



The Value of Ergonomics



The Value of Ergonomics

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Greenlee Inc

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1 Continuing Education Hour**

For these hours to appear on your certificate, you must:

- Have your badge scanned at the door
- Attend 90% of this presentation
- Fill out the online evaluation for this session: www.necanet.org/neca2018



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DUQUESNE
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AMERICAN COLLEGE OF SPORTS MEDICINE
of SPORTS MEDICINE
www.acsm.org



Board of Certification in
Professional Ergonomics



Human Factors and
Ergonomics Society

BS Exercise Science: Biomechanics, University of Delaware
Master of Arts: Teaching, Johns Hopkins University
Studied Physical Therapy, Duquesne University
CEP, American College of Sports Medicine
Member, Human Factors and Ergonomics Society

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Learning Objectives

- Define the cost saving aspects of ergonomics
- Describe how ergonomic risk factors cause injury
- Explore some ways to address ergonomic risk factors
- Identify ways ergonomics boosts productivity

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What is Ergonomics

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Definition:

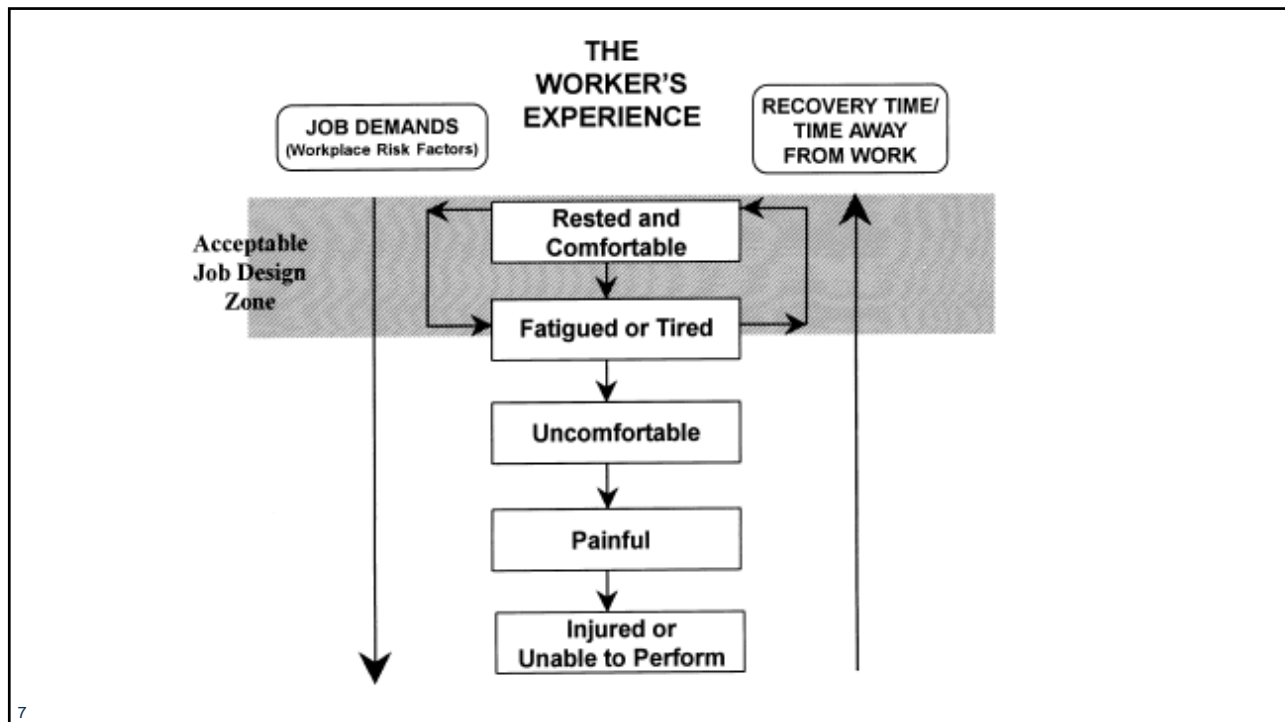
- An applied science concerned with designing and arranging things people use so that the people and things interact most efficiently and safely —called also *biotechnology*, *human engineering*, *human factors*
- The study of people's efficiency in their working environment.

