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Miguel E. Acevedo Alvarez

Dr. Miguel Acevedo is a Chilean Physician, who obtained his medical degree at Universidad de Chile, where also studied Public Health Magister oriented to Epidemiology. Some years later studied Ergonomics, obtaining a Diploma at Universidad de Valparaiso, and a Specialist grade at Inermep (Spain). Served as Medical Director at Puerto Aysén Hospital, located in the southern Chile, and from 1996 put his professional focus on Occupational Health, working as Occupational Health Physician at Instituto de Seguridad del Trabajo. In this role, his main responsibility is giving consultancy and advice in preventive health and Ergonomics issues, to a variety of business and clients, in the field, with identification and control of risks factors, developing healthy work environments, and promoting well-being and productivity.

Research Interest

- Musculoskeletal disorders
- Occupational stress
- Identification and control of risks factors
- Developing healthy work environments, and
- Promoting well-being and productivity

Ergonomics defined

- **Ergonomics** is usually understood as the science of fitting the job to the worker.
- More precisely, as stated by **IEA** (2000),
  - Ergonomics (or human factors) is the ***scientific discipline*** concerned with the understanding of interactions among humans and other elements of a system, and
  - the ***profession*** that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.

IEA: International Ergonomics Association

www.iea.cc

Domains of specialization

- There exist domains of specialization within the discipline, which represent deeper competencies in specific human attributes or characteristics of human interaction.

- Domains of specialization within the discipline of ergonomics are broadly the following:
  - Physical ergonomics,
  - Cognitive ergonomics, and
  - Organizational ergonomics

Physical ergonomics

- Physical ergonomics is concerned with human anatomical, anthropometric, physiological and biomechanical characteristics as they relate to physical activity.
- Relevant topics include working postures, materials handling, repetitive movements, work related musculoskeletal disorders, workplace layout, safety and health.

IEA: International Ergonomics Association

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Cognitive ergonomics

- Cognitive ergonomics is concerned with mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system.
- Relevant topics include mental workload, decision-making, skilled performance, human-computer interaction, human reliability, work stress and training as these may relate to human-system design.

IEA: International Ergonomics Association

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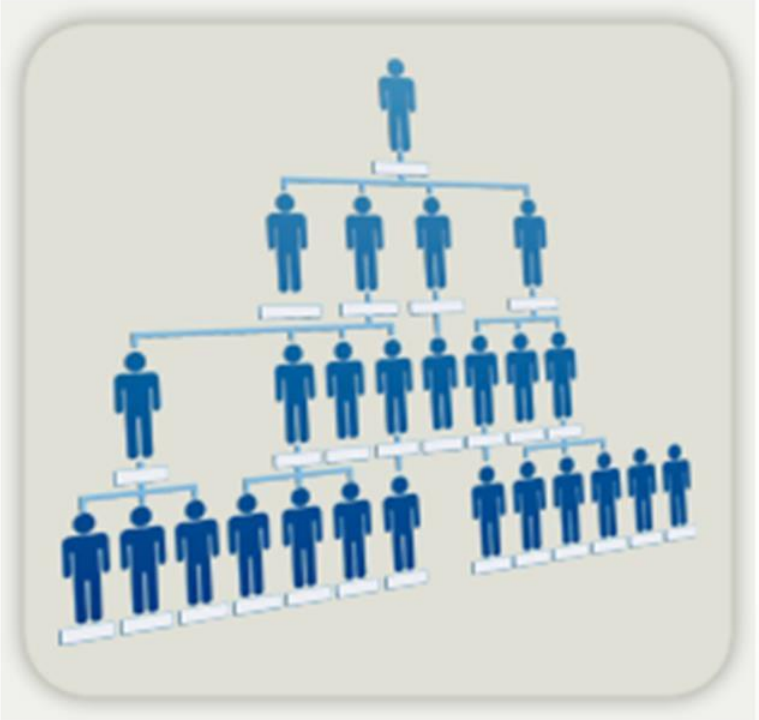
Organizational ergonomics

- Organizational ergonomics is concerned with the optimization of sociotechnical systems, including their organizational structures, policies, and processes.
- Relevant topics include communication, crew resource management, work design, design of working times, teamwork, participatory design, community ergonomics, cooperative work, new work paradigms, virtual organizations, telework, and quality management.



