

# **Ergonomics and therapy- An introduction**

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# Ergonomics

- The study of work performance with an emphasis on worker safety and productivity

# Occupational therapy

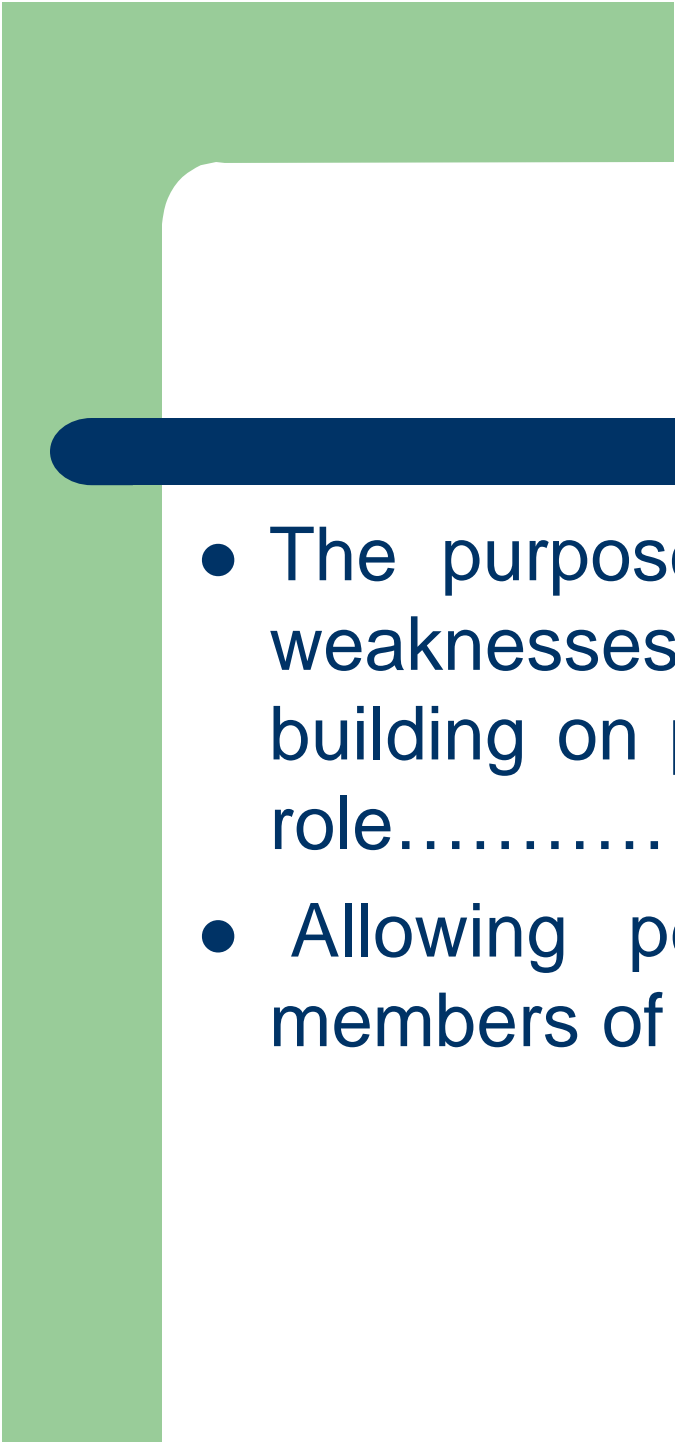

- Skilled treatment that helps individuals achieve independence in all facets of their lives

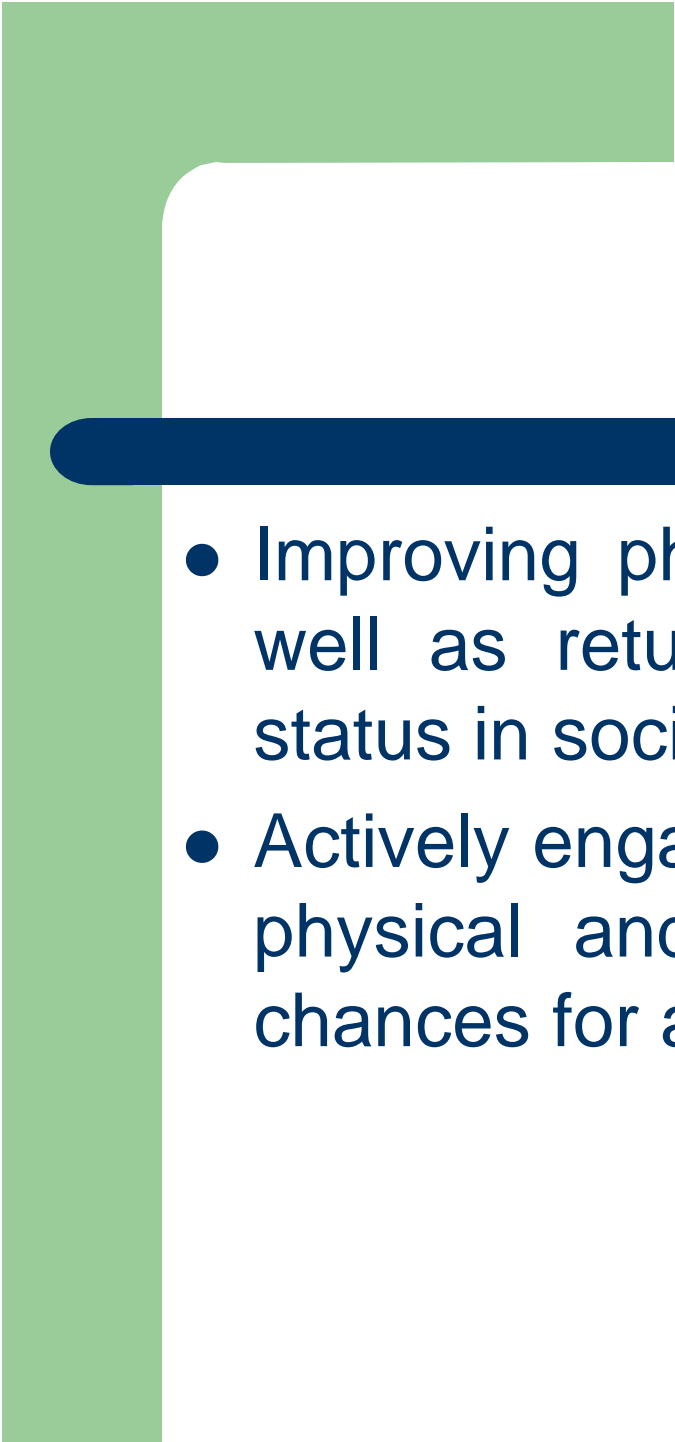

# Physical therapy

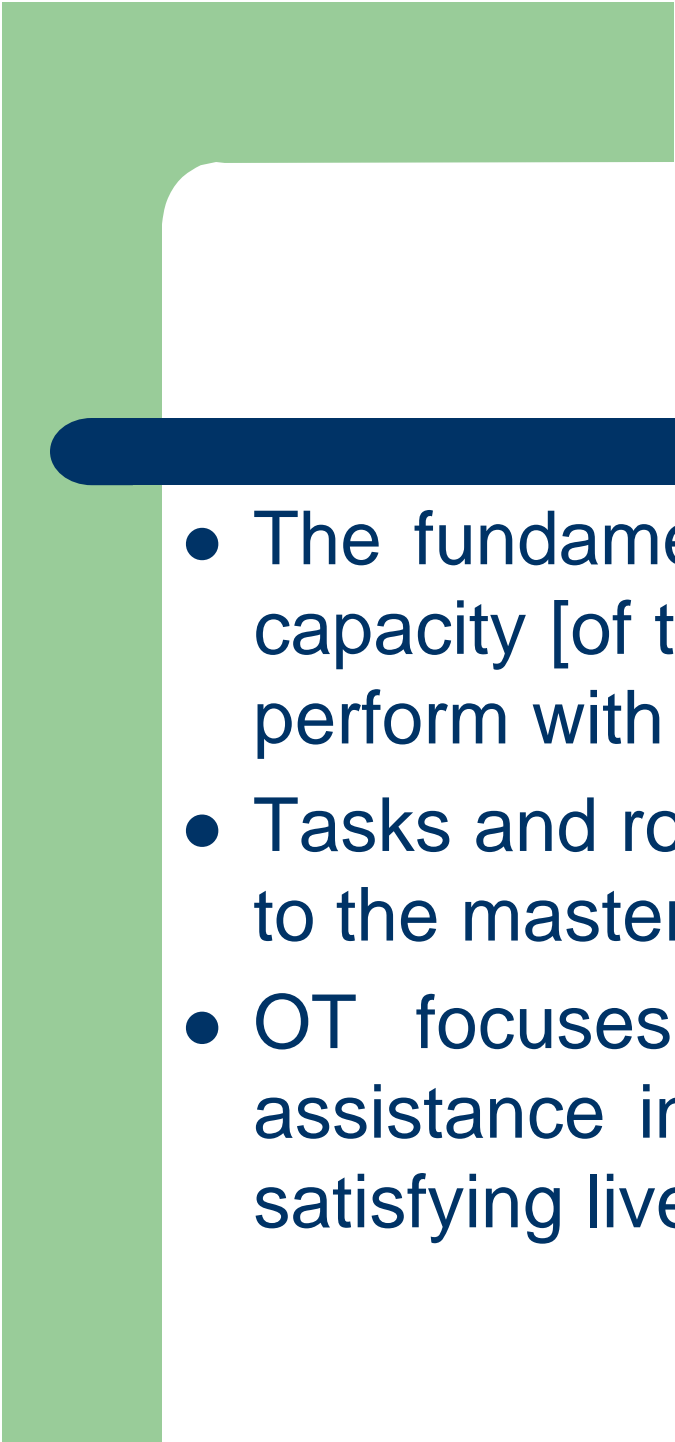

- The assessment, prevention, and treatment of movement dysfunction and physical disability, with the overall goal of enhancing human movement and function.

