Master Builders:  
Senior Strength Training

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STRENGTH TRAINING PROGRAMS are generally directed toward adolescents, middle-aged adults, and athletes, but fitness professionals are discovering a new market to train in the senior citizen. Seniors represent one of the fastest growing segments of population in North America and need exercise programs to help improve and maintain their quality of life (14). Despite any concerns related to strength training in the elderly population, the possible negative consequences may be avoided to a large extent through adequate and age-appropriate strength training.

To extend the quantity and quality of life, age-appropriate strength training for those more than 65 years of age requires individualization and organization of muscular strength and endurance, flexibility, and cardiovascular training (7, 9). Skeletal muscle mass loss with advancing age is termed sarcopenia and is predominantly due to inactivity (7, 11). Strength training in the elderly population may help overcome the negative effects associated with natural aging by improving muscular strength and endurance, basal metabolic rate, vitality, bone mineral density, balance, range of motion, flexibility, and elasticity of muscles, reducing joint pain and risk of falls (4, 7, 9). Thus the purpose of this article is to describe a model for safe and effective individualized exercise programs and the associated special considerations for an elderly population.

Recent research has shown that increased strength leads to improved balance and functional mobility among older populations (13). Reduced mobility increases the risk of weight gain (which in itself can accelerate osteoarthritis of weight-bearing joints and exacerbate symptoms) and impairs activities of daily living (ADLs); (5). Decreased mobility also leads to an increased chance of serious falls, which can be a major problem for the elderly (1, 14). According to the National Safety Council, falls are the most common cause of accidental death among those 55 to 79 years of age (12).

Most important, training provides an outlet for stress as well as improving overall levels of self-confidence and self-esteem (3, 6). Regular participation in a strength training program empowers older adults to achieve a more comfortable and independent lifestyle (3, 4). Another advantage of offering an older-adult program is the opportunity for them to socialize and have fun while exercising (Figure 1). In a follow-up survey given in the Master Builders program, participants cited exercise companionship as one of the main reasons they took the class. Participants also reported increased self-confidence to be one of the most important personal accomplishments they achieved from the class.

Exercise Training Program

Fitness Goals

The following program was designed to develop total body strength of the senior participants. Leg strength was emphasized to
improve overall mobility and endurance. Upper body strength training centered on improving daily activities such as lifting objects, standing from a chair, etc. Additional individualized exercises were included to meet the specific needs of the participants. When training older adults, it is important to remember why they are participating in a resistance training program. They wish to obtain an easier lifestyle via strength, flexibility, mobility, and decreased joint discomfort.

The program developed the participants’ knowledge base for all aspects of fitness. Each class session included a warm-up and stretching session of approximately 10 minutes. Strength training in a circuit format was performed next for a total of 20–25 minutes. Cardiovascular training, abdominal training, and specialized stability training for those with special balance impairments were included for 15–20 minutes (Figure 2). Every session was completed with a 5–10-minute cooldown and stretching (Figure 3). Total class time consisted of an hour and 15 minutes.

**Strength Training**

Resistance training was performed by utilizing variable resistance machines as well as body weight and dumbbells. Muscle groups involved in the program included quadriceps, hamstrings, calves, triceps, biceps, pectorals, latissimus dorsi, serratus anterior, deltoids, trapezius, and abdominals (Figures 4 and 5). Exercises were classified into core, assistance, and isolation groups.

Exercise selection was based on activities of daily living, weight-bearing exercises, postural exercises, and injury prevention exercises. Table 1 lists the exercises selected for particular groups of individuals on the basis of their reported goals, ADLs, and equipment variability. Many exercises were performed to help with strengthening and flexibility of the joints, such as wrist extensors and flexors, ankles, shoulders, hips, and knees.

Use of a circuit training format
allowed for a more organized class. It also allowed for easier understanding for the seniors, most of whom had never lifted weights before. Two or 3 sets were performed at a light-to-moderate intensity for 10–15 repetitions. The nature of this circuit allowed for at least 1 minute’s rest between exercises that taxed similar muscles.

The instructors assigned weights to participants on their individual record sheets. Once participants could complete the assigned weights for at least 15 repetitions with proper technique, loads were increased. New exercises were introduced once the participants felt comfortable with their current program.

**Cardiovascular Training**

Although the resistance training was the main focus of the class, a secondary goal was to decrease coronary artery disease risk factors (6). A variety of aerobic equipment and exercise modes were utilized so participants could choose a best-fit exercise for themselves. A walking track, recumbent bikes, stationary bikes, and an arm ergometer were all available (Figure 6). The participants were encouraged to alternate exercises each session for greater variety and adaptation possibilities.

The use of heart rates for monitoring purposes would have been futile because a high majority of the participants were on medications that influenced exercise...
heart rate. For this reason, the intensity of the aerobic exercise was based on the Rating of Perceived Exertion (RPE) scale. Typical sessions included 15–20 minutes of aerobic exercise at an RPE of 12–16 to ensure a positive physiological adaptation (10).

