

Exercise and Rheumatoid Arthritis

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Abstract

Rheumatoid Arthritis is an autoimmune disease that causes inflammation in the lining of the joints and/or other internal organs. While the disease has a negative influence on fitness, sufferers from the condition can benefit from managed exercise. This paper discusses exercise recommendation for people with Rheumatoid Arthritis, covering such considerations as the level of the disease, appropriate exercises, cardiovascular recommendations and contraindications. It concludes with a case study of a Rheumatoid Arthritis sufferer and the Pilates program designed for her.

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Exercise and Rheumatoid Arthritis

Overview of Rheumatoid Arthritis

The following overview of Rheumatoid Arthritis is based on the “Handout on Health: Rheumatoid Arthritis” from the National Institutes of Health ~ Department of Health and Human Services (2001) and “Disease Specific: Rheumatoid Arthritis” from the Arthritis Foundation (2004).

Features

Rheumatoid arthritis (RA) is an inflammatory disease that causes inflammation in the lining (synovium) of the joints and/or other internal organs. This inflammation causes pain, swelling, stiffness and loss of function in the joints. RA affects people differently. It can last only a few months or a year or two and then disappear or it can take a moderate form, with periods of worsening symptoms and periods of remission. In its most severe form, the disease is active most of the time and can last for many years or even a lifetime, resulting in joint damage and disability. RA typically affects many different joints, and can cause damage to the cartilage, bone, tendons and ligaments of affected joints.

Generally RA occurs in a symmetrical pattern, with the joints on both sides of the body involved. Often the wrist joints and the finger joints closest to the hand are affected. Elbows, shoulders, neck, jaw, hips, knees, ankles, and feet are other joints that may be affected.

People with RA may experience fatigue, occasional fevers, loss of appetite, loss of weight, and a general sense of not feeling well. Approximately one-fifth of people with RA develop rheumatoid nodules (lumps of tissue that form under the skin often over bony areas exposed to pressure), usually located around the elbows, though they can be found elsewhere including in internal organs.

How Rheumatoid Arthritis Develops and Progresses

RA is an autoimmune disease in which white blood cells travel to the joint (synovium) and cause inflammation (synovitis), characterized by warmth, redness, swelling, tenderness and pain. While the joint is inflamed, the usually thin synovium becomes thick and makes the joint swollen or puffy. White blood cells in the joint tissue produce many substances such as enzymes, antibodies, and other molecules (cytokines) that attack the joint and cause damage. As RA progresses and inflammation persists, destruction of nearby cartilage, bone, tendons and ligaments can follow. Muscles, ligaments, and tendons that support and stabilize the joint may become weak and dysfunctional and deformity and disability can occur.

Researchers believe that bone damage begins in the first year or two a person has RA, thus making early diagnosis and treatment important. Many people with RA develop anemia (a decrease in the production of red blood cells). Some people develop neck pain as well as dry mouth and eyes. Very rarely, people with RA develop inflammation of the blood vessels, the lining of the lungs, or the sac enclosing the heart. Scientists still do not know exactly what causes the immune system to turn against itself in RA.

Treatment of Rheumatoid Arthritis

Currently there is no cure for RA and treatment is focused on pain relief, reducing inflammation, slowing or stopping joint damage, and improving the patient's sense of wellbeing and ability to function. Current treatment approaches include medications, surgery, routine monitoring with ongoing care, lifestyle changes, including regular, therapeutic exercise, adequate rest, physical and occupational therapy, a healthy diet, joint care, stress reduction, and participation in self-help groups.

Rest and Exercise

People with RA need a good balance between exercise and rest. They should rest more when the disease is active and increase their exercise when it is not. Rest helps in the reduction of active joint inflammation, pain, and fatigue. The amount of time for rest will

vary between people, but generally shorter rest breaks every now and then are more helpful than long times spent in bed.

