

Empire Fitness would like to thank Mr Wayne Westcott PhD and www.ssymca.org for the following

Senior Exercise Info

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Seniors Improve Their Golf Game Through Strength Training

Wayne L. Westcott, Ph.D.

An estimated 40 million American men and women play golf each year, and many of these participants are seniors. The good news is that golf is a most interesting athletic activity that requires high levels of both mental concentration and physical skill. The bad news is that many golfers, especially those over age fifty, experience a variety of playing related injuries, typically affecting their hips, back, shoulders, elbows and necks. One reason for the numerous golf injuries is the explosive, body-torquing action required to swing the club for a powerful drive. However, assuming proper swing mechanics, a more likely explanation is the low level of personal fitness and the lack of physical conditioning characteristic of most recreational golfers.

Not surprisingly, many golfers spend their free-time playing golf. When they can't enjoy a game, they may go to the driving range, practice putting, watch golf videos, read golf books, or at least talk about golf. There is a misconception that playing or practicing golf provides some conditioning benefits, but this unfortunately is not the case. Like all sports, you do not get in shape by playing golf; you get in shape to play golf, at least to play golf more safely and successfully.

Most golfers, although always concerned about time away from the course, are willing to do a few stretching exercises to enhance their joint flexibility. However, golfers have traditionally resisted recommendations to try strength training. Regrettably, the popular consensus among golfers is that strength training is more likely to harm their game than help it. They are concerned that strength exercise will give them large, tight muscles that cannot be smoothly coordinated in skilled golf actions. Older golfers also fear that strength training will increase both their bodyweight and their blood pressure, as well as adversely affect medical conditions such as low back pain and arthritis.

Of course, strength training has actually been shown to reduce bodyweight, lower resting blood pressure, alleviate low back pain and ease arthritic pain (Westcott and Guy 1996, Risch 1993, Tufts 1994). For more information we decided to do some specific research studies examining the effects of strength training on golfers and golf performance.

Golf Research Studies

Beginning in the winter of 1995, we conducted four separate studies with a total of 77 golfers (average age 57 years). Each study was eight weeks in length, and completed during the months of January and February when none of the participants were playing golf. All of the subjects trained three days a week (Mondays, Wednesdays and Fridays), and performed one set of 8 to 12 repetitions of 12 Nautilus exercises for the major muscle groups of the body. Table 1 presents this information as well as the practical application of the exercise to the golf swing.

The results of this brief (25 minute) strength training program were nothing short of remarkable. After just two months of strength exercise, these senior golfers experienced significant improvements in their body composition, blood pressure and muscle strength. As shown in Table 2, the participants replaced four pounds of fat with four pounds of muscle, reduced their resting blood pressure by four mm Hg, and increased their muscle strength by almost 60 percent. Those who did strength training alone enhanced their driving power (club head swing speed) by 2.6 mph, and those who did strength training plus a few stretching exercises enhanced their driving power by 5.2 mph.

Due to the better golf performance results obtained by those who did both strength and stretching exercises, we recommend a combination training program. In fact, further research with 155 subjects has shown that combining stretching exercises with strength exercises can produce 20 percent greater strength gains as well as enhanced joint flexibility. We therefore recommend a stretching exercise following each Nautilus exercise for the muscles just worked.

For example, after completing the leg extension exercise perform a 20-second stretch for the front thigh muscles, and after completing the leg curl exercise perform a 20-second stretch for the rear thigh muscles. Doing a strengthening and stretching exercise for each major muscle group should ensure balanced physical development for greater performance power and better body coordination for increased skill refinement.

Although many of the golf study participants had prior golf related injuries, there were no physical problems reported during the playing season following their conditioning program. That is, the golfers who improved their physical fitness reduced their injury risk and actually enjoyed more pain-free playing time than they had experienced in previous years.

Summary

The findings from these four studies showed similar and significant benefits to golfers who participate in a brief program of basic strength exercise. The 77 senior golfers who completed two months of sensible strength training added four pounds of muscle, lost four pounds of fat, reduced their resting blood pressure by four mm Hg, and increased their muscle strength by almost 60 percent. Those who did strength training alone improved their driving power by 2.6 mph, and those who also did stretching exercises improved their driving power by 5.2 mph. All of the program participants were injury free during the following season, even though their improved physical fitness enabled them to play considerably more golf.

