Resistance Training for Life

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The benefits of aerobic exercise have been well documented over the last several decades. But many people still react indifferently to resistance training, thinking only of bodybuilding or training for athletes. Granted, bodybuilding is the result of progressive resistance training and athletes benefit from resistance training programs specific to their sport. However there are a large number of health and fitness benefits from regular resistance training for people of all ages. Resistance training enables people to: live a higher quality of life (e.g., greater ease with activities of daily living); be more physically active (e.g., engage in physical recreational activities); prevent/manage certain diseases (e.g., osteoporosis, arthritis); increase body image self-confidence due to the aesthetic results. Resistance training is beneficial for many aspects of life.

As a point of interest, resistance training is perhaps the best term used to describe this type of exercise. There are other terms often used but they can be slightly misleading. For example, resistance training enhances muscular strength (strength training) but also muscular size (hypertrophy), power, and local muscular endurance. Also, resistance training can involve free weights and machines (weight training) but also bodyweight, elastic tubes/bands, air resistance (Keiser), and other forms of resistance (e.g., water bottles).

In a properly designed program, resistance training provides increased stress to the bones, which can increase or maintain bone mineral density for those who may have, or who are prone to osteoporosis. Generally aerobic exercise only stresses the lower extremities. Resistance training can emphasize all parts of the body. Resistance exercise also can develop bone and muscle early in life thus preventing bone loss and maximizing bone density during growth years.

Resistance training can help overweight/obese persons pursue a more active lifestyle, leading to weight loss and weight maintenance. Even though resistance training shouldn’t be the emphasis of an exercise program designed to lose weight, it does complement the aerobic component. For example, resistance training results in additional calorie expenditure.

Resistance training helps to make the body more sensitive to insulin not only during, but following exercise sessions. This is beneficial to those who have type 1 or 2 diabetes or for those who are at risk for diabetes (insulin resistance). A recent study indicated that progressive resistance training can increase insulin sensitivity, even when not following a weight loss diet.

It was once believed that the loss of muscle...
Training for Independence

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Introduction

Chances are that if you regularly exercise or participate in some form of physical activity, resistance training (RT) is probably not a part of your exercise routine. According to the U.S. National Center for Health Statistics, 44 percent of American men and 38 percent of American women report engaging in some form of vigorous physical activity or exercise regularly, while 16 percent of Americans report participating in some form of resistance training, with 25 percent by age 90. Some of these changes are a physiological consequence of the normal aging process, but disuse and inactivity player a much larger role.

A study of healthy men between the ages of 60 and 72 who trained for twelve weeks using a standard strength training protocol at 80 percent of their 1 rep maximum (IRM) demonstrated increases in knee flexion strength by 107 percent and knee extension strength by 227 percent. These dramatic improvements were similar to those changes experienced by younger adults and demonstrate that changes in strength can be achieved later in life that are similar to those of younger counterparts with resistance training.

The impact of RT on muscle is easily understood and well accepted. However, its beneficial effects on health risk factors and chronic disease has only recently been recognized.

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The most dramatic effects of muscle loss translate into the loss of physical independ-
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erence. Weak muscles impact an individual’s ability to perform activities of daily living (ADL). Activities such as walking, cleaning or shopping become more difficult when strength declines. The ability to balance while moving or standing declines and the potential for falls increases. By the age of 65, one in three individuals will report experiencing some kind of fall, with 1 out of 20 of these reports resulting in some form of bone fracture.12 These injuries can be debilitating and are often difficult to recover from.

Enhanced Quality of Life

Even a modest amount of exercise substantially reduces the risk of dying from multiple risk factors and improves the functional characteristics needed to perform day-to-day tasks. The effects of (RT) along with a sound cardiovascular exercise program may assist with the management of those risk factors that put an individual’s long-term independence at risk.

Resistance training has been proven to be effective in the management of osteoarthritis. Functional ability can be improved if the muscles that surround the affected joint are strong and can share in the support of the stress experienced by the joint. Shared stress by the joints and muscles reduces the overall stress on the joint surfaces. Evidence also supports the fact that RT reduces the rate of bone loss and may also increase bone deposition as long as the training stimulus is weight bearing, of a magnitude that stimulates bone formation, or both.1 It is recommended that the training stimulus mimics those common movements of daily living that increase the functional capacity of the individual. Training for specific movements such as rising from a chair or one’s bed can easily be performed with either available equipment in a gym setting or repeated with added resistance in a home setting.12

Research suggests that regular aerobic exercise plays a role in the management of mild to moderate depression.1 Whether resistance training plays a significant role in the management of depression has yet to be clarified. Restoring lost abilities through resistance training restores confidence and boosts mood. The ability to move freely without fear of falling or losing one’s balance creates a better sense of independence and expands a person’s social abilities.12

Program Design

The fundamentals of a RT program design are the same regardless of age. When developing an individualized exercise prescription it is important to understand the unique challenges facing older adults and to manipulate the acute program variables in order to meet their needs. Incorporating such challenges begins with a physician’s medical clearance, especially in the presence of two or more coronary risk factors or the presence of metabolic disease, and a needs analysis, which takes into consideration any physical limitations and the individual’s goals. Many older adults may also require a period of time for basic conditioning so that they can RT at a level needed to experience adaptations. In such cases, starting levels of RT may be minimal and trainers should exercise caution in choosing equipment and movements that will not injure or over-train the person.