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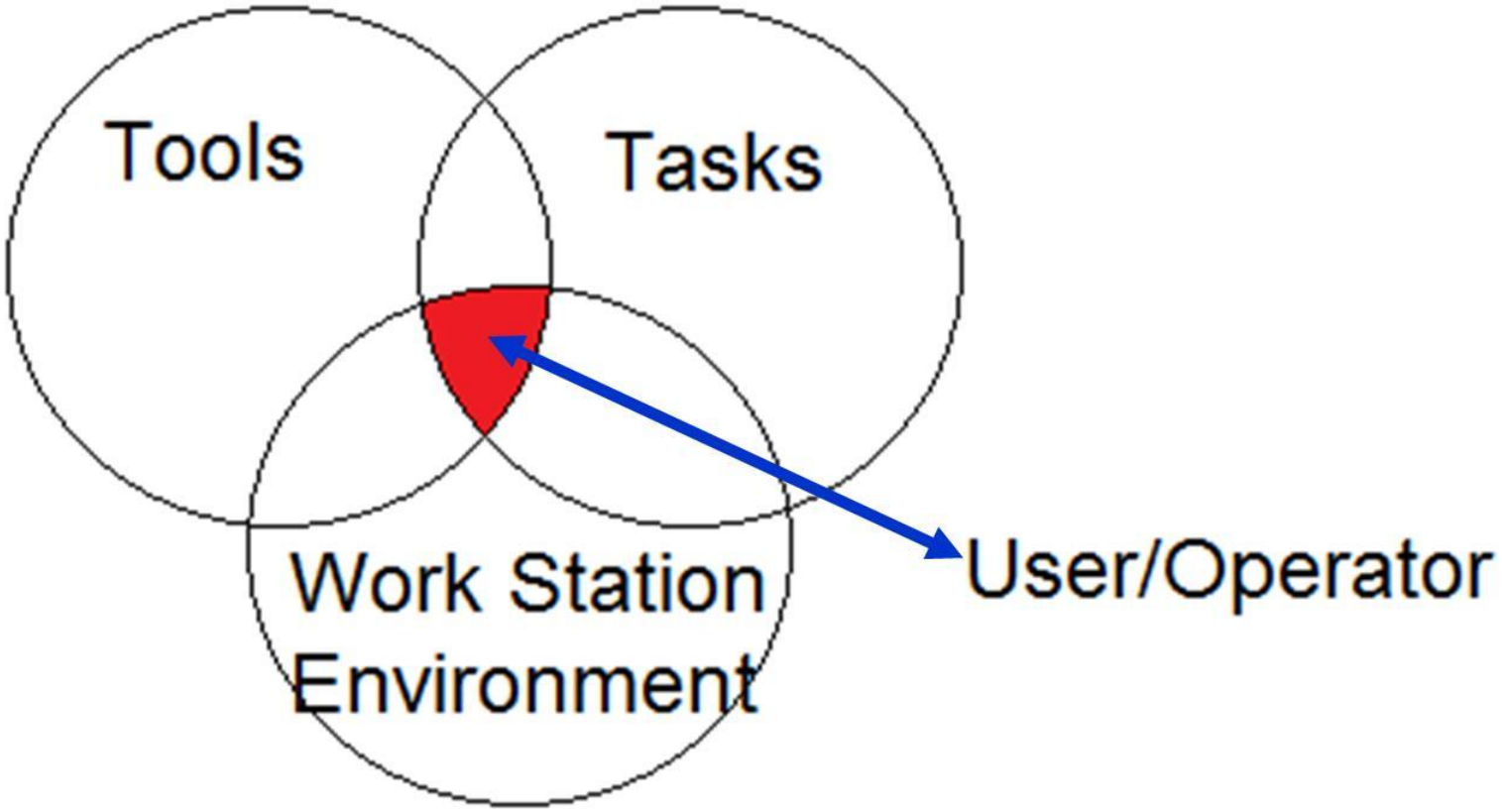
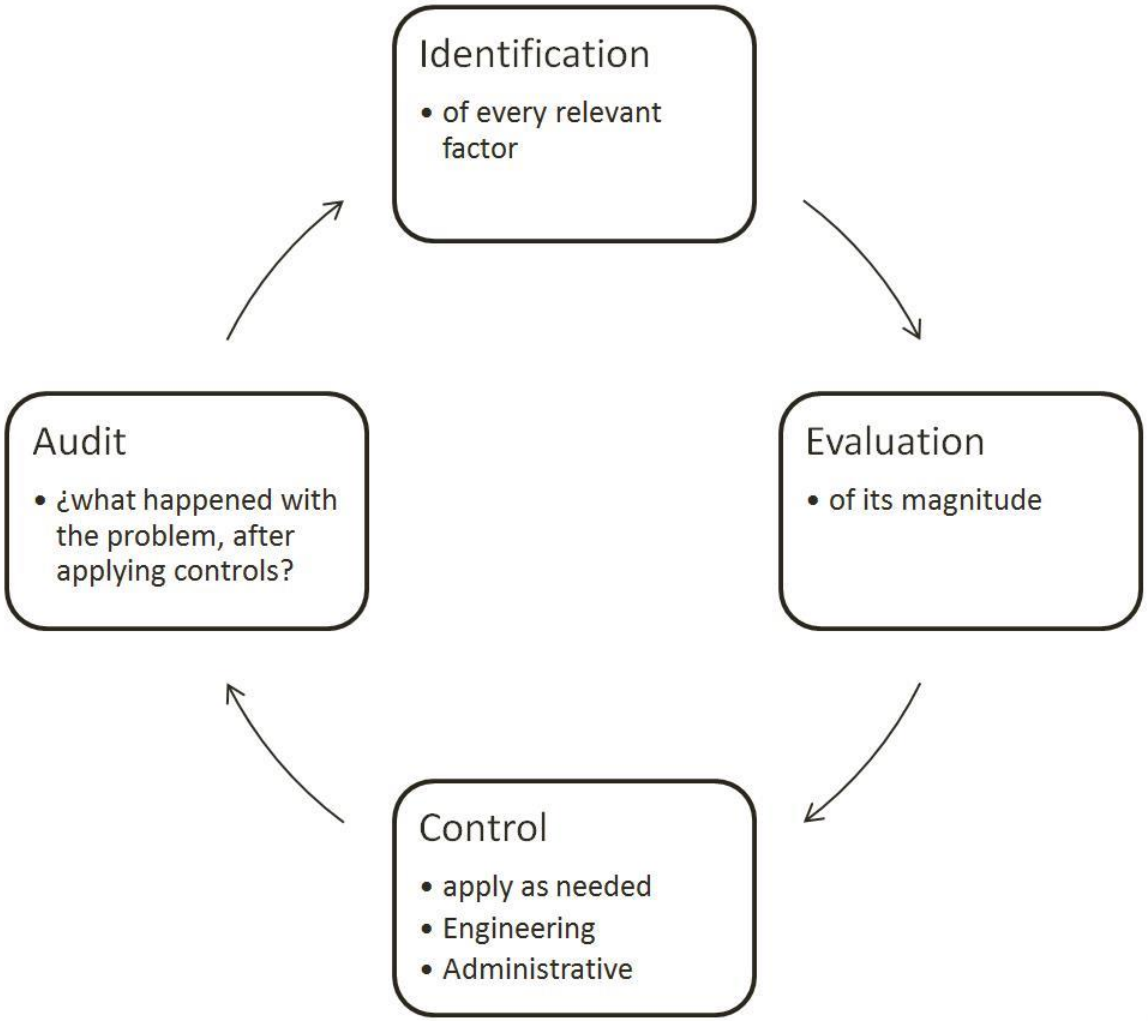
ERGONOMIC FOCUS