Consequences of Rheumatoid Arthritis in Relation to Fitness

RA has a negative influence on fitness. The disease course of RA varies and over time reduced function, difficulties in daily activities and negative psychological impact are often observed. Pain, stiffness, and fatigue generally occur in the early disease stages, and reduction of body function such as range of motion, muscular strength, and aerobic capacity may follow (Stenstrom and Minor, 2003).

RA is a catabolic (or wasting) disease; during heightened disease activity, the inflammatory process causes pain and joint swelling, leading to decreased activity and immobilization. That immobilization, which could be caused by splinting or avoiding use of a joint, leads in turn to muscle atrophy, with reduced fiber sizes (associated with decreased strength and power), reduced capillary density and increased intramuscular connective tissue (Hakkinen, 2004).

A large number of people with RA live with muscular strength that is just above the threshold needed to perform daily tasks, such as walking, stair climbing, or getting up from a chair. In such cases, even a slight decrease in muscle strength may make some everyday activities impossible, putting them in a situation in which independent living is not possible. (Hakkinen, 2004) This reduction in muscle function may also present itself as a loss of functional balance and coordination (Stenstrom, Minor, 2003).

Inactivity can also lead to a negative shift in body composition (muscle wasting and increased body fat percentage), thus increasing the risk of hypertension, obesity, osteoporosis, type 2 diabetes, cardiovascular disease and cancer of the colon (Maes and Kravits, Idea Vol. 15, No. 2, pg 27-31 citing the American College of Sports Medicine, ACSM 6th ed. Pg 5). In one study, the aerobic capacity of RA patients able to perform bicycle ergometer tests was 20-30% lower than that of the control group (Stenstrom, Minor, 2003).

Benefits of Exercise for People with Rheumatoid Arthritis

Exercise helps keep joints moving and increases flexibility, muscle strength, cardiac fitness and muscular endurance. It helps maintain bone and cartilage health, improves ability to perform daily tasks, and improves overall health and fitness.¹ All three major groups involved in the study of RA - The Department of Health and Human Services National Institute of Arthritis and Musculoskeletal and Skin Diseases, The Arthritis Foundation and The Rheumatoid Arthritis Center - agree that exercise reduces joint pain and stiffness in people with RA and may also help prevent further joint damage and the development of brittle bones that are prone to fracture. Exercise also increases energy and stamina, helps with weight control, helps people sleep well, improves overall function, decreases depression and improves self-esteem and sense of well-being. Weight control is important in people with RA due to the fact that extra weight puts extra pressure on many joints.

The Maes/Kravitz article cites the American College of Sports Medicine as maintaining that a gradually progressive low-moderate exercise program can positively affect fitness-related problems common to arthritis such as loss of flexibility, muscle atrophy, weakness, osteoporosis, elevated pain threshold, depression and fatigue. Individuals with arthritis who have done aerobic exercise and progressive strength training have shown improvements in strength, function, and joint symptoms.

Exercises found to be beneficial include, low-intensity isokinetic training, low-intensity physical therapy, intermediate circuit training, and high intensity strength training. (Maes, Kravitz, Vol. 15, No. 2, pg 27-31) One long-term study (de Jong 2003) investigated the effects of a challenging, long-term exercise program on patients with RA The findings showed great improvements in functional capacity and emotional status, with no observable negative side effects in the participants' disability (Maes, Kravitz, Vol. 15, No. 2, pg 27-31)

¹ (National Institutes of Health ~ Department of Health and Human Services National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2001 ~ Arthritis Foundation, 2004 ~ Rheumatoid Arthritis Center, 2004)

The effects of exercise on bone mineral density in RA are limited (according to the only study done into the subject.) However, the study concluded that the effect may become substantial if accumulated over years, due to the fact that prolonged physical exercise delays the decrease of age-related bone loss. Exercise also reduces the risk of falls, by improving balance, coordination, and reaction time. Therefore, improvement in neuromuscular function could also reduce an individual's risk of bone fractures. (Hakkinen, 2004)

