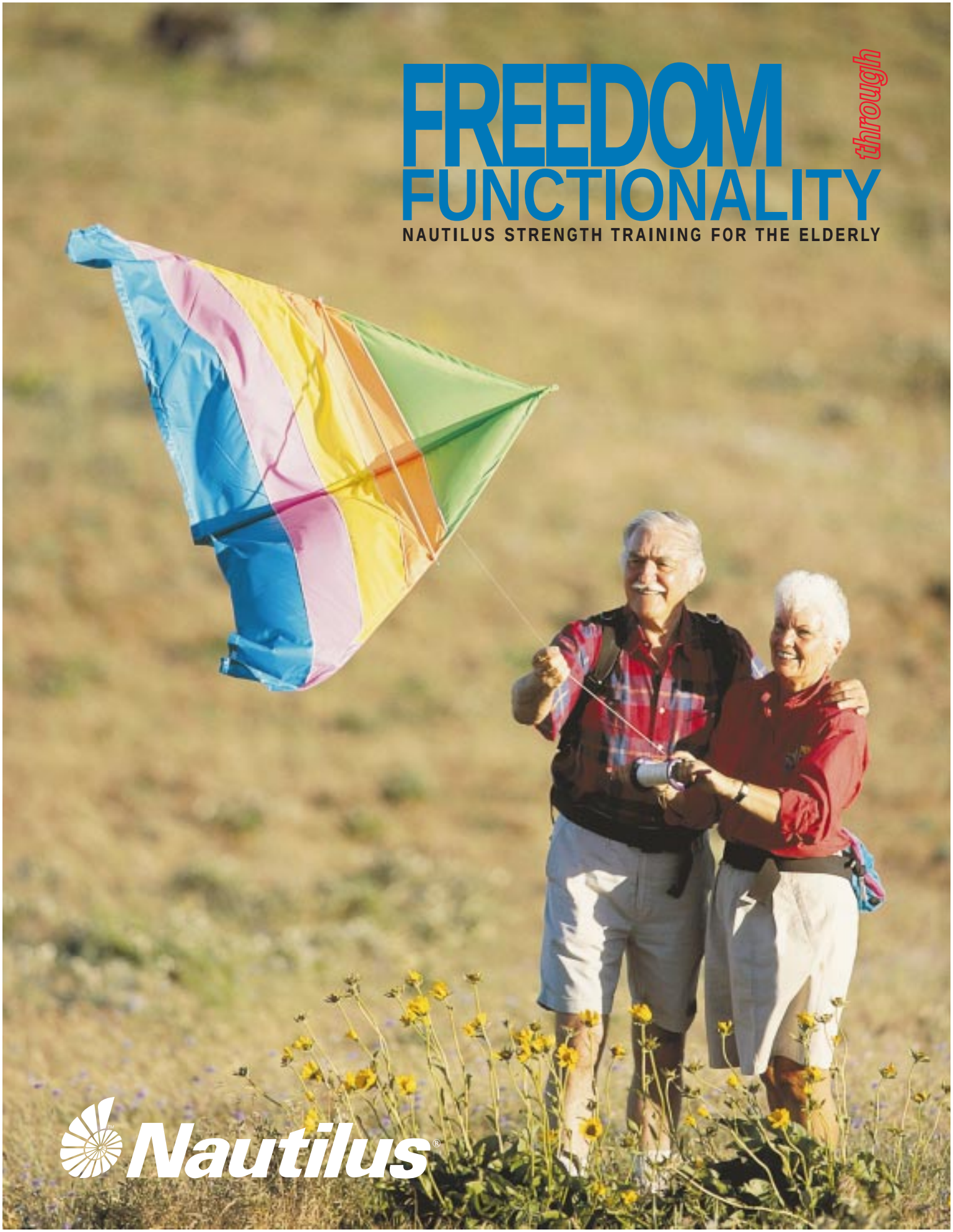
FREEDOM
through
FUNCTIONALITY
NAUTILUS STRENGTH TRAINING FOR THE ELDERLY
Nautilus®

FREEDOM through FUNCTIONALITY

NAUTILUS STRENGTH TRAINING FOR THE ELDERLY

Table of Contents

Nautilus

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Introduction

Ask your residents what's important and they'll tell you it's the freedom and independence that comes with being fully functional. Unquestionably, improved functionality leads to significant increases in the performance of everyday lifestyle tasks, that residents must complete. The Nautilus *FREEDOM THROUGH FUNCTIONALITY* program is modeled after a recent study that proves the most effective way to increase elderly residents' independence and functionality is a regular program of strength training. Nautilus® Strength Training Machines were exclusively used in this study.