Ergonomics work analysis

- To know, analyze and understand the particular reality in each work situation.
- To diagnose its malfunctions, including the analysis of all factors, variables and interactions existing in the system.
- With all collected data, plan the corrections needed.
- Collective and participative work, with all relevant actors involved.

Flowchart


Identification
• of every relevant factor
Evaluation
• of its magnitude
Control
• apply as needed
• Engineering
• Administrative
Audit
• ¿what happened with the problem, after applying controls?

What should I look for?

- Look for "**work demands**"
  - Factors of the job which require some response from the worker
  - The response may be in the physical or in the mental realm.
  - These factors may be in an appropriate level or be excessive to the worker/human capabilities.
  - May represent a threat to the workers wellbeing or health.
  - May compromise the sustainability, stability, or productivity of the process.

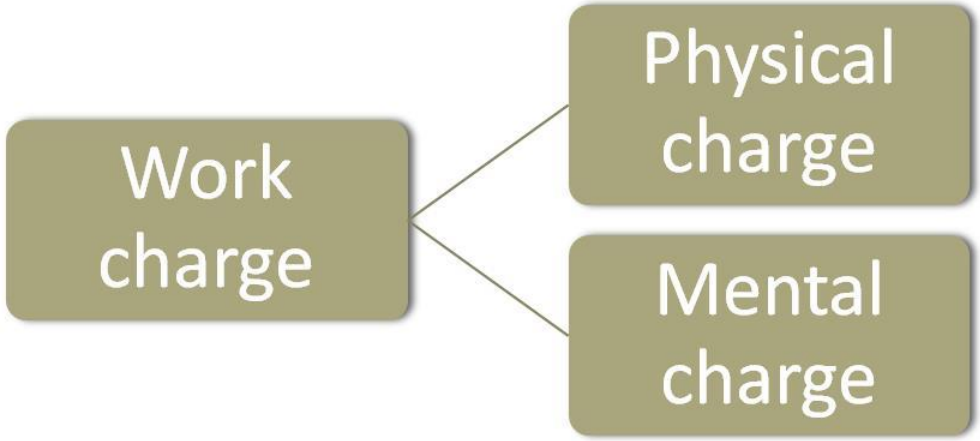
- Crosscheck with **human capabilities**

Types of work demands

- Physical:
  - Maintained/awkward postures, use of force (push, pull, sustain, etc.), manual handling, repetition…
- Mental:
  - Attention, concentration, visual-motor coordination, decision-making, responsibility for people, economical/financial responsibility, risk perception…
- Environmental:
  - Lighting, extreme heat/cold, noise, vibrations, dust, chemicals…
- Equipment:
  - Design, dimensions, anthropometrics, hand tools…
- Organizational:
  - Use of time, work schedules, shiftwork, psychosocial issues…

Consequences

- When work demands are higher than human capabilities, may result in different kinds of consequences, ranging from mild fatigue to severe injuries.
- To all of them we use to call “work charge”.
- This charge may be physical or mental.



Physical charge

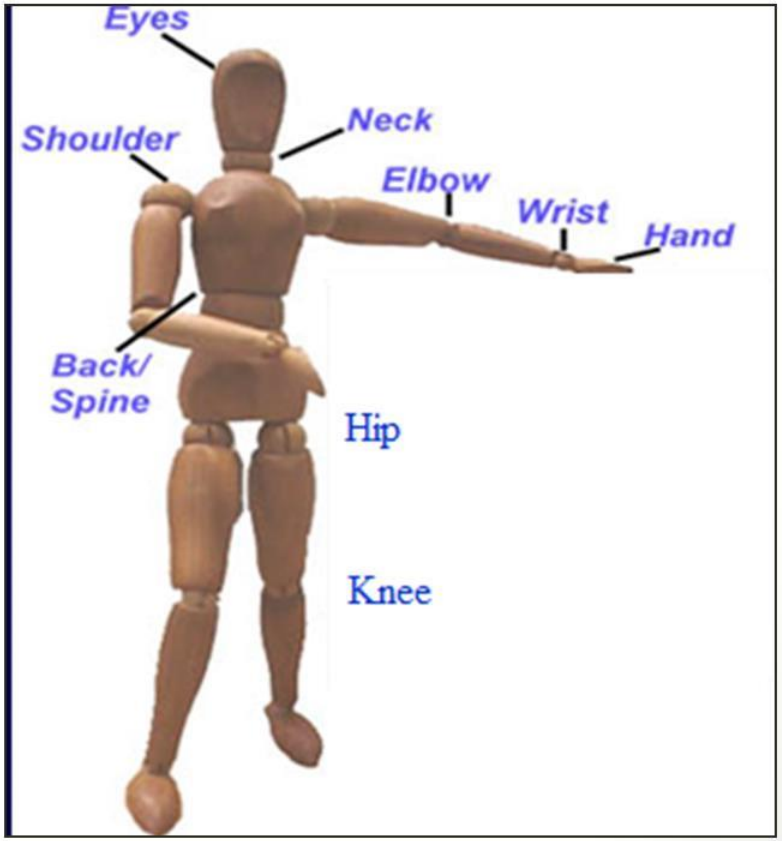
- The most usual form of physical charge are
- **Musculoskeletal Disorders** *(MSD),* also called **Cumulative Trauma Disorders** *(CTD) or* **Repetitive Strain Injuries** *(RSI).*
- MSD account for:
  - 1/3 of all lost day injuries each year
  - These injuries cost business $15-20 billion in worker's compensation each year