Based on these findings, golfer's concerns that strength training will add bodyweight, raise resting blood pressure, aggravate arthritis, cause low back problems, reduce flexibility, impair body coordination, and decrease swinging speed seem unfounded. In fact,

research clearly shows that a simple program of strength and stretching exercises is most desirable for improving physical fitness, reducing injury risk and enhancing playing ability in senior golfers.

Table 1. Machines, muscles and movements for improved golf driving performance.

Nautilus Exercise	Target Muscles	Relevance to Golf Swing
Leg Extension	Front Thigh	Power Production
Leg Curl	Rear Thigh	Power Production
Leg Press	Front Thigh	Power Production
	Rear Thigh	
	Buttocks	
Low Back Extension	Lower Back	Force Transfer - Legs to Upper Body
Abdominal Curl	Front Midsection	Force Transfer - Legs to Upper Body
Rotary Torso	Sides of Midsection	Force Transfer - Legs To Upper Body
Chest Cross/Press	Chest	Swing Action
Super Pullover	Upper Back	Swing Action
Lateral Raise	Shoulders	Swing Action
Biceps Curl	Biceps	Club Control
Triceps Extension	Triceps	Club Control
Neck Extension/Flexion	Neck	Head Stability

Table 2. Changes experienced by senior golfers following eight weeks of either strength training alone or strength training plus stretching exercises (77 subjects).

Factors	Strength Training Only (N = 52)	Strength Training and Stretching (N = 25)	All Participants (N = 77)
Club Head Speed (mph)	+ 2.6	+ 5.2	+ 3.4
Percent Fat (%)	- 2.3	- 1.7	- 2.0
Fat Weight (lbs)	- 4.6	- 3.0	- 4.1
Muscle Weight (lbs)	+ 3.9	+ 4.0	+ 3.9
Mean Blood Pressure (mm Hg)	- 4.4	- 4.8	- 4.5
Muscle Strength (%)	+ 56	+ 56	+ 56

Why Every Senior Should Do Strength Exercise

Wayne L. Westcott, Ph.D.

Please carefully consider the following thirteen health, fitness, and medical reasons for including some sensible strength exercise in your wellness oriented lifestyle.

Benefits of Sensible Strength Training

During the past few years more and more studies have shown that sensible strength training produces many health and fitness benefits especially for older adults. Key research studies, such as those conducted at Tufts University, the University of Maryland and the South Shore YMCA, have provided a wealth of data on the positive physiological responses to basic programs of strength exercise. Based on presently available research, consider the following thirteen reasons why every older adult should perform regular strength exercise.

Benefit One: Avoid Muscle Loss

Adults who do not strength train lose between 5-7 pounds of muscle every decade (Forbes 1976, Evans and Rosenberg 1992). Although endurance exercise improves our cardiovascular fitness, it does not prevent the loss of muscle tissue. Only strength exercise maintains our muscle mass and strength throughout our mid-life and senior years.

Benefit Two: Avoid Metabolic Rate Reduction

Because muscle is very active tissue, muscle loss is accompanied by a reduction in our resting metabolism. Information from Keyes et al. (1973) and Evans and Rosenberg (1992) indicates that the average adult experiences a 2-5 percent reduction in metabolic rate every decade of life. Because regular strength exercise prevents muscle loss it also prevents the accompanying decrease in resting metabolic rate.

Benefit Three: Increase Muscle Mass

Because most adults do not perform strength exercise, they need to first replace the muscle tissue that has been lost through inactivity. Fortunately, research (Westcott and Guy 1996) shows that a standard strength training program can increase muscle mass by about 3 pounds over an 8-week training period. This is the typical training response for men and women who do 25 minutes of strength exercise 2 or 3 days per week, and represents an excellent return on a time-efficient investment.

Benefit Four: Increase Metabolic Rate

Research reveals that adding 3 pounds of muscle increases our resting metabolic rate by 7 percent, and our daily calorie requirements by 15 percent (Campbell et al. 1994). At rest, a pound of muscle requires about 35 calories per day for tissue maintenance, and during exercise muscle energy utilization increases dramatically. Adults who replace muscle through sensible strength exercise use more calories all day long, thereby reducing the likelihood of fat accumulation.

Benefit Five: Reduce Body Fat

Campbell and his co-workers (1994) found that strength exercise produced 4 pounds of fat loss after 3 months of training, even though the subjects were eating 15 percent more

calories per day. That is, a basic strength training program resulted in 3 pounds more lean weight, 4 pounds less fat weight, and 370 more calories per day food intake.

