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#### Health Benefits of Resistance Training

The health benefits of appropriately prescribed long-term (more than 12 weeks) resistance training in older adults--ages 65 and older--are well known. They include improvements in muscle strength and endurance; other possible health benefits include increase in muscle mass, which translates into improvements in functional capacity. In addition, increased weight bearing with resistance training is considered beneficial in improving bone density and combating the effects of osteoporosis. Achieving appropriate levels of function is very important for older adults so they are able to carry out most of the daily living skills necessary to lead independent lives. Due to the fact that muscle wasting (sarcopenia) and weakness, exacerbated by physical inactivity, is prevalent in the aging population, more emphasis has been placed on developing resistance-training programs for older adults. When developing resistance-training programs for this group, important components to consider are the various training-related variables: frequency, duration, exercises, sets, intensity, repetitions, and progression.

In order to continually enjoy improvements in strength and functional capacity, it is important to consistently incorporate progression and variation into the resistance-training program. Progressing and varying one's program commonly involves incorporating the overload principle. The overload principle involves making adjustments to the training variables of the resistance-training program such as frequency, duration, exercises for each muscle group, number of exercise for each muscle group, sets and repetitions. In terms of adjustment, normally the overload principle involves making increases to these variables.

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# Current Comments

*Report on Resistance  
Training in the Older Adult*



## duration defined

Duration describes the length of each training session. In reference to training duration, longer training sessions are not necessarily more effective. If one has an appropriately designed program based on sound training variables, lengthy training sessions are not necessary. In fact, older adults should avoid lengthy training sessions, because they may increase the risk of injury, manifested by extreme fatigue. Present guidelines for resistance training in older adults recommend a range of approximately 20-45 minutes per session. In other words, one should attempt to train for at least 20 but no longer than 45 minutes. This range suggests an approximate average duration of 30 minutes per session.

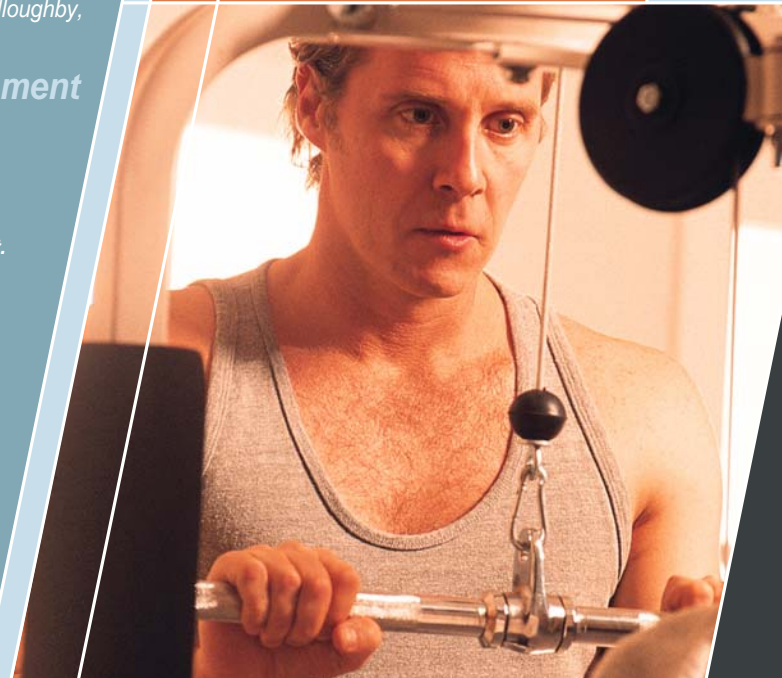
## Frequency

Frequency refers to the number of exercise sessions per week. The traditional recommendation for frequency is to engage in three training sessions per week for individuals primarily seeking improvement in their overall health and fitness capacity. Even though some individuals may be motivated to train more frequently, resistance-training studies with the elderly have indicated a range of two to four days per week to be effective and adequate in improving strength. So the recommendation is that the older individual train at least two days per week but no more than four, suggesting an average training frequency of three days per week. Also, the frequency of exercise should be structured so that there is at least 48 hours between training sessions. An individual could satisfy this requirement with a "total body" routine, meaning that they would exercise all of the chosen muscle groups during each training session two or three days per week. Another approach could be a "split" routine where some of the chosen muscle groups are exercised on one or two days a week while the remaining are exercised on a separate one or two days. This "split" routine approach may not be appropriate for those older individuals who are just beginning their program.