Physical charge

Common causes

- Repetitive and/or prolonged activities
- Awkward postures/positions for an extended time
- Static postures
- Vibration
- High/low Temperatures for an extended time
- Forceful exertions

Stress Areas



MSD

Syntoms

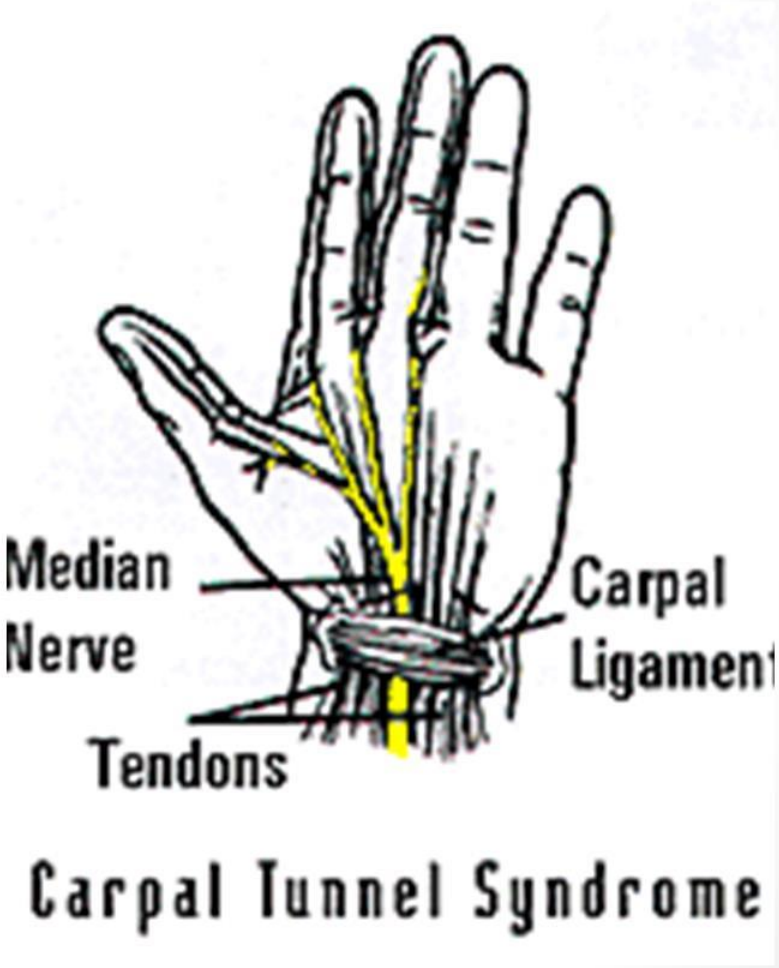
- Muscle fatigue or pain
- Aching
- Burning
- Numbness
- Stiffness
- Tingling