In other words:

- Design and use tools to improve productivity and decrease injuries

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Cumulative Effects

- Damage accumulates over time
 - Scar tissue
 - Joint damage
- Loss of ability
 - Range of motion
 - Strength

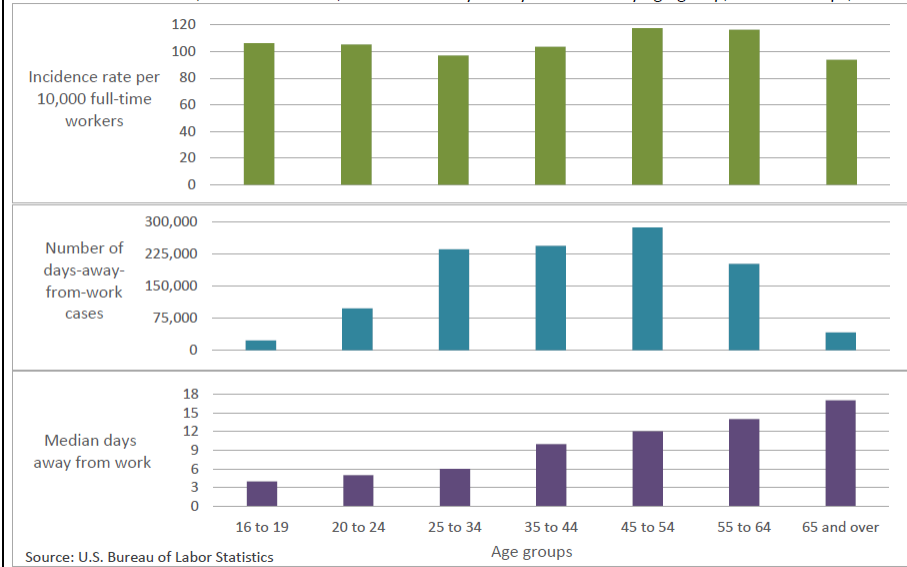
Injury? So what?

- That depends on the injury and how quickly it is addressed
- The older you get the longer it takes to get back to being able to work: maybe permanently
- You never get back 100%

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Chart F. Incidence rate, number of cases, and median days away from work by age group, all ownerships, 2014



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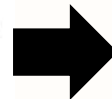
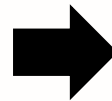
Ergonomic Solutions

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Tool Solutions

- In high repetition tasks:
 - Eliminate steps
 - Decrease other risk factors like force
 - Use power tool
- In high force scenarios:
 - Rest breaks
 - Job rotation
 - Use power tool

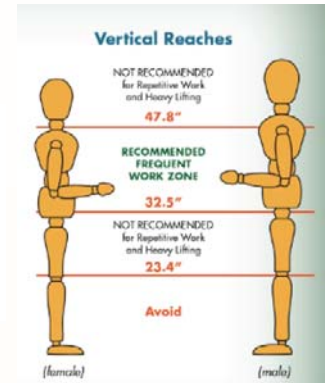
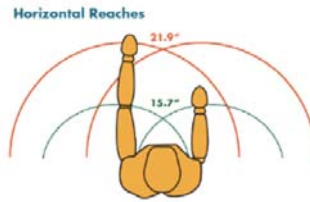


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Environment / Layout Solutions

- Bring work closer to worker
 - Then worker closer to work
- Stay in your body's sweet spots
 - Minimize reaching and twisting
- Bring necessary materials closer
 - Don't store objects on the ground



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Ergonomic Risk Factors

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Ergonomic Risk Factor- Force

