

Ergonomics & Aging

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By the time most people hit 50, they realize the party is over (at least the wild and crazy part of the party!). The attitudes we've held through life can be reflected in how our body feels when we get up in the morning. If we've been sedentary, we may feel sluggish, plump, and out of shape. If we've taken sports to the limit, we may feel stiff and sore in places we've overused and injured over the years. If we've experienced a lot of life stresses, we may just simply feel burned out from the pressures of everyday life and the damaging effects of cortisol on our body. If, on the other hand, we've managed to maintain a balance of activities, eaten right, and exercised regularly, chances are we don't feel a whole lot different than we did in our 20s or 30s.

There are people who take care of themselves and yet still experience soft tissue and other physical disorders, including Repetitive Strain Injury (RSI). It is important not to discount the effect of genetics. If you know your family history and are aware of your own predispositions to health problems, you can tailor your diet, exercise, and mental/physical/spiritual worlds to compensate for these risks or you can choose to ignore or deny them. Too many people are either unaware of their genetic predispositions or they choose to ignore them until the risks become a flashing red light in middle age.

There are a wide variety of conditions that catch up to people in middle age after a lifetime of sailing along without making healthy lifestyle choices. Of course, we all know or have heard about people who broke all the health rules throughout their life and still lived a long life, but these people are the exception. It is a real gamble to expect our body to put up with the consequences of inactivity, over-activity, improper eating and stress.

We experience injuries and illness when we push our body beyond its limits. Lifestyle choices and genetics have a dramatic affect on our tolerance to stress and resilience to illness and injury.

This article addresses some of the problems we may encounter as our bodies age, and recommends preventive and adaptive changes that can stave off physical limitations.

It is beyond the scope of this article to address all of the problems of aging, including cognitive issues, so we recommend the book Healthy Aging, by Dr. Andrew Weil, for a comprehensive discussion of the whole topic.¹

Ergonomics, Human Factors and Gerontechnology

Not surprisingly, there has been an increase in attention focused on the aging population as the baby boomers are starting to become “seniors”. An American Association of Retired People (AARP) poll in 2002 of workers between the ages of 45 and 74 found that less than 1/3 of these people plan to stop working when they reach “retirement age”.² Older workers are a valuable resource for employers because of their experience, stability, dedication and desire to work.² For this reason, it’s important for employers to consider the modifications to workspaces that are required for an older population with aging eyesight, loss of hearing and less strength.²

Ford Motor Company’s website features an article about the efforts of their ergonomics team to address the design issues of an aging population in their automobile design.³ In addition to their usual goal to make controls as intuitive and easy to use as possible, Ford employs the use of a “third-age suit” to give younger designers and engineers the feel for the needs of the older population. This is an outfit that adds bulk and restricts movement of the knees, elbows, back and neck. Gloves reduce the sense of touch, and goggles simulate cataracts. Even though it does not create a specific condition, the suit provides a feel for the worst-case scenario of older drivers with various physical impairments.³

Gerontechnology is a relatively new field that links gerontology, ergonomics and technology in the design of products and environments. The field originated in 1980 at the Eindhoven University of Technology in the Netherlands. Gerontechnology is applied in five major areas of design: prevention, compensation, enhancement, research, and aid to caregivers.⁴ Prevention is the most powerful and novel of these applications since it proposes that aging may be altered by redesign of the environment, products and services.⁴ For example, one study looked at the quality of indoor air as it impacts the health of the individual and the aging process.⁴

The traditional focus of ergonomics applied to aging has been on products and environments that compensate for declining physical and mental functioning, whereas gerontechnology addresses technologies and services that enhance performance opportunities in older age activities of communication, work, leisure, and learning.⁴ This type of design stresses the importance of user involvement in product design and evaluation, and uses experimental methods and task analysis.⁴ We are excited to see this field develop and hope that manufacturers, architects, and designers will use these principles not only to accommodate the disabilities of aging, but also to help prevent them.