Signs

- Decreased range of motion
- Loss of function
- Deformity
- Cramping
- Loss of color
- Decreased grip strength
- Loss of balance
- Local swelling and/or redness

Examples of MSDs

- Tendonitis
- Carpal tunnel syndrome
- Trigger finger syndrome
- Eye strain
- Hand/arm vibration syndrome
- Muscle strain



Prevention of MSDs

- According to the Bureau of Labor Statistics, medical expenses and worker's compensation costs will continue to rise unless companies make a conscientious effort to implement ergonomic solutions.
- One of the ultimate myths about ergonomic solutions is that it requires capital expense. Nothing could be farther from the truth. Most solutions are simple ones that do not require a lot of expense.
- The areas listed are broad areas that we can do something about concerning ergonomics. Remember solutions that work in one location may not work in another.

What to do?

Administrative controls

- Employee rotation/job task expansion
- Physical adjustments to the work pace
- Redesign of work methods
- Alternative tasks
- Breaks
- Work practice controls: Safe & proper work techniques & procedures, training, physical conditioning period

Engineering controls

- Design/redesign workplaces
- Proper tool selection
- Use of adjustable chairs
- Inclusion of supporting elements

And try "low-cost/no-cost" strategies

- Workstations:
- If the objective is to fit the workstation to the employee, reduce awkward positions, this can be done by using different methods:

Standard Way	Innovative Way
Adjustable workstation	Cut legs off
Adjustable chair	Add blocks
Foot rests	Build foot rest
Adjustable monitor	Thick book
Document holder	Build platform