# Historical background: OT

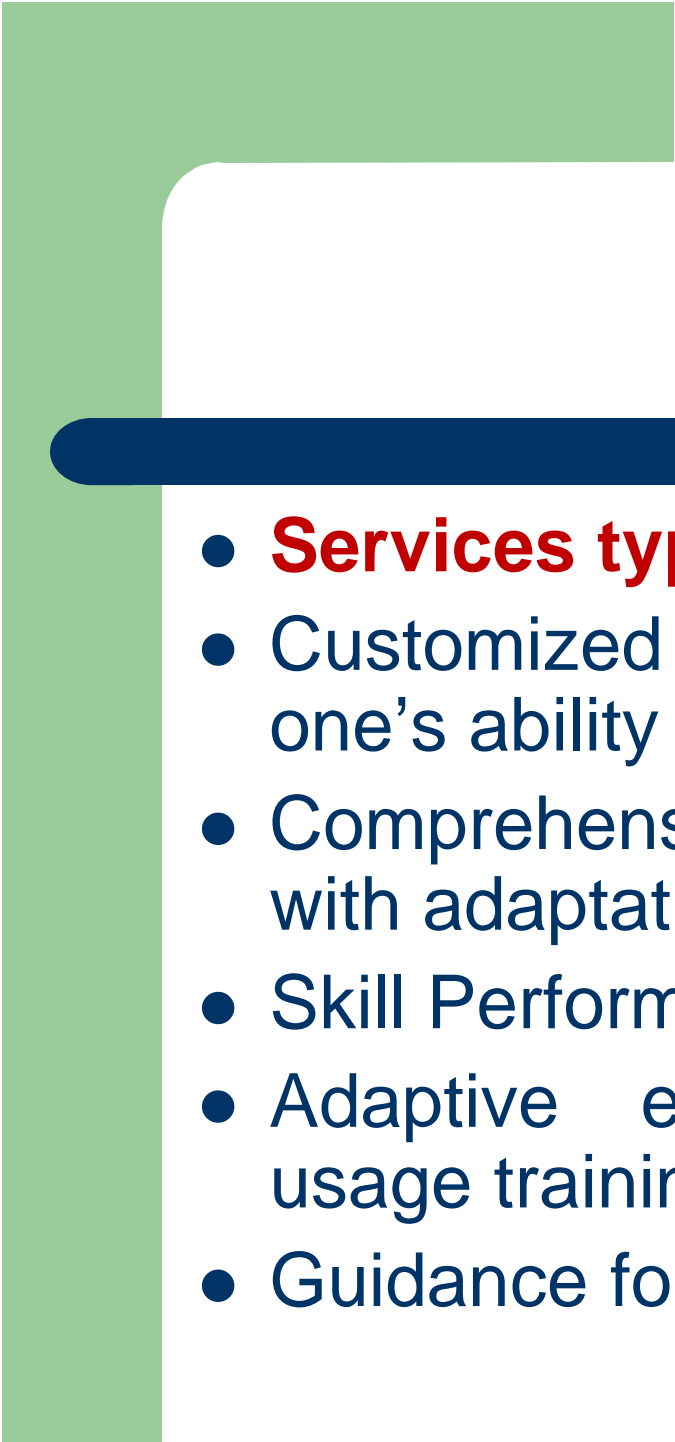

- Eradication of disease alone is insufficient for complete recovery....
- ....Physical and mental exhaustion
- **George Barton**, an originator of OT
- Strengthen himself physically and mentally.
- 1914 consolation house.....
- **Dr. Adolph Meyer** another originator of OT.....
- **Two questions**.....

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- The purposeful involvement helped reduce weaknesses caused by illness or injury by building on personal strengths.....(PT & OT role.....)
  - Allowing people to return as productive members of their families and society

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- Improving physical and mental functioning, as well as returning the patient to a functional status in society
  - Actively engaging the patient in carefully guided physical and mental activities enhances the chances for a more successful return to work.

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- The fundamental goal of OT is to enhance “the capacity [of the client] throughout the life span, to perform with satisfaction to self and others
  - Tasks and roles essential to productive living and to the mastery of self and the environment
  - OT focuses on those individuals who need assistance in order to achieve independent and satisfying lives.



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- **Services typically include the following:**
  - Customized treatment programs to improve one's ability to perform daily activities
  - Comprehensive home and job site evaluations with adaptation recommendations
  - Skill Performance assessments and treatment
  - Adaptive equipment recommendations and usage training
  - Guidance for family members and caregivers

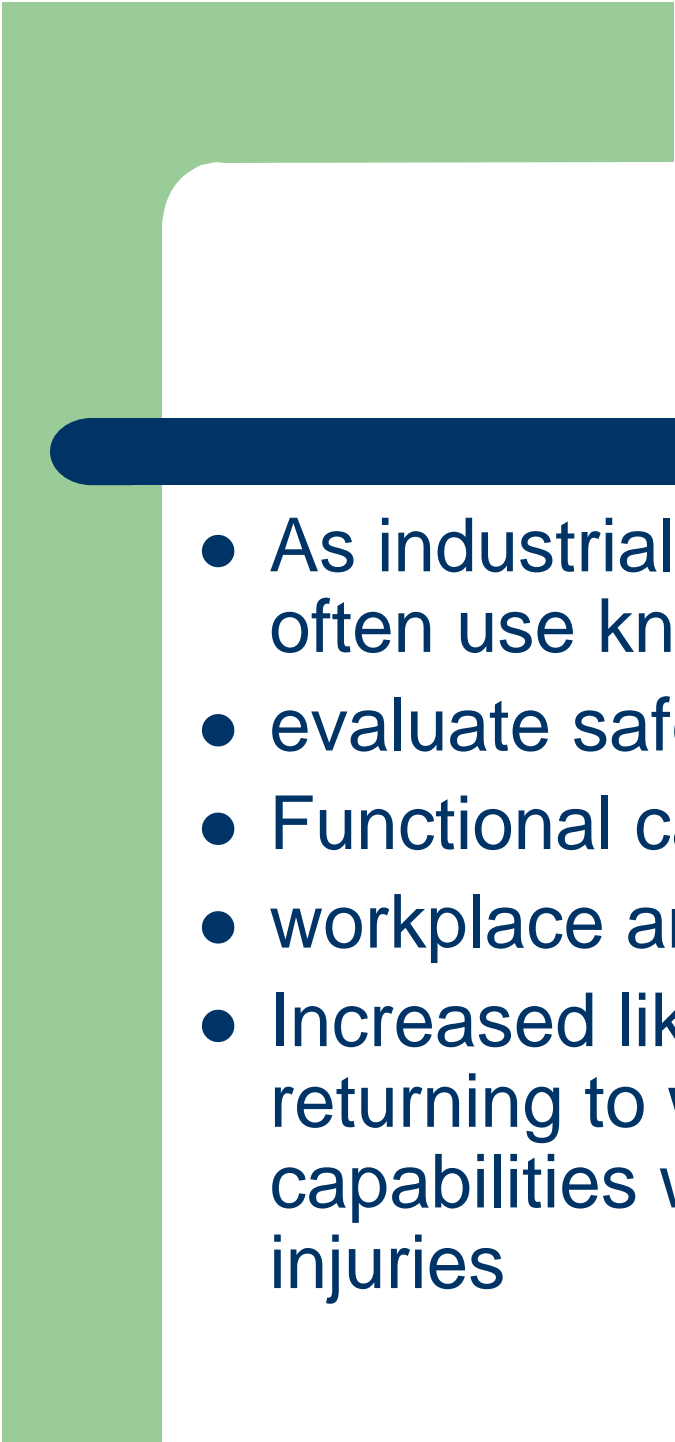

- **Therapists** must be aware of clients' current physical, cognitive, and psychologic limitations and capabilities; their potential abilities and disabilities; and the physiologic