Benefit Six: Increase Bone Mineral Density

The effects of progressive resistance exercise are similar for muscle tissue and bone tissue. The same training stimulus that increases muscle proteins also increases bone proteins and mineral content. Menkes et al. (1993) demonstrated significant increases in the bone mineral density of the femur bone (upper leg) after 4 months of strength exercise.

Benefit Seven: Improve Glucose Metabolism

Hurley (1994) has reported a 23 percent increase in glucose utilization after 4 months of strength training. Because poor glucose metabolism is associated with adult onset diabetes, improved glucose metabolism is an important benefit of regular strength exercise.

Benefit Eight: Increase Gastrointestinal Transit Speed

A study by Koffler et al. (1992) showed a 56 percent increase in gastrointestinal transit speed after 3 months of strength training. This is a significant finding due to the fact that delayed gastrointestinal transit time is related to a higher risk of colon cancer.

Benefit Nine: Reduce Resting Blood Pressure

Strength training alone has been shown to significantly reduce resting blood pressure (Harris and Holly 1987). Another study (Westcott and Guy 1996) has revealed that strength plus aerobic exercise is highly effective for improving blood pressure readings. After 2 months of combined exercise, the program participants dropped their systolic blood pressure by 4 mm Hg. and their diastolic blood pressure by 3 mm Hg.

Benefit Ten: Improve Blood Lipid Levels

Although the effects of strength training on blood lipid levels needs further research, at least 2 studies (Stone et al. 1982, and Hurley et al. 1988) have revealed improved blood lipid profiles after several weeks of strength exercise. It is important to note that improvements in blood lipid levels are similar for both endurance and strength exercise (Hurley 1994).

Benefit Eleven: Reduce Low Back Pain

Several years of research on strength training and back pain conducted at the University of Florida Medical School has shown that strong low-back muscles are less likely to be injured bow-back muscles. A recent study by Risch (1993) found that low-back patients had significantly less back pain after 10 weeks of specific (full - range) strength exercise for the lumbar spine muscles. Because 80 percent of all Americans experience low back problems, it is advisable for all adults to properly strengthen their low back muscles.

Benefit Twelve: Reduce Arthritic Pain

According to a recent edition of the Tufts University Diet and Nutrition Letter (1994), sensible strength training eases the pain of osteo and rheumatoid arthritis. This is good news, because most men and women who suffer from arthritic pain need strength exercise to develop stronger muscles, bones, and connective tissue to improve joint function.

Benefit Thirteen: Reduce Depression

A Harvard University study (Singh 1997) found that seriously depressed seniors responded most favorable to a basic program of strength exercise. After 10 weeks of strength training, 87 percent of the program participants no longer met the criteria for clinical depression, even though they received no other treatment. Apparently, increasing muscle

strength and physical functionality is highly effective for improving emotional states in previously depressed senior men and women.

Summary of Strength Training Benefits

There are 13 physiological reasons why older adults should perform regular strength exercise. On a more basic level, it is important to realize that proper strength training may help us look better, feel better, and function better. Understand that our skeletal muscles serve as the engine, chassis, and shock absorbers of our bodies. Consequently, strength training is an effective means for increasing our physical capacity, improving our athletic performance, reducing our injury risk, enhancing our personal appearance, and improving our self-confidence.

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Seniors Respond As Well As Young Adults to Strength Exercise

Wayne L. Westcott, Ph.D.

You have probably heard that strength exercise provides many important health, fitness and functional benefits to those who regularly perform this type of physical activity. However, you may have incorrectly assumed that these life changing physiological adaptations apply primarily to young or middle-aged adults. That is, you may feel that by the time you reach your senior years it is too late to reverse the degenerative effects of the aging process.

You should be pleasantly surprised to learn that a large research study recently revealed essentially equal effects among young, middle-aged and older adults who completed an eight-week program of basic strength exercise. The study was conducted by Wayne Westcott and Jane Guy (1996) at the South Shore YMCA in Quincy, Massachusetts, and included over 1,100 participants. There were actually 238 subjects between 21 and 40 years of age, 553 subjects between 41 and 60 years of age, and 341 subjects between 61 and 80 years of age. All of the participants trained in small groups under close supervision in a carefully controlled research setting.

The training program consisted of two components, namely 25 minutes of endurance exercise for the cardiovascular system and 25 minutes of strength exercise for the muscular system. The endurance exercise was performed on treadmills and stationary cycles at a moderate level of exertion (about 75 percent of maximum heart rate). The strength exercise was performed on 12 Nautilus machines with a moderate level of resistance (about 75 percent of maximum weightload). The strength exercises and target muscle groups are presented in Table 1.