Benefits of Strength Training

Benefits of resistance training include strengthening muscle groups around arthritic joints to provide protection and stabilization, improved shock absorption and reduced mechanical stresses that accelerate cartilage degeneration. (Maes, Kravitz, Vol. 15, No. 2, pg 27-31) In one study (Hakkinen 2003), RA patients participated in a dynamic strength training program for two years that trained all major muscle groups. The exercise program, performed twice a week, consisted of two sets of 8-12 repetitions using elastic bands and dumbbells for resistance. Participants were evaluated every six months and their programs progressed accordingly. Subjects showed a strength increase of 19%-59%. Along with significant improvement in physical function, the study results provide evidence for the safety and efficacy of strength training in individuals with RA. (Maes, Kravitz, Vol. 15, No. 2, pg 27-31)

Benefits of Aerobic Training

Aerobic or endurance exercises, such as walking, swimming or riding a bike, improve cardiovascular fitness as well as making the lungs more efficient. Some studies also show that aerobic exercise may reduce inflammation in some joints.² A systematic review conducted by The Cochrane Group of six randomized clinical trials of people with RA using aerobic conditioning exercises, including walking, riding a stationary bike and

² (National Institutes of Health ~ Department of Health and Human Services National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2001 ~ Arthritis Foundation, 2004 ~ Rheumatoid Arthritis Center, 2004)

aquatic exercise, showed that conditioning exercises were effective in improving aerobic capacity, muscle strength and joint mobility. Improvements in joint range of motion also have been reported, following conditioning exercises. (Greene, Sam Lim, Volume 52, Number 4) The review also found some support for the safety and benefit of exercise for patients with recent diagnosis, in the active disease state and with fragile bones. One study also suggests that patients with severe RA may benefit emotionally as well as physically. Rheumatologic-specific research suggests the possibility of exercise related changes in synovial circulation, immune response and inflammatory factors, and neuropeptide levels. (Stenstrom, Minor, 2003)

In another study (A. Hakkinen et al., 2003) low frequency concurrent strength and endurance training carried out for a prolonged period (21 weeks) resulted in considerable improvements both in muscle strength and aerobic performance capacity in healthy women and women with both early and longstanding RA. During this 21-week training period, the changes in body weight were negligible, however there were significant decreases in body fat in all three groups. There were also significant increases in bilateral concentric 1 RM strength of the leg extensors in all groups. Large strength gains in the muscle groups of the upper extremities, the trunk extensors, the trunk flexors, as well as grip strength also occurred.

This strength training program, which also included some explosive exercises for the leg extensors, led to considerable increases in vertical jump in all three groups. This increase indicates that considerable training-induced changes may have taken place in the involuntary or reflex-induced motor unit activation of the trained muscles. Both muscle strength and the ability of the leg extensor muscles to develop force rapidly are important performance factors for daily tasks, such as walking and climbing stairs without falling. Remarkable improvements were observed in the aerobic performance capacity with significant training-induced decrease in the heart rate at anaerobic threshold, indicating improved economy at submaximal working intensity. This is of practical importance, as most daily physical work takes place at a submaximal intensity, but the duration of the activity is usually long. (A. Hakkinen, Hannonen, Nyman, Lyyski, K. Hakkinen, 2003)

Exercise Recommendations for People with Rheumatoid Arthritis

Medical clearance from a client's physician should be obtained before starting an exercise program.

General Recommendations

According to one of the 2002 Exercise and Physical Activity Conference work groups, exercise recommendations should be specific to the type of arthritis. The following appear to be biomechanically relevant to exercise prescription: anatomic alignment, the anatomic compartment involved, body weight, baseline muscle status, quantitative gait characteristics, the type of activity - e.g. gardening (kneeling, crouching bending), higher impact sports and activities (high impact, high injury risk) and mechanical labor (lifting, bending, climbing). (Krebs et al., 2003). They also suggest the elimination of extreme activity and the promotion of moderate exercise and physical activity in people of all ages to:

- Prevent loss of proteoglycans resulting from immobilization, as well as the loss of cartilage and possible negative effects on bone mineral density.
- Eliminate compensation at other joints, that may lead to biomechanical abnormalities, such as asymmetrical loading, poor segment alignment (posture), uncoordinated movement patterns (inefficient energy transfer).
- Strengthen muscles
- Improve coordination
- Emphasize preventative measures for both overuse and under-use (Krebs et al., 2003).