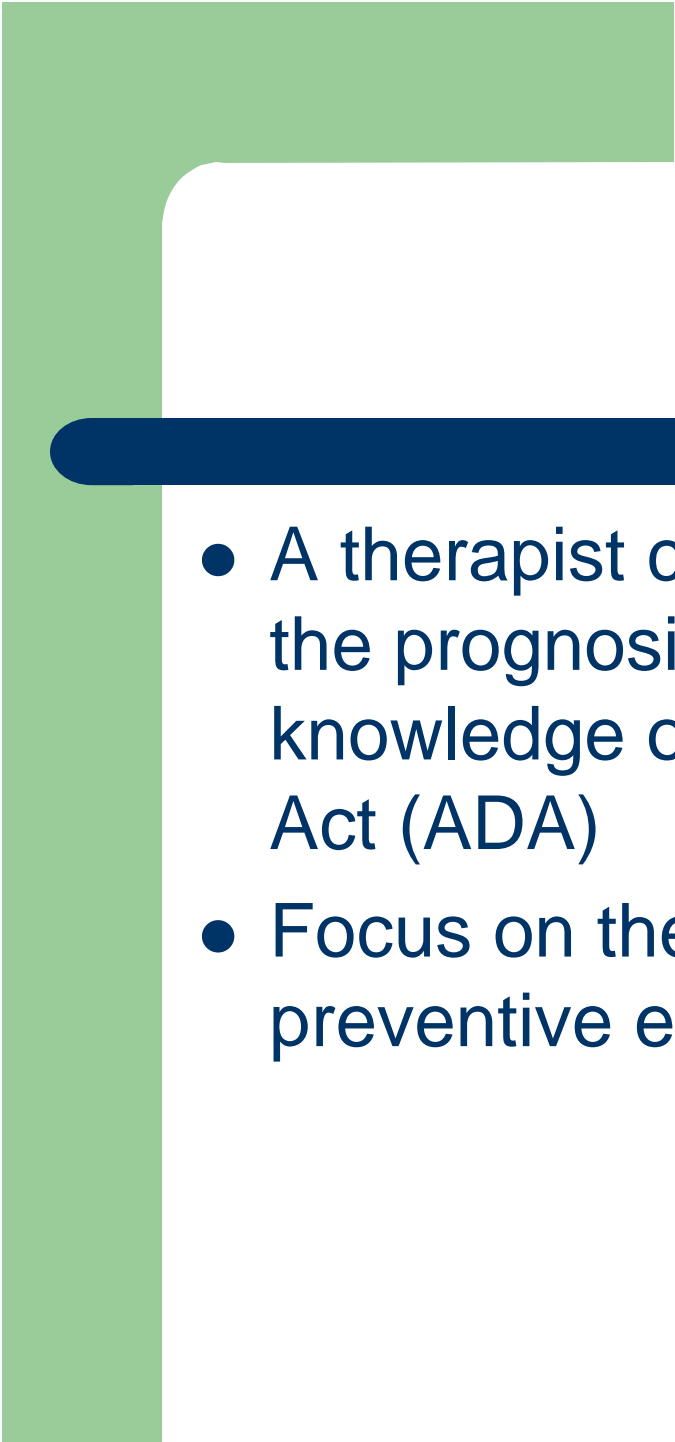

and psychologic demands of the clients' activities (including work).

- Therapists must also be aware of the performance competencies and limitations of people **without injuries** to be able to assess whether a client is functioning within normal range.
- The use of purposeful activities (e.g., work simulation) as treatment modalities was integral to the development of the profession, as suggested by its name: *occupational therapy*.

# Physical Therapy

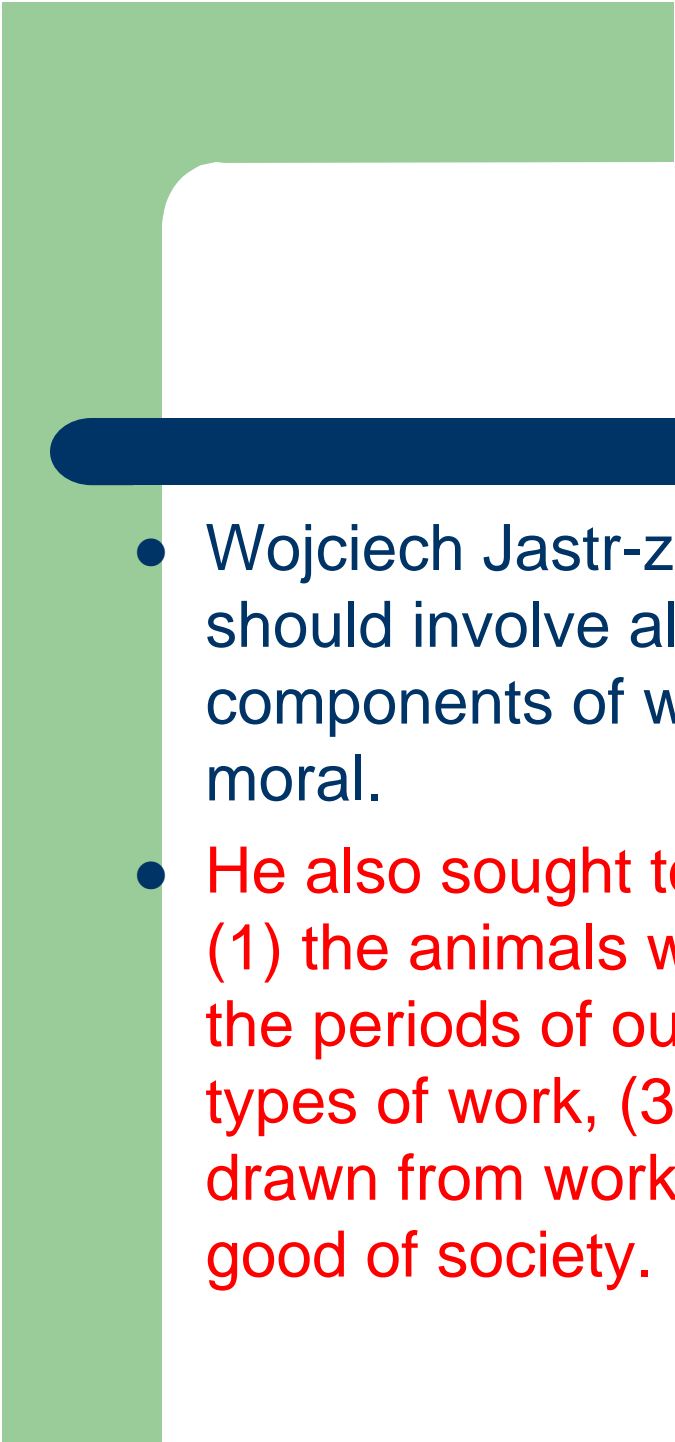

- The **American Women's Physical Therapeutic Association** was founded in 1921
- **American Physiotherapy Association** in the 1930s,
- **American Physical Therapy Association** in the 1940s.
- The early fundamental intention of physical therapy (PT) was “to assess, prevent, and treat movement **dysfunction and physical disability**, with the overall goal of enhancing human movement and function.”

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- As industrial consultants, physical therapists often use knowledge of human motion to
  - evaluate safe and effective working postures
  - Functional capacity assessment
  - workplace analysis
  - Increased likelihood of the employee's returning to work earlier, matching worker capabilities with work demands, and preventing injuries

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- A therapist can often provide information about the prognosis of an injury or illness, along with knowledge of the Americans with Disabilities Act (ADA)
  - Focus on the worker with an injury and preventive education

# Ergonomics

- First documented mention of the in 1857,
- when Wojciech Jastrzebski” published “*An Outline of Ergonomics, **or** The Science of Work Based upon the Truths Drawn from the Science of Nature.*
- ***Idea from “Bible”.....***
- ***He took idea of work and studied***