Exercise selection is very important and should include at least one exercise for all of the major muscle groups. This can be attained through a variety of equipment choices which can range from fixed equipment to soup cans. Equipment selection depends upon the person’s personal preference, availability, and physical abilities. Progression of exercises should emphasize movements that would enhance power and balance.

The order of exercises should progress from large muscle groups to smaller muscle groups in order to minimize fatigue and maximize the resistance used. Focus efforts on the optimal stimulation of the lower extremities to enhance balance and power training strategies.

The duration of rest between sets and exercises determines the metabolic demands of the workout. Rest period lengths should be consistent with program goals and consider the medical or physical condition of the individual. Longer rest periods optimize gains in strength and work well for individuals with type I diabetes while programs with shorter rest periods enhance muscular endurance and challenge the acid base balance which may be compromised in older individuals.1 Take every precaution to control rest lengths in an effort to avoid the metabolic stress that accompanies RT.

Single set programs work well for initiating RT programs for older individuals and provide a good starting point. Three sets of a single exercise are usually sufficient in providing a training stimulus and an adaptation. However, should the individual desire more of a training stimulus for a single body part it would be wise to consider the addition of another exercise before progressing beyond three sets.2 Consider also increasing the intensity of the exercise. Older adults may not be able to tolerate intensities up to 80 percent of 1RM with every session. A sound strategy would consider reducing the intensity over the course of three days and monitor the progression until the total volume of training is consistent with every workout. Training volume also factors in the repetitions for each set. Because of the high prevalence of cardiovascular problems, limit the number of repetitions to failure. Consider conservative training volumes and reserve the number of prescribed repetitions as an easy option for progression. One to three sets of eight to ten repetitions at an intensity of 70 to 90 percent of 1RM is a good starting point. Reevaluate the RT program every 12 weeks and carefully consider which of the aforementioned program variables will offer the best strategy for improvement and safety. Pay close attention to the person’s training volumes and monitor the individual for signs of stress and over-training.

Safety Considerations

The basic principles for RT are the same for older and younger individuals, but the specifics of the Rx differ and are dependent on the individual’s prior exercise history, medical history, available environment and resources, and personal goals and preferences. Because of the many co-morbidities that must be considered when prescribing RT for an older adult, the need for an individualized prescription becomes even more important.

Similar to an aerobic exercise prescription, prescribing RT for older adults should begin with a doctor’s medical clearance. And while the primary goal of every exercise professional is to keep the individual safe while training, safety is not to be confused with overprotection. An overcautious exercise prescription can further the loss of function by failing to elicit a training stimulus that forces the individual to adapt. The exercise professional must keep in mind that independence is the goal and should resist the temptation to assist the individual throughout the workout and focus on the movements that the person can perform and not those movements that are impossible or elicit pain.

By adhering to the following guidelines, the exercise professional can be reassured that the individual that is being trained will safely progress:

• Design the program to develop sufficient muscular fitness to enhance ability to live independently.
• Closely supervise and monitor initial sessions with trained personnel who are sensitive to the special needs and capabilities of older adults.
• Use minimum levels of resistance for the first eight weeks to allow for adaptation of connective tissue.
• Instruct and use proper technique for per-

**Table I: Summary of Adaptations to Aging and Resistance Training**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Aging</th>
<th>Resistance Training</th>
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<tbody>
<tr>
<td><strong>Muscle strength</strong></td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td><strong>Muscle endurance</strong></td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td><strong>Muscle mass</strong></td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td><strong>Muscle fiber size</strong></td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td><strong>Muscle metabolic capacity</strong></td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td><strong>Resting metabolic rate</strong></td>
<td>Increases</td>
<td>Decreases</td>
</tr>
<tr>
<td><strong>Body fat</strong></td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td><strong>Bone mineral density</strong></td>
<td>Decreases</td>
<td>Increases</td>
</tr>
<tr>
<td><strong>Physical function</strong></td>
<td>Decreases</td>
<td>Increases</td>
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forming all exercises.