Typical physical changes with aging

Most symptoms associated with aging that are relevant to ergonomics can either be prevented or at least successfully accommodated, so they need not become debilitating. By being aware of common changes in the body, people can modify their diet, exercise, and physical environments to lead comfortable and active lives. It is important to maintain a positive outlook and a sense of humor!¹

Common effects of aging include:

- Muscle loss resulting in reduced strength.
- Arthritis, a source of pain and loss of strength.
- Decreased visual and auditory abilities.
- Diminished nervous system response and reduced tactile feedback.
- Decreased water content of tendons, cartilage, and connective tissues causing stiffness, reduced cushioning, reduced elasticity and flexibility, and increased susceptibility to stresses.
- Lower tolerance to heat and cold.

Preventive measures

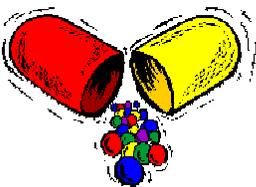
Diet – Your previous and current diet has a very big impact on your overall physical and mental health. It is extremely important in the reduction of chronic inflammation. Science now recognizes that inflammation plays a significant role in a wide range of debilitating conditions including Alzheimer’s disease, Rheumatoid and osteoarthritis, diabetes, and RSI. We covered this topic exhaustively in our articles on inflammation and nutrition (see Articles Archive: <http://working-well.org/articles/archive.html>). It is also covered in Dr. Weil’s book, Healthy Aging.¹

In short, eat a diet with:^{1,5}



- A predominance and wide variety of vegetables and fruits, organic when possible. Lutein, a carotenoid found in yellow and orange fruits and vegetables, appears to help in the prevention of cataracts and age-related macular degeneration.¹
- Little or no saturated and trans-fats from such sources as grain-fed beef, crackers, snacks, fried foods and margarine.
- An abundance of Omega-3 polyunsaturated fatty acids (best from oily cold-water fish).
- Whole grains, rather than flours and sugars (especially high-fructose corn syrup).
- Limited animal proteins.
- More vegetable protein (soy foods, legumes, beans, lentils, whole grains, seeds, and nuts).

Supplements



Use of supplements is not a substitute for eating a healthy diet.¹ But most people cannot consume enough food to get an adequate supply of antioxidants and phytonutrients. Therefore, supplements can help fill in the gaps in your diet. However, research is still quite preliminary on supplements. In addition, when compounds thought to be the active component of a food are isolated and consumed as a supplement, the effectiveness is often less than that found when whole foods are consumed.

There are supplements that can help reduce inflammation and stave off aging. We cover many of these in our second article on Inflammation including turmeric, ginger, green and white tea, and the formulation, Zyflamend.⁶ Supplementation with fish oil (approx. 2 gms/day) is recommended if you do not consume oily cold-water fish several times a week. Supplements can aid in immune support and detoxification.¹

General guidelines for supplementation:

- Vitamin C - about 200 mg/day (more is not used by the body)
- B Vitamins – 50 mgs of each B Vitamin except:
 - Folic acid – 400 mcg or more
 - B₁₂ – 50 mcg or more
- Vitamin E – 1,000 I.U. natural mixed tocopherols or better, at least 80 mg natural mixed tocopherols and tocotrienols. You will likely have to take an extra vitamin E pill to get this much.
- Selenium – 200 mcg, no more
- Mixed carotenoids – 10,000 to 15,000 I.U./day
- Vitamin D – 1,000 I.U. or more
- No iron
- No preformed Vitamin A (retinol)
- Calcium – Preferably as calcium citrate taken with meals
 - Women: 1,200 to 1,500 mg/day
 - Men: no more than 1,200 mg/day from all sources
- Fish oil – 2 gms/day
- Ginger and Turmeric or Zyflamend (blend of anti-inflammatory herbs)
- Co-Q-10 – 60 to 100 mgs taken with largest meal

