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Ohio Safety Congress & Expo

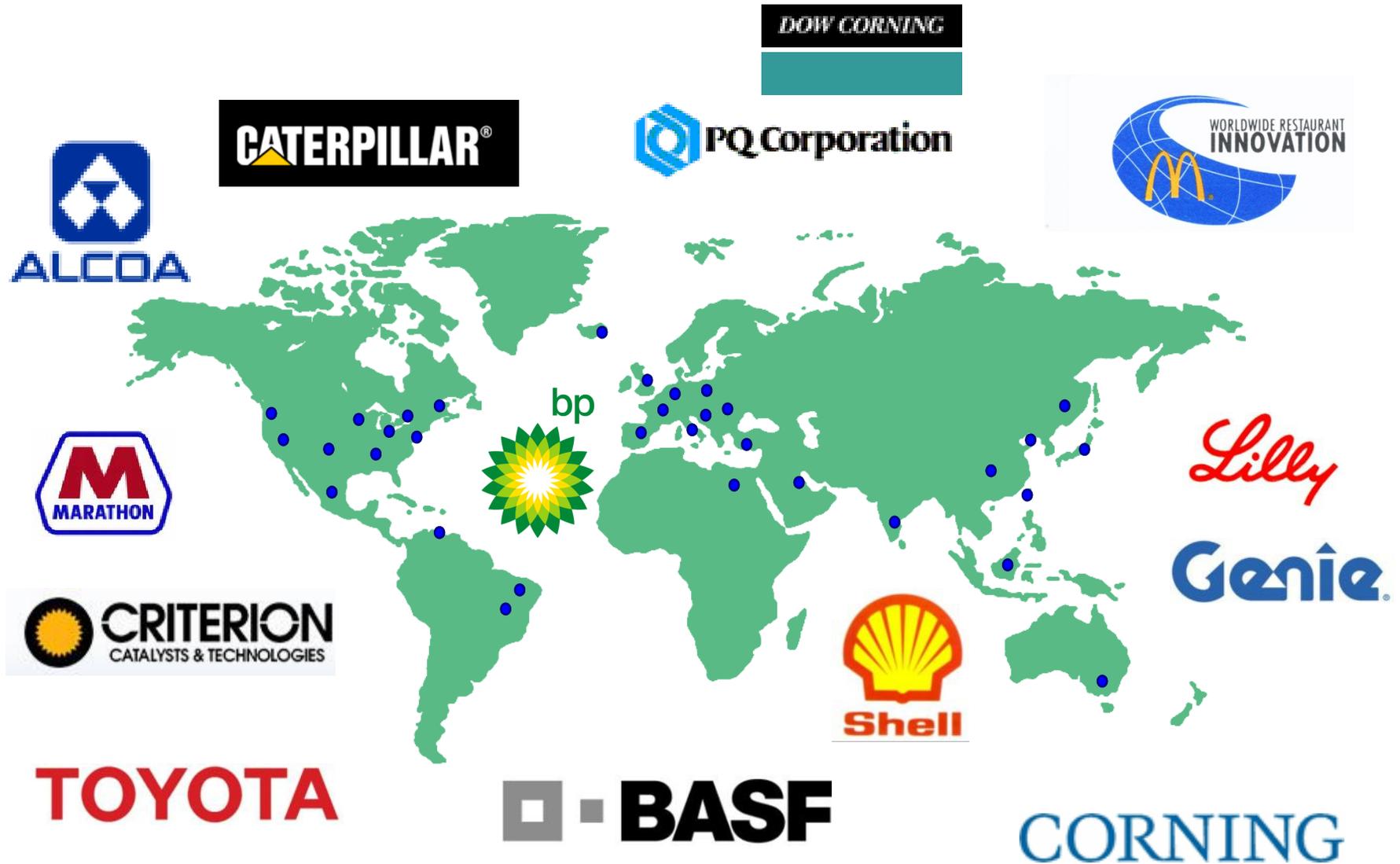
# Interactive Methods & Demonstrations for Ergonomics Training