Special Considerations
Injury prevention was emphasized throughout the class. Strength exercises were individualized to meet the needs of each participant. Overhead lifting was contraindicated because of possible blood pressure elevation due to the nature of the lift as well as the unconscious use of the Valsalva Maneuver (11). Many of the participants exhibited a lack of flexibility during the initial testing. For this reason, stretching exercises were performed both before and after the workout. Following the 10-minute warm-up, flexibility exercises via active and passive stretching were utilized to alleviate muscle imbalances. These exercises were highly beneficial in improving or maintaining mobility and circumventing joint mobility (5).

Initial Screening and Testing
When charged with developing the Master Builders resistance training program for the YMCA of McDonough County, we felt that extensive screening was necessary for liability reasons and for the safety of the participants. Although this initially caused some frustration to the interested individuals, it proved worthwhile in determining which participants were in need of a more closely monitored, hospital-based program. The American College of Sports Medicine guidelines were followed in developing a screening battery. Participants were given a Physical Activity Readiness Ques-

<table>
<thead>
<tr>
<th>Core exercises</th>
<th>Assistance exercises</th>
<th>Isolation exercises</th>
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<tr>
<td>Chair squats*</td>
<td>BW wall push-ups</td>
<td>Leg curl</td>
</tr>
<tr>
<td>Step ups*</td>
<td>Leg press</td>
<td>Leg extension</td>
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<tr>
<td>Bench press</td>
<td>One-arm bent over row</td>
<td>Front raises*</td>
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<tr>
<td>Lat pull-down</td>
<td>Vertical chest press</td>
<td>BW calf raises</td>
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<td></td>
<td>Seated rows</td>
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<td></td>
<td>Dumbbell deadlifts</td>
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<td>Tricep kickbacks</td>
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<td>Shoulder shrugs</td>
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<td>Wrist ex/flex</td>
<td>Obliques</td>
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<td>Pronation/supination</td>
<td>Grip strength exercises*</td>
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*Activities of daily living

Other Exercises performed, but not listed in table: stork stands for improved balance and coordination; Dynaband exercises (seated rows, shoulder raises [front/side], leg press, one arm pull-down, chest press, squats, tricep pushdowns, wrist curls, inversion/eversion, and bicep curls); physiological exercises (postural training, flexibility, and abdominal exercises).
tionnaire (PAR-Q) to fill out prior to participation. A medical clearance was also required. The requirements for participation or exclusion are indicated in Table 2.

For purposes of program validation as well as determining individual progress, testing was performed on weeks 1 and 12. Tests measured cardiovascular endurance, resting heart rate, blood pressure, flexibility, balance, and leg strength. Table 3 illustrates the average pre- and posttest results. Upper body tests were not utilized because of the numerous complications related to arthritic conditions of the shoulder and wrist, as well as time constraints.

Testing protocols may need to be modified when working with older adults. Self-esteem problems may be a concern if testing is viewed as a competition. It is possible that seniors observe what others perform and become discouraged. Emphasis should be placed upon personal improvement. If the instructor approaches testing in a proper manner, the participants may actually encourage each other during the testing sessions.

### Table 2

**Guidelines for Participation**

1. Individuals with a history of cardiac, pulmonary, or metabolic disease must complete a clinical exercise test.
2. Individuals with symptoms of cardiac, pulmonary, or metabolic disease must complete a clinical exercise test.
3. Physician’s release for moderate exercise, including strength training, aerobic conditioning, and flexibility exercise.
4. A physical examination is required. Participants are not eligible if they have
   - Abnormal hemodynamic responses or ischemic changes on an electrocardiogram during an exercise stress test.
   - Poor left ventricular function.
   - Peak exercise capacity below 6 metabolic equivalent of work (METS).
   - Uncontrolled hypertension or dysrhythmia.

### Testing Results

General measures included resting heart rate and blood pressure. Most individuals were under a doctor’s supervision, and many were on medications that affected blood pressure responses during exercise. Resting blood pressure responses were not included in Table 3 because many individuals had their medications changed while on the program.

ADL-specific tests were performed, including chair squats, the sit-and-reach, and the 1/2-mile walk. Flexibility and coordination tests were also administered. They included Apley’s back scratch (Figure 7), neck rotation, neck lateral flexion, and stork stand. These tests were included to detect any limitations that could affect their exercise regimen.

### Coordination and Strength

Posttesting revealed dramatic improvements in coordination, as indicated by the stork stand. On average, participants tripled the length of time they could maintain balance while standing on 1 foot. Scores were similar for both feet. Strength scores as indicated on the chair squat test also showed...
considerable improvements. On average, participants doubled the amount of chair squats they were able to perform before fatigue (Figure 8).

**Flexibility**

The sit-and-reach test revealed dramatic results, with participants gaining an average of more than 3 in. The most dramatic increase was 6 1/2 inches. Improved hamstring and lower back flexibility resulted in participants commenting on daily activities’ being performed with greater ease. Activities that many take for granted, such as tying a shoe or bending to pick something up, rely on flexibility of these muscle groups. Independence is gained by improving basic ADLs such as this.