- Force – tires out muscle quickly
 - At 10% maximum voluntary contraction (MVC) you start to use Type IIb muscle fibers
 - At 20% micro damage is done to muscles

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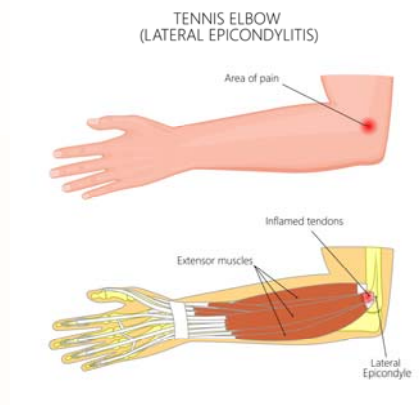
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Ergonomic Risk Factor- Force

Good Ergonomics

- Break down tasks
- Slow down
- Be methodical
- Rest breaks



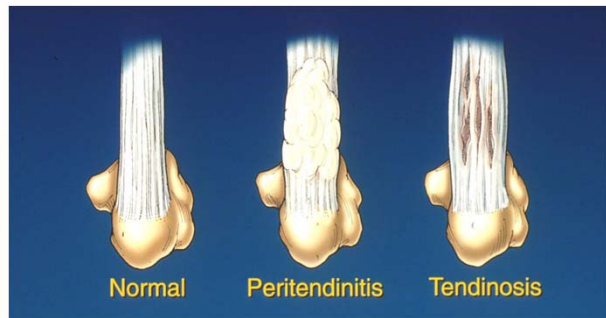
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Ergonomic Risk Factor- Repetition

- Repetition tends to wear down and damage tendons
 - Tendon sheaths
 - Tears and avulsions
- Speed kills
 - The more rapid the movement the more damage is done
 - Force Velocity curve



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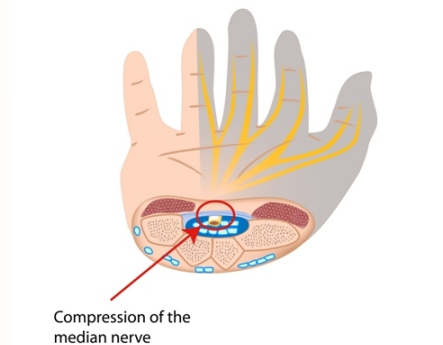
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Ergonomic Risk Factor- Repetition

Good Ergonomics

- Labor Rotation
- Rest Breaks
- Lean Process
- Slow Down

Carpal Tunnel Syndrome



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Ergonomic Risk Factor- Static Posture

- What is it?
 - Any body segment held outside a resting of time is a static posture
- How does it affect the body?
 - Sustained contraction w/o rest
 - Decreased blood flow/oxygen supply



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Ergonomic Risk Factor- Static Posture

Good Ergonomics

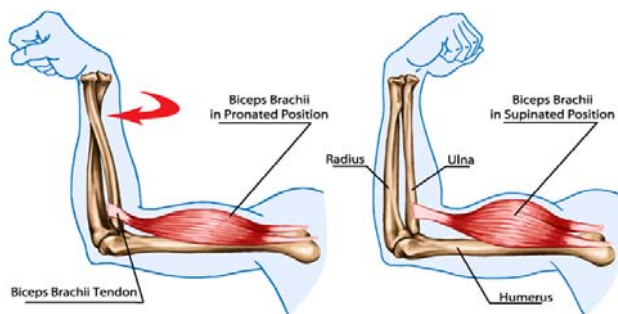
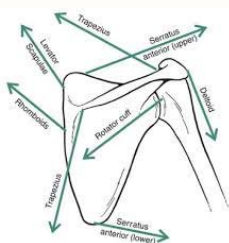
- Rest Breaks
- Labor Rotation
- Complete jobs faster
- Alternating postures
- Posture support

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Ergonomic Risk Factor- Awkward Posture

- Mechanical Advantage
 - Torque
 - Overhead/above shoulder
- Increased rate of fatigue



