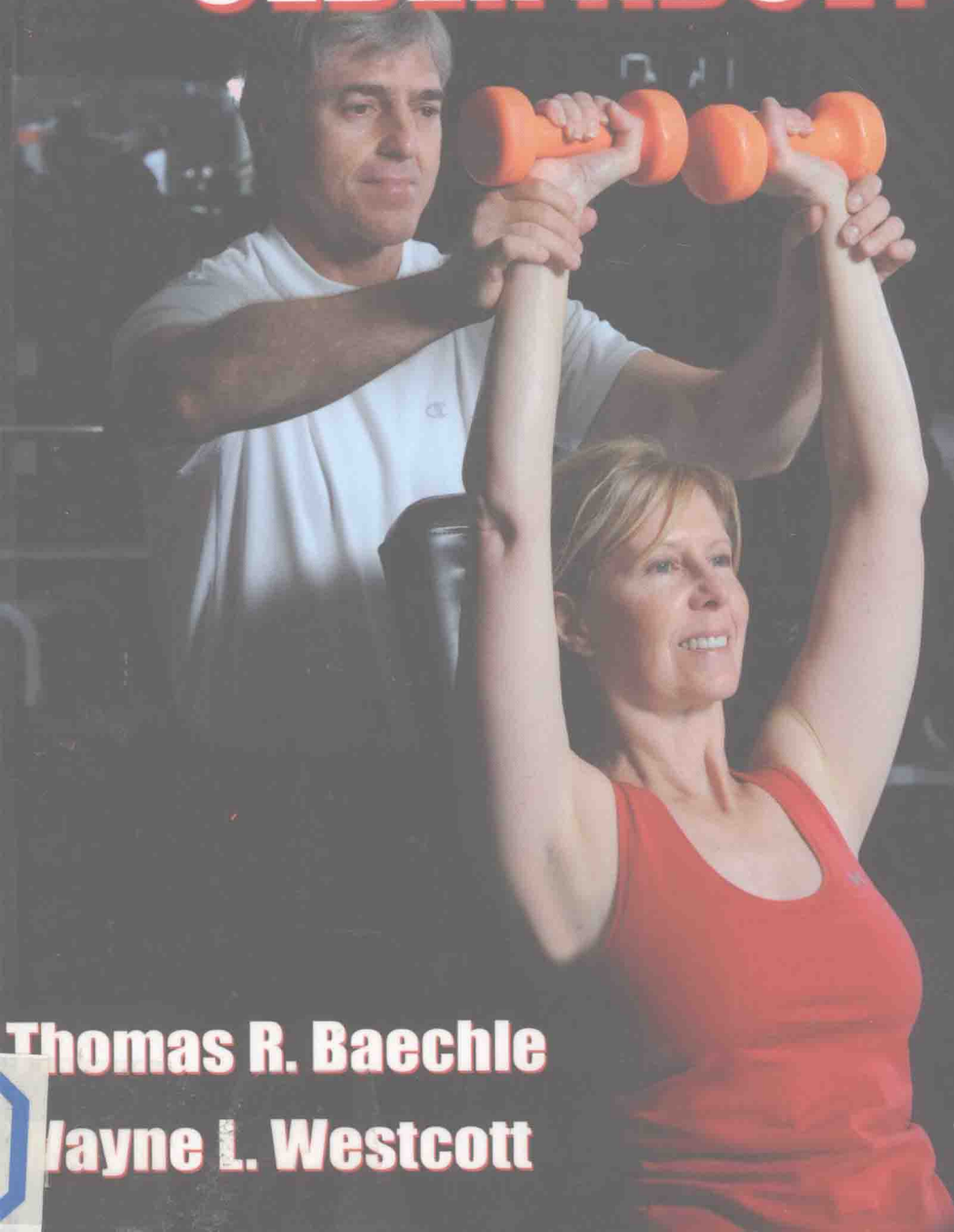


Second Edition

Fitness Professional's Guide to **STRENGTH TRAINING OLDER ADULTS**



Thomas R. Baechle

Wayne L. Westcott

老年人力量训练健身教练手册

Fitness professional's guide to strength training
older adults

Fitness Professional's Guide to Strength Training Older Adults

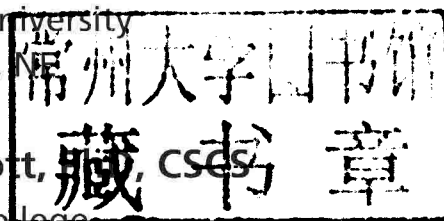
Second Edition

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**We are honored to dedicate
this book to our wives,
Susan Baechle and Claudia Westcott.**