- Instruct all older participants to maintain normal breathing patterns while exercising. Teach them to avoid the Valsalva maneuvers.
- Overload by increasing number of repetitions at first only subsequently by increasing resistance.
- Use a resistance that can be comfortably lifted for at least eight to twelve repetitions per set. Heavy resistance is dangerous and may damage skeletal and joint structure.
- Weights should be lifted and lowered in a slow, controlled manner. No ballistic movement should be allowed (to prevent orthopedic trauma to joint structures).
- Perform all exercises in a pain-free range of motion, that is, the maximum range of motion that does not elicit pain or discomfort. As positive adaptations occur, individuals may gradually increase range of motion and improve flexibility.
- Perform multijoint exercises (as opposed to single joint exercises) that tend to assist in the development of functional muscular fitness.
- The use of machines offers several advantages:
  - They require less skill to use.
  - They generally provide more support for the back by stabilizing body position.
  - They enable participants to start with lower levels of resistance (depending on the specific type of equipment).
  - They typically enable increased resistance level through smaller increments (not true for all resistance training machines).
  - They allow greater control of the exercise range of motion.
  - They generally provide a more time-efficient workout.

Do not over train your client. Two resistance training sessions per week is the minimum number required to produce positive physiological adaptations. While more frequent training may elicit larger strength gains, additional improvement is relatively small.

Resistance training must be avoided during periods of active pain or inflammation in older adults with arthritis. Exercise during these periods may exacerbate the inflammation.

The exercise professional should always emphasize proper form while instructing the individual. Always progress from large muscle groups to smaller muscle groups in an effort to minimize injury. RT progression should be gradual while working toward a goal or some application of the movements to those of everyday living. Constantly monitor the individual for signs of discomfort and cease any exercise in the event pain is experienced anywhere. Encourage proper hydration at all times and offer advice regarding proper nutrition and performance. Find ways to motivate the individual. Don’t allow routines to become stale by resetting goals and incorporating variety into a routine.

Conclusion

The challenge for the exercise professional is to motivate increased numbers of older adults to exercise and to provide programs that meet their needs over a long period of time.’ And while resistance training is considered safe for most populations, the art of prescription challenges the exercise professional to balance the needs of the individual with the basic precepts regarding safety, common sense, and basic exercise physiology. The resources and research regarding resistance training and older adults is numerous and growing, providing the exercise professional with the means to facilitate a healthier and fitter population of older adults.

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References

Successful Resistance Training for Arthritis

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Introduction

Arthritis is a general term encompassing similar diseases. Arthritis can affect people of all ages, genders, and ethnic groups. A recent CDC report in the Morbidity and Mortality Weekly Report found approximately 22 percent of Americans had doctor diagnosed arthritis. Common symptoms are joint pain, stiffness; especially in the morning, swelling, inflammation and loss of physical function. Arthritis negatively impacts not only exercise ability, but an active lifestyle as well. The two most prevalent types of arthritis are osteoarthritis and rheumatoid arthritis.

Osteoarthritis (OA) is a dynamic disease process characterized by the uncoupling of the normal balance between degradation and repair of the components of the articular cartilage and bone. It is the most common form of arthritis. This leads to pain, stiffness, movement problems, and limited physical activity. The most common affected areas of the body are the hands, knee, hip, foot, and spine. This type of arthritis is commonly referred to as “wear and tear” arthritis.

Rheumatoid arthritis (RA) is a systemic inflammatory disease of the joint capsule inner lining affecting multiple joints. Women are more affected than men. General symptoms include fatigue, malaise, fever, weight loss, and depression. As with OA, pain, stiffness, and swelling are also characteristics of RA. RA can decrease range of motion (ROM), muscle strength, and aerobic capacity. In severe cases, RA can affect connective tissue and blood vessels throughout the body.

One may think that exercise and arthritis do not go hand in hand. However, research has shown that exercise is a valuable tool in managing arthritis. In a recent study, persons with RA underwent a dynamic strength training program for two years. Subjects performed a program which trained all major muscle groups of the body. The program consisted of two sets of 8-12 repetitions using rubber bands and dumbbells as resistance. The frequency was 2 times per week. Subjects showed an average of 19-59 percent increase in strength. Stronger muscles absorb more of the attendant stress on a joint, thereby reducing stress placed on affected joint surfaces. In addition to resistance training, cardiovascular and flexibility exercises are also components of a well-rounded program for a person with arthritis. This article will focus primarily on the resistance training portion of exercise.