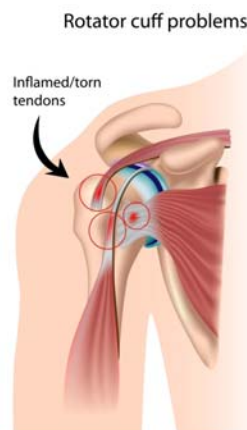
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Ergonomic Risk Factor- Awkward Posture

Good Ergonomics

- Get Closer
- Change environment
- Change approach



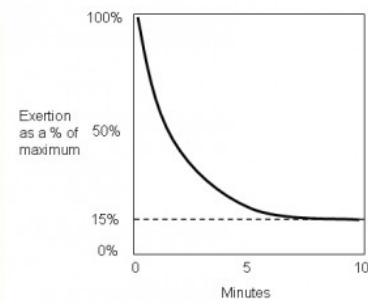
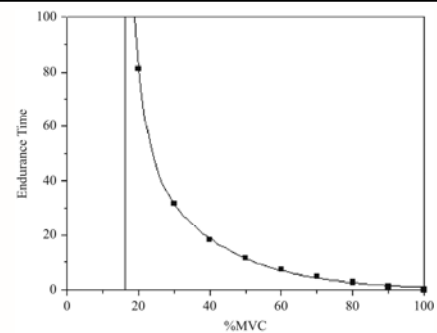
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Productivity Boost

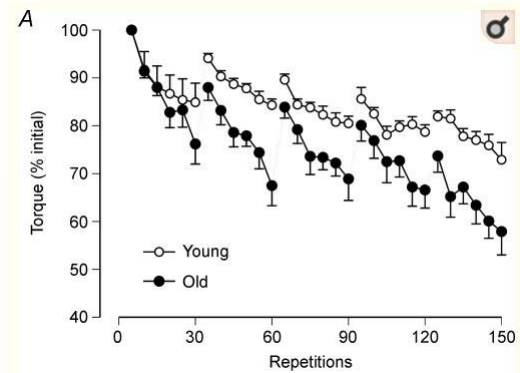
Rohmert Curve

- Curve describes how long a human can sustain exertion
- 15% of max strength is an important threshold
- Ergonomic tools and programs limit fatigue produced



Muscle Fatigue/Recovery

- Muscles lose the ability to achieve maximum strength quickly
- Muscles partially recover, but progressively less



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Loss of Ability Pre-Injury

- Before actual “injury” – workers will experience loss of ability
 - Strength
 - ROM
 - Sensation
 - Control
 - Capacity
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2375565/>

LOAD > CAPACITY = INJURY

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Eliminate Steps / Wasted Time and Motion

- Often part of LEAN process
- Motion Waste
- Prefabrication
- Reduces strain and risk exposure



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Hidden Cost of Injuries

- Musculoskeletal Disorders end up costing a company more than the medical cost.
 - Lots of hidden/indirect costs
 - Slow down work before the “injury” occurs

OSHA SAFETY PAYS ESTIMATES FOR INJURY COSTS

Injury Type	Direct Cost	Indirect Cost	Total Cost	Injury Type	Direct Cost	Indirect Cost	Total Cost
Strain	\$ 33,140	\$ 36,454	\$ 69,594	All Other Cumulative Injury, NOC*	\$ 39,728	\$ 43,700	\$ 83,428
Carpal Tunnel Syndrome	\$ 30,509	\$ 33,559	\$ 64,068	All Other Specific Injuries, NOC*	\$ 43,806	\$ 48,186	\$ 91,992
Inflammation	\$ 36,076	\$ 39,683	\$ 75,759	All Other Occupational Disease	\$ 49,104	\$ 54,014	\$ 103,118
Fracture	\$ 50,778	\$ 55,855	\$ 106,633				
Rupture	\$ 73,057	\$ 80,362	\$ 153,419				
Sprain	\$ 29,989	\$ 32,987	\$ 62,976				