Physical fitness is an important factor in overall health and wellbeing. Health-related physical fitness includes cardiorespiratory fitness, muscular strength, flexibility, and body composition. A better status of each is associated with a lower risk for functional disability. The program design for clients with arthritis should focus on increased flexibility, joint mobility and strength, improvement in cardiovascular conditioning, and

joint protection. Daily activities such as walking, rising from a chair or stair climbing require a certain amount of an individual's strength (Hakkinen, 2004). According to Hakkinen, to be effective, the training of people with RA should be carefully planned and followed. The exercise type, intensity and frequency are all important factors in the effectiveness of training (specificity, overload, frequency). Different types of muscle contractions (isometric or dynamic, concentric or eccentric) should be used at different stages of training.

As far as exercise level and duration are concerned, the programs that saw benefits for people with RA were mainly in accordance with the fitness recommendations for healthy adults. (Stenstrom and Minor, 2003) Green and Sam Lim (Vol.52 No. 4) cite both the Center for Disease Control and Prevention and the American College of Sports Medicine as recommending every U.S. adult, including those with disabilities, to have at least 30 minutes of moderate intensity physical activity on most days of the week. The 30 minutes can be accumulated from several shorter sessions of physical activity throughout the day.

Exercises that protect vulnerable joints should be considered in program design in an attempt to prevent anticipated sequelae of the disease process. An exercise program should take into account an individual's physical abilities, limitations, and changes. In addition to appropriate program planning, it is important to monitor a patient's response to exercise, reassess initial findings, and modify the program when necessary, according to Green and Sam Lim. According to Maes and Kravitz (Vol. 15 No. 2), the following should be considered in program design for people with RA.

- "Clients with arthritis tend to be less active and therefore less physically fit in both cardiovascular endurance and muscle strength than people without arthritis.
- The metabolic cost of activity can increase by as much as 50% due to pain, stiffness, gait abnormalities, and biomechanical inefficiency.
- The range of motion in affected joints may be restricted by bony changes, pain, stiffness, and swelling.

- Poorly controlled exercises and high-impact movements present a high risk for injury in deconditioned and poorly supported joints.
- Repetitive movements in activities such as walking and cycling may inhibit the ability of people with arthritis in performing these activities.
- The site and severity of affected joints are a determining factor in the mode of exercise for both aerobic and strength training.”

Reversibility is also an important consideration. After the cessation of active training, the improvements in physical function have been shown to disappear. One study reported that the 17% increases in strength achieved after a 24-week training period in knee extension had disappeared 12 weeks after training termination (Hakkinen, 2004). Therefore, RA patients should adopt physical exercise as part of their normal life-style to obtain long-term results.

Considerations for Disease State

The specific stage of the disease process, the number of joints involved, and the degree of inflammation are all important considerations in designing an exercise program. During an acute flare, the goals of therapeutic exercise are to decrease pain and inflammation and to maintain range of motion and strength without aggravating the affected joints.

Appropriate exercises during this stage are isometric exercises at multiple joint angles to slow atrophy due to rest and/or active range of motion exercises to prevent contractures and maintain nutrition to the cartilage.

Although these exercises represent the current standard of care, some have suggested that a more intensive dynamic exercise program has greater benefit, even in the acute stage of RA, without deleterious effects (Green and Sam Lim, Vol.52 No. 4). De Jong and Vlieland (2005) refer to a study, Van den Ende *et al.*, that examined the effects of intensive exercise on patients with active RA (disease flare). Thirty-four patients participated in an intensive exercise program consisting of supervised isokinetic and isometric strength training and bicycling at home for 15 minutes at 60% of maximum effort three times a week, plus conservative supervised range-of-motion and isometric exercises. A second group of 30 patients received the conservative exercises only. The

improvement of disease activity over the 24-week follow-up was similar in both groups with a trend toward slightly greater improvement in the intensive exercise group.