The study also demonstrated that improved functionality of residents can lead to significant reductions in cost. Based upon just 19 participants in the conditioning program the, study indicates that it is possible to reduce costs by $38,141 annually. If 100 residents were involved, the cost savings could total $200,750 annually.

"A six-exercise Nautilus strength training program is a safe, efficient, and effective means for improving body composition, muscle strength, joint flexibility, and functional capacity in activities of daily living in elderly nursing home patients."

Wayne Westcott., Ph.D.
Freedom Through Functionality Study Facilitator

"Based upon just 19 participants in the conditioning program the study indicates that it is possible to reduce cost by $38,142 annually. If 100 residents were involved the cost savings could total $200,750 annually."

The Study (ABSTRACT)

Strength Training Elderly Nursing Home Patients

Wayne Westcott, Ph.D., Gary Reinl, Donna Califano, PTA

Nineteen elderly nursing home patients (14 women, 5 men, mean age 88.5 years) completed 14 weeks of physician-prescribed and therapist supervised strength training. Participants averaged 2 workouts per week, and performed 1 set of 8 to 12 repetitions of the following Nautilus exercises:

- leg press
- triceps press
- compound row
- low back
- neck extension
- neck flexion


Leg Press


Triceps Press


Compound Row


Low Back


4-Way Neck

All subjects were assessed for body composition, muscle strength, joint flexibility, and functional capacity in activities of daily living before and after the strength training program.

Mean changes were:

- **9.7%** reduction in percent fat (22.7 to 20.5%)
- **9.8%** decrease in fat weight (29.7 to 26.8 lbs.)
- **3.8%** increase in lean weight (100.5 to 104.3 lbs.)
- **81.2%** increase in 10 RM leg press (58.1 to 105.3 lbs.)
- **38.8 %** increase in 10 RM triceps press (37.9 to 52.6 lbs.)
- **9.4%** increase in shoulder abduction range (100.0 to 109.4 deg.)
- **52.8%** increase in seated hip flexion range (29.0 to 44.3 deg.)
- **14.2%** improvement in functional independence measurement (FIM) score (77.5 to 88.5 pts.)
- **71.4%** increase in mobility distance (122.2 to 209.4 ft.)
- **36.4%** reduction in falls (1.1 to 0.4 falls)

All of the pre- to post-training changes were statistically significant ($p<.05$) except for the incidence of falls. There were no injuries associated with the exercise program. Based on these findings it is concluded that a six-exercise Nautilus strength training program is a safe, efficient, and effective means for improving body composition, muscle strength, joint flexibility, and functional capacity in activities of daily living in elderly nursing home patients.

Strength Training Elderly Nursing Home Patients

Wayne Westcott, Ph.D., Gary Reinl, Donna Califano, PTA

During the past decade, several studies have established that strength training is a safe and beneficial activity for adults of all ages

- Fiatarone et al. 1990
- Butts and Price 1994
- Campbell et al. 1994
- Pratley et al. 1994
- Westcott and Guy 1996

The basic studies showed that strength exercise is effective for increasing muscle strength and size in

- senior men (Frontera et al. 1988)
- senior women (Nelson et al. 1994)
- and even nursing home residents (Fiatarone et al. 1994)

Other research, much of which was conducted with senior subjects, revealed that strength training:

- reduced resting blood pressure (Harris and Holly 1987)
- improved blood lipid profiles (Stone et al. 1982)
- increased gastrointestinal transit speed (Kroffler et al. 1992)
- enhanced glucose utilization (Hurley 1994)
- alleviated low back pain (Risch et al. 1993)
- increased bone mineral density (Menkes et al. 1993)
- eased arthritic discomfort (Tufts 1994)
- relieved depression (Singh et al. 1997)
- improved post coronary performance (Stewart et al. 1988)

Based partly on the success of these studies, we designed a strength training protocol for elderly nursing home residents who were essentially non-ambulatory. Our research objectives were to determine how a 5-station strength training program would affect the patients' body composition, muscle strength, joint flexibility, and functional ability.

Subjects

We started the study with 27 physician-referred patients (18 women, 9 men) who resided at the John Knox Village Campus including the Med Center, Assisted Living, and Independent Living facilities in Orange City, Florida. Nineteen subjects (14 women, five men) completed the 14-week strength training program. Two residents passed away during the course of the study, four encountered illnesses that prevented them from training, and two discontinued the program for personal reasons. These losses were for reasons unrelated to the program or study. On average, the subjects were 88.5 years of age, 63.7 inches in height, and 130.0 pounds in weight. However, the men were considerably taller (66.9 inches to 62.6 inches) and heavier (164.7 pounds to 117.7 pounds) than the women.

