

RESISTANCE

EXERCISE FOR THE ELDERLY

We have conducted 2 large-scale strength training studies with adults between 20 and 80 years of age. In the first study (1132 participants), the older adults' (60 to 80 years) improvements in body composition (muscle gain and fat loss) were statistically similar to those of the younger adults (1). Likewise, in the second study (1725 participants), the older adults' (65 to 80 years) improvements in body composition (muscle gain and fat loss) were statistically the same as those of their younger counterparts (2). In both studies, the senior subjects experienced significant increases in muscle strength and size.

Although 80 years is relatively high in the normal age range, we decided to research the effects of resistance exercise on nearly 90-year olds at a life-care retirement community in Orange City, Florida. The 19 study participants (average age 88.5 years) were mostly frail and non-ambulatory residents at the John Knox Village of Central Florida. As presented in Table 1, the residents began the study with an average bodyweight of 130.2 pounds, an average percent fat reading of 22.7 percent, and average lean weight of 100.5 pounds, and an average fat weight of 29.7 pounds. Their initial leg strength (10 repetition maximum leg press) averaged 58.1 pounds, and their initial upper body strength (10 repetition maximum triceps press) averaged 37.9 pounds. Their average shoulder flexibility (abduction) was 100.0 degrees, and their average hip flexibility (flexion) was 29.0 degrees. The participants' starting score for functional independence (activities of daily living) averaged 77.5 points.

The strength training program designed by my colleague Gary Reinl, included only 6 weightstack machine exercises due to the

limited muscle strength, physical abilities, and energy levels of these frail older adults. However, the 6 resistance exercises cumulatively addressed most of the major muscle groups, and targeted those of greatest concern for this population who typically experience lower back pain, upper back pain, and neck pain, and who generally have difficulty getting up from wheelchairs or chairs.

TRAINING EXERCISES

LOW BACK EXTENSION: The low back extension was included to strengthen the erector spinae muscles for improved posture and stabilization, as well as for reduced discomfort in the lower back area.

SEATED ROW: The seated row exercise was included to strengthen the upper body pulling muscles (latissimus dorsi, teres major, trapezius, rhomboids, biceps) for improved posture and reduced discomfort in the upper back area.

NECK EXTENSION AND NECK FLEXION: These exercises were included to strengthen the muscle that hold the head erect and permit neck movements for improved posture and reduced discomfort in the neck area.

TRICEPS PRESS: The triceps press actually works the upper body pushing muscles (pectoralis major, anterior deltoids, triceps), and was



included to strengthen these muscles that are used to help lift the body from a wheelchair or chair.

LEG PRESS: The leg press involves the muscles of the hips (gluteus maximus) and thighs (quadriceps, hamstrings). These are the primary muscles for rising off a wheelchair or chair, as well as for walking and using stairs, which makes the leg press a key exercise in an older adult strength training program.

Research indicates that single-set strength exercise is highly effective for efficiently increasing muscle strength (3,4), especially with older adult trainees (1, 2, 5). For this reason, and to accommodate the participants' limited physical work capacity, our training protocol required 1 good set of each exercise. Because we wanted the subjects to train between 70 and 80 percent of their maximum resistance, our exercise protocol required a weightload that could be properly performed between 8 and 12 repetitions. When 12 repetitions could be completed with correct form, the resistance was increased by approximately 5 percent to provide progressive muscle-building stimulus.

To ensure adequate time for training recovery and muscle remodeling, our exercise protocol called for 2 weekly weight workouts. All of the program participants trained on Mondays and Fridays under close supervision of physical therapists.

Although the clients were regularly requested to perform 6-second repetitions (2 seconds concentric action, 4 seconds eccentric action) they typically moved even more slowly, averaging about 8 seconds per repetition. Due to discomfort and lack of joint flexibility, the participants gradually progressed towards full movement ranges in all of the training exercises.

TRAINING RESULT

Following 14 weeks of strength training (28 exercise sessions), the participants attained significant improvements on all of their assessment areas.

As shown in Table 1, the elderly trainees averaged a 1.0 pound increase in bodyweight, a 2.2 percent improvement in body composition, a 3.8 pound increase in lean (muscle) weight, a 2.9 pound decrease in fat weight, a 47.2 pound increase in leg press strength, a 14.7 pound increase in triceps press strength, a 9.4 degree increase in shoulder flexibility, a 15.3 degree increase in hip flexibility, and an 11.0 point improvement in functional independence score. From a percentage perspective, the basic and brief training program increased leg strength by almost 80 percent, upper body strength by almost 40 percent, shoulder flexibility by almost 10 percent, hip flexibility by more than 50 percent, and functional independence by 14 percent (1 percent per week).

In addition to these relatively remarkable improvements in important health/fitness factors and functional abilities, essentially all of the program participants experienced less physical discomfort (lower back, upper back, neck area). Although these nursing home residents spent significantly less time in wheelchairs and more time walking, the incidence of falls decreased due to their increased strength and improved balance.

As a result of this research study, more than 500 United States nursing homes have implemented our 6-exercise strength training program for their residents. In my opinion, the success of this muscle strengthening program is its simplicity. Even frail elderly individuals are capable of performing 1 set of 6 basic resistance exercises for 8 to 12 repetitions with approximately 75 percent of their maximum resistance. Equally important, this time-efficient training protocol has proven highly effective for increasing muscle strength, muscle mass, joint flexibility, and functional abilities in older adults of all ages. Clearly, sensible resistance exercise is an essential exercise activity for older adults who want to attain functional fitness and maintain a high quality of life. **OSF**

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Table 1. Changes in selected fitness factors for elderly exercisers following 14-weeks of strength training (N=19).

FITNESS FACTOR	PRE-TRAINING	POST-TRAINING	CHANGE
Bodyweight	130.2 lbs	131.2 lbs	+ 1.0 lbs
Percent Fat	22.7 %	20.5 %	- 2.2 %
Lean Weight	100.5 lbs	104.3 lbs	+ 3.8 lbs
Fat Weight	29.7 lbs	26.8 lbs	- 2.9 lbs
Leg Strength	58.1 lbs	105.3 lbs	+ 47.2 lbs
Upper Body Strength	37.9 lbs	52.6 lbs	+ 14.7 lbs
Shoulder Flexibility	100.0 °	109.4 °	+ 9.4 °
Hip Flexibility	29.0 °	44.3 °	+ 15.3 °
Functional Independence Measure	77.5 pts	88.5 pts	+ 11.0 pts

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