By changing the training volume and intensity within the same week, coaches can modify a workout based on how the patient feels that morning. If a patient arrives dealing with serious morning stiffness or joint discomfort, the coach can immediately change to lower-intensity isometric movements or reduce the sets. This flexible approach keeps consistency high, reduces the fear of movement and supports steady progress toward physical independence.

6. Discussion

The data presented in this review highlights an important change in how sports medicine specialists and rheumatologists perceive resistance exercises in rheumatic diseases. The traditional practice of recommending absolute joint rest has been replaced by a new and evidence-based approach. Progressive loading is now recognized as a safe and protective strategy for patients. It resolves functional disorders that cannot be corrected by pharmacological therapies alone. This type of training directly affects the deterioration of neuromuscular and metabolic functions typical for these pathologies.

6.1. Interpretation of Findings

The clinical usefulness of resistance training lies in its ability to both improve movement mechanics while at the same time adjusting systemic pathologies. Reversing muscle wasting through smart weight lifting is not just about looks; it changes a patient's functional capacity completely. Research data confirm that expanding lean muscle mass and boosting motor unit recruitment translates directly into better performance in everyday life—speeding up walking paces, stabilizing posture and making physical tasks feel less exhausting (9). At the same time, the release of anti-inflammatory myokines after exercise explains why lifting weights does not automatically cause clinical relapses. This combined action—reducing systemic inflammation while reinforcing the muscles protecting the joints—proves that resistance training belongs at the center of modern rehabilitation care (4).

6.2. Barriers to Implementation

Even with much scientific evidence supporting strength exercises, a major gap stands between clinical findings and daily reality. On the patient side, the biggest challenge is kinesiophobia, which is the strong fear that lifting weights will damage their joints permanently. Research shows that without close, expert coaching and reassurance during the early weeks, patients easily go back to old habits of avoiding movement, reducing long-term adherence (31,32). At

the same time, institutional roadblocks slow down progress. Many practicing rheumatologists confess they do not feel confident prescribing specific lifting parameters, often giving generic advice to "walk more" simply because exercise physiology is rarely taught in medical schools (34). Building close partnerships between sports scientists and medical clinics is necessary to remove these hesitations.

6.3. Limitations of Current Literature

While the short-term benefits of lifting are clear, a few major gaps in the current research must be acknowledged. Most randomized controlled trials are short, wrapping up within 8 to 24 weeks. Because of this, there is a shortage of long-term tracking data that follows patients over multiple years to see how weight-lifting impacts radiographic joint changes or bone erosion. Additionally, meta-analyses frequently note high study heterogeneity, as large differences in training volumes, progression schemes and unsupervised home plans make it hard to find an absolute gold-standard protocol (10).

6.4. Practical Implications for Sport and Healthcare

Moving a patient smoothly from a clinical rehab setting into a community gym requires a well-planned transition. Physical therapists and trainers must use highly adaptable periodization models to handle the unpredictable symptom shifts that define autoimmune conditions easily (29). By reframing strength workouts as an enjoyable form of health recreation rather than a medical obligation, long-term consistency is significantly boosted (28). Ultimately, incorporating progressive strength training into routine care may reduce financial strains on health systems, preserve patient independence and improve quality of life (32).