Methods

Testing Protocol

All of the subjects were assessed for body composition, muscle strength, joint flexibility, and functional ability before and after the 14-week training period. All body composition assessments were conducted by the same investigator using ultrasound (sonar) technology, with fat thickness readings taken at the mid-thigh and suprailiac sites on the right side of the body.

Subjects were tested for lower body muscle strength (quadriceps, hamstrings, gluteus maximus) by the 10-repetition maximum Nautilus leg press, and for upper body muscle strength (triceps, pectoralis major, anterior deltoids) by the 10-repetition maximum Nautilus triceps press. All testing repetitions were performed in approximately six seconds, with two seconds for each lifting movement (concentric muscle action) and four seconds for each lowering movement (eccentric muscle action).

Joint flexibility was assessed with an electronic goniometer at the shoulder joint and the hip joint. Shoulder abduction was measured from the side position (arm vertical) to the highest point attained without torso movement. Hip flexion was measured from the seated position (thigh horizontal) to the highest point attained with knee bent. All flexibility assessments were taken on the right side of the body.

Our assessment of functional ability included each subject's Functional Independence Measurement (FIM) score (a standardized system for rating patient independence in performing daily living activities), mobility distance, and frequency of falls.

All data was analyzed for differences in pre-training and post-training values by means of paired t-tests. The level of statistical significance was set at $p<0.05$.

Training Program

The strength training program lasted 14 weeks with an average of two exercise sessions per week. Each workout consisted of six strength exercises performed on five Nautilus machines as presented in Table 1.

Training Exercise	Target Muscles	Nautilus Machine
Leg Press	Quadriceps Hamstrings Gluteus Maximus	Leg Press
Triceps Press	Triceps Pectoralis Major Anterior Deltoids	Triceps Press
Seated Row	Latissimus Dorsi Teres Major Biceps Middle Trapezius Rhomboids	Compound Row
Trunk Extension	Erector Spinae	Low Back
Neck Flexion	Sternocleidomastoids	Four-Way Neck
Neck Extension	Upper Trapezius	Four-Way Neck

Table 1. Training exercises, target muscles and Nautilus machines.

Each exercise was performed for one set of 8 to 12 repetitions to the point of momentary muscle fatigue. When 12 repetitions were completed with proper exercise form the weightload was increased by 5 percent.

Our definition of proper exercise form was relatively slow movement speed and full movement range. All training repetitions were performed in approximately six seconds, with two seconds for each lifting movement (concentric muscle action) and four seconds for each lowering movement (eccentric muscle action). All training repetitions were executed through the full range of joint movement as determined by the subject's functional ability and freedom from discomfort.

The duration of the training sessions varied depending upon the subject's physical and cognitive abilities, but typically required between 15 and 20 minutes for completion. The actual time spent doing resistance exercise averaged six minutes per workout, as each of the six training exercises required about one minute of muscle activity (average 10 repetitions at approximately six seconds each).

Every exercise session was individually supervised by a trained instructor from the physical therapy staff. The instructors helped subjects get on and off the Nautilus machines, set seat positions, and pinned the weight stacks at the appropriate resistance level. They also provided participants with encouragement, feedback, and reinforcement throughout the workout.

Each 15 to 20 minute exercise session consisted of six exercises on five different 2ST machines, including the Compound Row.

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Results

Results of the strength training program were determined by analyzing the subjects' changes in body composition, muscle strength, joint flexibility, and functional ability.

Body Composition

The subjects' mean body weight changed from 130.2 to 131.2 pounds over the 14-week training period, representing a 1.0 pound increase. However, their mean percent fat decreased from 22.7 to 20.5 percent, for a 2.2 percent reduction in this parameter.

The subjects' mean fat weight decreased from 29.7 to 26.8 pounds, for a 2.9 pound fat loss. At the same time, their mean lean weight increased from 100.5 to 104.3 pounds, representing a 3.8 pound gain in lean tissue. It is assumed that most of the additional lean weight was in the form of muscle. All of the body composition results are presented in Table 2.

Table 2.
Mean changes in body weight and body composition over the 14-week training period (N = 19).

Parameter	Pre-Training	Post Training	Difference	Percent Change
Body weight	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%

**Statistically significant difference (p<0.05).*

Muscle Strength

Both lower body strength and upper body strength improved as a result of the 14-week training program. As shown in Table 3, the subjects' mean 10 RM Nautilus leg press increased 47.2 pounds from 58.1 to 105.3 pounds. Their mean 10 RM triceps press increased 14.7 pounds, from 37.9 to 52.6 pounds.

Table 3.
Mean changes in lower body strength and upper body strength over the 14-week training period (N = 19).