Resistance Training Recommendations

The sequencing of exercises for persons with arthritis is similar to that of the general population. One should begin with an aerobic warm-up to increase the tissue temperature throughout the body. Because a person’s joints are often irregular and mechanically unsound, persons with arthritis have to be taught to warm-up very slowly and increase their activity level gradually within the confines of comfort. A typical exercise session might consist of the following: 10 minutes of range of motion exercises such as head turns or head tilts, arm side-raises, side bends, elbow curls, standing hip extension and ankle circles; 10 minutes of stretching exercises such as a calf stretch, lower back and hamstring stretch, and shoulder and upper back stretch. An aerobic warm-up of approximately five minutes can follow the stretching. Skeletal muscle strengthening exercises should be performed following the warm-up. An aerobic session of 15-60 minutes is next. A cool-down period should end all sessions. Exercises during the cool-down should mimic the same exercises that were performed during the warm-up.

Persons with RA performing strength training exercises may perform either isometric or isotonic exercises when doing a program. Isometric exercises are of particular value for painful or inflamed joints. These exercises are the choice when a person is in the acute arthritic stage because they produce low articular pressures. An acute stage can be recognized by signs and symptoms such as fatigue, joint pain, swelling, and reduced joint tissue tensile strength attributable to inflammation. Isometric exercises may be done with such equipment as resistance rubber bands or no equipment. General guidelines for performing isometric exercises are listed in Table 1.

Isotonic exercises are preferred during the chronic stage of arthritis. The chronic stage can be identified by signs and symptoms such as permanent joint damage, pain at the end of normal ROM, stiffness after rest, poor posture and range of motion, joint deformities, pain with weight bearing, abnormal gait, weakness, contractures or adhesions, and reduced aerobic endurance. Isotonic exercises are beneficial because they closely correspond to everyday activities and promote improved daily function. Free weights, weight machines, elastic tubing, water, or manual resistance may provide the training stimulus. An advantage of many types of weight machines is that they can be double pinned. This technique allows people to exercise through their pain-free ROM. This entails placing the first pin in the desired resistance and placing the second pin in a desired hole below the resistance to cut down the range of motion of the exercise. A person must pay particular attention when doing this, because many machines are not intended to be double pinned. Placement of the second pin should be reversed because the hole in the bar is larger than the hole in the resistance plate. The person must also remember to carefully remove the pin when finished. One application that is particularly helpful in peo-
Enhancing proprioception and motor control is another recommendation for people with OA, in particular older individuals, who frequently have problems with balance. Person with RA may require modifications of certain exercises. People who have incurred problems with their wrists and hands may need to have the diameter of the bar, dumbbell, or handle decreased in an attempt to off-set their weakened grip. If this is not feasible, then using elastic tubing attached to the fore-arms can substitute for the free weight or weight machine equipment. Starting out with about 4-6 repetitions per exercise is recommended. It is possible to use as little as 2-3 repetitions with progression to 10-12 repetitions provided that the resistance is acceptable and does not cause joint pain. Each repetition should be performed slowly with emphasis on form and not on speed. One to two sets of each exercise can be performed 2-3 days per week. This can be modified for people who are new to resistance training or have not done any resistance training in some time. Single set routines, especially for people just beginning a resistance training program, may produce as much benefit as multiple sets performed 2-3 days per week. Of course in today’s society, single set routines have another benefit; they are more time efficient and generally result in greater adherence. Resistance training sessions should consist of 8-10 different exercises that train the major muscle groups. Table 2 summarizes the FIT Principle just discussed.

### Table 2: F.I.T. Principle for Resistance Training

<table>
<thead>
<tr>
<th>Repetitions</th>
<th>Sets/Week</th>
<th>Exercises</th>
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<tr>
<td>4-6 (2-3 if very novice)</td>
<td>10-12</td>
<td>8-10 exercises that train the major muscle groups</td>
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</table>

When dealing with persons new to resistance training, education and safety are major considerations. It cannot be emphasized enough to enforce good form and safety instead of how much a person can lift.

### Conclusion

Remember, whatever exercise program a person with Arthritis is going to embark on, they should always consult with their doctor before starting out. A well-designed and monitored exercise program incorporating range of motion flexibility exercises, muscular strength and endurance exercises, and aerobic exercises will provide great benefit to people with arthris. Exercise can help alleviate the deconditioning associated with arthritis as well as improve quality of life. Communication with the person as well as their medical team will help ensure a safe and effective program.

### References


For a complete list of references, please e-mail certification@acsm.org.

### Table 4: Comparison of Rheumatoid and Osteoarthritis

| Rheumatoid arthritis (RA) is a disease in which your own immune system mistakenly attacks healthy tissue, causing inflammation that damages your joints. | Osteoarthritis (OA) is a condition of wear and tear associated with aging or injury. Your immune system is not affected. |
| RA usually causes pain or stiffness lasting for more than 30 minutes in the morning or after long rest and lack of activity. | OA usually occurs as individuals age and in those whose joints have worn down by excessive use. |
| RA is associated with symmetrical swelling (e.g., both hands, both elbows, etc.) | OA is associated with asymmetrical (not “matching”) swelling in individual joints that are not part of a pair — e.g., one knee and an elbow, instead of both knees. |

| Most typically, RA symptoms include joint pain, swelling, tenderness, and redness of the joints; prolonged morning stiffness; and less range of movement. Some people also experience fever, weight loss, fatigue, and/or anemia. | Generally, OA symptoms include joint stiffness, pain, and enlarged joints. |

### About the Author

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A Wellness Coach’s Guide to Working with Physicians

This is the fourteenth edition of the Coaching News column, sponsored by Wellcoaches Corporation in alliance with ACSM, and it appears regularly in ACSM’s Certified News.

