

# “BETTER ’N EVER” CHANGES WITH AGE

## A 20-Year Case Study of Successful Aging

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### LEARNING OBJECTIVES

- To illustrate the importance of diet and aerobic exercise on obesity and weight management.
- To examine the influence of age and resistance training on body composition.
- To illustrate the importance of fitness on the functional performance of daily activities.
- To illustrate the importance of “teachable moments” as motivational factors for lifetime behavioral change.

#### Key words:

Weight loss, Aerobic conditioning, Resistance training, Sarcopenia, Physical function

Seeing results from his body composition assessment at the health fair motivated Dr. Flatt to evaluate his lifestyle habits in the context of two important motivational factors. One motivator was his grandchildren. If Dr. Flatt expected to live long enough to see his 2-year-old and 5-year-old grandchildren attend college, he would need to lose at least 30 lbs of fat. Another motivating factor for losing weight and increasing his physical fitness at age 58 years was his responsibility as a primary caregiver for his 120-lb wife, who was quadriplegic and had been paralyzed for 16 years because of Guillain-Barré syndrome. He realized that physical fitness was critical for him to be able to care for his wife in their own home and optimize her quality of life.

Photo courtesy of M. Elaine Cress, PhD, FACSM.

### GETTING MOTIVATED

If you ask Bill Flatt, Ph.D., a 78-year-old professor emeritus and former university administrator, how he is doing, he will tell you with a lilt in his voice, “Better ’n ever.” Part of the reason for this upbeat response is because of two decisive moments in his life. At age 58 years, he had a “teachable moment” when his body composition was assessed by a nutrition faculty at a statewide health fair. At that time, Dr. Flatt was 5 ft 8 inches tall and weighed more than 220 lbs, a weight he had carried for 20 years as a very sedentary university administrator. Although his body mass index (BMI) was 33, he did not consider himself obese until he received the computer printout from a bioelectrical impedance measurement showing that he was 30% fat! As an animal nutritionist, he knew that obesity increases the risk for cardiovascular disease, type II diabetes, hypertension, cancer, and several other chronic diseases, as well as premature death.



In the following case report, we describe the lifestyle changes implemented by Dr. Flatt to address his overweight status and potential muscle, strength, and bone losses. Moreover, Dr. Flatt is a good case to illustrate the American College of Sports Medicine's (ACSM) strength training principles described in the July/August 2009 issue of *ACSM's Health & Fitness Journal*<sup>®</sup> by Wayne Westcott, Ph.D. (10). The data presented below include 20 years of body weight and BMI measures since age 58 years, with body composition and bone measures since age 65 years. In addition, data documenting stability in physical function from age 69 years also are summarized in this article.

### BEATING OBESITY

The body composition printout generated by bioelectrical impedance indicated that Dr. Flatt would need to lose 0.5 to 1 lb week<sup>-1</sup> of fat by decreasing caloric intake and increasing physical activity. He was aware that to lose 1 lb (3,500 kcal) of fat in 7 days while largely maintaining lean body mass, he needed to have a negative energy balance of approximately 500 kcal day<sup>-1</sup> by making dietary modifications and increasing regular physical activity.

#### Here is the math:

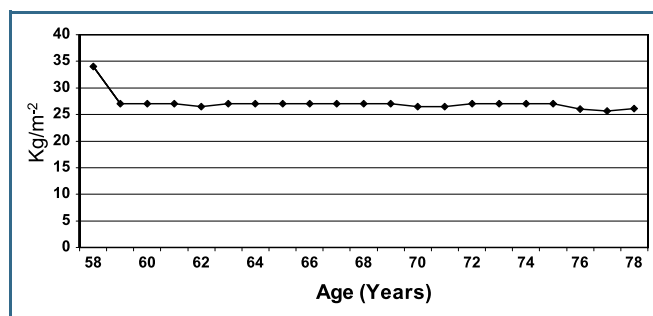
- To lose 1 lb week<sup>-1</sup>
- Fat = 3,500 kcal of stored energy
- Gross exercise energy expenditure at his body weight is 443 kcal per session \* 5 days week<sup>-1</sup> = 2,215 kcal
- Reduced caloric intake 184 kcal \* 7 days = 1,288 kcal  
2,215 kcal expended + 1,285 fewer kcal eaten = 3,503 kcal to be taken from the stored fat each week