Parameter	Pre-Training	Post-Training	Difference	Percent Change
Leg Press (10 RM)	58.1 lbs.	105.3 lbs.	+47.2 lbs.*	81.2%
Triceps Press (10 RM)	37.9 lbs.	52.6 lbs.	+14.7 lbs*	38.8%

**Statistically significant difference (p<0.05).*

Joint Flexibility

All joint flexibility measures improved over the 14-week training period. The subjects increased their shoulder abduction by 9.4 degrees (100.0 to 109.4 degrees), and their hip flexion by 15.3 degrees (29.0 to 44.3 degrees). The joint flexibility changes are presented in Table 4.

Table 4.
Mean changes in flexibility measured at the shoulder joint and hip joint (seated) over the 14-week training period (N = 19).

Parameter	Pre-Training	Post-Training	Difference	Percent Change
Shoulder Abduction	100.0 deg.	109.4 deg.	+9.4 deg.*	9.4%
Hip Flexion	29.0 deg.	44.3 deg.	+15.3 deg.*	52.8%

**Statistically significant difference (p<0.05).*

Functional Ability

The subjects' mean Functionality scores increased from 77.5 to 88.5, for an 11.0 point improvement over the 14-week training period. Their mean mobility distance increased from 122.2 to 209.4 feet, for a gain of 87.2 feet. The mean number of falls decreased from 1.1 during the previous 14 weeks to 0.7 during the training period, for a 0.4 reduction. The functional ability results are displayed in Table 5

Table 5.
Mean changes in functional ability measures over the 14-week training period (N = 19).

Parameter	Pre-Training	Post-Training	Difference	Percent Change
Functionality Score	77.5 pts.	88.5 pts.	+11.0 pts.*	14.2%
Mobility Distance	122.2 ft.	209.4 ft.	+87.2 ft.*	71.4%
Falls	1.1	0.7	0.4	36.4%

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

Discussions

The physician-referred patients who participated in our strength training study were mostly non-ambulatory individuals who initially required considerable assistance getting on and off the Nautilus machines. Nonetheless, after the introductory exercise sessions, they followed standard Nautilus training protocol. That is, they performed one set of each exercise with a weightload that produced momentary muscle fatigue within 8 to 12 controlled repetitions. This required a relatively high exercise effort, as 8 to 12 repetitions to fatigue represents about 70 to 80 percent of maximum resistance.

Because there were no injuries associated with the exercise program, it appears that standard strength training procedures are well tolerated by elderly nursing home residents. Unrelated illnesses forced four participants to discontinue training, while two patients dropped out due to personal reasons. The 19 subjects who completed the 14-week strength training program reported that it was a positive experience and planned to continue their exercise sessions. According to the lead trainer, patients liked the challenge of serious strength training and saw much more improvement than previous resistance exercise with light cuff weights.

The six training exercises were selected specifically for non-ambulatory nursing home residents for the following reasons:

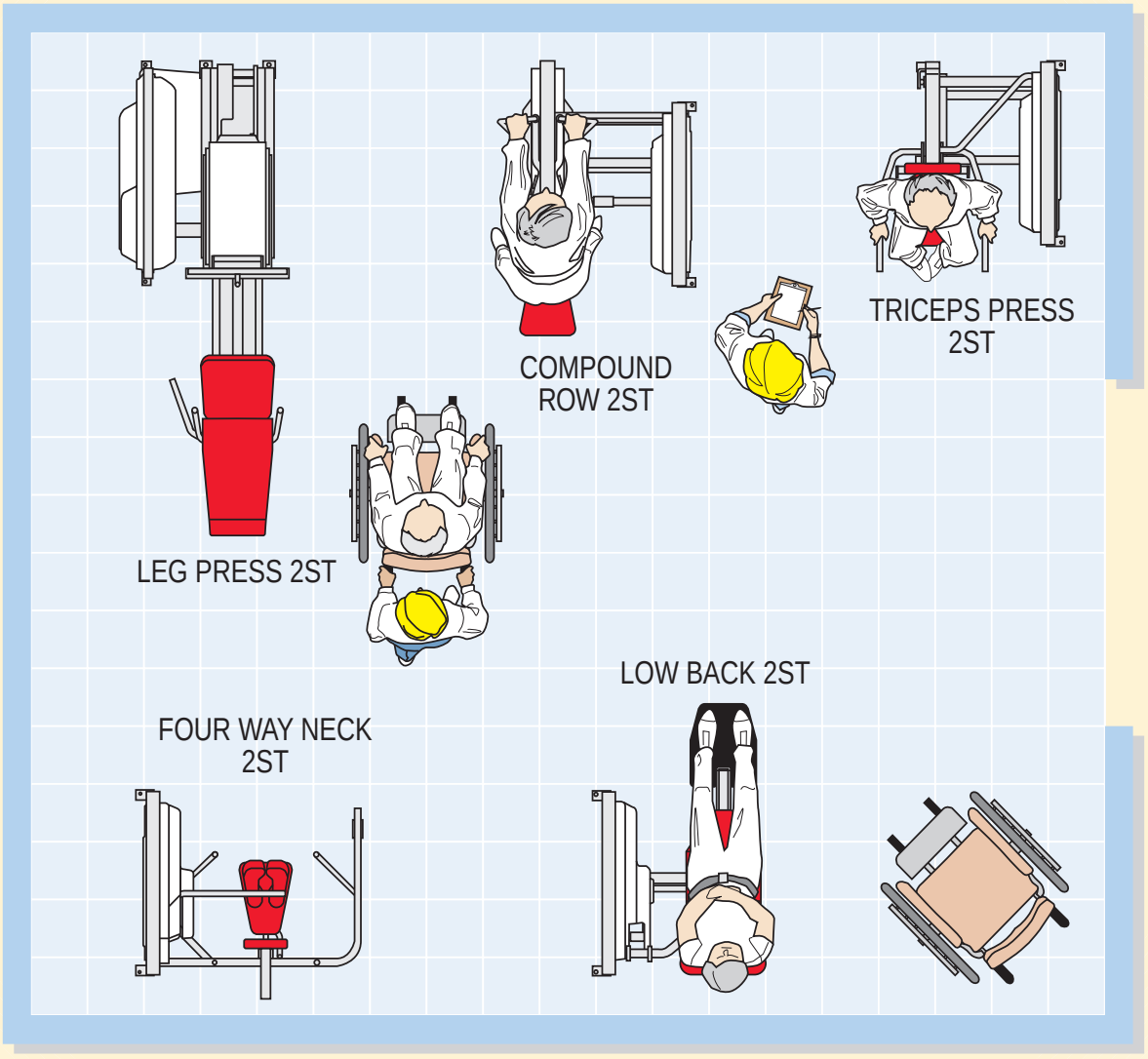
Nautilus Leg Press

The Nautilus Leg Press machine involves the quadriceps, hamstrings and gluteus maximus muscles used for moving between seated and standing positions, such as getting in and out of wheelchairs.

Strengthening these large leg and hip muscles should therefore improve the patients' ability to lift and lower their bodies.

Because these muscles are also essential for standing and walking, the leg press is the foundational exercise in our strength training program. It is noted that the Nautilus leg press exercise is performed with the torso fully supported and at a right angle to the line of force through the legs. This prevents resistance loading on the spinal column which could be contraindicated for frail, elderly individuals.

THE FLOORPLANS



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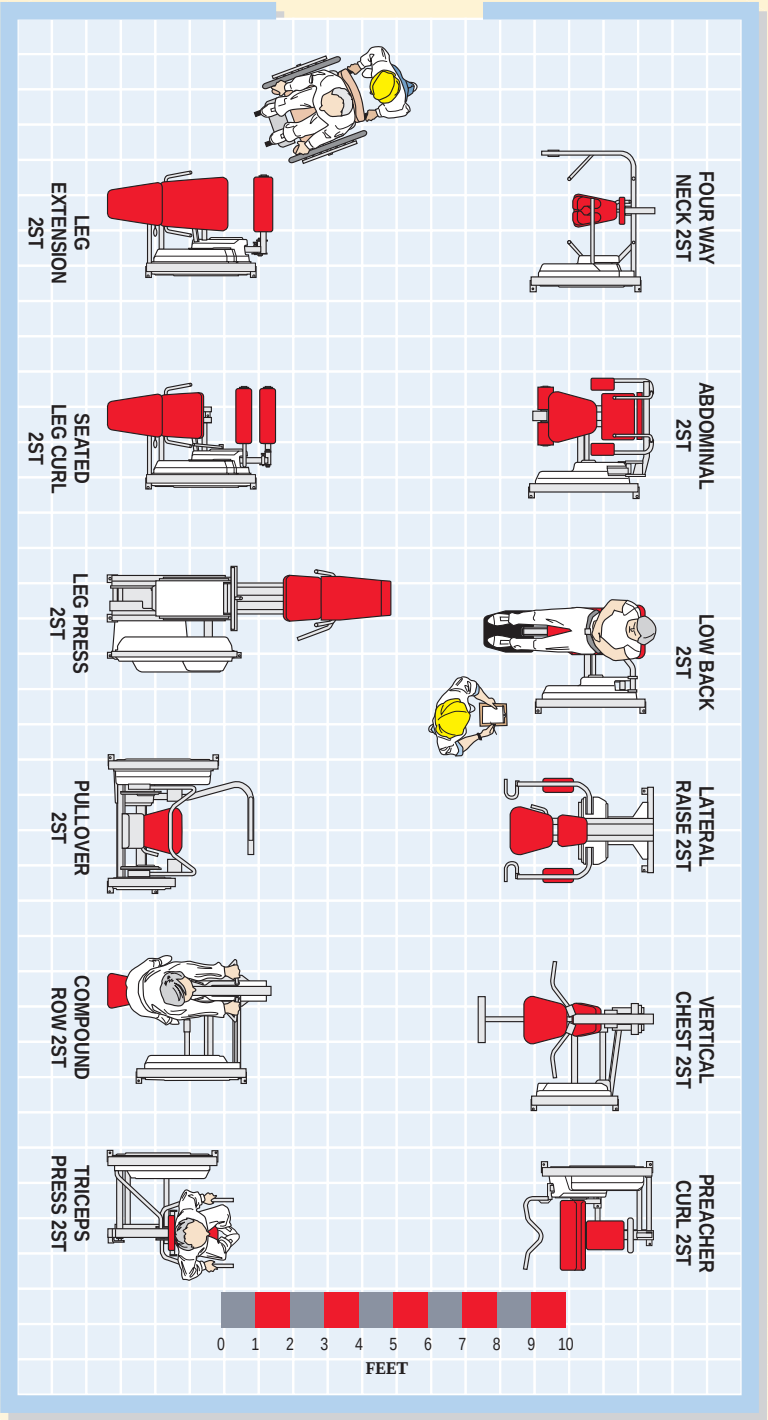
THE FLOORPLANS