Participants showed excellent neck flexibility during both trials. All participants passed both the neck rotation and lateral flexion tests. During pretesting, the Apley back scratch test revealed a number of imbalances (2). Most participants performed better when testing in the right hand over the left test. This resulted in an emphasis on flexibility training with special attention placed upon the shoulders. In spite of the fact that the scores were better during posttesting, the subjects in this particular group still have a need for continued work in this area.

### Cardiovascular

The 1/2-mile walk was included to measure cardiovascular endurance. Many of the participants walked on a regular basis before taking this class. Although there was an improvement in the 1/2-mile walk times, the improvements may not be as impressive as if the subjects had been previously untrained. During posttesting, subjective evaluation revealed that the participants were not as motivated for the 1/2-mile walk test as they were for the other tests.

### Special Considerations and Recommendations

#### Class Size

When working with older adults, special considerations should be taken. In the Master Builders class, there were 16 participants ranging from 65 to 89 years of age. Because of the wide variety in age and fitness levels, it is recommended that class size be decreased to no more than 12 partic-

| Table 3 | Average Pre- and Posttest Results |
|-----------------|-----------------|-----------------|
|                | Pretest | Posttest | Change |
| Resting heart rate | 79 bpm  | 70 bpm  | 9 bpm |
| Chair squats | 20.09 | 46.91 | 26.91 |
| Sit-and-reach | 13 in. | 16.9 in. | 3.9 in. |
| Apley’s back scratch | | | |
| Right over left | 2.5 in. | 1.8 in. | 0.7 in. |
| Left over right | 5.1 in. | 4.2 in. | 0.9 in. |
| Neck rotation | pass | pass | — |
| Neck lateral flexion | pass | pass | — |
| 1/2-mile walk test | 9:21 min. | 8:48 min. | 33 s |
| Stork stand | | | |
| Right foot | 7.6 s | 25 s | 17.4 s |
| Left foot | 7.3 s | 24.4 s | 17.1 s |
participants per 2 instructors. Others have proposed the use of even smaller class sizes (15).

**Education**

When instructing an older adult class, emphasis should be placed not only on training, but also on educating the individuals. Explaining the importance of sets and repetitions is the key to helping seniors gain benefits from their strength training experience. Older adults may have a tendency to think more is better. Education should also include explaining the benefits of the exercises selected for the class. To help express the importance of exercise, instructors should provide exercises that help develop a home-based program.

**Adherence and Understanding**

Short-term memory loss serves as a possible challenge for older adults, as well as for the instructors. Dementia is a common effect of the aging process (8). Those individuals who exhibit signs of short-term memory impairment may need additional instruction. This may include further instruction on exercise techniques, exercise names, breathing cues, etc.

One technique that improved exercise adherence and cognition was the use of daily logbooks. Each participant was given daily logs to record weights, repetitions, etc. Extra large print was used on the logs so they were easier to read. It is suggested that with the logbooks that instructors make pictures available to each exercise name to help seniors better identify the exercise. This helped improve memory recall while reinforcing prior instruction given for each exercise.

**Individualization**

Another consideration in planning a program for older adults is their widely varying fitness levels. In this particular group of the Master Builders program, there were a variety of participants with special needs. Some of the more unique needs of this group included an above-the-knee amputation, a patient with a recent hip replacement, bypass surgery patients (with medical clearance), and patients with osteoarthritis and rheumatoid arthritis. Many of the participants were taking medications that affected heart rate and blood pressure, such as beta-blockers and calcium channel blockers. A concerted effort was made to encourage these participants in spite of their formidable limitations.

There are other recommendations for training older adults in terms of cognitive and emotional development. Giving positive encouragement builds self-confidence and self-esteem. Instructors should make a point during the class to speak to each of the class members to let them know that they are important and that their goals and health mean something.

**Patience and Respect**

Patience is a challenge in handling older adults for the participants as well as for the instructors. As previously stated, short-term memory loss is common in this population. This results in a greater need for effective instructor-participant communication. Repeating directions thoroughly and speaking slowly, clearly, and at an appropriate...
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ate volume helps alleviate this challenge.

Above all, respect should be of paramount importance when dealing with older adults. Working effectively means learning from each individual as much as you can. They have much to offer with respect to teaching us, as trainers, the best way to modify exercises and programs to meet their individual needs. With each new participant come new challenges, new opportunities, and greater chances for growth as a trainer.

■ Conclusion

Older adults have different goals, special needs, and unique medication considerations that must all be accounted for when designing programs for strength and fitness. Modifications should be made in order to meet the special needs of each individual. A thorough screening process is essential for determining fitness levels, medications, and special concerns of not only new but also repeat participants. A well-planned training program for older adults will build strength, confidence, a better understanding of exercise principles, and most important, a healthy, independent lifestyle.

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