Opening the door to the medical world is like trying to pry open a door that has been nailed shut, both by the American Medical Association as well as pharmaceutical companies. Is it even possible to begin to open that door? Yes, the time has never been better for wellness coaches to collaborate with physicians to better serve the health needs of their patients.

One important trend is that women will dominate family practice in the future because they are well-suited to be nurturers who are interested in prevention as well as treatment of illness, and who look out for the health interest of the entire family.

Today, family physicians are overwhelmed and understand that while pharmaceutical companies have an important role to play, they are not the only solution. The opportunity to combine medication with lifestyle change supported by wellness coaches will provide physicians welcome support.

Wellness coaches are trained to deliver mastery of wellness and behavioral change, and will make major strides in supporting patients to pursue healthy behaviors, including medication compliance, to treat and prevent disease. We now know that our lifestyle choices determine 70 percent of our health status, and the coaching model has measurable outcomes, including behavior self-efficacy and biometrics.

The door is open for the collaboration of physician and wellness coach. Here are eight guidelines based on my experience as a licensed therapist and wellness coach who has worked closely with a family physician for the past three years.

1. Have your credentials available in print form
Physicians are required to post their medical credentials, and they want to readily see and understand the scope of training you bring to this new partnership. It is important for physicians to understand your specialties as a wellness coach, and how you can best intervene. Describe client scenarios when presenting your services to a physician and her team. Provide references to demonstrate that you can work with all kinds of personality types. They want to know how you will work under conflict if a patient is volatile. Let them know what you have been able to do with your clients and show them the results.

2. Help make the physician’s day easier
I work in a family practice with a woman doctor, her husband who is a physician assistant, and one nurse. On a Monday in the cold weather, this office sees between 60-70 patients, not including the patients who I work with. I step in to calm someone down and try to make an appointment with him/her for the next day. If there is a patient who would like information on the new drug for nicotine addiction, I give that to him/her because I sat in on the drug reps’ educational lecture, and the physician knows that is in my scope of practice. If a patient needs advice on losing weight to respond to a recent diabetes diagnosis, I give the relevant educational information to him and then send him to a certified diabetes educator or a personal trainer. Doctors want help: not more work. They rejoice if they get some assistance in their daily office life.

3. Present coaching outcomes simply and clearly
Behavioral goal charts and readiness/confidence ratings are excellent tools because they capture the coach’s skill and the patient’s efforts. Presenting material succinctly is critical because physicians have so little time.

4. Reduce unnecessary physician visits
We now have reports that health coaches, who help patients manage medical conditions, are effective in assisting people to better manage their illnesses and cut down on their emergency room visits. With a wellness coach working in a doctor’s office and being available at all times with specific information and resources related to patients needs, unnecessary doctor visits can be reduced. The coach can also use his/her time in the office to meet their other clients’ needs by using cell phones and laptops.

5. Be available, mobile, and efficient
Being available and being mobile are two very important steps to take to set up in the medical arena. The medical world is overloaded with patients and paperwork, so be as efficient as possible. Be present but with as little baggage as possible.

6. Handle referrals professionally
I always follow up with a thank you letter to the professional who refers a patient to me. I put a “First Time Contact” on the doctor’s desk to let her know that a patient that she referred to me came to the coaching session, and then describe the goals we will be working on.

When appropriate, I refer to an ACSM-certified personal trainer, and to certified diabetes educator (CDE) and a certified alcohol counselor (CDAC).

7. Stay up to date with the latest high quality research
Read the latest research on the impact of health behaviors, and share a succinct synopsis with the doctor to support his/her discussions with patients. Be sure that everything you recommend is backed up by the latest high quality research. Prepare educational handouts to give to patients, and display handouts in your office or the waiting area with your company name and contact details. I subscribe to Dr. Weil’s newsletter and some other current journals to help stay up to date. Putting the most recent health and wellness information on the doctor’s desk every week with an FYI is an invaluable service and one that will earn you great respect.

8. Describe your compensation and payment process clearly
Present your means of being paid clearly and firmly. Physicians have enough trouble getting paid both by insurance companies as well as patients, without having more hassles to deal with. Let there be no misunderstanding between the coach and the doctor’s staff as to how you will be reimbursed. Also, make sure that there is a specific boundary between you and the doctor’s services.