Each strength exercise was performed for one set of 8 to 12 repetitions in good form. Good form required that each repetition was executed at a controlled movement speed (6 seconds), through a full movement range, with proper posture and continuous breathing.

Although all of the subjects trained for two months, 716 exercised three times per week (Monday, Wednesday and Friday), whereas 416 exercised two times per week (Tuesday and Thursday). Other than the training frequency, all aspects of the exercise program were identical for all of the study participants.

Results

To determine the age-related results for this standard program of strength and endurance exercise, we assessed all of the subjects' body composition and blood pressure before and after the two-month training program.

Body Composition Comparisons

All three age groups (21-40 years, 41-60 years, 61-80 years) began with similar bodyweights (173-180 lbs), similar fat weights (45-49 lbs) and similar lean weights (127-131 lbs). As you will note in Table 2, the younger adults lost 4.9 pounds of fat, the middle-aged adults lost 4.4 pounds of fat and the older adults lost 4.1 pounds of fat, which averaged less than a one-pound difference among the three age groups.

The results were even closer for changes in lean weight which represented the subjects' muscle gain. As shown in Table 2, the younger and middle-aged adults added 2.3 pounds of muscle, and the older adults added 2.4 pounds of muscle. In other words, the 61-80 year old group replaced muscle tissue at the same rate as their younger counterparts between 21-60 years of age. Based on the findings from this large-scale study, strength training appears to be equally effective for improving body composition in adults of all ages.

Blood Pressure Comparisons

As might be expected, the older adults entered the exercise program with higher resting blood pressure readings (143/80 mm Hg) than the middle-aged subjects (128/79 mm Hg) and younger adults (121/76 mm Hg). In fact, the average beginning systolic blood pressure for the older participants exceeded the generally accepted hypertensive level of 140 mm Hg. As presented in Table 2, the 21-40 year olds reduced their resting blood pressure by 4.5 points systolic and 3.2 points diastolic; the 41-60 year olds reduced their resting blood pressure by 2.5 points systolic and 2.4 points diastolic; and the 61-80 year olds reduced their resting blood pressure by 6.2 points systolic and 3.7 points diastolic.

Although they started the exercise program with the highest blood pressure readings, the senior subjects made the greatest improvement. It is particularly noteworthy that the older adults reduced their resting systolic blood pressure by 6 mm Hg, from 3 points above the hypertensive level to 3 points below the hypertensive level, after just eight weeks of training. These results indicate that the blood pressure benefits derived from a basic program of strength and endurance exercise is at least as effective for improving blood pressure readings in seniors as in younger adults.

Conclusion

The large number of subjects in this comparative research study render the results generalizable to the three different age groups (21-40 years, 41-60 years, 61-80 years). Although the younger adults, middle-aged adults and older adults all made significant improvements in their body composition and blood pressure, the senior subjects experienced the largest increase in muscle mass and the largest reduction in resting blood pressure. Based on these findings, men and women between 61 and 80 years of age respond at least as well to sensible strength training as younger adults between 21 and 60 years of age. It is never too late to reap the important health, fitness and functional benefits of regular and reasonable strength exercise.

Table 1. Strength exercises and target muscle groups.

Exercise	Target Muscle Groups
Leg Extension	Quadriceps
Leg Curl	Hamstrings
Leg Press	Quadriceps, Hamstrings, Gluteals
Double Chest	Pectoralis Major
Super Pullover	Latissimus Dorsi
Lateral Raise	Deltoids
Biceps Curl	Biceps
Triceps Extension	Triceps
Low Back Extension	Erector Spinae
Abdominal Curl	Rectus Abdominis
Neck Flexion	Neck Flexors
Neck Extension	Neck Extensors

Table 2. Changes in body composition and blood pressure by age groups.

Age Group	Change In Fat Weight	Change In Lean Weight	Change In Systolic BP	Change In Diastolic BP
21-40 Years	- 4.9 lbs*	+ 2.3 lbs*	- 4.5 mm Hg*	- 3.2 mm Hg*
41-60 Years	- 4.4 lbs*	+ 2.3 lbs*	- 2.5 mm Hg*	- 2.4 mm Hg*
61-80 Years	- 4.1 lbs*	+ 2.4 lbs*	- 6.2 mm Hg*	- 3.7 mm Hg*

* Statistically significant change ($p < 0.01$)

Strength Training Increases Height, Improves Posture and Enhances Balance In Older Adults

Wayne L. Westcott, Ph.D.