Session #255

Josh Kerst, CPE, CIE



**Josh Kerst**, CPE, CIE  
Vice President, Ergonomics Engineer



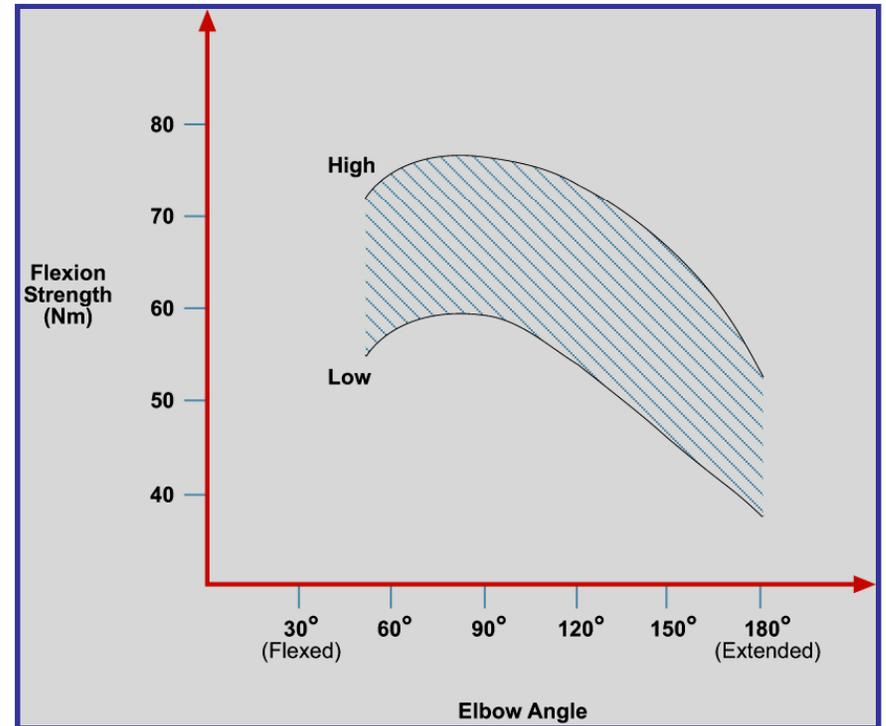
# Agenda Topics

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- Review adult learning theories that are most applicable for ergonomics
- Experience Hands-on Demonstration(s) of Biomechanics Principles
- Understand the Do's and Don't of Audience Engagement
- Questions & Answers

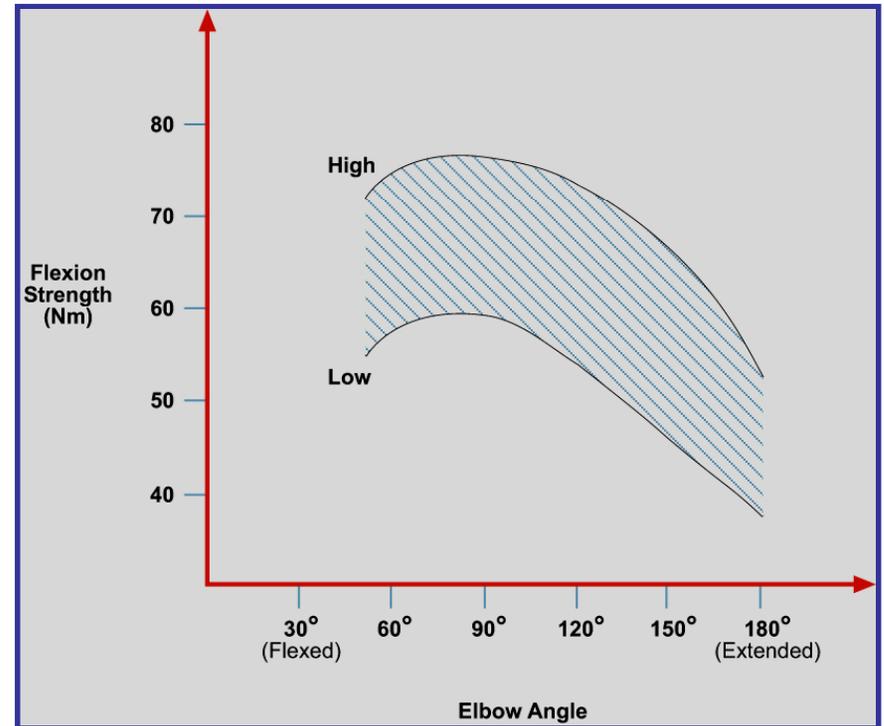
# What is Ergonomics?

Designing the workplace *for* what people do well, and designing *against* what people do not do well.



# Demonstration #1 “Elbows Out”

Ergonomics defines the limits to human capability much like the specifications for a machine define its limits.



# Adult Learning Theories

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- Adult's commitment to learning is improved when the goals and objectives are considered realistic and important to each individual.
  - In the early 1970s Malcolm Knowles introduced the term "andragogy," describing differences between children and adult learners (Knowles, Swanson, & Holton, 2005). Andragogy focuses on special needs of adult learners.
- Six Important Concepts

# Adult Learning Theories

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- There are six assumptions about adult learning that are applicable for ergonomics:
  1. need to know,
  2. self-concept,
  3. prior experience,
  4. readiness to learn,
  5. learning orientation, and
  6. motivation to learn.

