

# **The Aging Workforce: Secondary Ergonomics Risk Factors and Solutions**

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## **Introduction**

As our workforce ages we see an increase in the musculoskeletal disorders (MSD) reported in occupational environments. Despite our best efforts the MSDs frequently persist or reoccur. We have had many experiences where we determined what was causing the problem and usually fixed it. Now we will look to see why these problems may persist despite our best efforts and learn reproducible ways to approach our duties and validate our findings

So how has ergonomics evolved? Currently we view ergonomics as: well designed tools and equipment, an efficient layout of the workplace, a mechanically sound work organization, positive behavior of the worker towards self-care and a proactive leadership/management team. In other words, ergonomics is a blending of the worker with their work environment.

In ergonomics our objectives are to prevent injuries to people at work, improve productivity, increase effectiveness of services, control costs and exposure of the company and be a catalyst for change in management's attitude and involvement and the workers performance and satisfaction.

The benefits of ergonomics to management include reducing wasteful motions and reducing friction and fatigue producing tasks, increasing productivity, contributing to design changes and savings on time and money by improving quality and speed of activities, employee's morale and decreasing injury rates and turn over. We accomplish these objectives with physical and cognitive ergonomics. In physical ergonomics we work with human anatomy, anthropometrics, physiology and biomechanical characteristics as they relate to physical activity. Cognitive ergonomics involves the workings of our brain in the areas of perception, memory, reasoning and motor response, which is the way the human, connects to the machine. Cognitive ergonomics determines how long a person can do their job.

Ergonomics issues that we cannot control include compliance to work safety standards, lifestyle demands, preferences and culture, hobbies, second (or third and fourth) jobs and psychosocial issues. Other human issues that we cannot control are behaviors in and out of the work environment, psychosocial influences on pain and injury and attitudes towards management by workers as well as attitudes towards workers by management.

Ergonomics Principles to Reduce Risk of Injury or Re-injury

We try to control the primary risk factors of prolonged, awkward or static posture, repetition without adequate rest periods, force sustained beyond minimum effort, contact stress which compromises circulation and vibration that contributes to neurovascular shutdown. Applying the following principles can result in a reduction of musculoskeletal disorders risk factors.

1. Give the body the best biomechanical advantage to improve leverage and reduce friction.
2. Manage the pacing and duration of tasks to decrease fatigue.
3. Promote and sustain the circulation of blood and other body fluids.
4. Address the cognitive workload.
5. Involve the worker in the ergonomics solution process.
6. Change positions and move the body frequently.
7. Manage time as part of the ergonomics process.

Time is a finite commodity. How we use it affects our well-being. Duration, intensity, frequency and maximum effort are variables of endurance. A person's endurance is unique to them and it determines their response to the primary ergonomics risk factors of repetition, force, posture, contact stress and vibration.

### Job Hazard Analysis Tools

To help manage time and people there are many evaluation tools that can be used. Some of the most effective ones include the Snook Push/Pull/Lift/Lower/Carry Hazard Tables, Washington State Ergonomics Checklists, Rapid Upper Limb Assessment (RULA), Rapid Entire Body Assessment (REBA), Roger's Fatigue Analysis, National Institute of Safety and Health – NIOSH, Lifting Guide and the American Conference of Government Industrial Hygienists Hand Activity Level and Threshold Limit Values among many others. These tools for assessing ergonomics risks provide objective quantifiable information. When used they will assist in understanding the degree of the problem with each task performed in a job. This information can provide a better understanding of the root cause for the MSD and why it did not resolve after the ergonomics intervention. When used proactively, the information will assist with correct ergonomic design of jobs and reduce the potential of fatigue that leads to injury.

There are many experiences where we have determined the ergonomics problem and tried to fix it. We now need to look at why these problems may persist despite our efforts and learn reproducible ways to approach our duties and validate our findings. So why does the persistent injury hang on? It may be because it is cumulative over time. Small injuries built into big ones. This is where we must make a difference. Sleep, age, gender, stress, fitness and secondary risk factors all need to be addressed. So let us look at these ergonomics issues.

Ergonomics injuries are the result of a problem not the source. No two people present, act upon or respond to a situation in the same way. Most workers will compensate for ill-fitting equipment and tasks to get the job done.

The bottom line is that it is still more cost effective to keep the workforce healthy and on the job. Ergonomics training statistically does work. Just visit [www.osha.gov](http://www.osha.gov) and look under ergonomics successes. Ergonomics is about sick jobs that can make sick workers and our ability to solve the source of the problem. We have to be able to see the whole picture and see why the INDIVIDUAL fails to fit in the ideal workstation set-up. When we blend the worker and the workplace and the workplace is at optimum efficiency yet problems continue to occur, then we need to look again at the WORKER.

The persistent pain problem can be the result of company policies of piecework and/or incentive programs. It may be that it is due to labor versus management posturing. It could be that the employee denies the issues or chronic stress situations at work and home. It may be age or lifestyle related. It can also result from the “Mechanical Fit” mindset of purchasing ergonomics solutions like expensive chairs and hoping that will solve the problem.