At 58 years of age, Dr. Flatt started his weight loss efforts by reducing his caloric intake through smaller servings sizes, decreasing fat intake, and consuming more fruits and vegetables (5 to 10 servings per day). He increased caloric expenditure by exercising an average of 45 minutes day<sup>-1</sup>, at least 5 days week<sup>-1</sup> using Richard Simmons' video "Sweatin' to the Oldies" (8). Based on energy expenditure charts for aerobic activity (1) for his initial weight of 220 lbs, his gross energy expenditure for each exercise session was 443 kcal per session or approximately 2,215 kcal week<sup>-1</sup> (1). The remainder of his weekly caloric deficit was made up by eating 184 fewer kcal day<sup>-1</sup> or the equivalent of one candy bar per day. He then adopted a mindset of maintaining this lifestyle for the long haul. When his body composition was measured at the same health fair the following year, he weighed 179 lbs, his BMI was 27, and his body fat was reduced to 20%. All his health indices were within normal range for a 59-year-old man. However, as Dr. Westcott pointed out,

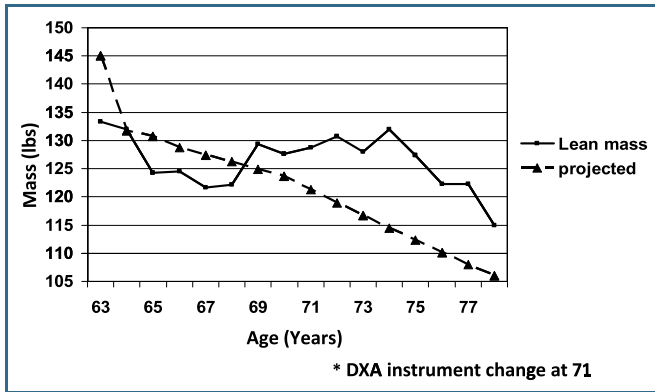
weight loss is usually temporary (10). Dr. Flatt was told that if he could maintain the weight loss for 5 years, he would be more likely to keep the weight off permanently. He continued to follow the same dietary pattern and regular aerobic exercise with additional incidental exercise that included using stairs (120 steps, 2 to 3 times per day) instead of elevators, parking farther from destinations to increase walking distance, pushing his wife's wheelchair, and transferring her when needed. In recent years, he added a Pilates class 3 days week<sup>-1</sup>. After 20 years, he successfully has maintained the initial weight loss of 38 lbs, of which 28 lbs was from fat mass, but he has continued to lose body weight. He currently weighs 164 lbs and is well within a healthy weight range for his height. His BMI during the 20 years is shown in Figure 1. An important question that is not answered by the BMI data, however, is whether he is maintaining his lean mass as he ages.

### SARCOPENIA, CAN IT BE PREVENTED?

Dr. Westcott's article (10) describes that despite maintaining body weight, sarcopenia can result from a person losing 0.5 lbs of lean mass per year that ends up with a higher percentage of body fat. Other estimates indicate a loss of 1% of lean mass per year between ages 60 and 70 years (5). In Dr. Flatt's case, his lean mass would be expected to go from 153 lbs to 138 lbs in 10 years in the absence of progressive resistance training. The projected and actual change in lean mass is illustrated in Figure 2. Dual-emission X-ray absorptiometry (DEXA) instrumentation was used during a 5-year period from ages 63 to 68 years to calculate the loss in lean mass. The lean mass weight was 133.5 lbs at age 63 years and 11.5 lbs lower (122 lbs) by age 68 years. That represents a loss of approximately 2.2 lbs year<sup>-1</sup> or 1.6% of his lean mass. Despite the aerobic exercise, demanding caregiving responsibilities that included lifting his 120-lb wife for transfers from the bed to chair four to six times a day and taking the stairs several times per day, Dr. Flatt would lose a significant amount of lean mass by age 68 years. He believed that his aerobic exercise regimen, weight loss, and demanding caregiving responsibilities would be sufficient to help him maintain his strength. However, he began to suspect that the increased difficulty



**Figure 1.** BMI changes from 58 to 77 years of age. The BMI (body weight in kilograms height<sup>-2</sup> in square meters) for the years 58 through 77.