As we age we inevitably experience a variety of degenerative processes that, left unchecked, have a negative effect on how we look, feel and function. The pervasiveness of these physical problems may be best illustrated by low back pain, which for the past several decades has adversely affected four out of every five Americans. While we are not aware of the corresponding ratio for upper back discomfort, our observations indicate that it is a prevalent problem among senior men and women, and is becoming increasingly more common in middle-aged adults.

Because there are many probable causes for tissue damage in the lower back, upper back and neck areas, it is unlikely that any simple or single solution will successfully remediate or prevent all such problems. Nonetheless, two related factors are typically identified as major contributors to dysfunction and discomfort in the spinal area. Both of these predisposing factors, muscle weakness and poor posture, are associated with sedentary lifestyles. Unfortunately, these common problems appear to be additive, as muscle weakness can lead to poor posture and poor posture can result in muscle weakness.

Over the past 15 years, research from the University of Florida Medical School has demonstrated that properly performed strength training can reduce or even eliminate lower pack pain in a large percentage of patients (Risch 1993). While there is less research regarding discomfort in the upper back and neck regions, it is logical to assume that greater muscle strength and better body posture should be beneficial.

Posture Study

To examine this possibility, we recently conducted a research study to determine whether a basic program of strength, endurance and stretching exercises could improve posture, increase standing height, and reduce discomfort in the spinal column.

Training Program

Thirty-four men and women (average age 45 years) completed a 10-week training program that included about 20 minutes of aerobic activity (stationary cycling and treadmill walking), 12 strength exercises and 12 stretching exercises. The study participants performed one set of 8 to 12 repetitions of the following Nautilus exercises for their major muscle groups.

Strength Exercise	Major Muscles
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Leg Extension	Quadriceps
Seated Leg Curl	Hamstrings
Chest Cross	Pectoralis Major
Chest Press	Pectoralis Major, Triceps
Pullover	Latissimus Dorsi, Teres Major
Lateral Raise	Deltoids
Biceps Curl	Biceps
Triceps Extension	Triceps
Low Back Extension	Erector Spinae
Abdominal Curl	Rectus Abdominis
Neck Flexion	Neck Flexors
Neck Extension	Neck Extensors

Each strength exercise was followed by a 20-second stretch for the muscle group just worked. For example, the leg extension exercise was followed by a 20-second stretch for the quadriceps muscles and the leg curl exercise was followed by a 20-second stretch for the hamstrings muscles.

In addition to the basic program of strength, endurance and stretching exercise, all of the program participants received relevant information, verbal cues, and positive reinforcement on proper posture. Also two specific stretches for the chest and shoulder muscles were performed to address the round shoulder - forward head posture so prevalent among older adults.

Research Results

Each study subject was carefully assessed before and after the 10-week training period for bodyweight, body composition (muscle weight and fat weight), standing height and head position. Although the participants did not change their bodyweight, they did achieve a 1.5 percent improvement in body composition, resulting from a 2.4-pound muscle gain and a 2.9-pound fat loss. Their standing height increased by 0.2 inches and their head position improved by 0.4 inches. As shown in Table 1, these exercise-related changes represented statistically significant improvements in body composition and posture components.

Based on these research results, it would appear that a basic program of strength, endurance and stretching exercise is effective for replacing muscle, decreasing fat, increasing standing height and improving head position. Just as important, written questionnaires completed by the participants revealed an overwhelmingly positive response to the training program. Their comments included noticeable improvements in personal posture, reduced neck and upper back discomfort and less lower back pain.

Balance Study

Although poor balance is not a painful condition, it is a condition that can cause considerable pain and disability resulting from a fall. And while there are many physiological and neurological factors that affect our balance, perhaps none is more foundational than strong muscles.

To test this premise, we recently conducted a research study to determine whether a basic program of strength, endurance and stretching exercises could improve standing balance.

Training Programs and Results

Using the same training protocol as the posture study, 87 men and women (average age 51 years) completed a 10-week fitness program that included 20 minutes of aerobic

activity, 12 Nautilus exercises and 12 stretching exercises. Each study subject was carefully assessed before and after the 10-week training period for bodyweight, body composition (muscle weight and fat weight), and standing balance (single leg stand with eyes closed).

As in the posture study, the participants added a significant amount of muscle (2.7 pounds) and lost a significant amount of fat (2.4 pounds). They also improved their balance score by 50 percent, increasing their single leg stand from 8.6 seconds to 12.9 seconds.