Isometric strength training may be used during immobilization. Pre-immobilization strength training (when possible) can be advantageous in minimizing the effects of strength loss in muscles to be immobilized. The location and level of joint inflammation in RA are likely to vary, therefore it is important to train all major muscle groups and not only the affected sites (Hakkinen, 2004).

The goals of therapeutic exercise during the subacute and chronic stages of the disease are to progressively increase muscle strength, range of motion and function. Aquatic exercises, dynamic isotonic exercises, and passive range of motion exercises are all appropriate exercises at these disease stages. Aerobic exercises should also be included, once joint symptoms have subsided (Green and Sam Lim, Vol.52 No. 4).

Risk and Safety Factors

Any exercise risks aggravating the arthritis by overworking the joints. This may occur if exercise duration is too long or the intensity is too high, especially when beginning an exercise program. How much exercise is too much? Most experts agree that if exercise results in pain that lasts over an hour it is too strenuous. Unusual or persistent fatigue, increased weakness, decreased range of motion, increased joint swelling and pain lasting more than an hour after the exercise are all signs of a program that is too strenuous and should be adjusted. New or sharp joint pain is a signal to stop exercising. Furthermore, correct positioning is critical; incorrectly performed exercises can cause muscle tears, more pain and more joint swelling (**RA Center, Arthritis Foundation, NIAMS**).

Some patients with RA, particularly those with large joint involvement, might be at risk of additional joint damage and should avoid high intensity weight-bearing activity. Although intensive exercise might be detrimental to the large joints in subgroups of patients, it was found safe and even beneficial for the small joints that are characteristically involved with RA. However, the safety regarding the impact of high intensity exercise on large joints with preexisting joint damage, especially for the shoulder and subtalar joints, is still under debate (de Jong and Vlieland, 2005). Low

intensity land or water based exercises can be advised safely for people with RA in any stage of the disease, according to de Jong and Vlieland.

To slow age-related bone loss, impact-generating activities seem essential, with effects specific to sites loaded. However, de Jong and Vlieland think that specific weight-bearing, impact-generating exercises should not be encouraged in this group of RA patients, due to the lack of data with regards to the potential detrimental effects of moderate- to high-intensity exercise in patients with pre-existing extensive damage of the large joints. The same applies to patients with joint prostheses.

Recommendations for Better Exercise

Temporary pain relief can make it easier for people with arthritis to exercise. There are known methods to help reduce pain for short periods of time, such as moist heat, cold, hydrotherapy, mobilization therapies, TENS, relaxation therapy and acupuncture. Heat or ice treatments can be applied to the area that will be exercised. Heat relaxes joints and muscles and helps relieve pain, while cold reduces pain and swelling for some people.

Begin exercise at a slow pace and increase the pace gradually. Warming-up is important to prevent injuries. A comfortable, unhurried pace, that allows talking without running out of breath, should be kept. Also, the breath should not be held while exercising. A five to ten minute cool down is important at the end of an exercise session to bring the heart rate down and allow muscles to relax (RA Center, Arthritis Foundation, NIAMS).

Range of Motion Recommendations

Range-of-motion exercises can be done daily and should be done at least every other day.

Strength Recommendations

A sound strength-training program incorporates all muscle groups, not just those affected with arthritis. Exercises may be static or dynamic and can be performed using gravity or various types of resistance equipment, including Pilates, free weights, elastic bands, weight machines and ankle weights. The goals of strength training are to increase muscular strength, peak torque, power and joint stabilization. Maes and Kravits advise

beginning each strength training session with adequate range of motion warm-up exercises. Intensity for a strength training program will vary according individual abilities. A generally agreed-upon goal for the load level for strength training exercises should be moderate to hard (i.e. 50%-80% of 1 RM), progressively adjusted. Exercises for the muscles of arthritic joints should be performed at a lighter intensity in the early stages of an exercise program (Maes and Kravits).