21 FT. X 39 FT. = 819 SQ. FEET

Triceps Press

The Nautilus Triceps Press machine targets the upper body pushing muscles, namely the triceps, pectoralis major, and anterior deltoids. These muscles are used in conjunction with the legs when raising from a wheelchair.

Patients typically lean forward, place their hands on the chair armrests, and push hard as they attempt to stand.

Of course, they use these same muscles to control their lowering movement when getting back into the wheelchair.

Compound Row

Because it is important to attain balanced muscle development, our third exercise is the Nautilus Compound Row machine. This exercise addresses the upper body pulling muscles (latissimus dorsi, teres major, biceps, posterior deltoids), as well as the shoulder retraction muscles of the upper back (rhomboids and middle trapezius).

An intended outcome of the compound row exercise is improved breathing through better posture and reduced round-shoulderness, which appears to be very common among nursing home residents.

Low Back

Our fourth exercise is the Nautilus Low Back machine, which essentially isolates the trunk extensor muscles. Strengthening the erector spinae muscles should improve the patients' posture and counteract their typical slumped forward position. In addition, strong low back muscles have been shown to reduce discomfort in this vulnerable area of the body. Researchers at the University of Florida Medical School (Risch et al. 1993) have reported

significant increases in low back strength and significant decreases in low back pain after 10 weeks of specific strengthening exercise for the lumbar spine muscles.

Their training protocol was identical to that used in this study, namely, one set of 8 to 12 repetitions to the point of momentary muscle fatigue, performed twice a week.

Four-Way Neck

The final exercise in our strength training program are neck extensions (upper trapezius) and neck flexions (sternoclecidomastoids), both of which are performed on the Nautilus Four-Way Neck machine. One of the most prevalent problems among nursing home residents is the head-down position that makes it difficult for many patients to swallow, speak, and see effectively.

Strengthening the upper trapezius muscles should help remedy this situation, enabling the patients to hold their heads erect more of the time. Strengthening the sternocleidomastoid muscles should enhance anterior-posterior muscle balance, and improve the patients' ability to turn their heads.

According to the instructional staff, the five resistance exercises were relatively easy for the subjects to learn and perform. With only six minutes of actual exercise time, all of the patients were able to do the strength training program. Although transition time between exercises increased the session duration to 20 minutes for some subjects, the training program required a relatively small time commitment.

Previous strength training studies with older adults have produced significant improvements in body composition (Frontera et al. 1988, Fiatarone et al. 1990, Campbell et al. 1994, Nelson et al. 1994). Unlike this study, however, these training programs incorporated three sets of each exercise. Because our subjects made significant and similar body composition changes over a 14-week training period (about 4 pounds more lean weight and 3 pounds less fat weight), by performing only one set of each exercise, single-set protocols should also be given consideration for older adult strength training programs. Single-set protocols may be particularly advisable for elderly nursing home patients who are in poor physical condition.

Training intensity appears to be the critical factor for stimulating strength development, as one set of 8 to 12 repetitions to momentary muscle fatigue produced significant strength gains in the program participants. The 47.2 pound increase in leg press 10 RM represented about an 80 percent increase in lower body strength, and the 14.7 pound increase in triceps press 10 RM represented about a 40 percent increase in upper body strength. The practical result for most patients was less difficulty getting in and out of wheelchairs, and for one patient the ability to ambulate without a wheelchair.