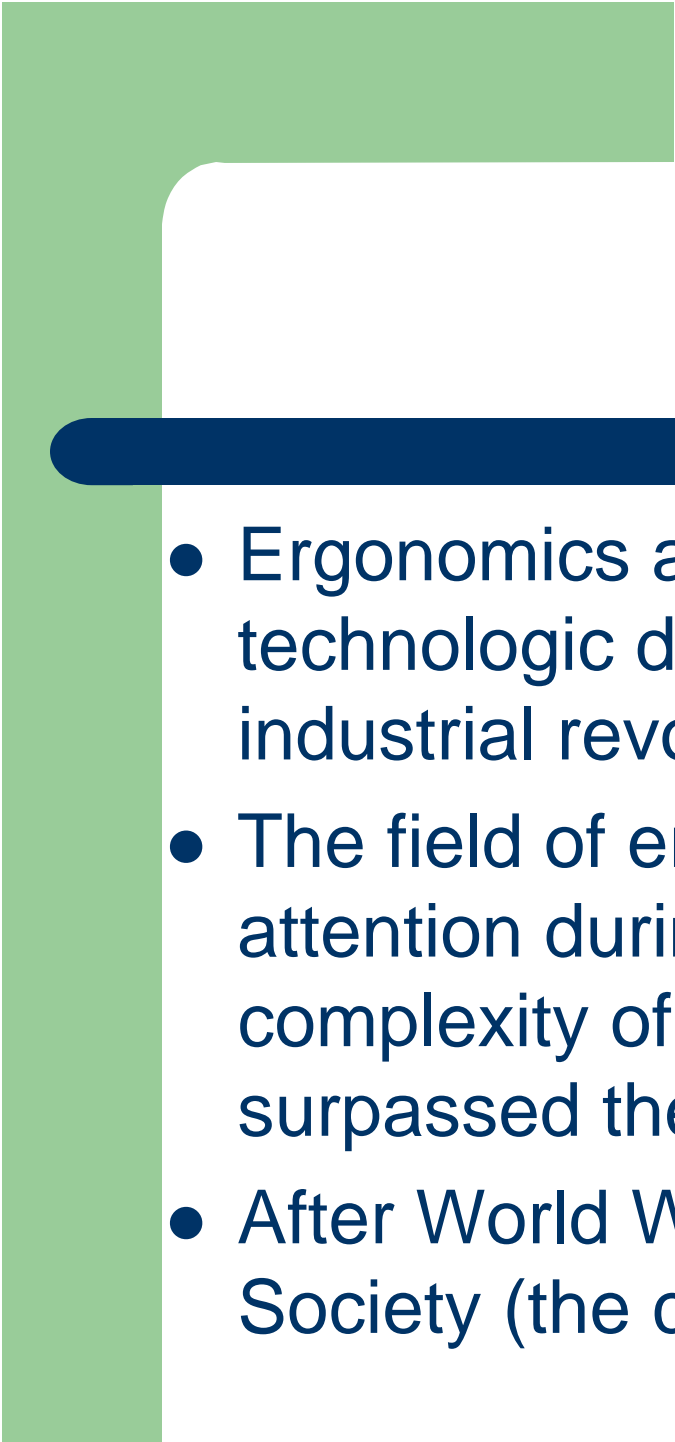

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- Wojciech Jastrzebowski's study of work, or ergonomics, should involve all aspects of useful work, the four main components of which are physical, aesthetic, rational, and moral.
  - He also sought to identify further areas of study including (1) the animals with which we share work categories, (2) the periods of our lives that are particularly suited to various types of work, (3) the manner of work, and (4) the benefits drawn from work for both the individual and the common good of society.

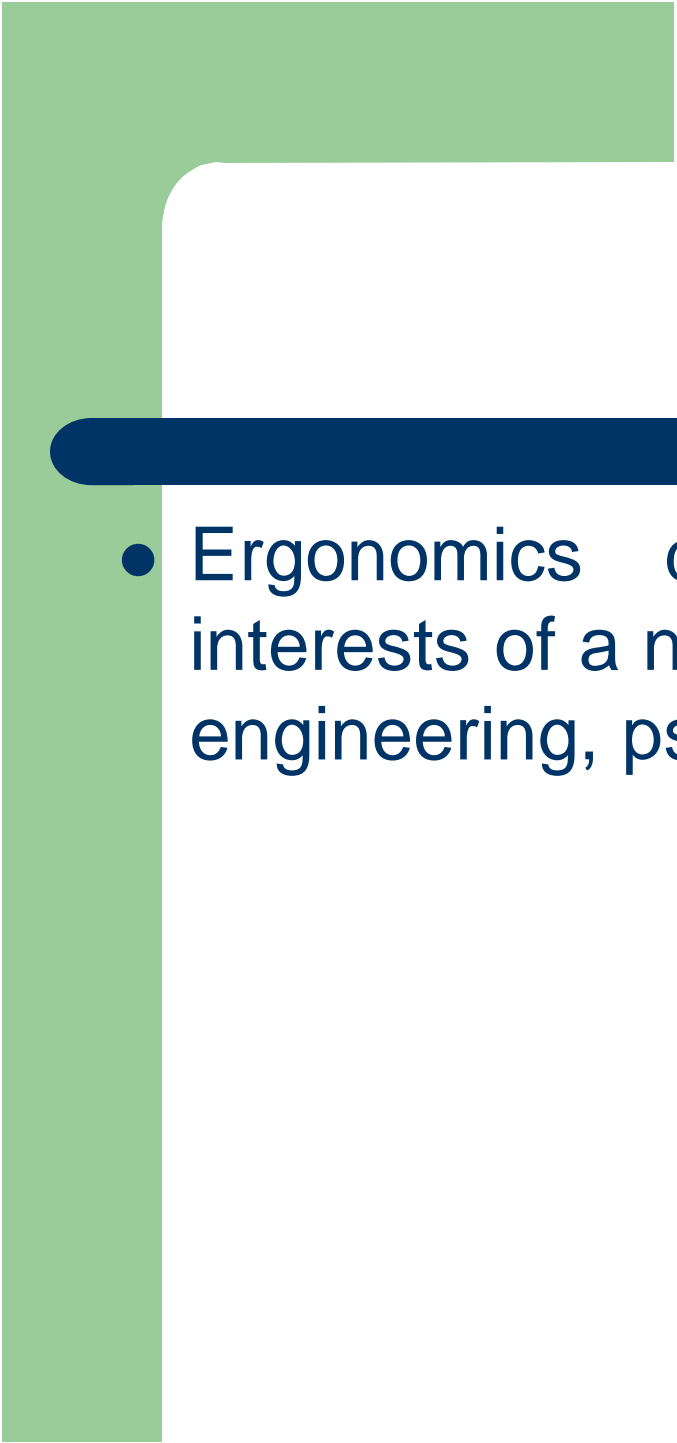

**TABLE 1-1** Jastrzebowski's Divisions of Useful Work

Physical	Aesthetic	Rational	Moral
Kinetic or motor	Emotional or sensory	Intellectual or rational	Spiritual
Labor or toil	Entertainment or pastime	Thinking or reasoning	Devotion or dedication
Breaking stones	Playing with stones	Investigation of a stone's natural properties	Removing stones from the road to remove untidiness and possible suffering for other persons and animals

*Adapted from Jastrzebowski W: An outline of ergonomics, or the science of work based upon the truths drawn from the science of nature, Warsaw, 1997, Central Institute for Labor Protection (translated by T Baluk-Ulewiczowa).*



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- Ergonomics as a specialty made gains as technologic developments emerged during the industrial revolution.....
  - The field of ergonomics received particular attention during World War II, when the complexity of military equipment frequently surpassed the abilities of human operators
  - After World War II, the Ergonomics Research Society (the current Ergonomics Society)

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- Ergonomics developed from the common interests of a number of professions, particularly engineering, psychology, and medicine.