Written for ACSM by Darryn S. Willoughby, Ph.D., CSCS, FACSM

## ACSM Current Comment

*Older adults often have orthopedic issues that contraindicate resistance training of the affected joint(s). Older adults are also at a higher risk of cardiovascular disease, and in many cases have even been diagnosed with it. Therefore, it is critical that the older adult receive prior approval from their physician before participating in resistance training. It should be noted that proper supervision of the individual's resistance-training program, including any testing procedures, by an appropriately trained exercise professional, is highly recommended. It should also be noted that performing maximum strength testing in many older adults is not recommended. Therefore, when strength testing is appropriate, sub-maximum testing protocols for estimating maximum strength are recommended.*



## Resistance Training in the Older Adult An ACSM Report

*Studies have shown improvements in muscle strength employing ranges of one to three sets of each exercise during the training program. Based on current guidelines, it would be recommended that the individual start with one set of each exercise and, depending on individual need, possibly progress up to no more than three sets when the fitness professional deems it appropriate. It should be noted, however, that an average of two sets of each exercise would be beneficial for most individuals. To avoid excess fatigue, a two-to-three minute rest period between sets and exercises is recommended.*

### Resistance-Training Program

Exercise may be categorized as either multi-joint, meaning more than one joint is dynamically involved to perform the exercise (e.g., bench press, shoulder press, leg press), or uni-joint, meaning only one joint is dynamically involved (e.g., bicep curls, triceps extensions, leg extensions). In the older adult, the resistance-training program should focus primarily on multi-joint exercises. Uni-joint exercises are not discouraged entirely but should not make up the majority of exercises within the training program.

Additionally, machines are recommended over free weights (i.e., barbells and dumbbells) due to skill-related and safety factors. As the individual progresses, they can use free-weight exercises appropriate for their level of skill, training status and functional capacity.

If a person is performing both multi-joint and uni-joint exercises for a particular muscle group, it is recommended that the multi-joint exercise(s) be performed before the uni-joint exercise. Additionally, within each resistance-training workout, larger muscle groups (i.e., legs, back, and chest) should be worked before smaller muscle groups (i.e., arms and shoulders).



## Repetitions and Intensity

Repetitions (reps) refer to the number of times an individual performs a complete movement of a given exercise. There is an inverse relationship between intensity and repetitions, indicating that as the intensity increases the repetitions should decrease. Based on previous research, a rep continuum has been established that demonstrates the number of repetitions possible at a given relative intensity. For example, an intensity of 60% relates to 16-20 reps, 65% = 14-15 reps, 70% = 12-13 reps, 75% = 10-11 reps, 80% = 8-9 reps, 85% = 6-7 reps, 90% = 4-5 reps, 95% = 2-3 reps, and 100% = 1 rep.

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## Traditional Muscle Groups

Traditionally, muscle groups are classified as the following: 1) chest, 2) shoulders, 3) arms, 4) back, 5) abdomen, and 6) legs. Specifically, the chest group contains the pectoral muscles, the shoulder group contains the deltoid, rotator cuff, scapular stabilizers and trapezius muscles, the arm group contains the biceps, triceps, and forearm muscles, the back group contains the latissimus dorsi of the upper back and the erector muscles of the lower back, the abdomen group contains the rectus abdominis, oblique, and intercostals muscles, and the leg group contains the hip (gluteals), thigh (quadriceps), and hamstring muscles. In the older adult, it is important to attempt to incorporate all six of these muscle groups into the comprehensive resistance-training program.

## Intensity

Intensity refers to the amount of weight being lifted, and is a critical component of the resistance-training program, considered by many fitness professionals to be the most important training-related variable for inducing improvements in muscle strength and function. In other words, the more weight lifted, the more strength gained. Even though this may not always be the case, the importance of intensity in facilitating strength improvements is well documented. Intensity is often expressed as a percentage of the maximum amount of weight that can be lifted for a given exercise (1RM). For example, if someone who has a maximum effort of 100 pounds on the bench press exercise performs a set with 80 pounds, they would be training at 1RM of 80%. Studies have suggested that older individuals are able to tolerate higher intensities of exercise, up to 85%. However, research has also shown intensities ranging from 65%-75% of maximum to significantly increase muscle strength. Therefore, in order to increase strength while simultaneously decreasing the risk of musculoskeletal injury that often accompanies higher intensities of resistance training, a low-intensity to moderate-intensity range of 65%-75% is recommended.