In an analysis of the results of 15 studies, it was found that the relative increase in knee extension strength values were highest in those studies that included actual, high-intensity strength training, compared with lower-intensity mixed strength and aerobic, or pure aerobic training programs (Hakkinen, 2004). According to Hakkinen, moderate or high-intensity strength training for people with RA is more effective than low intensity training and has no deleterious effects on disease activity or pain.

In general, it is recommended that a full body program be performed 2-3 times per week, and no more than four times a week, with 24 hours between sessions for recovery. One 21-week study found improvements in strength and aerobic capacity for women with both early and longstanding RA, doing a concurrent strength and endurance program with a frequency as low as 1.5 times per week for aerobic and 1.5 times per week for strength training, with sufficient initial loading intensity progressively increased. (A. Hakkinen et.al, 2003) This study found no increase in disease activity, while, in patients with longstanding RA, there were improvements in Erythrocyte sedimentation rate and general health. This demonstrates that women with RA in a stable state can safely carry out intensive physical exercise.

A severely deconditioned client, or one with severe arthritis, may only be able to perform 2-3 repetitions initially. This should be progressed to 10-12 repetitions. It is important that proper care be taken to ensure that affected joints are protected at all times during strength training. Modifications should be made so clients can perform exercises in a pain-free range of motion.

Flexibility Recommendations

Stretching exercises should be preceded by a thorough warm-up, in order to increase internal body temperature and circulation. Daily stretching sessions targeting the major muscle groups can be safely done. Stretches should be held for 10-30 seconds and should be performed in a pain-free range of motion. Bouncing and ballistic stretching should be avoided. Static stretches should not cause pain, but rather a mild tension should be felt. Maes and Kravits recommend using caution to avoid overstretching unstable joints.

Cardiovascular Recommendations

Mode selection is important in aerobic exercise design and should emphasize predominantly non-weight bearing modes that utilize smooth, rhythmical motions of large muscle groups. Minor et al., (2003) recommend whole body dynamic activity, such as walking, dancing, water exercise or riding a stationary bike. However, for some people with arthritis the repetitive nature of cycling may be contraindicated. A multi-mode approach to aerobic exercise may be worthwhile. The goal of an aerobic exercise program is to increase cardiovascular endurance. The intensity should be set at 60%-80% of maximal heart rate, 2-5 days per week, and with a duration of 30-60 minutes—starting with five minutes and progressively increasing the minutes per session. Intensity should be increased first, then duration. Maes and Kravits cite the American College of Sports Medicine as advising that people with arthritis of the lower body should avoid stair climbing, jogging, and running. Proper warm-up and pre-exercise joint range of motion exercises should be incorporated into the program.

Pilates Program for Diane Butman

Diane Butman was diagnosed with RA when she was 9-years-old. Now, at 41, her disease state is stable with occasional joint flare/pain. The ROM in her ankles and feet is very slightly limited with greater limitation in her toe joints. Her RA does not affect her hip and knee joints. Her Right shoulder has a slightly decreased ROM. Her left shoulder, partly due to a car accident, is much more limited in ROM. The most severely affected joints are at her elbows, wrists, and hands. Her elbow joints will not allow full arm extension, and her left wrist is fused in a “straight position” at or near 0°. Many of her finger joints are deformed. They have a very limited ROM and are unable to extend very far. Diane has been doing Pilates for a several years and is at an intermediate/advanced level in many exercises but needs modifications for many of the exercises to accommodate her structural limitations.

General exercise recommendations for Diane:

Based on my research I would recommend an exercise regime consisting of Pilates strength training 2-3 times per week at a moderate intensity, cardiovascular conditioning 2-3 times per week and daily flexibility/ ROM exercise—moving each joint through its full range. The Pilates program will emphasis strength yet still focus on flexibility and full body integration.

Pilates is good mode of exercise for people with RA. Because of the versatile nature of the equipment, many of the exercises can be modified to suit an individual’s needs.

Pilates also incorporates both strength and flexibility exercises and can even be done as a circuit with a cardiovascular component incorporated. With personal instruction, there is the additional benefit of feedback with regards to proper alignment. Based on the research done, the following program should be performed at moderate- to hard-intensity 2-3 times per week.

