HEALTH, SAFETY, AND PRODUCTIVITY OF THE AGING WORKER

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ABSTRACT

Aging is a complex process which results from the interaction of genetic, environmental and life-style factors. Longitudinal studies have shown that there is no general pattern of aging that applies to all performances, all organ systems, or all individuals. Some people may exhibit a constant level of a function, some may decline gradually, while others may show a rapid decrease in the level of functioning. Since changes due to aging are highly heterogenous, most information available on physiological changes with age cannot be applied indiscriminately to all aging workers. Therefore the design of job tasks and work environments may need to be more individualized and flexible after the age of 45 years.

INTRODUCTION

Demographic changes in the United States are causing a "graying" of the population and a larger number of older workers in the work force. By the year 2050, people over the age of 55 may represent 33% of the population, and the average life expectancy is projected to be almost 85 years for men and 90 years for women. These demographic trends will certainly have an impact on the age composition of the work force. Faced with the prospect of an aging work force, it will be necessary to develop effective strategies to prevent or reduce occupational health risks, injuries, disability and death of middle-aged and older workers. In order to assess safety and health risks in the work place and develop appropriate prevention strategies it will be necessary to: 1) develop a solid empirical base of information on age-related physiological, psychological, and disease processes which affect the performance and safety of older workers, 2) undertake human factors research on the work capabilities, task demands, and work environments of older workers, and 3) develop and assess strategies designed to enhance worker capabilities, modify tasks and work environments, and develop preventive programs appropriate for older workers.

The increase in longevity and aging of the "baby boom" generation will cause the number of people 65 years and older to increase by 40% between 1984 and 2010 until they represent nearly 14% of the total population. Presently, approximately 30% of the civilian labor force in the United States is 45 years of age or older. As of 1990, there were approximately 12 million workers over age 55 and almost 3.5 million workers age 65 years

or older. Figure 1 shows the marked increase in the number of middle-aged and older workers in the civilian labor force population (in millions of workers) from 1960 to 2000, particularly among women.

AGING AND WORKER SAFETY

The aging of the U.S. population and the growing number of older people participating in the labor force will focus special attention on the safety and occupational health of the older worker. The Baltimore Longitudinal Study of Aging (BLSA), a major intramural research program in the National Institute on Aging, has been studying longitudinal changes that occur as part of the aging process for over 30 years. Results from the study have led to the conclusion that aging is a complex process which results from the interaction of genetic, environmental and life-style factors. Figure 2 shows BLSA data illustrating the decline in seven different physiological processes. Each line in the figure shows the percent of function remaining relative to a 30 year old. While some of the factors governing these processes are primarily genetic, biological, biochemical, or physiological; others may be greatly affected by behavioral characteristics, such as life styles and changes in social conditions. Many of the longitudinal declines observed in the BLSA may have an impact on job performance and subsequent safety in older workers. Table 1 summarizes some of the human factors that have been observed in the BLSA and their relevance to occupational safety. Thus far, this knowledge has been based primarily on laboratory research and has seldom been applied to occupational safety and health.

Table 1. Relationship between occupational safety and human factors.

Work capacity and cardiovascular fitness

cardiac output

muscle mass

strength

maximum VO2 pulmonary function

Cognitive, sensory, and neural factors affecting work performance

blood flow to brain

memory

reaction time

hearing

nerve conduction

vision

Occupational injuries and mortality

bone density

equilibrium

obesity

Adaptation to, or recovery from, work-related stress or injuries

adrenaline response

heat stress

immune system

cold tolerance

homeostasis

Detoxification and clearance of hazardous substances liver function renal function

A HUMAN FACTORS APPROACH TO THE **OLDER WORKER**

A human factors approach may be useful in evaluating the work capabilities of older workers, as well as relevant characteristics of task demands and the work environment. This understanding in turn can be used for interventions such as redesigning work characteristics and promoting work ability. The purpose of re-engineering job tasks and environments is to create improved work conditions by tailoring work content and work environment to the abilities of the aging worker.

An aging work force will bring special challenges to the field of occupational injury, disability and lifethreatening casualty prevention because the work abilities of some elderly workers may decline precipitously while other elderly workers may maintain relatively stable performance levels. Research from longitudinal studies such as the BLSA has found no general pattern of aging that applies to all performances, all organ systems, or all individuals. Since the changes due to aging are highly heterogenous, most information available on physiological changes with age cannot be applied indiscriminately to all aging workers. Therefore, the design of job tasks and environments may need to be more individualized and flexible after the age of 45 years. Only by the careful study of longitudinally-collected information can we estimate and take into account the variability between persons, the large within-individual differences in changes in different functions, and age cohort differences. It is possible that injuries, disability, morbid and fatal events

among older workers may be prevented by understanding the relationship of age changes to work abilities and work demands.

POTENTIAL INTERVENTION STRATEGIES

More information is needed that shows how to apply interventions appropriate for older workers. Technological intervention to promote the safety of the aging worker is needed because of the age-related declines in "reserve capacity" in various biological or physiological systems. Thus, older workers may be at higher risk of serious outcomes given the same exposure or injury in a younger worker.

In addition to promoting new technologies in the area of worker safety, more can be done in modifying the person as well as the task. Strategies aimed at promotion of work abilities would include interventions to strengthen functional capacities (physical, mental, social) and health, assessments of work abilities, and training and education programs for the older worker. For example, there is an increasing amount of information indicating that exercise, weight loss, and strength training can improve strength as well as morale and self confidence and at the same time reduce the likelihood of injuries and other consequences related to the decline in performance of the aging worker. On the other hand there is little reason to expect training to affect sensory capacity, except in the area of attention, or response speed in tasks which have a reasonable amount of uncertainty in the task requirements. In these areas, environmental interventions might have the greatest positive effect.

CONCLUSION

By combining research on the basic mechanisms of aging, including biological, environmental, demographic, physiological, and ergonomic factors, we wish to study the health, safety and performance of the aging worker with a view to providing guidance on such aspects as training, work task design and work place design to enable workers to maintain productivity without stress, illness, injury or disability.

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Figure 1. Demographic trends of U.S. civilian labor force (source: Bureau of Labor Statistics, 1991)

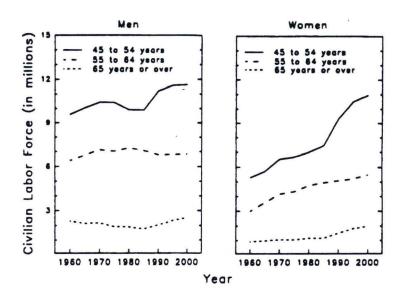
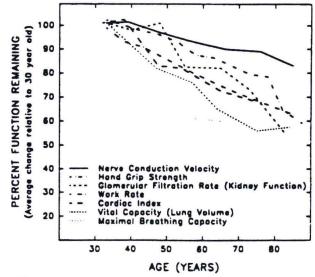


Figure 2. Average changes with age, relative to a 30 year old, for seven differet physiological functions (source: N.W. Shock, 1962



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