**Figure 2.** Lean mass from ages 63 to 77 years. This graph illustrates the change in the amount of weight (in pounds) in lean mass that made up Dr. Flatt’s overall body composition.

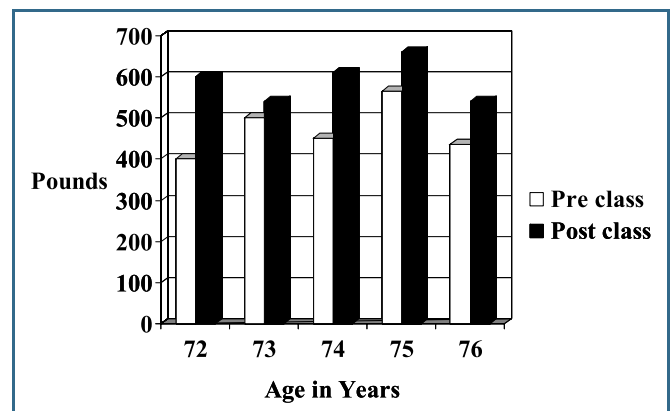


lifting his wife, which he had been doing for 27 years, was the result of his getting weaker rather than her getting heavier. His suspicion was reinforced when he learned about sarcopenia in a kinesiology seminar that stressed the importance of progressive resistance training. Dr. Flatt connected the dots between the need for strength in his caregiving responsibilities and the information he had just learned on sarcopenia. To learn more, he volunteered as a non-strength training control for a research experiment that compared older adults who had strength trained regularly with those who had not. Because of his demanding caregiving lifestyle, Dr. Flatt expected his strength to be similar to that of older adults engaging in regular strength training. However, the results of the study clearly showed that those who engaged in progressive resistance training were stronger than even the aerobically active non-strength training comparison group (9). He learned from the seminar and research project that by participating in a regular strength training program he could prevent the expected loss of lean mass and strength during the next decade and improve his ability to care for his wife.

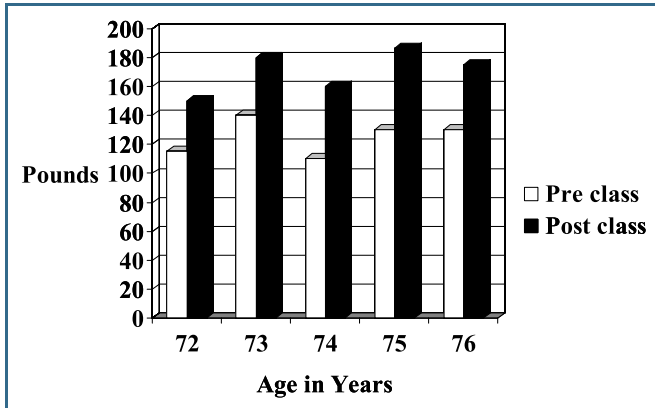
From age 70 to 80 years, the projected rate of muscle loss accelerated to approximately 2% year<sup>-1</sup> (5). The projected decline in Dr. Flatt’s lean mass would plummet from 130 lbs to 108 lbs. Starting a strength training program that prevents or slows down this loss was an important step for maintaining both body composition and ability to perform his demanding everyday functional tasks. Figure 2 illustrates the rather dramatic loss in lean mass of 11.6 lbs during 4 years. At age 69 years, he began regular weight training, taking supervised classes at the university when they were available, but continuing on his own between classes. Figure 2 shows the stabilization and reversal of the loss in lean mass, particularly between ages 69 and 75 years (solid line).