# Ergonomists include

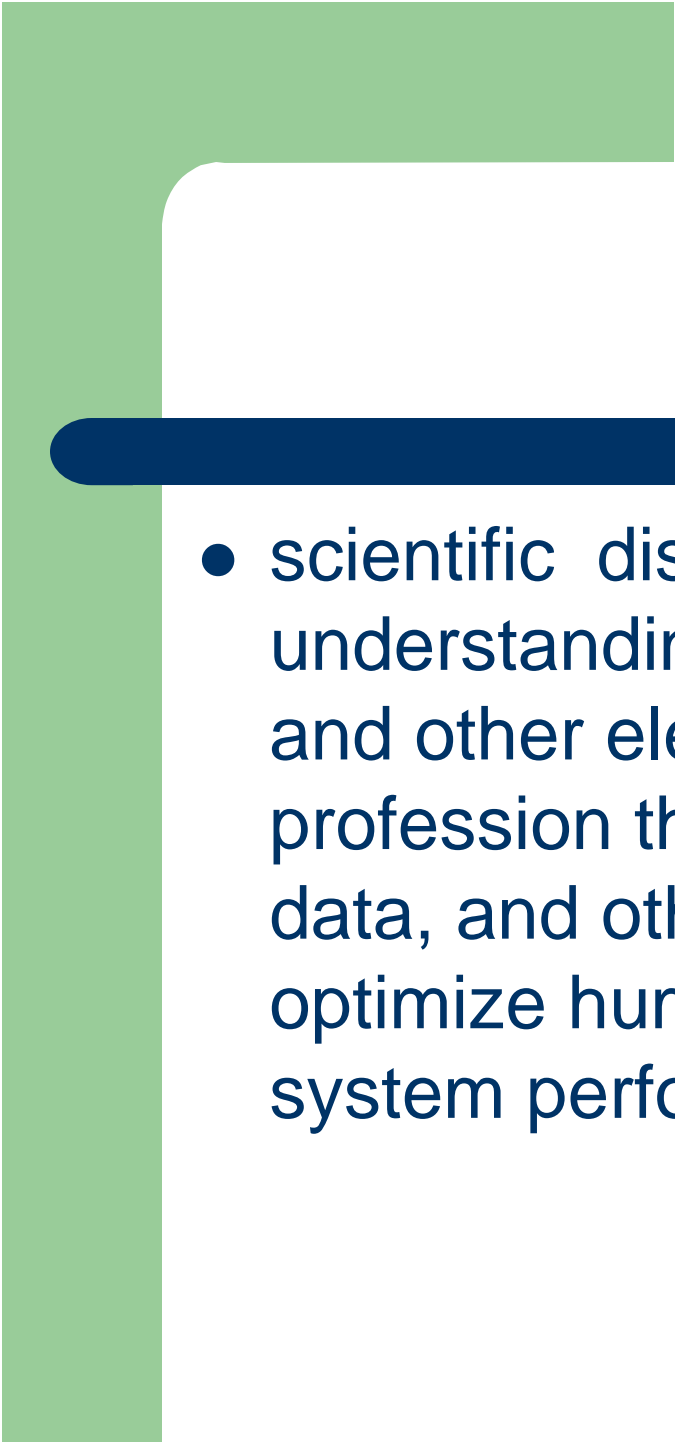

- Psychology
- engineering
- Ergonomics
- industrial design
- Education
- Physiology
- Medicine ,health and rehabilitation sciences, business administration, computer science, and industrial hygiene.