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Introduction

According to the 2007 report on *Physical Activity and Public Health*, copublished by the American College of Sports Medicine (ACSM) and the American Heart Association (AHA), adults and seniors need regular aerobic and strength training exercises to promote and maintain health (Haskell et al. 2007). Unfortunately, most older adults do not perform the minimum amount of physical activity required for health and fitness. Although lack of physical activity is obviously associated with the current obesity epidemic, it is also related to a variety of degenerative conditions including cardiovascular disease, stroke, hypertension, type 2 diabetes, osteoporosis, colon cancer, breast cancer, anxiety, and depression (Kesaniemi et al. 2001).

The good news is that the minimum activity recommendations for older adults from ACSM (2010) are not difficult to achieve. For cardiovascular fitness, the guidelines call for moderate-intensity aerobic activity 5 days a week for a total of at least 150 minutes, or 20 to 25 minutes of vigorous-intensity aerobic activity 3 days each week for a total of 75 minutes, or 20 to 30 minutes of moderate- to vigorous-intensity exercise 3 to 5 days per week. For musculoskeletal fitness the recommendation is 8 to 10 resistance exercises, performed for one set of 10 to 15 repetitions, 2 or 3 days per week. A circuit of 8 to 10 resistance exercises can typically be completed in 15 to 20 minutes.

The time required to exercise on a regular basis, even among time-pressured people, represents a reasonable and doable commitment of time. Although we are strong proponents of aerobic activity, the focus of this book is on designing and directing sensible strength training programs for seniors. Strength training is the foundation on which the strength required in aerobic exercise and everyday tasks can be improved, thus enabling seniors to complete such tasks with less effort. Furthermore, strength training helps to counter the loss of muscle that accompanies the aging process. On average, men and women lose more than 5 pounds (2.3 kg) of muscle tissue each decade between ages 25 and 55, and they experience an even greater rate of muscle loss during their senior years (Forbes 1976; Evans and Rosenberg 1992). Because muscles are the engines of the body, less muscle leads to a lower resting metabolism, which in turn results in fewer calories being burned and more calories being stored as fat. We believe that an important underlying factor in fat gain is muscle loss. With 65 percent of our population classified as overweight (35 percent) or obese (30 percent), participation in strength training should be understood as essential to addressing this problem (Hedley et al. 2004).

Although you may concur that strength training is effective for enhancing muscle development in youth and young adults, you may not be convinced that resistance exercise is a safe activity for seniors. We completed a large-scale study in 2009 with 1,644 men and women

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who performed one set of 10 resistance exercises, 2 or 3 days a week, for a period of 10 weeks (Westcott 2009). On average, the participants added 3 pounds (1.4 kg) of lean (muscle) weight and lost 4 pounds (1.8 kg) of fat weight and seniors (ages 65 to 80) developed muscle at the same rate as did those in the younger age groups. Be assured that strength training is a highly productive activity for older adults and that the incidence of injury is extremely low. Just as important, seniors find strength training positively reinforcing, and they exhibit excellent exercise compliance. Studies with senior strength trainees have demonstrated 2- to 6-month attendance rates of approximately 90 percent, which indicates a high level of exercise satisfaction (Hedley et al. 2004; Westcott and Guy 1996; Westcott et al. 2008).

Classic studies with postmenopausal women (Nelson et al. 1994), older men (Frontera et al. 1988), and nonagenarians (Fiatarone et al. 1990) have shown significant gains in muscle mass, strength, and functional abilities following several weeks of basic strength training. Additionally, research from Tufts University (Campbell et al. 1994) and the University of Maryland (Pratley et al. 1994) has revealed that 12 to 16 weeks of standard strength training increases resting metabolic rate by more than 7 percent in senior men and women.