His lean mass at age 77 years slightly was higher than at age 67 years. Figure 2 (dashed line) also shows what the projected loss of lean mass would have been had Dr. Flatt not begun a progressive resistance training program. Because of the progressive resistance training, Dr. Flatt cut his loss of lean mass to 19 lbs

(1% year<sup>-1</sup>) instead of the expected 45-lb loss in lean mass during 19 years. His lean mass was measured at 127 lbs, a mere 1-lb loss year<sup>-1</sup> instead of the 2.3 lbs that could have occurred. Maintaining or increasing muscular strength, he also could have reduced the load on his heart. Through improved strength, he would have decreased the hemodynamic response (heart rate and blood pressure) when lifting or carrying any given object, including his wife. In other words, weight training has been shown to decrease the rate-pressure product (and cardiac demands) when any given load is lifted (7). Furthermore, if Dr. Flatt had not performed strength training exercises from 69 to 75 years of age, he would have lost considerable leg press strength, projected to be almost 34 lbs (from 295 lbs down to 261 lbs) or 12% lower. The strength training prevented the parallel losses in lean mass and strength. Figures 3 and 4 show the increase in Dr. Flatt’s upper and lower body strength after participating in student-supervised strength training sessions twice a week for 12 weeks. His leg press weight progressed up to 600 lbs, however being more than is



**Figure 3.** Leg press from ages 72 to 76 years showed an increase from 21% to more than 50%, with the largest increase when the initial weight was low. Strength gains are attributed to the motivation provided by the student in the formal strength training class. 1RM is one repetition maximum, the maximum weight that can be lifted through one repetition using good form.



**Figure 4.** Seated row from ages 72 to 77 years shows increases on average of 30% with each training period.

needed for his caregiving responsibilities, he now routinely leg presses 300 lbs. The leg press was an important exercise that directly translated to Dr. Flatt’s need to lift his wife safely using proper lifting technique. The seated row was used to strengthen the rhomboid and upper arm muscles to increase his strength for transferring his wife from the bed to a chair.

From the class, Dr. Flatt was interested in learning proper lifting technique and the importance of resistance training. The importance of progressive resistance was illustrated from Dr. Flatt’s strength data. 1) Although his strength training was continuous, he did not maintain the same level of muscular strength during the time between the supervised classes. 2) He increased his strength as much as 45% from participating in the 12-week class. 3) A demanding caregiving schedule that included both upper- and lower-body tasks was insufficient to prevent loss of lean mass and strength. 4) The strength training was necessary for him to continue to meet the demands of everyday functional tasks.

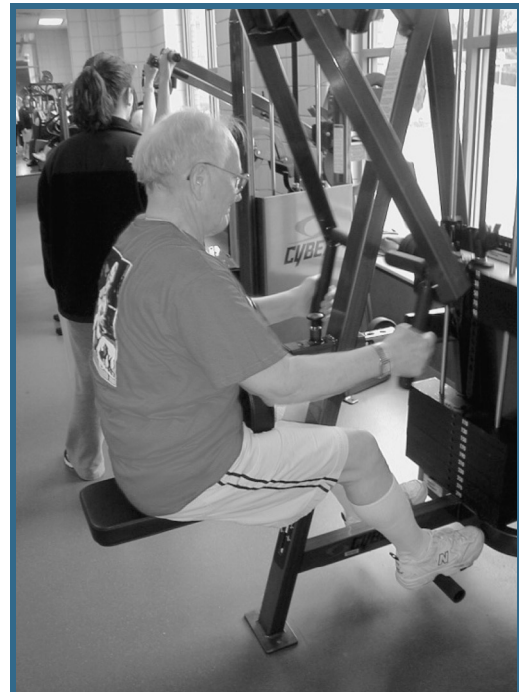
### BONE HEALTH

One of the major preventable health risks associated with aging is bone loss and osteoporotic fractures. High-intensity progressive resistance and high-impact aerobic training can prevent or