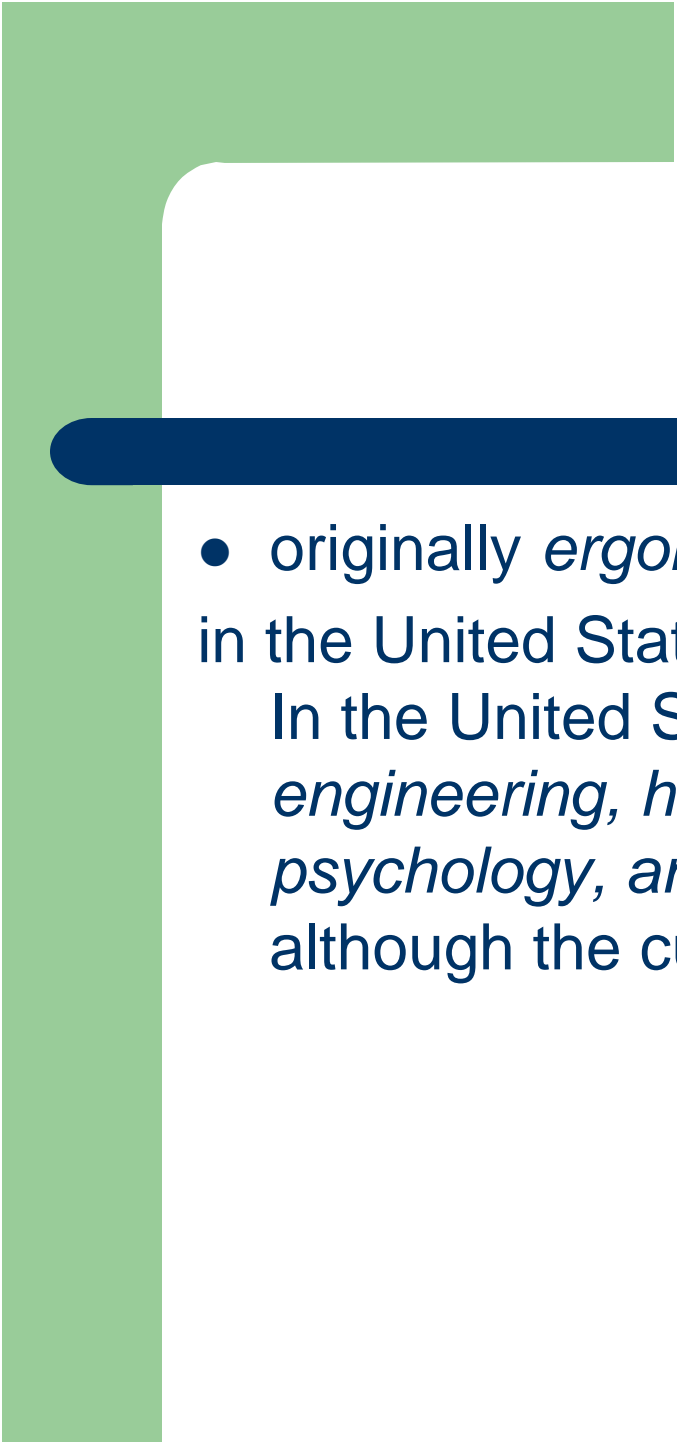

# Ergonomic design for children is challenging.

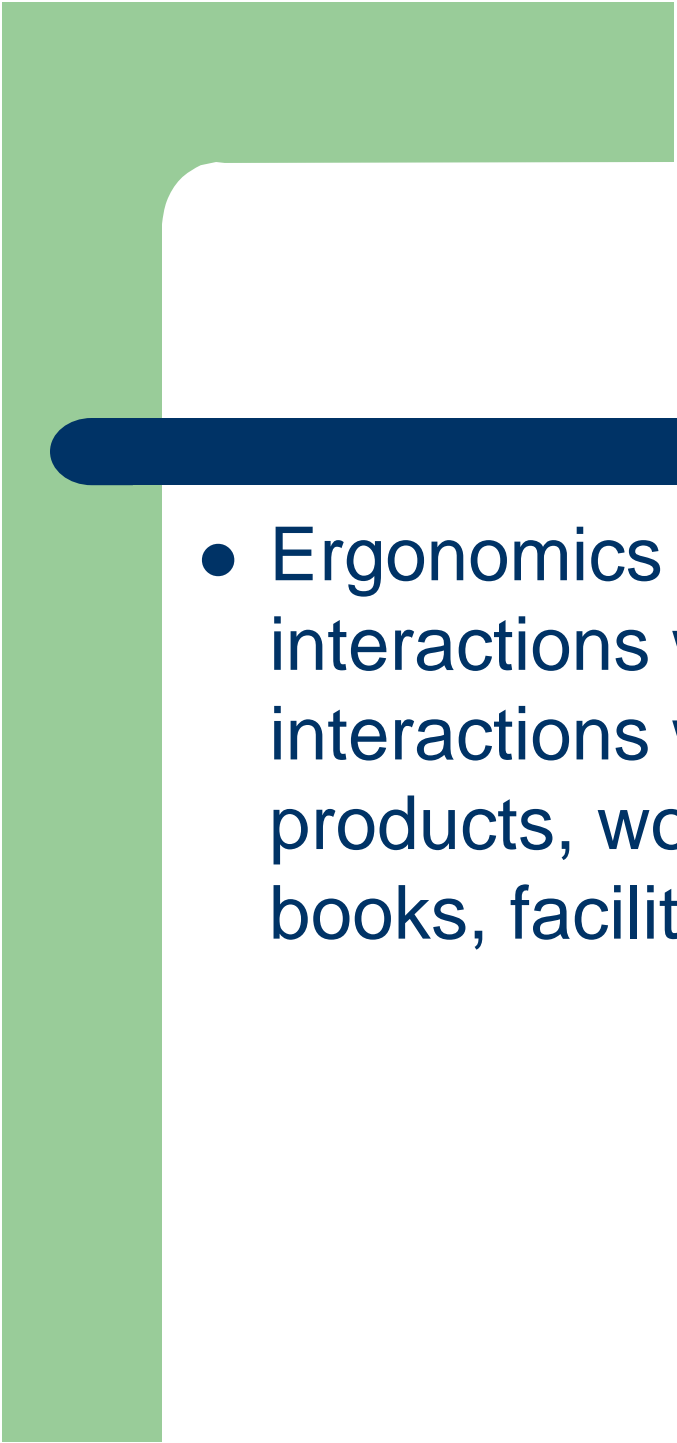



# ERGONOMICS DEFINED

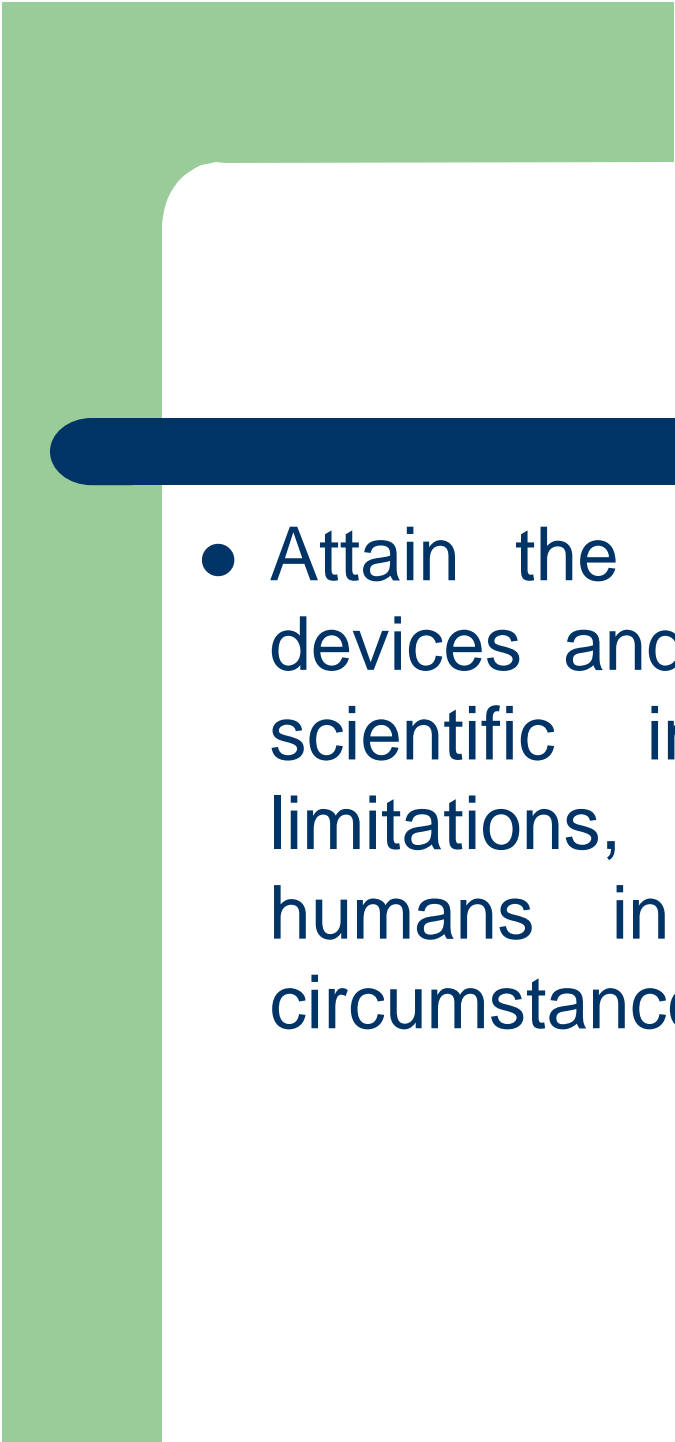

- Human factors (ergonomics) is a body of knowledge about human abilities, human limitations, and other human characteristics that are relevant to design
  - *Human factors engineering*(ergonomics implementation) is the application of human factors information to the design of tools, machines, systems, tasks, jobs, and environments for safe, comfortable, and effective human use.”
- Ergonomics focuses on humans and their interactions with the environment

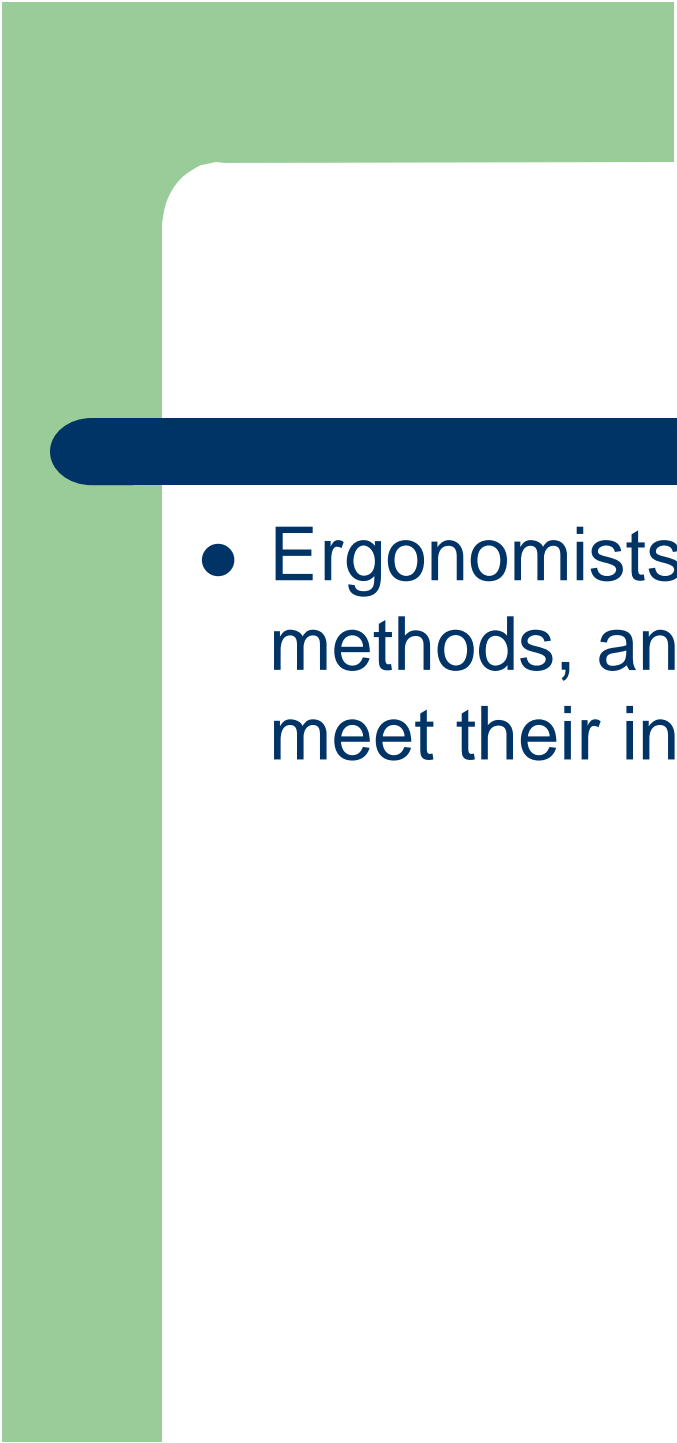

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- scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and other methods to design in order to optimize human well-being and overall system performance.

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- originally *ergonomics* was not as widely used in the United States and Canada as in other parts the world. In the United States, the terms *human factors engineering*, *human engineering*, *engineering psychology*, and *human factors* have all been used, although the current term of choice is *human factors*.

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- Ergonomics focuses on humans and their interactions with the environment. It involves interactions with tools, equipment, consumer products, work methods, jobs, instruction books, facilities, and organizations.