As a therapist as well as a wellness coach, I am credentialed by major insurance companies, so I bill insurers myself using as much online and direct reimbursement as possible. I do not send out bills to patients, and I ask for payment immediately from those with no insurance.

In conclusion, I believe that wellness coaches will become firmly established as health practitioners, and ultimately we will be integrated into the family practice office, and perhaps sooner for integrative medicine practices. Good Luck!

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The Coaching News column is sponsored by Wellcoaches Corporation, the leader in health, fitness, and wellness coach training and delivery of wellness coaching services, in partnership with ACSM. To learn more about this topic or other topics on coaching health, fitness, and wellness, visit www.wellcoach.com.
Resistance Training During Pregnancy

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In 2002, the American College of Obstetricians and Gynecologists (ACOG) published updated recommendations and guidelines for exercise during pregnancy and the postpartum period. The basis of their recommendations was that clinical and epidemiological studies have not provided evidence that there were adverse maternal or fetal effects for women who engaged in mild to moderate exercise during pregnancy. To the contrary, mild and moderate exercise during pregnancy can have very positive benefits on the mother and infant.

Some of the benefits include: (a) a reduction in pregnancy-related symptoms such as back pain, heartburn, leg cramps, nausea, fatigue, varicosities, and swelling of the extremities; (b) a reduction in the ‘active stage’ of labor (the time from 4-10 cm dilation); (c) an increased sense of maternal well-being; (d) fewer delivery complications because of the endurance gained that is needed to get through the long hours of labor; (e) a reduction in risk of developing pregnancy induced hypertension (PIH); (f) reduction in bone density loss during the lactation state; (g) enhancement of birth weight; and (h) a reduction in risk of developing gestational diabetes (especially in women with at BMI index greater than 33)\(^4,5,6,7\).

The American College of Obstetrics and Gynecologists (ACOG) currently recommends 30 minutes or more of moderate-intensity exercise per day for most days of the week during pregnancy in the absence of medical or obstetric complications. Two new components of the ACOG guidelines merit special attention. First, the updated recommendations promote exercise for previously sedentary pregnant women and those with medical or obstetric complications, but only after having gone through an extensive medical evaluation and clearance. Secondly, the updated guidelines suggest that exercise may play an important role in the prevention and management of gestational diabetes mellitus.

To date, most exercise and pregnancy recommendations have focused on aerobic exercise. But what about resistance training (RT)? In support of the recommendations from the ACOG, the Royal College of Obstetricians and Gynecologists (RCOG) issued a position statement on exercise and pregnancy in January of 2006. A summary of their key points can be found in Table 1. They stated that all women should be encouraged to participate in aerobic and strength-conditioning exercise as a part of a healthy lifestyle during pregnancy.

While there is less evidence on RT, and stretching exercise such as yoga and Pilates in pregnancy, it seems that appropriate RT provides pregnant women with an enhanced level of muscular fitness, which may help compensate for the postural adjustments that typically occur during pregnancy. However, heavy lifting during pregnancy is never appropriate. Additionally, the recommendation from the ACOG is that exercise in the supine position should be avoided, especially after the first trimester.

All RT exercises should be performed in a slow and controlled manner. RT should occur every other day with one day of rest between sessions. One to three sets is appropriate depending on the exercise and the stage of pregnancy. An exercise set consisting of at least 12-15 repetitions without undue fatigue is recommended for the lower body and 10-12 reps for the upper body for the desired goal. If the client cannot perform the desired number of repetitions initially, start with fewer repetitions and build up to the desired number before adding additional weight. Increased recovery time between sets may be needed with fewer repetitions and less weight as time of pregnancy increases.

Heavy lifting should be avoided during pregnancy since it may expose the joints, connective tissue, and skeletal structures of an expectant woman to excessive forces.

Table 1: Royal College of Obstetricians and Gynecologists Key Points for Exercise During Pregnancy

- All women should be encouraged to participate in aerobic and strength-conditioning exercise as a part of a healthy lifestyle during pregnancy.
- Reasonable goals of aerobic conditioning in pregnancy should be to maintain a good fitness level throughout pregnancy without trying to reach peak fitness level or train for athletic competition.
- Women should choose activities that will minimize the risk of loss of balance and fetal trauma.
- Women should be advised that adverse pregnancy or neonatal outcomes are not increased for exercising women.
- Initiation of pelvic floor exercises in the immediate postpartum period may reduce the risk of future urinary incontinence.
- Women should be advised that moderate exercise during lactation does not affect the quantity or composition of breast milk or impact fetal growth.