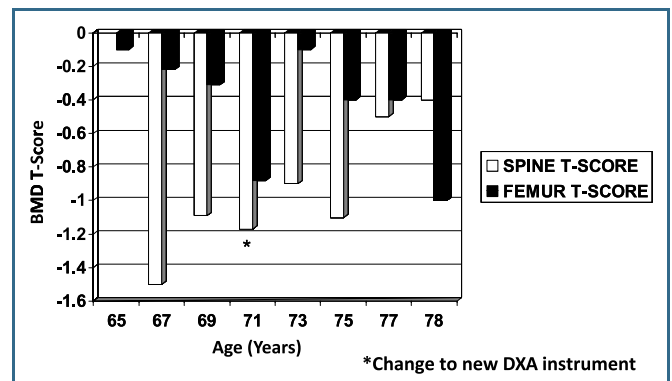
Photo courtesy of M. Elaine Cress, PhD, FACSM.



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slow bone loss in older individuals (2, 6). From 69 to 78 years of age, Dr. Flatt was able to maintain and actually improve his overall bone mineral density (BMD). This period coincided with Dr. Flatt’s progressive resistance training. T-scores represent how a person’s BMD value compares with a young adult norm in standard deviation units, where a T-score of  $-1.0$  to  $-2.5$  is considered osteopenic or having low BMD, and an even lower value of less than or equal to  $-2.5$  is considered osteoporotic. Figure 5 illustrates Dr. Flatt’s hip and spine T-score values from 65 to 78 years of age. Although his hip BMD T-score value of  $-1.0$  at 78 years of age is borderline osteopenic, the value is considered average for someone his age and is similar to his value at



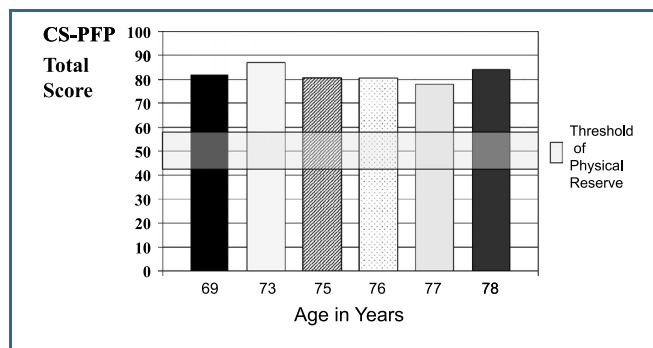
**Figure 5.** Lumbar spine and proximal femur BMD. T-scores are from ages 65 to 77 years, where zero at the top of this graph is representative of “no change.” Any distance below zero is a loss in BMD. The open bars represent the lumbar spine, and the closed bars represent the head of the thigh bone (proximal femur).

71 years of age. Dr. Flatt's spine BMD T-scores considerably improved for 11 years, a remarkable achievement, considering that men his age typically lose approximately 0.5% BMD year<sup>-1</sup>. The weight-bearing exercise and the strength training program performed by Dr. Flatt may have reduced his risk of spine and hip fractures.

### ARE THE MUSCLE AND STRENGTH GAINS FUNCTIONAL?

The primary goal of older adults is to remain independent; maintaining more strength than is needed to complete everyday functional tasks is key to meeting this goal. Physical strength in excess of what is needed to complete daily function is considered a physical reserve (3). Dr. Flatt's physical function was quantified from his performance on 10 everyday activities usually done by people living independently. Examples of the 10 tasks included on the Continuous Scale Physical Functional Performance 10 (CS-PFP10) test include carrying groceries, moving laundry from a washer to a dryer and then into a basket, sweeping the floor, climbing stairs, and reaching onto a high shelf. To see a complete list of tasks, please visit [www.coe.uga.edu/cs-pfp](http://www.coe.uga.edu/cs-pfp) (4). His physical functional performance scores on the CS-PFP10 are shown in Figure 6. Throughout 6 years of testing between ages 69 and 75 years, Dr. Flatt maintained a high level of functional performance with scores between 80 and 87 on a 100-point scale. Scores higher than 57 (confidence interval, 47–58) are a reflection of physical reserve or fitness over that needed to perform tasks of independent living (3). Dr. Flatt consistently maintained a physical reserve of 23 to 30 CS-PFP units, and this physical reserve may have accounted for his ability to care for his wife at home, meeting demanding caregiving responsibilities that required ample strength and stamina. Thus, increased muscle strength and preservation of muscle and bone mass helped to contribute to a higher quality of life for Dr. Flatt and his wife.