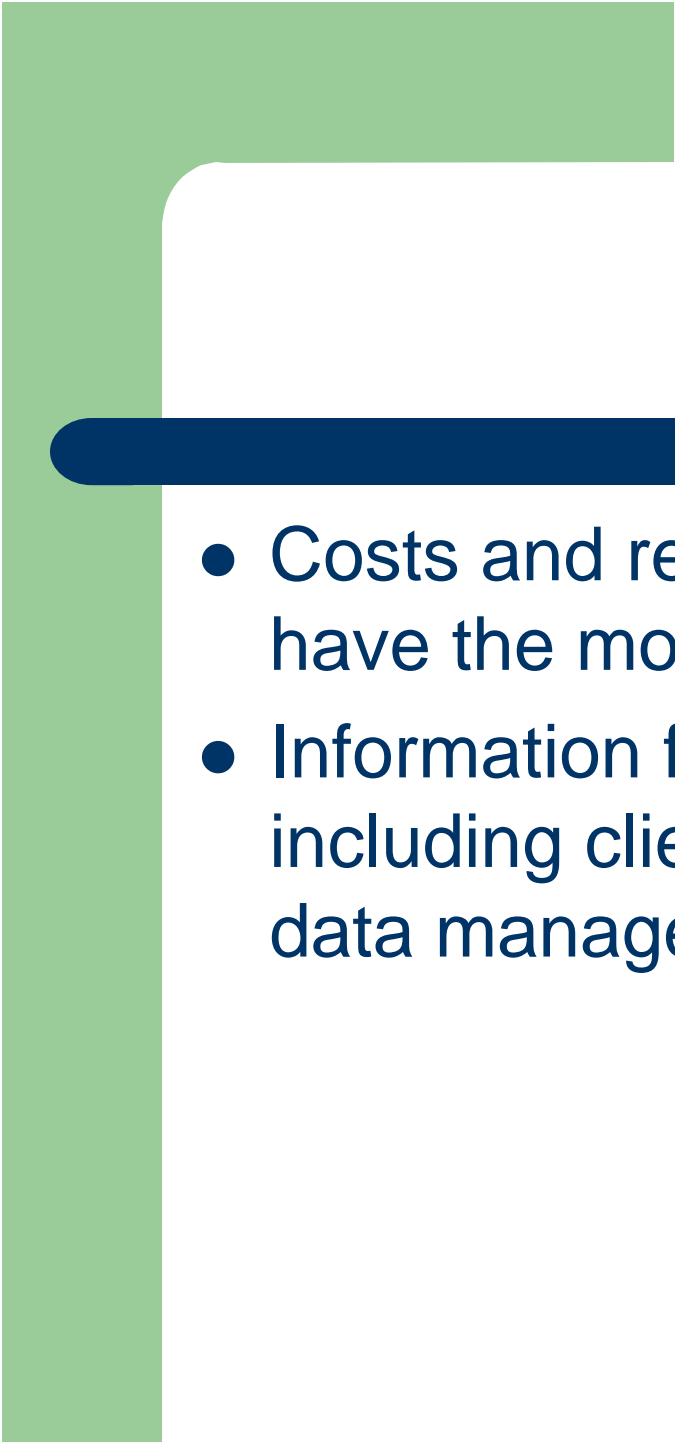

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- Attain the goal of designing user-friendly devices and systems, ergonomists conduct scientific investigations to identify the limitations, capabilities, and responses of humans in a variety of climates and circumstances.

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- Ergonomists evaluate equipment, jobs, work methods, and environments to ensure they meet their intended objectives

# Why use ergonomics

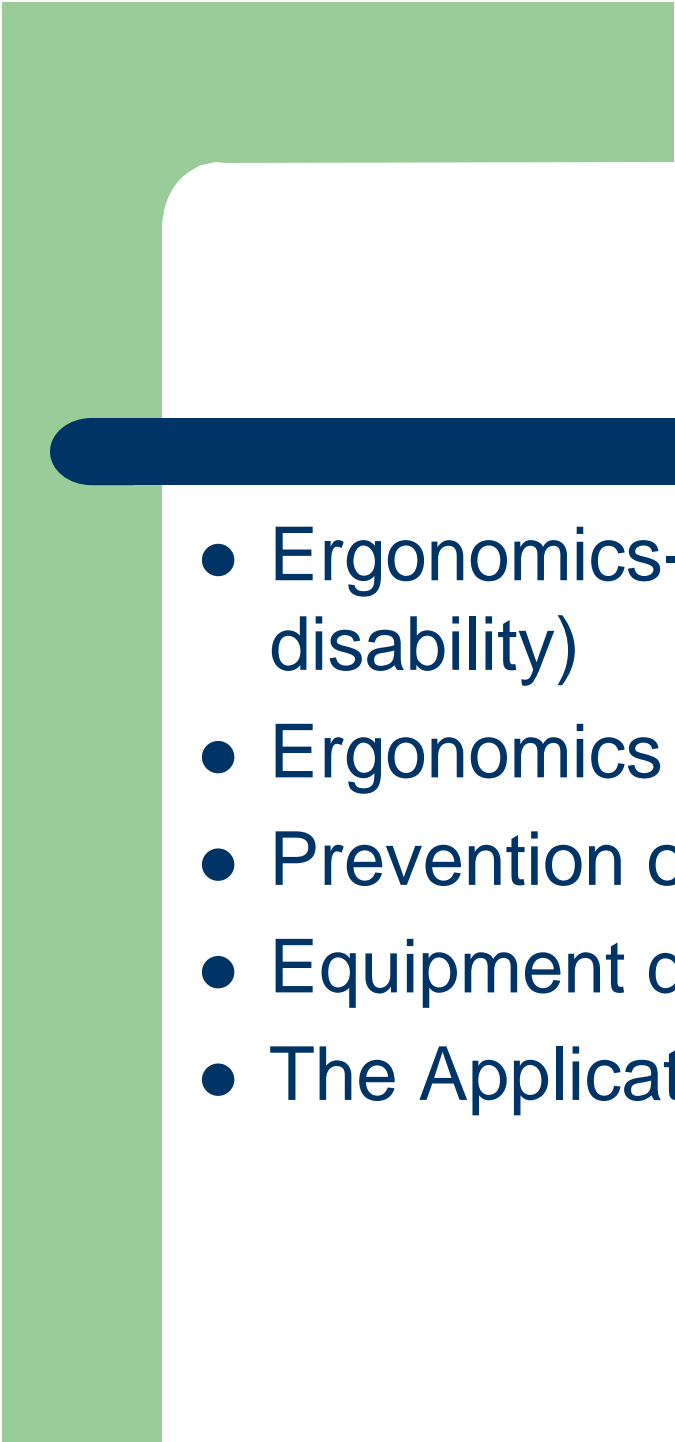

## Ergonomists could start by evaluating

- Safety practices, procedures, and records, including deaths, injuries, and near-miss occurrences in terms of patient safety
- Injuries, illnesses, turnover, and workers' compensation cases among the employees
- The health care practitioners' perceptions regarding the products they use and environments they work in

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- Costs and revenues to see where they might have the most impact on a redesign effort
  - Information flow throughout the facilities, including client care, team interactions, and data management

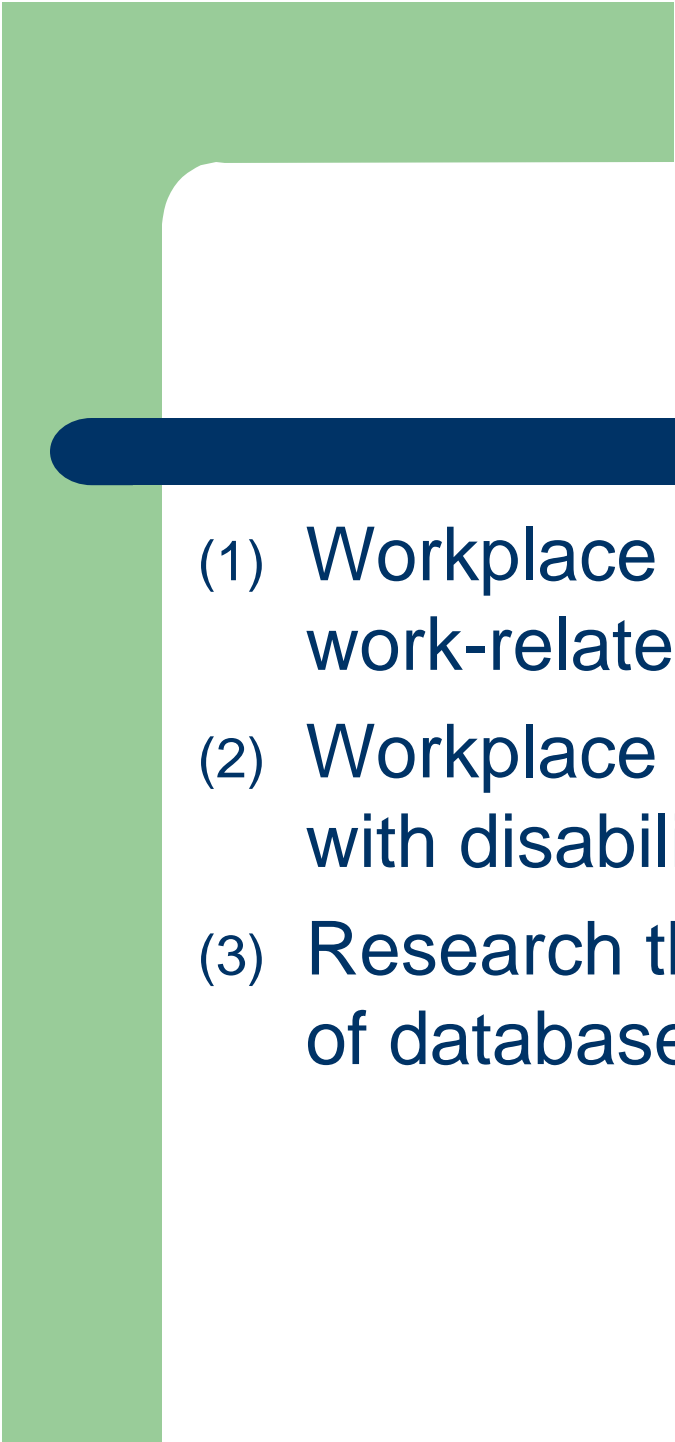

# The interrelationship between therapists and ergonomists

- Therapists and ergonomists share some **common interests**, and therapists can contribute their unique strengths to the practice of ergonomics in **five principal areas**

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- Ergonomics-for-one (individuals who have a disability)
  - Ergonomics for special population
  - Prevention of musculoskeletal injuries
  - Equipment design
  - The Application of the ADA.