Although the subjects did not perform stretching exercises during the course of the study, their joint flexibility improved significantly in both upper body and lower body sites. Apparently, the full-range strength training was responsible for increasing shoulder abduction by about 10 percent and hip flexion by about 50 percent. For nursing home patients with limited mobility, enhanced range of joint movement can have important practical applications in the performance of daily tasks, such as putting on and taking off shoes and clothing.

It is most encouraging to see elderly nursing home patients improve their body composition, increase their muscle strength, and enhance their joint flexibility. However, these physiological changes become more relevant if they result in greater functional capacity and personal independence for activities of daily living. The significantly higher Functionality scores attained by the patients after the 14-week strength training program was therefore an important finding. The 11 point increase represented a 14 percent improvement in functional independence, indicating considerably less need for caregiver assistance.

An 11 point functionality gain therefore represents a cost of care reduction of $5.50 per day. Multiplying this by the 19 subjects in the study, we get a daily cost of care reduction of $104.50.

While this is good news for both patients and staff, higher functionality scores also have financial benefits. It is estimated that every point increase in a resident's functionality score reduces cost of care by 50 cents a day. An 11 point Functionality score gain therefore represents a cost of care reduction of $5.50 per day. Multiplying this by the 19 subjects in the study, we get a daily cost of care reduction of $104.50. On a yearly basis, this equals $38,642. Because the strength training equipment costs less than half of this amount, the program would appear to provide desirable financial dividends.

Of course, if 100 residents were involved in the strength training program, the annual cost of care reduction could easily exceed $280,000.

Other indicators of improved functional capacity were mobility distance, which increased by 71 percent and incidence of falls, which decreased by 36 percent. All of these factors taken together attest to the practical benefits of the basic strength training program.

Because this was one of the first studies to examine physician prescribed and therapist supervised strength exercise in a nursing home facility, we interviewed several of the medical staff and a few of the participants to ascertain their perceptions of the strength training program. The following information was obtained from one-on-one interviews with the lead researcher on the final day of the program.

Dr. Pradeep Mathur - Medical Director, John Knox Village

Dr. Mathur was very pleased with the patients' progress, especially their improved functional capacity for the activities of daily living. According to Dr. Mathur, the program participants exhibited better physical and mental fitness, more endurance and less low back pain. From a practical perspective, he found the strength training program easy to implement in the nursing home environment. He noted that the strength exercises were simple to teach and uncomplicated to perform, with gradual progressions to facilitate muscle development in elderly individuals.

Gary Brcka - Assisted Living Administrator, John Knox Village

Mr. Gary Brcka is a hands-on administrator who is actively involved with the assisted living residents. He cited two examples in which the strength training program helped patients. In one case, an 87 year old female with compression fractures of the lower spine had been fitted for a brace to reduce pressure and pain. She participated in the strength training program without any discomfort and has discontinued wearing the brace, claiming that she did not need it any longer.

In another case, a double amputee had difficulty transferring from her wheelchair to her bed, and she had severe postural problems. After completing the strength training program, she now gets around with greater ease, sits more upright in her chair, and breathes with less difficulty.

Mr. Brcka stated that other residents have shown notable improvements in gait, stability, and stamina. He also said that he would like to have all of the assisted living residents do strength training on a regular basis.

Ms. Carol Sullivan - Director of Nursing, John Knox Village

Ms. Sullivan was initially uncertain about the usefulness of strength training for nursing home residents. She indicated that most nurses expect the elderly to be seated on wheelchairs rather than on Nautilus machines. Because nurses are generally unfamiliar with strength exercises, she believes professional education is necessary in this area. Ms. Sullivan shared that, with more muscle strength, some patients could spend less time in their wheelchairs after completing the strength training program.

Ms. Sullivan noted that the program participants claimed to feel better and stronger. She also observed that, as the patients became stronger, they were more capable and cooperative when working with nurses. In her opinion, strength training may delay degenerative processes that cause nursing home residents to regress from walking independently, to walking with a cane, to walking with a walker, to using a wheelchair, to being bedridden.

Ms. Carol Ann McGovern - Director of Health Care Services

Ms. McGovern's first observation regarding the strength training program was positive feedback from the patients, therapists, and nurses who participated in the study. She also noted much interest on the part of other nursing home and independent living residents who would like to use the strength training facility.

According to Ms. McGovern, an unforeseen outcome of the strength training program was closer communication and greater cooperation among the various care givers, including nurses, physical therapists, occupational therapists, speech therapists, and recreation specialists. She also found the strength training program provided an advantage for recruiting new professional staff.