Dr. Flatt is a clear example of 1) how to achieve weight loss through increased physical activity and good dietary choices



**Figure 6.** The CS-PFP tests. Dr. Flatt's scores were between 80 and 87. The shaded area indicates Threshold of Physical Reserve (confidence interval, 47–58). Scores above the shaded area reflect an overall fitness that is greater than that needed to perform the tasks on the test; also called a physical reserve.

and 2) how to preserve lean mass, bone health, and the ability to meet the physical functional demands of life by participating in progressive resistance strength training. With his “better ’n ever” attitude and good health, Dr. Flatt trained at age 79 years to cross-country ski in Alaska and was a spectator at the March 2010 Iditarod.

### Key Points

- Good dietary choices with aerobic exercise are effective for losing weight.
- Keeping the weight off is as important as losing it and key to long-term health.
- Functional activity alone is not enough to prevent sarcopenia or loss of strength.
- Weight training prevents muscle loss and preserves function.
- Motivation is a key factor for making lifestyle changes: seeing grandchildren grow up and caring for wife were important motivating factors.

Photo courtesy of M. Elaine Cress, PhD, FACSM.

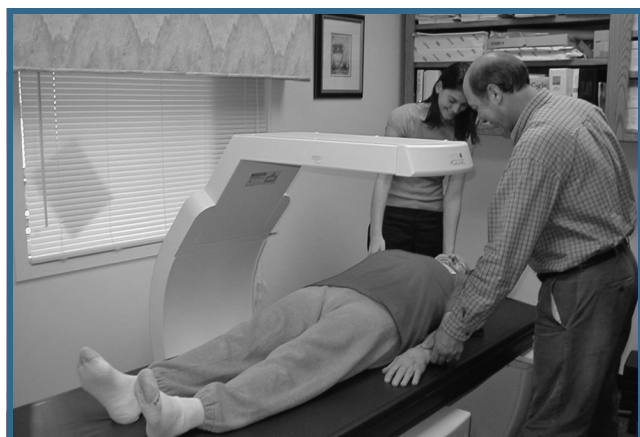


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## Recommended Reading

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*Richard D. Lewis, Ph.D., R.D., FACSME, is a professor of foods and nutrition at The University of Georgia. He also holds adjunct faculty appointments within the UGA Department of Kinesiology and in the Department of Pediatrics, School of Medicine, at the Medical College of Georgia. Dr. Lewis' research focuses on osteoporosis and obesity prevention, particularly in children and adolescents. He teaches life cycle nutrition and medical nutrition therapy courses. Dr. Lewis is a fellow in the American College of Sports Medicine and is an active member of the American Dietetic Association, American Society for Nutrition, and the American Society for Bone and Mineral Research.*



*William Flatt, Ph.D., is a D.W. Brooks distinguished professor emeritus of foods and nutrition and animal and dairy science at The University of Georgia. He taught human and animal nutrition and is conducting energy metabolism research, particularly as it relates to obesity. He has been named an honorary fellow of the American Society of Animal Science, a fellow with the American Association for the Advancement of Science, a fellow of the American Dairy Science Association, and a fellow of the American Society for Nutrition.*

### CONDENSED VERSION AND BOTTOM LINE

Adopting a lifestyle that includes a balanced healthful diet and regular aerobic exercise can promote significant weight loss and facilitate the maintenance of a healthy weight. Incorporating a resistance training program into the lifestyle improves strength, ameliorates the age-related loss of muscle mass, and preserves physical function. As described in this case report, motivation is an essential ingredient for making the requisite behavioral changes necessary to lose weight, improve fitness, and remain independent.