

ERGONOMICS

FUNDAMENTALS

QUICK REFERENCE CARD



BRIEF HISTORY

Has been present ever since human beings began interacting with the environment. Ergonomics actually emerged as a scientific discipline in the 1940s due to the technological advances of World War II

WHAT IS ERGONOMICS?

Taken from two Greek words, 'ergon' meaning work, and 'nomos' meaning laws, ergonomics in its simple form is a science that defines the laws of work.

IDEAL VS. REALITY

If worker is required to spend long hours at a workstation it is very important to have a good workstation design. In reality, it is difficult to design equipment which can be used by any worker.

DOMAINS OF ERGONOMICS

- Physical Ergonomics
- Cognitive Ergonomics
- Organizational Ergonomics
- Environmental Ergonomics

APPLICATIONS OF ERGONOMICS

- Health & Safety at Work – In Reducing Human Error & Preventing Accidents
- Cognitive Ergonomics & Complex Tasks
- Human-Computer Interface Design
- Design & Layout of Displays & Controls
- Environmental Ergonomics
- Production Design & Consumer Ergonomics
- Task Analysis
- Usability Assessment
- Research & Education

WHY SHOULD WE LEARN ABOUT ERGONOMICS?

The worker comes under the effect of various factors which may lead to the development of disorders that impact his or her muscles and joints. These disorders - called work-related musculoskeletal disorders (WMSDs) - are the leading cause of occupational injury in most of the industry sectors, accounting for over half of the injury compensation costs.

PRINCIPLES OF ERGONOMICS

The five main principles of ergonomics are:

- Safety
- Comfort
- Ease of use
- Productivity and performance
- Aesthetics

BARRIERS TOWARD IMPLEMENTATION OF ERGONOMICS

Some of the most common barriers are a lack of:

- Resources
- Knowledge or expertise
- Attitudes toward ergonomics
- Safety culture
- Application of regulation at workplace
- Commitment at all levels (management to employees)

ACUTE VS. CUMULATIVE INJURIES

Acute injuries occur instantly such as an injury resulting from a slip or a fall. The cause of an acute injury is often easy to identify. Examples include fractures, cuts and bruises.

Cumulative injuries occur over time and it is not easy to identify the cause of this kind of an injury. Most of WMSDs are cumulative in nature as they may not result from a single event.

SIGNS AND SYMPTOMS

Some of the symptoms of WMSDs include:

- Fatigue
- Aching
- Tingling
- Numbness
- Muscle tightness
- Cramping
- Burning sensation
- Pain

CONTRIBUTING FACTORS

The common contributing factors towards WMSDs are:

- Awkward Postures
- Static Postures
- Repetitive Motions
- Forceful Exertions
- Vibration
- Environmental factors
- Engineering factors
- Organizational factors

RISK MODULATORS

The degree of risk posed by those contributing factors is modulated by these three characteristics:

- Intensity
- Frequency
- Duration

ANTHROPOMETRY

Anthropometry is a science of measuring the physical aspects of a person. Anthropometric information gives the various dimensions of the human body, usually through the use of bony landmarks to which height, breadths, depths, distances, circumferences and curvatures are measured.

BIOMECHANICS

Biomechanics is the study of the effects and control of forces that act on or produced on living tissue. It involves in understanding the generation of internal forces within the body – ex. muscular force, and external forces affecting the body – ex. gravity. Biomechanics thus covers both Kinematics (movement) and Kinetics (forces that produce movement).

PARTICIPATORY APPROACH

Participatory ergonomics is defined as ‘involving people in planning and controlling a significant amount of their own work activities with sufficient knowledge and power to influence both processes and outcomes in order to achieve desired goals.

SYSTEMS APPROACH

In a systems approach, a problem is seen as part of an overall system, rather than reacting to specific parts, outcomes or events. Various components of a system interact with each other and understanding this context of relationships with each other helps in providing the solution in a more effective way.

WORK DESIGN

Along with engineering designs that may assist a worker while working at the workstation it is very important to design the job itself. This is very important because the job can then be divided into various tasks to be performed thus helping in identifying hazards and various risk factors present while performing the task. This will help in designing the task accordingly so as to reduce possible injuries.

LEGISLATION

Sections 4.46 to 4.53 of Part 4 General conditions of OHS regulations provided by WorkSafeBC looks into Ergonomics Musculoskeletal Injuries (MSI) requirements that employers have to comply with. Sections 4.47 to 4.50 discuss on various risk factors and their identification along with assessment and controls. Participatory ergonomics is given importance in the regulations which can be looked at in the sections 4.51. Section 4.53 states that workers should be trained in recognizing risks and various control measures.

EDUCATION AND TRAINING

Training provided should include the fundamentals of ergonomics, various principles and concepts, task specific training and risk management. Risk management training is very important, especially to workers and management who are involved in the assessment and part of the ergonomics team. The training should be evaluated regularly to ensure that the objectives are met.

JOB ANALYSIS

Each job/task that has potential to cause musculoskeletal injuries should be evaluated thoroughly.

RISK ASSESSMENT

During a risk assessment, various tools are used to find out which different contributing factors are affecting the task to be performed.

Tools that are commonly used in ergonomics risk assessment.

- Rapid Upper Limb Assessment (RULA)
- Rapid Entire Body Assessment (REBA)
- Job Strain Index (JSI)
- Manual Tasks Risk Assessment (ManTRA)
- Occupational Repetitive Action Index (OCRA)
- Quick Ergonomic Checklist (QEC)
- Liberty Mutual (Snook) Psychophysical Tables

GENERAL CONTROLS OF ERGONOMIC HAZARDS

The following are the controls that should be looked into:

- Engineering Controls (implementing physical change to the workplace, which eliminates or reduces hazards on the job/task.
- Administrative and work practice controls (establish efficient processes or procedures)
- Personal Protective equipment (use protection to reduce exposure to ergonomics-related risk factors)

EVALUATION OF THE ERGONOMIC PROGRAM

It is very important to evaluate the program regularly so as to measure how well the program implementation is progressing and also to check if the program objectives were achieved. As part of the evaluation, always ask how workers feel about the solutions that were provided and get their feedback on if the solutions were effective.