These recommendations were produced on behalf of the Guidelines and Audit Committee of the Royal College of Obstetricians and Gynaecologists by: Dr BB Bell MD FFMRCS, Dr P Coffey FFMRCS, Dr MM P Donovan FFMRCS, Dr MJ J Holt FFMRCS. The final version is the responsibility of the Guidelines and Audit Committee of the RCOG. Valid until January 2006 unless otherwise indicated. The Source: Royal College of Obstetricians and Gynaecologists. Exercise in pregnancy. RCOG Statement No. 4 - January 2006. 1-6. (Accessed July 19, 2006 from http://www.rcog.org.uk/printindex.asp?PageID=1666&file=PDF)
As with all exercise programs, precautionary measures should be taken prior to and during RT. All prenatal populations should obtain a clearance from their physician prior to beginning an aerobic or RT exercise program. One of the most often used screening tools, the PAREMED-X for pregnancy, is available to download from the Canadian Society for Exercise Physiologists at http://www.csep.ca/pdfs/parmed-xpreg.pdf.

It is also recommended that women who have never participated in RT not initiate a program during pregnancy. Absolute and relative contraindications to exercise during pregnancy and the postpartum period as recommended by the American College of Obstetrics and Gynecologists (ACOG) are pregnancy-induced hypertension, preterm rupture of membranes, preterm labor during the prior or current pregnancy, incompetent cervix or cervical placement, persistent second- or third-trimester bleeding, placenta previa, and intrauterine growth retardation. Relative contraindications are chronic hypertension, thyroid function abnormality, cardiac disease, vascular disease, and pulmonary disease. Indications to stop exercising include abdominal pain, dizziness, and vaginal bleeding.

In closing, the pregnant mother must be aware of her limitations and exercise within those limitations. She should also know the contraindications to exercise and the signs and symptoms to stop exercising. If properly educated on the appropriate exercise to perform during pregnancy, the mother and her baby can enjoy the benefits of exercise, even light resistance exercise throughout her entire pregnancy. Readers are encouraged to read Fit to Deliver, An Exercise Program for You and Your Baby by Karen Nordahl, Susi Kerr, and Carl Petersen for more explicit instructions on RT exercises during pregnancy.

Table 3: Recommendations Regarding Resistance Training during Pregnancy

- Medical advice and physician recommendations should be obtained prior to resistance training during pregnancy.
- Resistance training for all pregnant women may not be appropriate. If women have any of the contraindications to aerobic exercise as proposed by American College of Obstetrics and Gynecology they should not participate in resistance training.
- Women who have never participated in resistance training should not initiate one during pregnancy.
- Women should be encouraged to breathe normally during resistance training, breath holding reduces oxygen delivery to the placenta.
- Heavy resistance should be avoided since it may expose the joints, connective tissue, and skeletal structures of an expectant woman to excessive forces. An exercise set consisting of at least 12-15 repetitions without undue fatigue is recommended.
- As training accuracy is broad initially by increasing number of repetitions and, subsequently, by increasing resistance. Resistance training on machines if preferred to free-weights because machines can be more easily controlled and require less skill.

As established in 1977, NOCA is the leader in setting quality standards for credentialed organizations. Through its annual conference, regional seminars, and publications, NOCA serves its membership as a clearinghouse for information on the latest trends and issues of concern to practitioners and organizations focused on certification, licensure, and human resource development.

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CAAHEP to Finalize Academic Standards and Guidelines for Personal Fitness Training Programs

Finally, the Committee on Accreditation for the Exercise Sciences (www.coaes.org) has submitted a final draft version of standards and guidelines for academic programs in Personal Fitness Training. A public comment period was made available through the Commission on Accreditation of Allied Health Education Programs’ Web site (www.caahcep.org). Because ACSM is a sponsoring organization of the CoAES, this information was disseminated previously through Certified E-News, the ACSM Web site, as well as through ACSM’s Sports Medicine Bulletin (SMB) both to current certified professionals and ACSM members. CAAHEP is hosting an open hearing on the proposed standards and guidelines on Friday, January 26. This hearing may have already occurred by the time you receive this newsletter. Please visit either www.coaes.org or www.caahcep.org for the latest updates on this process. If the standards and guidelines are approved, interested academic institutions can begin submitting “Request for Accreditation Services” forms in the spring of 2007.
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SELF-TEST #1 (1 CEC): The following questions were taken from “Training for Independence” published in this issue of ACSM's Certified News, pages 2-4.

1. Any person who is reasonably healthy or has their health problems controlled may safely participate in an exercise program provided that:
   A. Their doctor has contacted you regarding their health status.
   B. Their exercise prescription adheres to the FITT principle and takes into account their medical history.
   C. Their immediate family has expressed their approval.
   D. They have slept well and taken their medications prior to exercise.