Modifications: Because of the condition of her shoulders, wrists and elbows, Diane is not able to do any exercise with the weight on her hands. She is, however, able to support herself on her forearms and some exercises can be modified accordingly (e.g.

front support done on the forearms). It is sometimes necessary to use Velcro straps around the arms rather than the hands in the straps. Although many exercises can be modified so that Diane can do them in a beneficial manner, for the purpose of this paper, I have decided not to modify exercises. Instead, I created a program she can do from the BASI repertoire as we learned it.

Cues: New or sharp joint pain is a sign to stop exercising. I would remind my client of this and advise that she perform exercises in a pain-free ROM. Furthermore, because incorrectly performed exercises can cause muscle tears, more pain, and more joint swelling, general cues for correct positioning is critical and would be given for each exercise.

Pilates Program

Warm up

- Pelvic Curl
- Roll-up
- Supine Twist
- Double Leg Stretch
- Single Leg Stretch
- Crisscross

Footwork

- Parallel Heels ~ Cadillac
- Parallel Toes ~ Cadillac
- V-Position ~ Cadillac
- Open V Heels ~ Cadillac

- Open V Toes ~ Cadillac
- Calf Raises ~ Cadillac
- Prances ~ Cadillac
- Single Foot Heels ~ Cadillac
- Single Foot Toes ~ Cadillac
- Hip Opener ~ Cadillac

Abdominal Work

- Roll-Up Top Loaded ~ Cadillac
- Teaser 1 ~ Cadillac

Hip Work

- Frog ~ Cadillac
- Circles ~ Cadillac
- Walking ~ Cadillac
- Bicycles ~ Cadillac

Spinal Articulation

- Tower

Stretches

- Shoulder Stretch 1 ~ Ladder Barrel
- Shoulder Stretch 2 ~ Ladder Barrel

- Gluteals ~ Ladder Barrel
- Hamstrings ~ Ladder Barrel
- Adductors ~ Ladder Barrel
- Hip Flexors ~ Ladder Barrel

Full Body Integration 1

- Sitting Forward ~ Cadillac
- Side Reach ~ Cadillac
- Saw ~ Cadillac

Arm Work

Arms Standing with Velcro Straps

- Chest Expansion ~ Cadillac
- Hug A Tree ~ Cadillac
- Circles & Reverse ~ Cadillac
- Punches ~ Cadillac
- Biceps ~ Cadillac
- Butterfly ~ Cadillac
- Shrugs ~ Chair
- Scapula Glide ~ Cadillac
- Shoulder Stretch Lying Side ~ Step Barrel

Full Body Integration 2

Due to the fact that most Full Body Integration 2 exercises require weight on the hands with the shoulder joint in positions Diane can not support, I have decided to eliminate this block and add additional stretches and exercises that focus on mechanics (such as scapula glide) to other blocks.

Additional Leg Work

- Hip Opener ~ Chair

Lateral Flexion/Rotation

- Side Overs ~ Ladder Barrel

Back Extension

- Swan ~ Ladder Barrel

Theraband

Ankle-foot exercises with emphasis on articulating the joints of the feet and toes

- Sitting Dorsiflexion ~Ankle-foot Dorsiflexors
- Sitting Big Toe Up and Away ~ Ankle-foot Invertors
- Sitting Little Toe up and Away ~ Ankle-foot Evertors
- Sitting Plantar Flexion ~ Ankle-foot plantar Flexors

Squishy Ball

- Hand Squeezes ~ Grip Strength

I would end this program with stretching/ROM exercises to help prevent muscle tightness and help maintain the range of motion in her joints.

Conclusion

Diane's ongoing Pilates regime has helped her to maintain a healthy, strong body, without losing any additional range of motion in her joints. She has improved her strength and flexibility. She has also improved some of her biomechanical patterns that have allowed her to increase her active range of motion especially with regard to the shoulder and the scapula humeral rhythm. Pilates has help Diane to maintain an active lifestyle despite her arthritis.

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