Ms. McGovern reported the Wellness Committee showed interest in the strength training program, and considered it especially important for healthy residents who want to develop and maintain a functional level of physical fitness. Because so many residents are enthusiastic about the benefits of strength exercise, the newly constructed wellness center will include an expanded strength training facility.

From a promotional perspective, Ms. McGovern finds the strength training program makes a favorable impression on potential residents, and gives John Knox Village a definite advantage in the competitive arena. Because she sees many positive aspects of the strength training program, she is looking forward to expanding the facilities and equipment for greater resident participation in the future.

Ms. Donna Califano - Physical Therapy Assistant, John Knox Village

Ms. Califano worked closely with the strength training participants, supervising all assessment sessions and a large percentage of individual workouts. As the onsite program director, Ms. Califano reported that the patients enjoyed doing strength exercises because they felt they were really working and seeing progress as their weight loads increased. She also noted the therapists were also receptive to the strength training initiative, interacted productively with the patients, and considered the exercise sessions one of their favorite tasks.

In Ms. Califano's experience, serious strength training on Nautilus machines was both efficient and effective, with significantly better patient results than previous work with cuff weights. She believes training with relatively heavy weight loads and reasonably high effort is essential for developing functional strength in patients. And they must use progressively more resistance as they become stronger, in order to eventually handle their own body weight, get up and down and move around without assistance.

Ms. Florence Friffin - 92 Year Old Resident, John Knox Village

Ms. Griddin is a 12-year resident of the John Knox independent living campus who has undergone three back surgeries. Although not a member of the research study, her physician prescribed eight weeks of the strength training program for back rehabilitation. Ms. Griffin stated that as a result of her strength exercise she can now stand straight again. In her opinion, the strength training program helped both her back and her posture. She also attributed a feeling of well-being and more energy to work around her campus home to her strength workouts.

Ms. Esther Duvall - 84 Year-Old Resident, John Knox Village

The interview with Ms. Duvall and her husband was most interesting. She claimed to hurt al the time prior to the strength training program, and her husband confirmed that she had a very low functional capacity. Ms. Duvall said she was somewhat frightened at first, but after using the Nautilus machines her strength increased and her walking ability improved. In fact, the combination of therapy and strength training enabled her to leave the nursing home and return to the independent living campus with her husband.

Ms. Peg Terbeek - 77 Year-Old Resident and Chairman of the Wellness Program Committee, John Knox Village

Although Ms. Terbeek was an active and energetic individual at the start of the study, she claimed that her energy level and posture improved considerably as a result of the strength training program. In fact, she insisted that she now feels just like she did in her 20s in terms of muscle strength and physical function. Ms. Terbeek also noted that the program helped reduce her low back pain, and that her chiropractor was very impressed with the effects of the strength exercise.

All of the staff and participant interviews indicated a high level of satisfaction with the strength training program. The general consensus was that the strength exercises were easy to learn, satisfying to perform, and productive from a performance perspective. Everyone agreed that the strength training program was both safe and effective, and that it produced positive outcomes in addition to improved physical fitness and functional capacity.

The strength training model employed in this study is in the Vigor program developed by Gary Reinl and operated by NovaCare in over 120 senior living facilities nationwide. It is a simple, successful, and time-efficient program that provides an excellent model for training older adults. However, there are other proven strength training programs for the elderly, such as the Tufts University model used in numerous research studies.

Regardless of the training protocol utilized, the important point is that sensible and supervised strength exercise should be provided to residents in assisted living centers. In a very real sense, these are the individuals who can benefit most from more muscle strength. While one is never too old to begin strength training, it is certainly advantageous to start sooner rather than later. We therefore recommend independent living facilities also make well-designed strength training programs available to all residents. In addition to improving the participants' functional capacity such programs should be instrumental in reducing health care costs, thereby benefiting society in general.

We therefore recommend independent living facilities also make well-designed strength training programs available to all residents

Conclusion

Based on the results of our 14- week strength training study at the Med Center of the John Knox Village Campus, we conclude that a basic program of progressive resistance exercise may be a safe and effective means for enabling elderly patients to attain:

- improved body composition
- increased muscle strength
- enhanced joint flexibility
- increased functional capacity
- improved mobility

Based on firsthand reports from medical staff and residents at the John Knox Village Campus, we further conclude that a supervised strength training program may be related to:

- increased potential for patient independence
- improved cooperation between caregivers and patients
- improved cooperation among nurses, physical therapists, occupational therapists, speech therapists, and recreation specialists
- enhanced potential for recruiting new residents
- enhanced potential for recruiting new professional staff
- reduced health care costs

The Freedom Through Functionality program restored independence to participants. This woman usually uses a wheelchair, however, strength training has allowed her the functionality of using a walker as well.

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