Physical activity



Guess what? Diet and supplementation isn't everything! Regular exercise seems to be critical in maintaining both physical and mental health. It improves blood flow to the brain and the rest of the body, providing necessary nutrients and oxygen as well as aiding the healing process for injured tissues.^{1,7} However, it is important to recognize that behaviors and levels of exercise that were appropriate when we were younger can be harmful as we age.¹ Learn to let go of behaviors more suited to younger bodies.¹ Be aware of your personal health risks, weaknesses caused by previous injuries, your past medical history, and your family history when you plan activities and physical activities.¹ Get medical exams to screen for such problems as cardiovascular and pulmonary limitations.¹

Most people in their 50s and 60s have an increased risk of injury due to their sedentary lifestyle, but some are at higher risk due to overactivity.¹ Over activity damages joints, muscles, and bones, and creates adverse effects on body composition, the nervous system, and immune functions.¹ In cultures where physical activity is a part of everyday life and activities are varied, degenerative joint disease, RSI, and musculoskeletal disorders are not as much of a problem as they are in our culture.¹

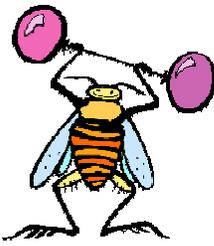
Excessive physical activity is a source of oxidative stress creating excess free radicals. Too many free radicals overwhelm the body's system and leave the body susceptible to age-related diseases. In addition, it causes a decrease in reserves to protect you in the event of illness and weight loss.¹ Low fat body composition is correlated with better cardiovascular health and low risk of type 2 diabetes, but neurological health appears to suffer because the nervous system is made up of special kinds of lipids (fats). Pesticides and other toxins, which are fat soluble, are likely to concentrate in nervous tissue of lean people and may be linked to the development of ALS (Lou Gehrig's disease).¹

Regular aerobic exercise keeps the cardiovascular system healthy, prevents weight gain, improves immune and cognitive function, improves mood, prevents depression, and reduces stress.¹ Exercise should be:

- Done daily for at least 30 minutes
- At a moderate level so you have difficulty talking, but it's not impossible to talk
- Suited to your body and not likely to lead to injury

Avoid running and jogging which is very hard on aging cartilage and connective tissue.¹ Walking, cycling, swimming, hiking or using an exercise machine are all excellent ways to get your daily dose of aerobic exercise.¹ Variety is the spice of life, so try to mix activities on different days. Exercise machines are good for days when the weather doesn't allow outside activity.

Strength training



Bone and muscle mass diminish with age as a result of changes in hormone levels and metabolism. To preserve bone mass, you must engage in weight bearing exercise that causes the formation of new bone and minimizes loss of mineral density.¹

Resistance exercises, or strength training, build muscle that protects and stabilizes joints, optimizes metabolism, and reduces the risk of obesity.¹ This can be accomplished with either resistance machines, free weights or rubber tubing. Strength training should be done two or three days a week for about 30 minutes, with at least one day between sessions.

Pilates classes that use special machines are a very good choice because they include posture instruction and stretching in addition to strength training.

Flexibility and balance training



Falls are a major source of disability in older people.^{1,8} Aches and pains caused by chronic muscle tension and joint stiffness are also a common complaint. Stretching maintains flexibility, tones muscles, and keeps joints lubricated. Balance training minimizes the risk of falling and the injuries that result from falls.^{1,8}

Yoga, especially hatha yoga, when done correctly and under proper supervision is an excellent way to stretch gently. Yoga also has the benefit of teaching you correct breathing, which is essential to overall

benefit of teaching you correct breathing, which is essential to overall health and helps to relieve stress.¹ Tai Chi is completely safe and is an excellent way to improve balance.¹ Other options are balance boards and exercise balls for improving balance.¹

Compensation for loss of ability and other challenges in aging

Vision problems



Cataracts, presbyopia (loss of the ability to focus on close objects), and age-related macular degeneration limit visual acuity as we age. To compensate for difficulties with vision, modify environmental factors at work and home to make things easier to see.^{8,9,10}