Based on these research findings, we feel justified in adding better balance to the growing list of benefits associated with sensible strength training. Apparently, stronger muscles play a major role in our ability to maintain postural stability and to resist gravitational forces that may otherwise lead to loss of balance and physical injury.

We conclude that basic strength training, as part of a general exercise program, is highly effective for increasing height, improving posture and enhancing balance in older adults.

Table 1. Physical changes resulting from 10 weeks of basic strength, endurance and flexibility exercise (34 subjects).

	Percent Fat	Lean Weight	Fat Weight	Height	Forward Head
Pre-training	28.2%	133.9 lbs.	54.7 lbs.	65.1 in.	2.0 in
Post-training	26.7 %	136.3 lbs.	51.8 lbs.	65.3 in.	1.6 in.
Change	+1.5*	+2.4 lbs.*	-2.9 lbs.*	+0.2 in.	-0.4 in.

* Statistically significant change ($p < 0.05$).

Strength Training Changes Lives of 90-Year Old Nursing Home Patients

Wayne L. Westcott, Ph.D.

The assisted living patients selected to participate in our strength training study were typical of many nursing home residents. They were old, weak and relatively immobile. As a general description, our new research participants were characterized by a dropped head, rounded shoulders and a curved back. Most had low back pain, and spent the majority of their time in a bed, chair or wheelchair.

Nonetheless, after talking with senior exercise advocate Gary Reinl, the administrators and medical team at the John Knox Village Senior Living Center in Orange City, Florida were convinced that these deliberated individuals had the potential to change their lives for the better through a simple and sensible program of strength exercise. In fact, they challenged us to implement a safe, efficient and effective strength training program that would enable these older adults to feel better, function better, and ambulate better. Basically, they were hoping that after 14 weeks of strength training these special seniors would have less low back pain and spend fewer hours in their wheelchairs.

We accepted the challenge, and introduced a five-machine Nautilus program to the physical therapists and elderly patients who would participate in this innovative research experiment. All of the subjects were assessed for body composition, muscle strength, joint flexibility and functional ability before and after the 14-week training period.

The participants completed two brief strength training sessions per week, working one-on-one with a physical therapist. Each exercise was performed for one set of 8 to 12 repetitions to the point of moderate muscle fatigue. When 12 repetitions were completed in good form (slow movement speed and full movement range), the weightload was increased by about five percent. Although each strength exercise required less than 90 seconds of physical exertion, the training sessions typically took between 15 to 20 minutes depending upon the participant's physical ability to transfer on and off the equipment. Table 1 presents the Nautilus exercises, target muscles and desired outcomes of the strength training program.

Results

The results of the assisted living patients strength training study surpassed everyone's expectations. As presented in Table 2, the elderly exercisers achieved significant improvements in body composition, muscle strength, joint flexibility and functional ability over the 14-week training period. Specifically, they replaced about four pounds of lean (muscle) weight, reduced about three pounds of fat weight, increased their leg strength by more than 80 percent, increased their upper body strength by almost 40 percent, enhanced their joint flexibility by 30 percent, and improved the functional independence measure (FIM Score) by almost 15 percent.

Even more impressive than the objective outcomes of the strength training program were the personal observations by the medical professionals and administrative directors. Dr. Pradeep Mathur, John Knox Village Medical Director, reported that the exercise participants exhibited better physical and mental fitness, more endurance, and less low back pain.

Gary Brcka, Assisted Living Administrator, cited examples of how the strength training program helped patients. In one case, an 87-year-old woman with compression fractures in her lower spine wore a back brace to reduce pressure and pain. After completing the exercise program, she discontinued wearing the back brace claiming that she no longer needed it.

Carol Sullivan, John Knox Village Director of Nursing, noted that with more muscle strength some patients spent less time in wheelchairs, and one patient no longer needed to use a wheelchair.

Donna Califano, PTA and On-Site Program Director, reported that the patients enjoyed doing the strength exercises because they felt they were really working and seeing progress as their weightloads increased.

Perhaps the most remarkable lifestyle change was experienced by Esther Duvall, an 84 year old assisted living patient who claimed to hurt all the time. After completing the strength training program, her functional capacity and walking ability improved so much that she actually left the nursing home and rejoined her husband in the independent living campus.

Fitness, Function and Finance

As the exercise participants increased their physical fitness, they concurrently improved their functional abilities. That is, they were able to perform various activities associated with daily living that they were unable to do before the strength training program. These restored abilities included walking, washing, dressing, brushing, combing and other activities characteristic of personal independence.