If strength training did nothing more than add muscle, elevate metabolic rate, and reduce fat, it would be well worth the effort. Remarkably, in addition to these impressive physical improvements, strength training provides important health benefits. Regular resistance exercise has been shown to reduce the risk of type 2 diabetes by increasing glucose uptake (Hurley 1994); the risk of cardiovascular disease and stroke by decreasing resting blood pressure (Harris and Holy 1987); the risk of colon cancer by increasing gastrointestinal transit speed (Koffler et al. 1992); the risk of low-back pain by strengthening the lumbar spine muscles (Kell and Asmundson 2009; Carpenter and Nelson 1999; Bayramoglu et al. 2001; Risch et al. 1993); the risk of osteoporosis by increasing bone mineral density (Layne and Nelson 1999; Nelson et al. 1994); the risk of falls by improving balance (Campbell et al. 1999; Nelson et al. 1994); and the pain and debilitating effects of arthritis (Hakkinen 2004; Baker et al. 2001), fibromyalgia (Rooks et al. 2002), and clinical depression (Singh et al. 1997). In addition, strength training can restore physical function to the frail elderly (Westcott et al. 2000).

Musculoskeletal weakness is a pervasive problem in the baby boomer generation, and it typically leads to physical frailty among adults in their 70s, 80s, and 90s. One of our studies with wheelchair users in a nursing home clearly demonstrated the benefits of brief strength training sessions for increasing strength, decreasing discomfort, and improving functional abilities in 90-year-old men and women (Westcott et al. 2000). The 19 patients performed just one set of five weight-stack exercises, twice a week, for 14 weeks. The simple and short training sessions produced remarkable results. These elderly participants added 4 pounds (1.8 kg) of muscle, lost 3 pounds (1.4 kg) of fat, increased their upper-body strength by 40 percent, increased their leg strength by 80 percent, and reported significantly less discomfort in their neck, upper-back, and lower-back areas. All but one patient (a double amputee) reduced or discontinued wheelchair use, and one woman made so much physical improvement that she left the nursing facility to rejoin her husband in an independent living apartment.

Although there is no fountain of youth, strength training is clearly the best means for reversing many of the degenerative processes associated with aging (especially muscle loss, metabolic slowdown, and fat gain) and for reducing the risk of several health problems common among older adults. People have gained excellent results with two 20-minute exercise sessions per week, so strength training is a practical physical activity from a time-management perspective.

Today, more than 500 retirement homes have implemented our five-exercise strength training program for their residents. Almost every senior living in a retirement community today has access to a well-equipped strength training room, and most YMCAs, health clubs, fitness facilities, and community centers offer specialized strength training programs for older adults. Many personal trainers specialize in senior strength training using a variety of exercise equipment including portable resistance tools for in-house sessions.

The purpose of this book is to provide instructors of older adults with important information and research-based principles for designing and developing safe and effective strength training programs for this age group. To enable you to put the training principles and exercise protocols into practice, we have included chapters on general guidelines for senior strength training; specific training strategies and training procedures; methods for assessing strength fitness levels; and recommended exercises for machines, free weights, elastic bands, and balls. This text includes basic and advanced sample programs, as well as sport conditioning programs for runners, cyclists, swimmers, skiers, golfers, tennis players, rowers, rock climbers, and hikers. Because of the prevalence of obesity, diabetes, cardiovascular disease, cancer, osteoporosis, low-back pain, arthritis, fibromyalgia, depression, visual and auditory impairments, and strokes among older adults, we have included recommendations for training them and the frail and elderly. In addition, we also address nutritional considerations for older adult exercisers. Perhaps most important, the book includes precise illustrations and biomechanically sound explanations of resistance machine, free-weight, elastic band, and medicine and Swiss-ball exercises, along with key exercises to reduce the risk of injuries typically associated with particular sports or activities.