2. Sarcopenia is the term for:
   A. Normal aging.
   B. Unusual aging effect.
   C. Muscle tissue loss.
   D. Muscle tissue gain.

3. The most dramatic effect of muscle loss is:
   A. Clothes no longer fit well.
   B. Increase in blood sugars.
   C. Weight gain.
   D. Loss of physical independence.

4. True or False: It is possible to be overcautious with a strength training prescription and assist functional muscle loss.

5. True or False: It is possible for a septuagenarian to gain muscle mass and strength at a rate similar to a twenty-five year old when strength training.

SELF-TEST #2 (2 CECs): The following questions were taken from “Successful Resistance Training for Arthritis” published in this issue of ACSM's Certified News, pages 5-6.

1. An acute stage of arthritis can be identified by all except:
   A. Joint pain
   B. Fatigue
   C. Permanent joint damage
   D. Swelling

2. People who have severe RA in the wrist or hand may benefit from this piece of equipment:
   A. Exercise machines
   B. Elastic tubing
   C. Free-weights
   D. None of the above

3. Which of the following is not a guideline when performing isometric exercises?
   A. Hold the muscle contraction for 10-12 seconds
   B. Between each exercise, rest for 15-60 seconds
   C. Start with 1-3 repetitions of the exercise
   D. When using resistance bands, use the thickest band

4. True or False: Resistance exercise programs using predominately closed kinetic chain exercises in the upper extremity are recommended.

5. True or False: Osteoarthritis (OA) is also known as “wear and tear arthritis.”

SELF-TEST #3 (1 CEC): The following questions were taken from “Resistance Training During Pregnancy” published in this issue of ACSM's Certified News, pages 8-9.

1. Which of the following recommendations regarding resistance training during pregnancy is false?
   A. Women who have never participated in resistance training should not initiate a training program during pregnancy.
   B. Heavy resistance should be avoided since it may expose the joints, connective tissue, and skeletal structures of an expectant woman to excessive forces.
   C. An exercise set consisting of at least 12-15 repetitions without undue fatigue is recommended.
   D. As training occurs, overload initially by increasing resistance, and subsequently by increasing the number of repetitions

2. True or False: Resistance training on machines during pregnancy is preferred to free-weights because machines can be more easily controlled and require less skill.

3. According to the American College of Obstetricians and Gynecologists an absolute contraindication to aerobic exercise during pregnancy is:
   A. Severe anemia
   B. Poorly controlled Type 1 Diabetes
   C. History of extremely sedentary lifestyle
   D. Preeclampsia/pregnancy-induced hypertension

4. In the absence of either medical or obstetric complications, the American College of Obstetricians and Gynecologists suggests that pregnant women should:
   A. Accumulate 30 min or more of moderate exercise on most days, if not all, days of the week
   B. Accumulate 60 min or more of moderate exercise on most days, if not all, days of the week
   C. Accumulate 60 min or more of vigorous exercise on most days, if not all, days of the week
   D. Accumulate 30 min or more of vigorous exercise on most days, if not all, days of the week

5. The American College of Obstetricians and Gynecologists advises to avoid exercise in this position as much as possible. This position should especially be avoided after the first trimester.
   A. Prone
   B. Upright
   C. Semi-inclined
   D. Supine
Resistance Training... Continued from Page 1

mass, especially in the upper body, was a normal part of the aging process (sarcopenia). Resistance exercise helps offset the loss in muscle mass and muscular strength typically associated with normal aging. Resistance training has been shown to modestly lower resting blood pressure. Resistance training may also assist in improving blood lipids, though the evidence is limited at this point. Healthy, elderly individuals who are stronger are at less risk for falls and associated injuries (e.g., fractures). An appropriately designed resistance program can also help maintain/increase strength, flexibility, and balance. It can also have significant cardiovascular benefits. Resistance training plays a vital role in preventing heart attacks by conditioning the cardiovascular system to cope more efficiently with sudden changes in blood pressure and heart rate. There are specific resistance training program design guidelines and safety considerations that should be followed when working with the elderly population. Thomas Mahady, MS, CSCS does an excellent job explaining how resistance training can benefit elderly persons to maintain their independence.

Resistance training has beneficial effects on osteoarthritis and rheumatoid arthritis. John Patzan, BS, CSCS provides the readership with great information on how resistance training helps manage these diseases. Resistance training reverses some of the deconditioning associated with arthritis, alleviates stress on the affected joints, improves functions of daily living, enhances aerobic exercise tolerance, and helps improve quality of life.

Resistance training also has specific benefits for pregnant women. These include reduced back pain, lower risk of pregnancy-induced hypertension and gestational diabetes, and less delivery complications.

Jacalyn McComb, Ph.D., FACSM, has written an excellent article discussing these benefits as well as how to safely and effectively design a resistance training program during pregnancy.

About the Author
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