### Anatomy and Physiology of Ergonomics Injuries

What is an ergonomics injury? It is pain and dysfunction as a result of static and/or awkward postures especially when there is force, repetition, vibration or contact stress involved. The tissues most often involved are the muscles, nerves, tendons or fascia. An ergonomics injury is primarily a Nutrient Pathway Disorder.

The nutrient pathway is the delivery of nutrients to tissue and the removal of subsequent waste products of metabolism. The maintenance of the most patent vascular and lymph system assures the healthiest physiological environment. The waste products generated are hydrogen ions, lactic acid, Ph changes and nitrogen ions. It is like a fireplace inside your body. Circulation through our entire body is promoted actively and passively. Our heart muscles and gravity all play a role.

### Circulation and Dynamic or Static Work

With dynamic work there is increased pulmonary ventilation, heart rate, blood pressure and blood flow to active muscles and decreased flow to inactive muscles. In static work, pulmonary ventilation, heart rate and cardiac output stay steady. Pressure inside the muscle increases and delivery of oxygen and nutrients to muscles is hampered causing fatigue. Static work increases pressure inside the muscle. This mechanical compression occludes blood circulation partially or totally. The end product is hampered delivery of nutrients and oxygen leading to fatigue. If this condition persists neurological signs will develop over time.

Muscle fibers arrange in specific angles of attachment to the bone. The ideal angle is 0 -15 degrees. Force decreases when the angle is greater than 30 degrees and can decrease as much as 50% with angles greater than 60 degrees. A neutral position can range from 0-30 degrees. Changing the angles increases or decreases stresses on some fibers and can lead to calcium spurs at the insertion points.

### Tendinitis versus Tendinosis

Tendinitis is an acute injury and refers to inflammation. Tendinosis refers to a chronic injury and refers to degenerative changes, micro trauma without inflammation and weakness. The recovery time from fatigue will be different for all individuals depending on the combination of physical and psychological issues. Recovery from fatigue is variable for each individual depending upon, the intensity of the activity, time between cycles, areas of the body involved and the duration of the task. The actual time for recovery for any specific task has not been determined but may be estimated from research and charts from Susan Isernhagen’s work.

### Risk Factors for Musculoskeletal Disorders

The primary risk factors for musculoskeletal disorders are posture, force, repetition, contact stress and vibration. How much of a risk factor is a problem and how do we determine that specific amount? Just because your job has risk factors does not mean that you will develop a MSD. In fact, a little bit of exposure to some risk factors can actually be good for you.

Occasionally moving into awkward postures like reaching or bending will help to stretch and exercise your muscles. Also, if you occasionally do some lifting, especially if you do it properly, it can help to strengthen your muscles. This is one of the reasons that people exercise.

Whether or not a risk factor will result in a MSD depends on the duration, or how long you are exposed to it. Usually hours of exposure, not just minutes. Working bent over for two hours without a break could cause you a back strain but so could work while bent for 15 minutes at a time for a total of two hours per day. The frequency, or how often you are exposed to it and how much rest that you get in between, is also an issue. Frequency addresses the speed at which you work. It can be measured in units per time, like boxes per hour. What can be defined as frequent can change with the task. Lifting 30-pound boxes 5 times per minute can be considered frequent, while typing 5 words a minute probably would not be considered frequent. The intensity or how much of the risk factor is a third modifier. This refers to force issues like weight, push/pull, carry, grip or pinch, impact or contact stress and vibration levels. Combinations of risk factors increase your likelihood of hitting your personal threshold for developing a MSD.

Rest is one way to decrease the impact of the risk factors for MSDs. There are several ways to get rest. Spontaneous or just stopping, administrative which is built into the work schedule, engineered such as the pacing of the machine or task or hidden such as light duty or task enlargement. Implementing a 30 -180 second ergo break into the work schedule may give your body the diversity and added rest it needs to withstand the stress of the common risk factors for MSDs.

### Worker Productivity

What determines productivity? Is it the speed of a machine, the speed of the worker or the stamina of the worker? Obviously the stamina of the worker will be the determining factor in work productivity. Errors increase and productivity decreases with worker fatigue. In the United States we work more hours and take fewer vacation days than most any industrialized country in the world. We average fewer hours of sleep than we did 20 years ago.

There are two types of fatigue, peripheral and central. Peripheral relates to adequate circulation to the tissue. Jobs must be designed to reduce static loading to the minimum required to do the job or face possible shift into anaerobic metabolism, which is less efficient and produces more waste products. Central fatigue is related to psychophysical aspect of work capacity. It may be described as a feeling of tiredness or a perception of increased exertion though working at the same level as before. It may occur with high mental intensity tasks and performance errors are considered “behavioral symptoms”. Work without regular breaks is more likely to lead to central fatigue even if the muscles themselves are not fatigued. It is not the same as injury impairment although production reduction may seem the same.