Of course, this is beneficial to both the participants and the providers. It is estimated that every point increase in a patient's FIM Score reduces the cost of care by 50 cents a day. An 11-point FIM Score gain therefore represents a cost of care reduction of \$5.50 per day. Multiplying this by the 19

subjects in our study, we have a daily cost of care reduction of about \$105. On a yearly basis, this represents almost \$40,000, which is about 2.5 times the cost of the Nautilus machines.

Conclusion

Based on the results of our 14-week strength training study with frail nursing home residents, we conclude that performing one set of 8 to 12 repetitions on five selected Nautilus machines is a safe, efficient and effective means for enabling elderly exercisers to attain:

- Improved body composition
- Increased muscle strength
- Enhanced joint flexibility
- Increased functional ability

Our findings further indicate that senior living facilities that provide well-designed and properly supervised strength training programs may expect:

- Increased patient independence
- Improved cooperation between patients and care givers
- Reduced health care costs
- Enhanced potential for attracting new residents and professional staff

Table 1. Nautilus machines, target muscles and desired outcomes of the strength training program.

Nautilus Exercise	Target Muscles	Desired Outcome of the Training Program
Neck Machine	Neck Extensors Neck Flexors	Able to hold head erect for enhanced breathing, swallowing, speaking, seeing, and comfort.
Low Back Machine	Spinal Erectors	Able to hold torso erect for better posture, physiological function, ambulation, and comfort.
Compound Row Machine	Latissimus Dorsi Teres Major Trapezius Rhomboids Biceps	Able to hold shoulders square for better posture, physiological function and comfort.
Triceps Press Machine	Triceps Pectoralis Major Deltoids	Able to push against chair arms to assist legs in rising from and lowering to wheelchairs or chairs.
Leg Press Machine	Quadriceps Hamstrings Gluteus Maximus	Able to lift body up from and down to wheelchairs or chairs. Able to walk without losing balance or falling.

Table 2. Changes in body composition, muscle strength, joint flexibility and functional ability for elderly exercisers following 14 weeks of strength training (N=19).

Parameter	Pre-Training	Post-Training	Percent Change	Difference
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Bodyweight	130.2 lbs	131.2 lbs	+ 1.0 lbs	0.8 %
Percent Fat	22.7 %	20.5 %	- 2.2 %*	9.7 %
Fat Weight	29.7 lbs	26.8 lbs	- 2.9 lbs*	9.8 %
Lean Weight	100.5 lbs	104.3 lbs	+ 3.8 lbs*	3.8 %
Leg Press	58.1 lbs	105.3 lbs	+ 47.2 lbs*	81.2 %
Triceps Press	37.9 lbs	52.6 lbs	+ 14.7 lbs*	38.8 %
Shoulder Flexibility	100.0 deg	109.4 deg	+ 9.4 deg*	9.4 %
Hip Flexibility	29.0 deg	44.3 deg	+ 15.3 deg*	52.8 %
FIM Score	77.5 pts	88.5 pts	+ 11.0 pts*	14.2 %

* Statistically significant difference (p<0.05).

How to Interest Seniors In Strength Training

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As you have read in previous editions of the *Nautilus Newsletter for the Senior Living Community*, there are numerous compelling health and fitness related reasons why every older adult should do sensible strength exercise. Unfortunately, many senior men and women are not aware of these life-changing strength training benefits. Of those who are, many do not feel knowledgeable enough about strength training to attempt this new activity on their own or at a potentially intimidating fitness facility.

Worse yet, some seniors have mistakenly assumed that strength training will increase both their resting blood pressure and their bodyweight. Both of these misconceptions are categorically incorrect. In fact, research clearly reveals that seniors who complete a well-designed strength training program experience lower resting blood pressures and lower bodyweights. An eight-week study of more than 1,100 adults and seniors showed significant reductions in both resting blood pressure and bodyweight (Westcott and Guy 1996). Notably, the participants above age 60 reduced their systolic blood pressure by six mm Hg and their diastolic blood pressure by four mm Hg. They also added two and one-half pounds of muscle and lost four pounds of fat for a six and one-half pound improvement in their body composition.

So how do we reach and teach the senior community with respect to reasonable strength exercise? Based on our 15 years of research with senior strength training, we recommend the following guidelines for motivating mature adults to exercise appropriately.