# Work-Site Analysis

- Therapists should be familiar with the field of ergonomics as a whole to understand terminology being used
- Describe their own expertise, and recognize when an ergonomist with specialized training should be consulted

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- (1) Workplace analysis aimed at prevention of work-related musculoskeletal trauma
  - (2) Workplace and tool design for individuals with disabilities
  - (3) Research through the development and use of databases.



## knowledge base of therapists compared with that of ergonomist



- Therapists → sensory nervous system considerations, anthropometry, kinesiology, human development, anatomy and physiology, work capability analysis, and basic research.

# occupational therapists

- Communication, learning, motivation, normal and abnormal psychology (including the effects of stress)
- Job and task analysis
- Measures of job satisfaction

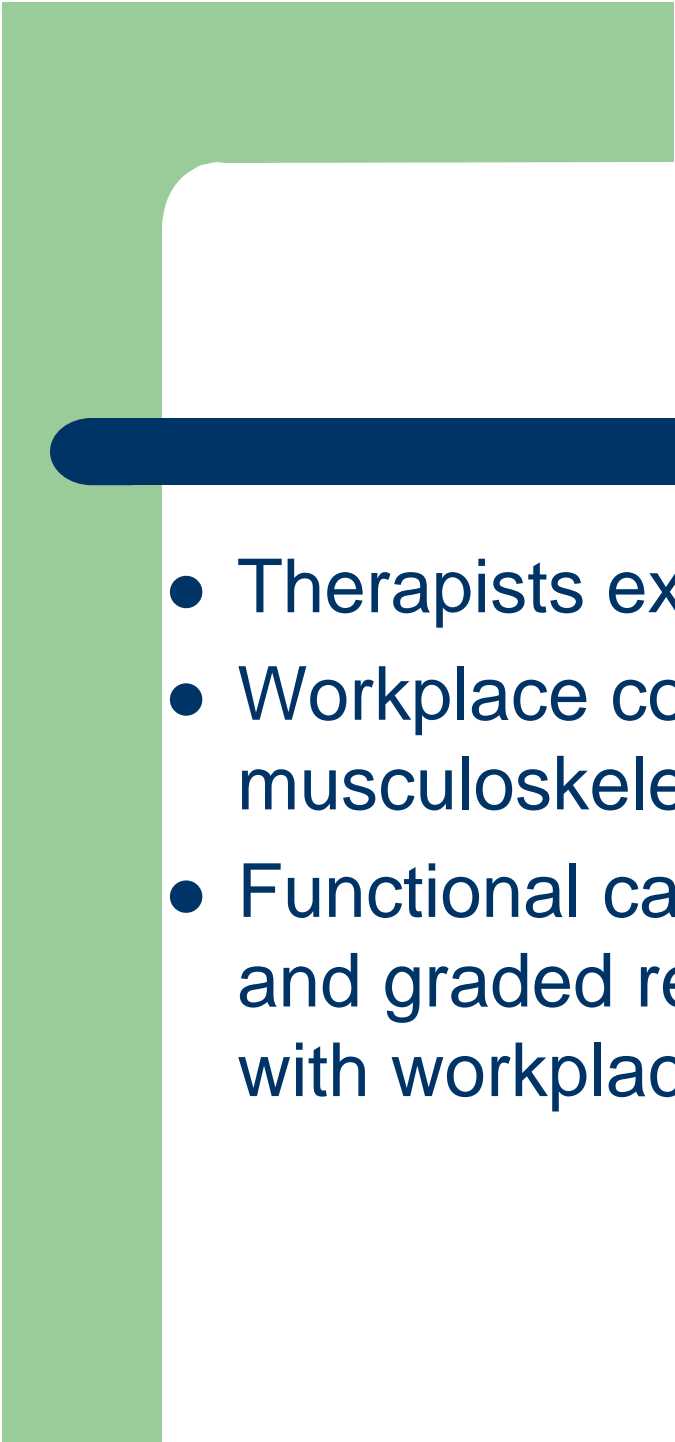

# Topics in ergonomics

- *Workplace design, seating and posture, and safety may or may not be included in the knowledge of **entry-level therapists.***
- Person machine communication
- Workstation design, vibration, noise, temperature, illumination , training, inspection and maintenance error and reliability, signal detection theory, visual displays, legal aspects of product liability, physics as applied to machinery as well as human motion
- Advanced statistical research methods

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- Therapists may consider themselves educated in safety, they may be unfamiliar with safety as it is taught in ergonomic

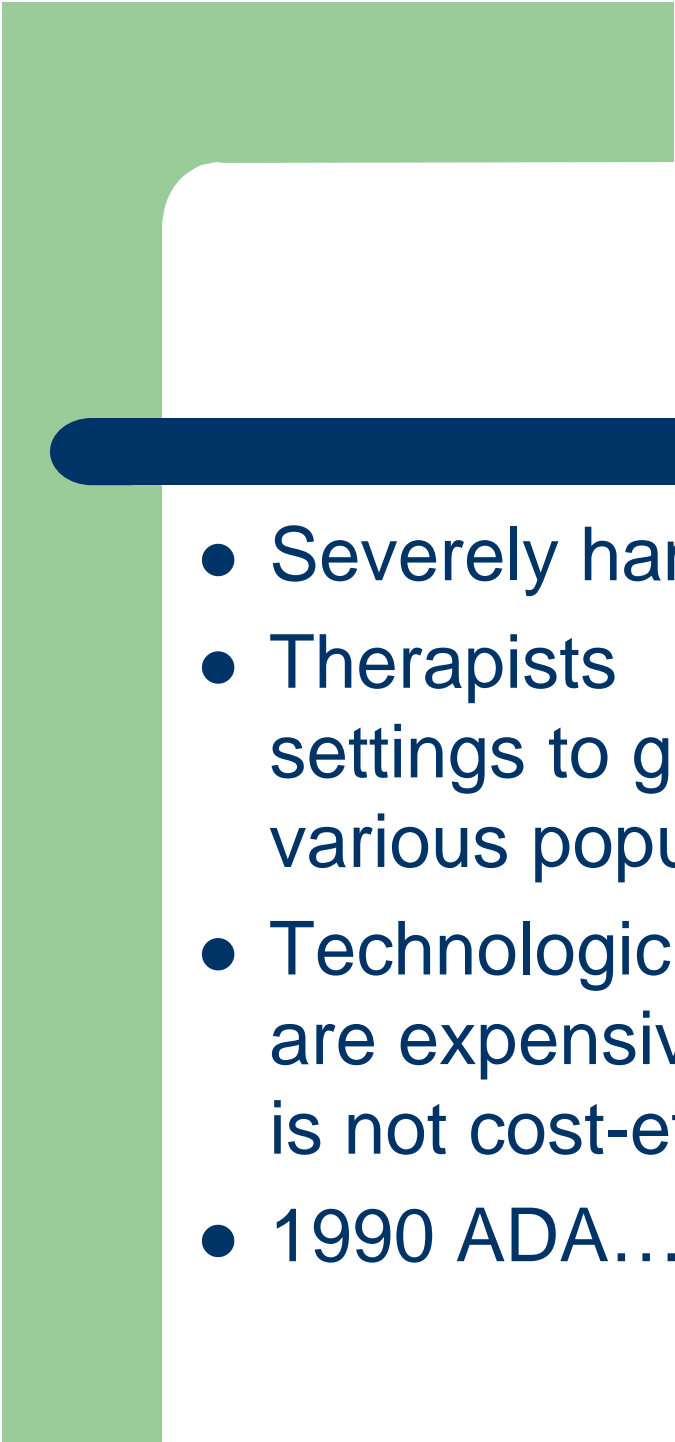

# Safety in ergonomics

- Accident losses
- Occupational Safety and Health Act; standards, codes, and safety documents
- Designing, planning, and production errors
- Hazards; acceleration, falls, and other impacts
- Pressure and electrical hazards
- Explosions and explosives; toxic materials; radiation; vibration and noise
- Slip, trip, and fall (traction and physical materials, as well as biomechanics and physiology); and methods of safety analysis

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- Therapists excellent allies for ergonomists
  - Workplace consultation directed at preventing musculoskeletal injuries
  - Functional capacity testing, work hardening, and graded return-to work placements along with workplace evaluations

# Design for Individuals with Disabilities

- Between 11.5% and 18.1% of the total population in the USA has a disability
- Individuals who have a disability are less likely to finish high school or to attend college and are more likely to live in poverty
- Ergonomic intervention could do much to enhance quality of life, at work and home

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- Severely handicapped most affected category
  - Therapists have the skills and are in the settings to gather information for a database on various populations with disabilities.
  - Technologic aids for individuals with disabilities are expensive because small-scale production is not cost-effective
  - 1990 ADA.....



# Research Interests

- Therapists can and do use ergonomics data in clinical treatment and prevention programs