<https://www.osha.gov/dcsip/smallbusiness/safetypays/estimator.html>

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Hidden Cost of Injuries

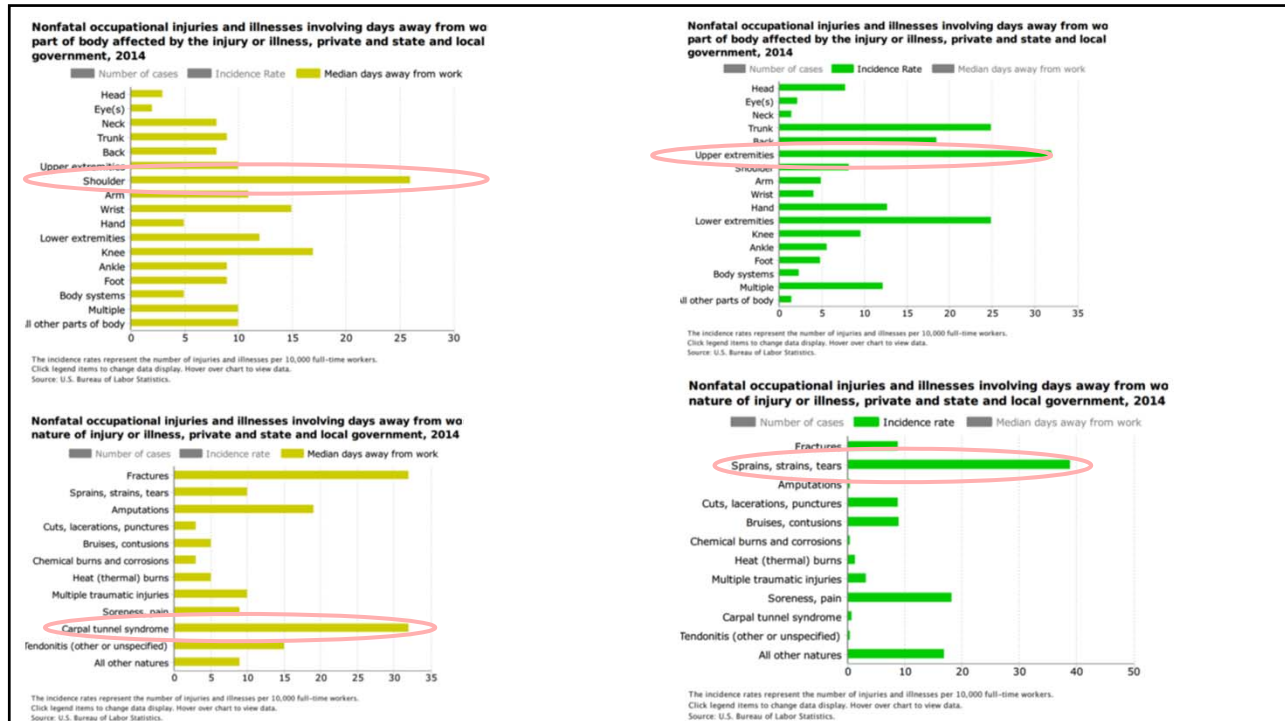
- Lingering pain and soreness from job sours morale and affects life outside work
- Experience Modification Rate (EMR) are sensitive to the number of injuries



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Real World Proof of Ergonomic Success



Pacific Gas and Electric Company®

- 100% reduction of LWD Cases
- 62% reduction of OSHA Recordable Cases
- 10% work efficiency improvement saving 25,504 work hours

Annual savings **\$7,353,248**

Thank you



ERGO^{LAB}™

<https://www.greenlee.com/resources/greenleeergo/ergo.html>

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Questions?

Don't forget...

- 10:15 am – 11:30 am – General Session with Christopher Tarbell & Hector Monsegur
- 11:30 am – 4:00 pm – NECA Show Hours

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