As older adults realize that muscles are the engines of their bodies, they become more interested in initiating appropriate strength training programs. But many find the field of resistance exercise confusing and intimidating, and they are reluctant to start strength training on their own. Clearly, qualified professional instructors in the area of strength training are needed to work competently and confidently with men and women in their senior years. One of the most useful features of this textbook is the emphasis on physiological adaptations and health benefits associated with strength training, especially for several special populations of older adults. Knowing and sharing this information with older clients is essential to helping them appreciate the true benefits of strength training and make the commitment to training on a regular basis.

By studying the information presented in this book, you will acquire a better understanding of sensible strength training and gain competence and confidence in presenting appropriate strength workouts to older adults. If you use the standard strength training principles, implement the recommended exercise protocols, and follow the sample program designs, you will be able to provide

effective leadership for senior strength training participants. The logical and progressive manner in which this information is presented makes it easy to comprehend and apply, allowing you to implement appropriate adaptations for your particular training situation. You should find the figures, tables, and logs especially helpful in setting up specific strength training programs that are relevant to previously sedentary clients.

A successful strength training program can make the difference between older adults who have low strength levels and endure a sedentary existence and those who have high strength levels and enjoy a physically active lifestyle. The tools in this book will enhance your skill as a professional strength training instructor and enable you to become an agent of positive change for the health of older men and women in your community.

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Why Seniors Should Strength Train

Put yourself in the position of a typical older adult, say a 55-year-old male or female who has been physically inactive and has added 30 pounds (14 kg) of fat. You have been on several diets, but none has produced a permanent reduction in bodyweight. You have tried walking, but your exercise schedule has been inconsistent and your body composition has remained essentially the same. You have read about the benefits of strength training but you're not fully convinced that it would be beneficial to you, and you've heard that it may raise your blood pressure. You're not very athletic, and you've never even tried to lift weights. You're concerned about looking uncoordinated or experiencing an injury, and you're wondering whether the benefits of strength training are really worth the time and effort. Unless someone clearly explains why you should undertake a strength training program and carefully shows you how to perform the exercises, chances are that you will not attempt this unfamiliar physical activity. A fitness professional who has expertise in strength training older adults can play a vital role in helping you and the growing number of older adults get on track with respect to improving musculoskeletal fitness. In fact, research shows that strength training has many health and fitness applications beyond building stronger muscles.

The purpose of this chapter is to present the beneficial effects of strength training—including replacing muscle, reducing fat, increasing metabolic rate, decreasing low-back discomfort, relieving arthritic pain, minimizing osteoporosis, enhancing glucose utilization, speeding up gastrointestinal transit, lowering resting blood pressure, improving blood lipid levels, and improving postcoronary performance, as well as boosting self-confidence and beating depression. When discussed with older clients, this information can help you, the fitness professional, convince them that strength training is an important physical activity that they can do and that can do them a lot of good (American Heart Association and American College of Sports Medicine 2007).

BODY COMPOSITION

Most people realize that strength training is the best way to develop larger and stronger muscles. They know that bodybuilders perform strength training to build exceptionally large muscles, and that weightlifters do it so that they can lift exceptionally heavy weights. Because most older adults have no desire to

compete in bodybuilding or weightlifting events, they tend to avoid strength training altogether. This circumstance is unfortunate because everyone, especially people over age 50, can benefit from larger and stronger muscles. Contrary to what some may think, few people have the genetic potential to develop exceptionally large muscles, and those who do must work deliberately for many years to achieve the profound muscularity that they exhibit. Fears of becoming huge overnight or too strong are without scientific basis.

Too Little Muscle, Too Much Fat

For almost all men and women, the reality is typically the opposite. Rather than being concerned about too much muscle, older adults should be concerned about too little muscle. Adults who do not regularly perform strength training exercises lose about 0.5 pound (0.23 kg) of muscle per year during their 30s and 40s (Evans and Rosenberg 1992). Unfortunately, evidence indicates that the rate of muscle loss may double (to 1 pound, or 0.45 kg, per year) in people over 50 years of age (Nelson et al. 1994). Even more disturbing, the number of type II (fast-twitch) muscle fibers in sedentary males decreases more than 50 percent by age 80 (Larsson 1983). These are the fibers that are most involved in movements requiring high levels of strength (e.g., ascending and descending stairs) among older adults. Because muscles are the engines of the body, the loss in muscle tissue is comparable to going from an eight-cylinder engine car to one with four cylinders, while the weight of the automobile (the person's bodyweight) remains the same or even increases.