- Tools/equipment
- Facilities

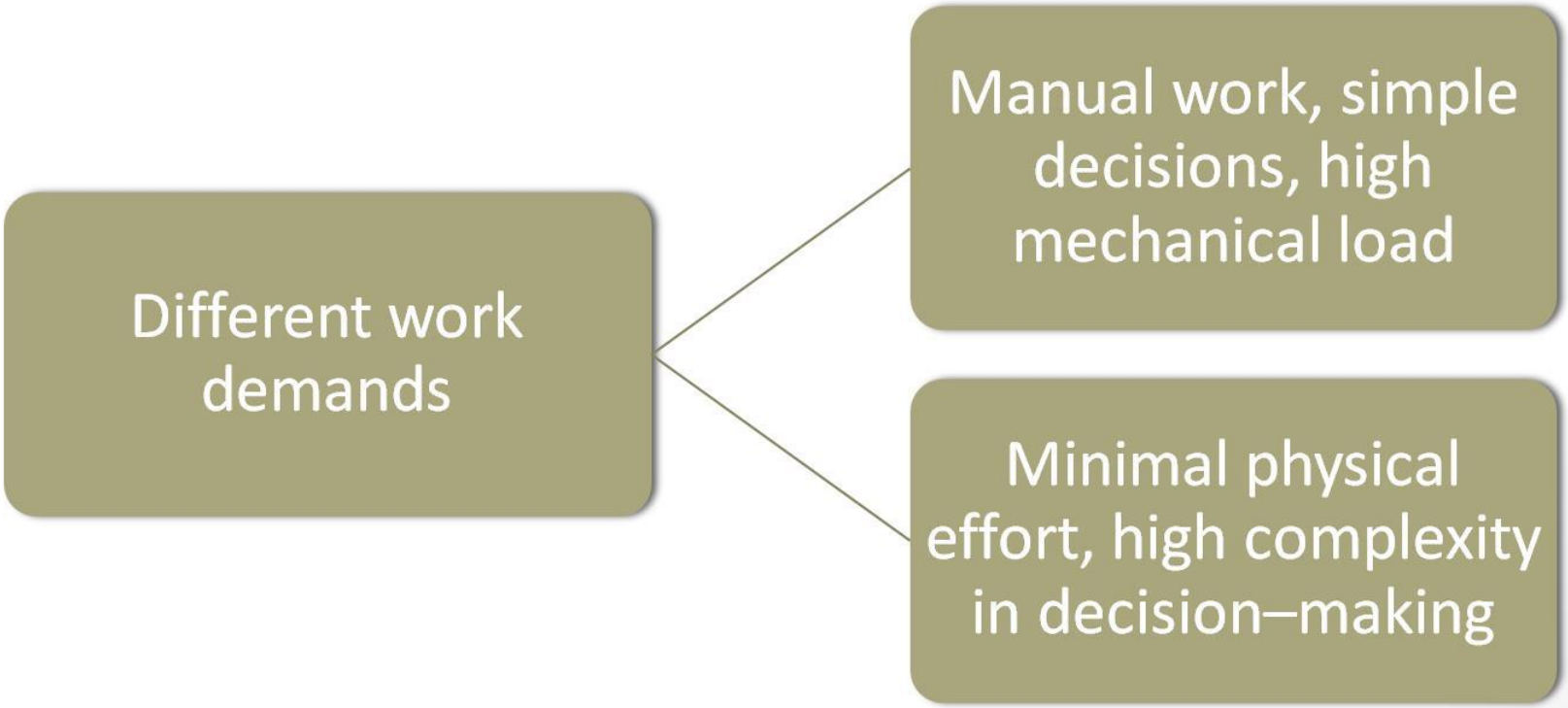
Tools

- **Use of Force or of grip-strength**
  - Longer/shorter and thicker/thinner handles
- **Repetitive motion**
  - Ratcheting mechanism or gears
  - Power tools
    - Electric stapler
    - Electric knife
    - Spring-loaded returns
