

**Strategies to prevent late life dysfunction and chronic disease in
elderly people**

**William J. Evans PhD,
Professor of Geriatric Medicine, Nutrition, and Physiology
Donald W. Reynolds Institute on Aging
University of Arkansas for Medical Sciences
Central Arkansas Veterans Healthcare System
Little Rock, Arkansas**

The sixth age shifts
Into the lean and slippered pantaloon
With spectacles on nose and pouch on side,
His youthful hose, well sav'd, a world too wide
For his shrunk shank, and his big manly voice
Turning again toward childish treble, pipes
And whistles in his sound. Last scene of all,
That ends this strange and eventful history,
Is second childishness and mere oblivion,
Sans teeth, sans eyes, sans taste, sans everything
As You Like It, Act II, Scene VII, lines 157-166

While attitudes towards aging as an inevitable decline towards oblivion have been with us for thousands of years, for the first time in human history these attitudes and notions are changing. New research has altered our ideas of what aging is. For the first time in history, we can begin to separate what may be inevitable consequences of aging from how we live our lives. One of the most universal features of aging is a change in body composition. This change involves an increase in body fatness (with an increase in visceral or belly fat) and a substantial loss of muscle. This loss of muscle mass has been termed sarcopenia (2). Sarcopenia, like osteopenia, appears to be a life-long process with a many causes. Sarcopenia results in weakness, frailty, reduced Calorie needs, reduced functional capacity (1) and a greatly increased risk of disability in older people (6). The prevalence of sarcopenia among men and women above the age of 65 is greater than 20%

The estimated direct healthcare cost attributable to sarcopenia in the United States in 2000 was \$18.5 billion (\$10.8 billion in men, \$7.7 billion in women), which represented about 1.5% of total healthcare expenditures for that year. A sensitivity analysis indicated that the costs could be as low as \$11.8 billion and as high as \$26.2 billion. The excess healthcare expenditures were \$860 for every sarcopenic man and \$933 for every sarcopenic woman. A 10% reduction in sarcopenia prevalence would result in savings of \$1.1 billion (dollars adjusted to 2000 rate) per year in U.S. healthcare costs (7). In addition, body fatness is a powerful predictor of late-life disability (9). As the obesity level of the US population continues to increase, the lethal combination of decreased muscle and increased fat threatens to overwhelm health services for elderly people and costs for caring for an increasingly frail elderly population.

The good news is that older people are remarkably responsive to dietary and exercise interventions. At one time, it was thought that age diminishes the capacity to respond appropriately to exercise. We lose fitness at the rate of about 1% every year between the ages of 20 and 70 years. After 70, the rate of decline increases. My laboratory and those of many others have demonstrated the extraordinary capacity of elderly people to grow stronger, fitter, and healthier through exercise and diet. We have demonstrated that seniors can regain more than 15 years of loss in their aerobic capacity (fitness) in only 12 weeks. However, activities such as walking, riding a bike, or even swimming cannot restore lost muscle. Perhaps the most important functional deficit among elderly people is weakness. Our initial research was in health, but inactive, older men. In 10 weeks, we demonstrated that resistance exercise training tripled the strength of these men and substantially increased the size of their muscles (5). We were also able to demonstrate that one year of strength training (two days per week) stopped the loss of bone and increased bone density of the spine in a group of older, post-menopausal women. This effect was as great as any seen with anti-osteoporosis drugs that are currently in use. However powerful the effects on

bone, the exercise intervention affected other factors that are known to be associated with a risk of falling. The women in this study got stronger, increased their muscle mass, improved their balance, and showed an increase in levels of physical activity (8).

Our research has also shown that strength training is safe and effective even in the most frail of seniors in their 10th decade of life. We recruited a group of 100 nursing home residents – many with cognitive disorder and multiple chronic diseases. Ten weeks of strength training tripled their strength, improved their balance, their ability to stand from chair, their ability to walk and climb stairs. This simple intervention increased their activity level and decreased their symptoms of depression. Many told us that they no longer needed to ring for a nurse to use the toilet. Many told us that they could get up and get their meals rather than having it delivered to them.

Strength training is very safe and has a powerful effect in older people. In fact the gains that elderly people make from this exercise are greater than those seen in young men and women. These effects include: improved strength and fitness, increased levels of physical activity, decreased risk of osteoporosis, improved retention of dietary protein (older individuals need more protein than do young people – and this exercise increases the ability of older people to retain protein even on a marginal intake), improved glucose tolerance and decreased risk of type 2 diabetes (and the long-term consequences of this disease), improved balance, and increased Calorie needs (so that the overweight elderly can lose weight safely) (4). Because older people are more frail and have a much higher incidence of chronic disease, there is no single segment of our society that can benefit more from a regularly performed exercise program. Exercise and increased physical activity should be the standard of care for every elderly person (3). The greatest cost savings of good nutrition and exercise will be seen in this population because the effects are seen so quickly.

Finally, it goes without saying that this research could not have been accomplished without support of the Veterans Administration and the National Institutes of Health. These two agencies have been at the forefront of efforts in understanding the physiological and metabolic consequences of aging and how exercise and diet can allow seniors to live and active, productive, vigorous life with dignity.

Although Shakespeare reflected on growing disability with age, he must have also been a specialist in geriatric, because he understood that it was possible to prevent late-life disability through good habits:

Though I look old, yet I am strong and lusty;

For in my youth I never did apply

Hot and rebellious liquors in my blood

Nor did not with unbashful forehead woo

The means of weakness and debility:

Therefore my age is as a lusty winter,

Frosty, but kindly. Let me go with you;

I'll do the service of a young man

In all your business and necessitites.

As You Like It, Act II, Scene III, lines 46-55.

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