All tissue that has gone to fatigue due to over use can recover with under use, if rest is applied in a timely manner. Overuse that is unchecked leads to micro tears at the cellular level that can be extended by behavior, carelessness and inadequate recovery time. The ultimate determinate of a workers ability to do their job is fatigue. Fatigue leads to tissue damage, which in turn leads to disruption of the nutrient pathway. Women appear to be more resistant to dynamic fatigue. This may be due to metabolism efficiency. During static activities women’s endurance is equal to that of a man’s. The most likely reason for this is the greater reserves of energy in the muscle mass of men.

Monotony and fatigue may be relieved by color, decoration, music and exercise. Work conditions that allow workers to control their environment, hours and rest periods as well as

proper equipment will reduce or eliminate fatigue. Boredom leads to more errors. Designing jobs for only right-handed workers is also a source of increased fatigue for both left and right handed workers.

### Our Aging Workforce

In 1972 the average age of a worker in the United States was 28. Currently it is around 46. There are 18.2 million workers 55 and older. By 2010 there will be 25.6 million workers over the age of 55. Extensive research has found no relationship between age and on the job performance. Maturity does work.

The chemistry of cartilage, which provides cushioning between bones, changes with age. With less water content the cartilage becomes more susceptible to stress. As cartilage degenerates osteoarthritis can develop. Ligaments and connective tissue between bones become less elastic reducing a person's flexibility. As muscles age they can begin to shrink and lose mass. This is a natural process but a sedentary lifestyle can accelerate it. The number and size of muscle fibers also decrease. Thus it takes muscles longer to respond in our 50's than in our 20's. The water content of tendons decreases as we age. This will make tissues stiffer and less able to tolerate stress.

How does aging effect ergonomics? Aging effects hearing, eyesight, strength, flexibility, reflexes, hand-eye coordination, endurance, stamina, balance and sleep patterns. All of these issues may increase risk for MSDs and slow down recovery. Older workers are 30% less likely to be hurt severely enough to miss work but will take longer to recover. Simple accommodations for older workers will help all workers. Provide tools and workstations that avoid extremes in motion and postures. Larger knobs, switches, dials and print will decrease errors and increase ease of use. Reducing the force required to perform a job with adaptive equipment for lifting, carrying, pushing, pulling, grip and pinch forces will benefit all from an ergonomics perspective.

### Prevention of Ergonomics Injuries

In approaching prevention of MSDs, what are the areas for focus? Our first task is to evaluate the job tasks to identify the root causes and then modify or replace the task. This is where use of the ergonomics risk factor assessment tools that we mentioned earlier is appropriate. Without a proactive management team, there will not be an improvement in the overall health of the workers or an improvement in the bottom line costs for the company. If the employee is not involved in the process it will be difficult to get them to buy into the solutions and there is a significant increase in the probability of the worker becoming injured or disabled.

Education of management and workers is a necessity including both group and individual attention. Motivation is a key component for success. It is important to teach how self-care is a major component of success. Workers must feel that they are part of a TEAM and that the work is appreciated and their opinions count. Having control over their tasks and breaks is also important. Employees want and should receive respect from upper management and above all management must show interest in employees well-being and safety.

Design consultation is part of the process of change. In all reality good proactive ergonomics begins in the design process. Unfortunately, we generally do not involve it until there is a problem identified and so we are applying it reactively instead. So we are redesigning which is twice as expensive as building it correctly originally.

Advocacy is an important element for successful education. This is where to install the Ergo Leader program. Nations Business magazine reported as early as March of 1990 that injury risk at work was only 20% the result of work design but 80% the result of worker habit. One accepted

technique of behavioral modification is peer pressure. We call this an Ergo Leader program. In this program first identify areas of high risk for MSDs. Recruit as team members workers from those areas with skills and interest in the job and safety processes. Build a team of both management and workers focused on ERGO health and safety as the primary directive. Bring in or grow your own experts with the authority to propose and effect changes.

Ergo Leader objectives include:

- Recognizing work place risk factors for work related musculoskeletal disorders.
- Identifying the signs and symptoms of MSDS that are resulting from the risk factors.
- Know the company policy and procedures for health and safety.
- Know the process that the employer is using to address injuries and how to initiate it.
- Know the procedure for reporting risk factors.
- How to perform a job task analysis.
- How to select ways to implement control measures

Some of the problems that face the Ergo Leader program may include:

- An initial increase in the number of lost or modified workdays.
- Employee or medical director turnover.
- Can you recruit dedicated employees?
- Does the program cost more then it is saving?
- Can you actually conduct a reliable cost – benefit analysis of the program?
- After full implementation of an ergonomics program there may be an initial increase in costs secondary to increased reporting of complaints.

Keys to a successful program include:

- The employee must be taught to understand that caring for and using their body correctly while avoiding MSDs is THEIR responsibility.
- It is the responsibility of the employer to provide a safe workplace.
- Having both work together as a TEAM is the best approach.

## Summary

In summary, an aging workforce will continue to produce work related musculoskeletal disorders. The effects of aging on vision, noise discrimination and tolerance, adaptation to non-optimal temperatures, shift work and the related fatigue and cognitive issues will continue to have more impact on this segment of our workforce then younger workers. To maintain a healthy workforce and to keep productivity at acceptable levels, methods for identifying these risks and reducing their impact must be a top priority.

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