Reaching Techniques

1. *Educate the Senior Community.* We publish frequent articles on the benefits, principles and practicals of strength training for seniors in the local newspaper. We also do occasional radio and television shows, as well as presentations to senior centers, church groups and service organizations (Rotary, Kiwanis, Lions, etc.). We have found that the more seniors hear about strength exercise, the more likely they are to try it.

2. *Motivate the Senior Community.* Upon gaining their confidence, our next step is to provide an early evening meeting to present and discuss our strength training program with interested seniors. We begin with a motivational slide presentation featuring our senior exercisers, and proceed to an informative question - and - answer session. This is followed by a tour of our Nautilus Fitness Center, an introduction of our instructional staff, and an opportunity to join one of our upcoming senior strength training classes.
3. *Share Essential Information.* During our first class session, we obtain participant release forms, medical history questionnaires, personal fitness goals, and other exercise-related information. In exchange, we provide a variety of materials on strength training, endurance exercise and healthy nutrition, as well as recording cards for workout data and eating behaviors.
4. *Perform Fitness Assessments.* During our second-class session we conduct basic fitness assessments on all of our class members to determine their performance improvements over the 10-week training period. These simple assessments include bodyweight, body composition, resting blood pressure, muscle strength and joint flexibility. Test results are shared with the participants to set realistic fitness goals and to design appropriate exercise programs.
5. *Provide Individualized Training.* Based on the participants' personal information and fitness assessment results, we develop individualized exercise programs and training protocols. This includes monitoring each person's heart rate response and perceived exertion level during the exercise session and adjusting the workout accordingly.
6. *Give Personal Attention.* We offer as much encouragement, feedback and reinforcement as possible to our senior exercise participants. We want them to know that they are performing the exercises properly and that their training efforts are appreciated. We also try to answer all of their questions regarding their exercise program and fitness progress.
7. *Ensure Active Participation.* We do our best to keep our seniors actively involved at their own ability level in all of our fitness class components, including the warm-up, endurance exercise, strength training, stretching exercise and cool-down segments. Although we encourage social interaction, the emphasis in our senior fitness program is personal physical activity.
8. *Provide Follow-up Information and Training.* Re-assessment is an important aspect of a meaningful fitness program, especially for seniors who need reassurance that their exercise efforts were productive. We therefore perform follow-up fitness tests, and provide additional training to enable the program graduates to function more independently should they decide to join our fitness facility. Thankfully, most of our senior class members choose to do so.

Teaching Techniques

Because interaction between fitness instructors and senior exercisers is so important, please consider the following 10 teaching tools for facilitating favorable training experiences on the part of your participants.

1. *Clear Training Objectives.* Tell the trainees exactly what you expect them to accomplish during the exercise session.
2. *Concise Instruction and Precise Demonstration.* Tell and show the participants exactly how you want them to perform their exercises.
3. *Attentive Supervision.* Observe the seniors carefully as they train to assure them that they are performing the exercises properly and productively.

4. *Appropriate Assistance.* Whenever necessary help participants position themselves properly, execute an exercise movement or complete a final repetition. Make yourself available to assist their training efforts.
5. *One Task At A Time.* Project a single task at a time, adding a follow-up procedure only after the first task has been successfully accomplished.
6. *Gradual Progression.* Progress slowly with senior exercisers, emphasizing small steps on a workout-by-workout basis rather than large increases in training intensity or duration.
7. *Positive Reinforcement.* Provide lots of positive comments, personal compliments and pats on the shoulders to reinforce your participants' exercise efforts.
8. *Specific Feedback.* For more meaningful positive reinforcement add specific feedback information to your encouraging comments. Giving your participants a reason for your compliment increases its value as an educational and motivational tool.
9. *Careful Questioning.* Because seniors may not volunteer information that could be useful in their program design, ask them interactive questions regarding their exercise experiences and training responses.
10. *Pre and Post Exercise Dialogue.* Try to sandwich each participant's workout experience between a brief arriving and departing dialogue. Welcoming seniors to each workout and obtaining their perceptions at the end of each training session is time well spent on everyone's behalf.

Conclusion

Persuading sedentary seniors to participate in a sensible program of strength exercise is not an easy task, as many have unfavorable misconceptions about strength training. Nonetheless, we believe that by incorporating the time-tested reaching and teaching strategies presented here, you will have considerably more success in educating and motivating seniors to experience the benefits of regular and reasonable strength exercise.

Reference

Westcott, W. and Guy, J. (1996). A physical evolution: Sedentary adults see marked improvements in as little as two days a week. *IDEA Today*, 14 (9): 58-65.