- **Awkward positions**
  - Bent or curved handles
  - Extensions or add-ons
  - Headphones
  - Support equipment overhead
  - Step stool
- **Forceful exertions**
  - Soft-touch keyboards/buttons
  - Lifting devices

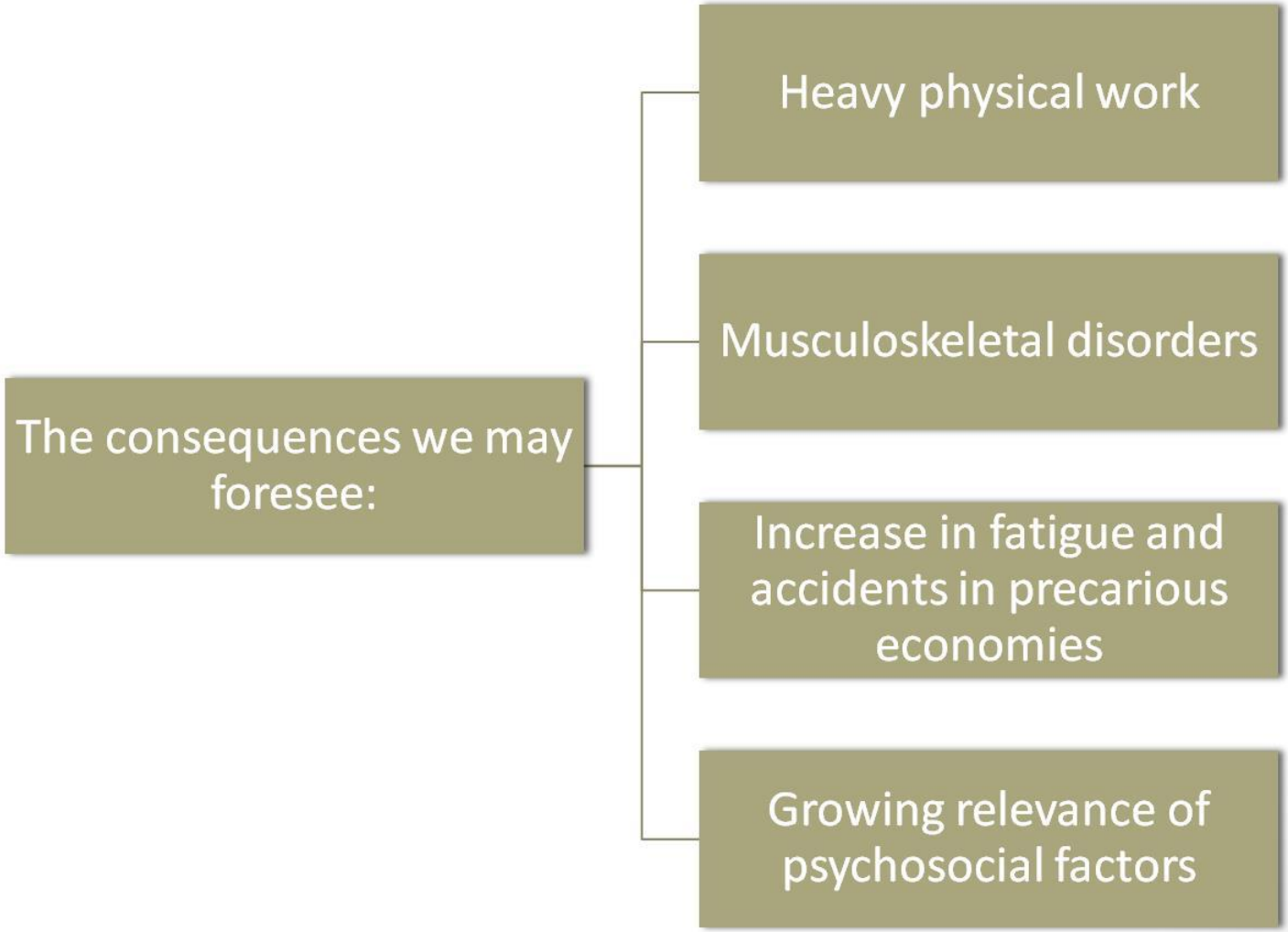
What can we expect in XXIth century?