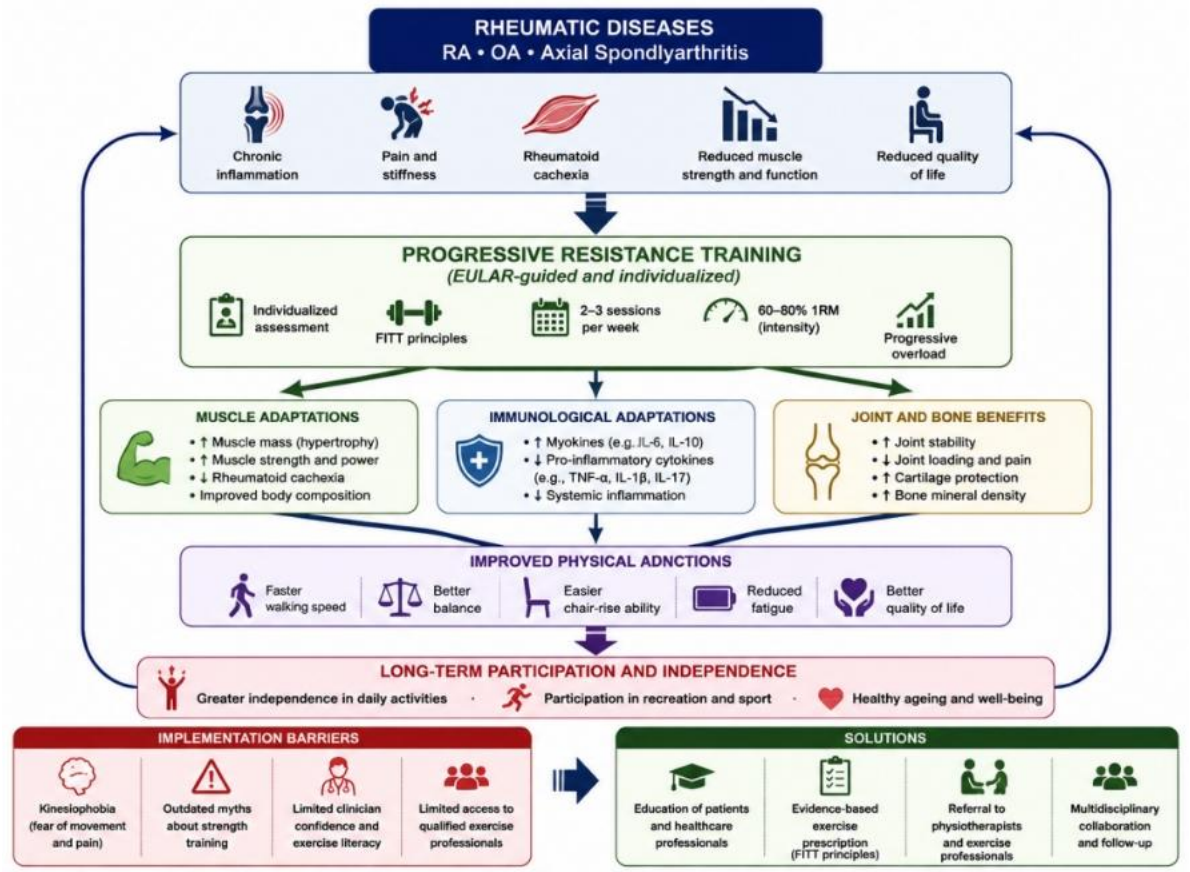

Figure 1. Proposed conceptual pathway illustrating the implementation and physiological effects of progressive resistance training in rheumatic diseases (4–6, 8–15, 18–24, 29, 34).

7. Conclusions

Pulling all the recent data together proves that progressive strength training is a necessary part of modern rheumatology care. The old clinical habit of ordering joint rest only accelerated physical decline, weakened joints and caused metabolic harm. Today, it is known that structured mechanical loading safely reverses muscle wasting, changing a patient's path from structural fragility to muscular resilience. This functional restoration yields visible improvements in everyday tasks, giving patients the physical ability to live with total autonomy (9).

Resistance training has a promising safety record across arthritic population. The short metabolic changes that occur during intense muscle contractions trigger anti-inflammatory

pathways without causing systemic and clinical exacerbation. This myokine release that occurs post-exercise, dedcreases systemic inflammation and provides a protective mechanism which complements standard pharmacological therapies (4). Resistance exercise reduces dangerous intra-articular shear forces by strengthening muscles stabilizing arthritic joints. This results in preserving cartilage integrity and optimizing biomechanical movement patterns (21). It is crucial that exercises recommended for patients remain highly structured to make sure that patients benefit from the physiological changes. Relying on the FITT variables allows coaches to design workouts that respect joint limitations while driving real neuromuscular adaptations. Current findings show that lifting weights 2 to 3 days per week at intensities between 60% and 80% of 1RM can play an important role in reversing cachexia and stabilizing hypermobile joints (5).

To fully benefit from incorporating resistance training into patients' lives, changes are needed to address psychological and educational barriers. Intense movement fears and outdated institutional myths keep many patients away from the gym. Overcoming this requires greater exercise literacy within medical education, enabling clinicians to prescribe resistance exercise more confidently and refer patients to appropriately qualified exercise professionals (34). By building strong networks connecting doctors, physical therapists and sports scientists, clear care pathways can be built that guide patients safely from initial diagnosis to lifelong active living.

Ultimately, bringing progressive loading into standard care pathways is deeply tied to raising the quality of healthcare and human well-being. By connecting the old divide between sports science and medical clinics, functional gaps can be closed actively and lower the financial strain on public healthcare systems (6). Restoring physical capacity to individuals with rheumatic diseases returns their independence and opens the door to meaningful participation in sports, recreation and active living. Therefore, strength training should no longer be treated as an alternative lifestyle tip; it is a mandatory medical prescription vital for reclaiming long-term quality of life.

DISCLOSURE

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