Having less muscle and more fat compromises physical fitness and contributes to health problems, including a variety of degenerative diseases such as

diabetes, osteoporosis, heart disease, and colon cancer.

Although most seniors know that they have more fat than they should and are not as strong as they once were, many do not realize that they have lost muscle as they have become older. Even fewer older adults understand that muscle loss contributes to a decrease in their metabolic rate, which plays a major role in their fat gain.

Muscle Loss

Muscle loss causes two of life's major problems and is associated with a variety of health-related consequences:

1. Reduced functional capacity, which leads to less physical activity and further muscle loss
2. Reduced calorie utilization, which leads to slower metabolism and fat accumulation

The typical approach taken by many who desire to lose fat is to undertake a low-calorie diet plan. Although almost half of the adult population is dieting (Tufts 1992), fewer than 5 percent will be successful (Brehm and Keller 1990). According to an exhaustive review of the research by Mann and colleagues (2007), essentially all those who shed weight through dieting will regain all the weight lost within a relatively short postdiet period. The inability to keep the weight lost off is as much a matter of physiology as it is willpower. On most diets, approximately 25 percent of the weight lost is muscle tissue (Ballor and

Poehlman 1994), which in turn results in a reduction in resting metabolic rate that may exceed 125 calories per day (Alexander 2002). Consequently, among dieters, the eventual return to normal eating provides too many calories for the slower metabolism and lower postdiet energy requirements. Older adults must understand that too much fat is only part of the body composition problem, and that dieting is not an effective solution (Westcott 2005).

Adding Muscle to Lose Fat

The less obvious but more important issue to discuss with your clients is that they have too little muscle. Adding muscle has the two-fold effect of increasing both physical capacity (a larger engine) and resting metabolism (higher daily energy requirement). Research clearly demonstrates that regular strength training can replace muscle lost by older adults (Grimby et al. 1992; McCartney et al. 1996) and increase resting metabolic rate (Pratley et al. 1994; Hunter et al. 2000; Ades et al. 2005) in older adults.

One of the earlier studies in this area was conducted at Tufts University with previously sedentary men and women between 56 and 80 years of age (Campbell et al. 1994). The 12 subjects performed three 30-minute strength training sessions each week for 3 months and did not engage in other forms of exercise during the study. Their strength training program consisted of three sets of four exercises that collectively addressed all the major muscle groups. At the conclusion of the study participants demonstrated, on average, an increase of 3 pounds (1.4 kg) of lean (muscle) weight and a loss of 4 pounds (1.8 kg) in fat weight, even though they were eating about 250 more calories per day than they were at the beginning of the study. How did this happen? The muscle development from strength training apparently increased resting metabolic rates by almost 7 percent, while the training increased daily energy utilization by approximately 15 percent. Similar results in resting metabolic rate were reported by Pratley and colleagues (1994) and by Paffenbarger and Olsen (1996).

Unlike dieting, which decreases the number of calories eaten per day (and results in muscle loss among inactive people), strength training increases the number of calories used each day. Besides raising the resting metabolic rate, stronger muscles enable older adults to perform essentially all physical activities with less effort.

In another early study, Butts and Price (1994) examined the effects of a relatively high-effort strength training program on body composition in adult and senior-aged women. The participants completed one set in each of 12 exercises 3 days per week for 12 weeks. After the 3-month training period, women increased their lean (muscle) weight by 2.9 pounds (1.3 kg) and decreased their fat weight by 3.0 pounds (1.4), for a 5.9-pound (2.7 kg) improvement in body composition.

In a similar study with mostly male subjects (Draovitch and Westcott 1999), 77 older adults performed relatively high-effort strength training sessions (one set in each of 12 exercises), 3 days per week for 8 weeks. After 2 months of training, participants increased lean (muscle) weight by 3.9 pounds (1.8 kg) and decreased fat weight by 4.1 pounds (1.9 kg), for an 8.0-pound (3.6 kg) improvement in body composition.