- Coexistence of heavy manual labor with the modernization of work machining.
- In poor, developing countries, we will see use of simple tools, use of human energy. Potentially critical risk with aggregating factors (heat, cold, hypoxia) in primary industries such as forestry, mining, agriculture, fishery.
- In rich, developed countries, we'll see faster and more productive machinery, sedentary workers dedicated to perceive and analyze information to run decisions for maintain or change the course of process, low muscular actions and heavy mental load.

What can we expect in XXIth century?



What can we expect in XXIth century?

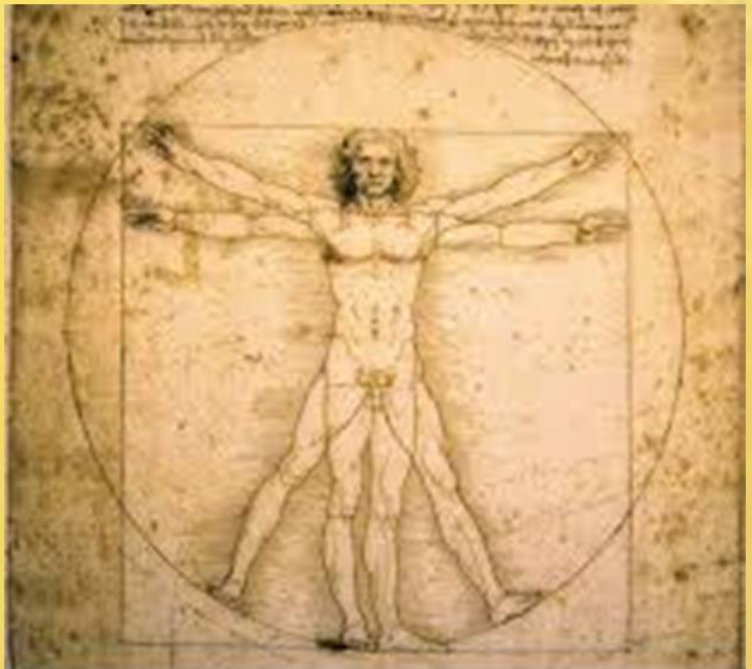


A call for action

- Finally, we need ergonomists who can lead the occupational safety and health teams, in the idea to improve continuously the working conditions, to protect the health and wellbeing of workers, maximize the productivity, and to strength the development in every country.

Journal of Ergonomics Related Journals

- Occupational Medicine & Health
- Forensic Biomechanics
- Rheumatology: Current Research



Journal of Ergonomics Related Conferences

- 4th Dental health Congress Bangalore, India
- 5th International Conference and Exhibition on Occupational Health & Safety

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