- Increase brightness of lighting and make lighting task-specific. Brightness levels may require adjusting throughout the day, so it's useful to have brightness controls on task and overhead lighting.
- Have annual eye exams and wear proper corrective lenses.
- Remove sources of glare. Alter the angle of the computer monitor or TV screen to avoid reflections and glare. Close blinds or move the monitor away from the glare source if necessary.
- Increase the font size on the computer screen and use magnifiers to improve the ability to see small objects and fine print.
- Turn computer monitor brightness down, which can cause eyestrain, and add task lighting for papers that need illumination.
- If you need to wear bifocals and work at the computer, lower the monitor so you can see the entire screen without raising your chin. It is best to wear single lens glasses (i.e., "computer glasses") to avoid this problem.
- Use products with audio or tactile information and cues (e.g., beeps or speech)

Hearing loss



Hearing loss is common in older people. Compensate for hearing loss with one or more of the following measures:^{10,11}

- Reduce unnecessary background noises.
 - Get ears checked and wear hearing aids if required.
 - Use volume controls on equipment. Get a telephone amplifier.
 - Avoid high-frequency noises.
- Make sure others are aware of your hearing loss and coach them in behaviors that enable you to hear them better (e.g., looking at you while speaking, not talking from another room).
 - Use visual or tactile feedback for controls that are difficult to hear.

Stress management



Stress is an enemy of good health because it causes the body to release cortisol. Chronic exposure to cortisol has many detrimental health effects.

Take time to de-stress with relaxation techniques.¹ Please note that physical exercise, taking a vacation, or watching TV do not achieve the same end as practicing relaxation techniques. The above activities often present stresses of their own and do not result in the same mental and physical state as achieved by the following techniques:¹

- Practice breathwork, meditation, and visualization.
- Get a massage.

Eliminate environmental characteristics that are stressful:¹⁰

- Open and level spaces for ease of movement.
- Increase lighting to improve visibility and perception.
- Choose warm-toned decorations, walls, and flooring.
- Install dimmers and volume controls.
- Play relaxing music.

Most of this category is not specific to aging. In terms of employment and choice of hobbies, however, it is particularly important to pay attention to issues of strength and flexibility to avoid injury. Tendons, ligaments, cartilage, and connective tissues lose water content and become less flexible with age. In addition, there is loss of muscle mass and strength.⁸ There is a greater intolerance to heat and cold that presents health risks such as higher heart rate, greater loss of body fluid, and restriction of blood vessels. Employers should identify jobs that present the greatest physical risks to soft tissues and limit assignment of these jobs to older workers.⁸ Older people should be aware of these risks in all of their life activities and take responsibility for their health. The following recommendations benefit everyone, but especially older people:⁸

- Reduce work with static postures (i.e., avoid tasks that require the same posture for a long period of time).
- Increase use of mechanical lifts.
- Keep work in your “neutral zone” (i.e., between elbows and finger tips).
- Eliminate twisting of the upper torso.
- Stretch the body throughout the day.
- Maintain a daily exercise, stretching, and flexibility program.
- Avoid extreme temperatures by use of shade, air-conditioning and fans in hot weather and wear proper clothing (e.g., hats, socks, and gloves) when it is cold. Be aware of medications that affect your ability to tolerate various temperatures.

Tool selection and positioning

Loss of strength associated with aging, arthritis and pain, makes it difficult to manipulate tools. Some older people lose tactile sensation and experience tremors that can become a problem.¹¹ There are hundreds of gadgets and tools designed for people who have

various disabilities, especially arthritis. A few good resources for such devices are listed below in the “Resources” section. The following suggestions may make tool use easier:¹¹

- Maintain a regular strength training program to minimize loss of strength.
- Position controls and tools within easy reach.
- Controls should be logical and easy to read.
- Tools and equipment should require minimal force and fine motor control, and eliminate twisting or bending of the wrist.
- Tools and equipment that fit enlarged joints or have enough space to accommodate tremors.
- Use controls that are easy and intuitive (e.g., rocker switches, push-buttons, knobs with raised arrows and logical clockwise adjustments). Multi-function digital displays are difficult.
- Replace doorknobs with levers or open handles.

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This article and all of our articles are intended for your information and education. We are not experts in the diagnosis and treatment of specific medical or mental problems. When dealing with a severe problem, please consult your healthcare or mental health professional and research the alternatives available for your particular diagnosis prior to embarking on a treatment plan. You are ultimately responsible for your health and treatment!
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RESOURCES:

Functional Solutions: <http://www.beabletodo.com>. North Coast Medical’s catalogue of products for independent living.

Arthritis Supplies/The Wright Stuff, Inc.: <http://www.arthritissupplies.com>. Another supplier of great gadgets to help with everyday tasks.

Dr. Weil on Healthy Aging: <http://drweilonhealthyaging.com>. Dr. Andrew Weil’s website and companion to his book, *Healthy Aging*. A \$3.99/mo membership includes information and programs on health issues from the country’s leading authorities.

American Association for Retired Persons(AARP): <http://www.aarp.org>. A huge resource for all aspects of life after 50, with an emphasis on a healthy and active lifestyles`. Offers discounts and information on products and services, travel, finances, legal issues, legislation and health.

REFERENCES:

1. *Healthy Aging: A lifelong guide to your physical and spiritual well-being*, by Andrew Weil, M.D. ©2005 Andrew Weil. Alfred A. Knopf publisher, New York. ISBN 0-375-40755-3.
2. *Trend of Hiring Older Workers Means Greater Call for Ergonomics*, by Jeanie Croasmun. May 10, 2004. ©2006, Ergoweb.com.
<http://ergoweb.com/news/detail.cfm?id=924>
3. *Aging Baby Boomers Influence New Vehicle Design*. July 5, 2006, Ford Motor Company Enews. http://media.ford.com/article_display.cfm?article_id=23730
4. *Herman Bouma and Gerontechnology – A View from the USA*. March 26, 1999 working lunch in honour of the emeritus status of Prof. dr. Herman Bouma., by James L. Fozard, Ph.D. <http://www.gerontechnologie.nl/fozard.htm>

5. *Nutrition and Repetitive Strain Injuries Part III: Treatment & Healing*, by Tamara Mitchell. Working-Well Ergonomics Information Website. http://working-well.org/articles/pdf/Nutrition_Treatment.pdf
6. *Feeling Swell: Part II, Arming your body in the inflammation battle*, by Tamara Mitchell. Working-Well Ergonomics Information Website. http://working-well.org/articles/pdf/Inflammation_2.pdf
7. *How to Protect the Aging Work Force*, by Cynthia L. Roth. Feb. 18, 2005. Occupational Hazards. <http://www.occupationalhazards.com/articles/13012>
8. *How to Protect the Aging Work Force*, by Cynthia L. Roth. Jan. 20, 2005. Occupational Hazards. <http://www.occupationalhazards.com/articles/12868>
9. *Aging Eyes Can Benefit from Ergonomic*, by Jeanie Croasmun. April 16, 2004. ©2006 Ergoweb.com. <http://ergoweb.com/news/detail.cfm?id=913>
10. *Ergonomics for the Aging Population: Implementing Methods to Maintain Quality of Life*, by Margarita M. Posada, Fordham University. ©2003 Margarita Posada. Human Factors and Ergonomics Society, National Ergonomics Month. http://hfsnem.org/articles_files/Ergonomics_for_the_aging_population.pdf
11. *Guidelines for the design of consumer products to increase their accessibility to persons with disabilities or who are aging*, by Gregg C. and Katherine R. Vanderheiden, Trace R&D Center, University of Wisconsin-Madison. Working Draft 1.7, 1992. http://trace.wisc.edu/docs/consumer_product_guidelines/toc.htm