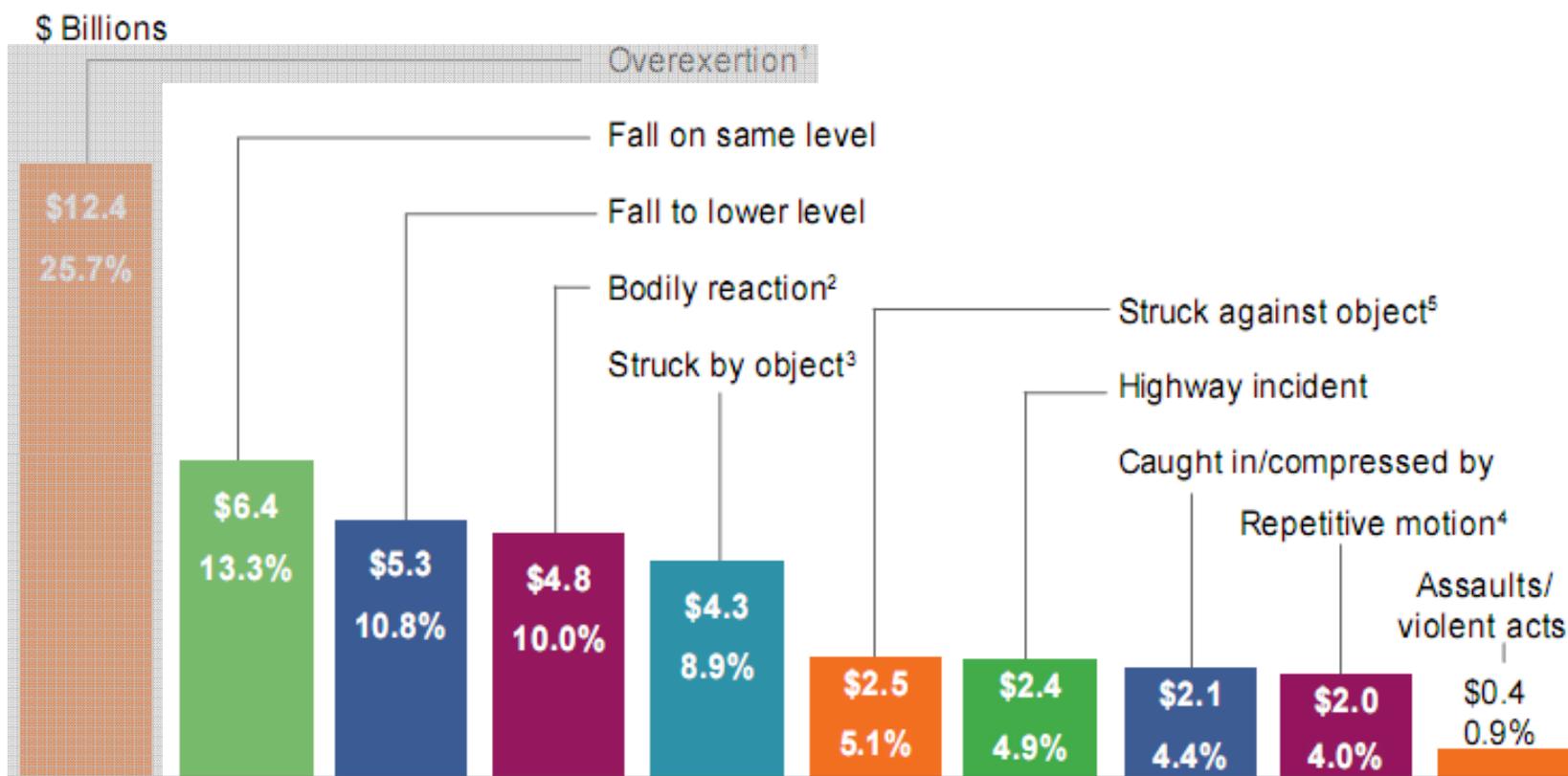
# Adult Learning Theories:

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- 1. The Need to Know.** Adults want to know why they need to learn something before undertaking learning (Knowles et al., 2005). Facilitators must help adults become aware of their "need to know" and make a case for the value of learning.
- 2. The Learners' Self-Concept.** Adults believe they are responsible for their lives (Knowles et al., 2005). They need to be seen and treated as capable and self-directed. Facilitators should create environments where adults develop their latent self-directed learning skills (Brookfield, 1986).

# Need to Know... or, What's In It for Me (WIIFM)

## Top 10 Causes of Most Disabling Workplace Injuries



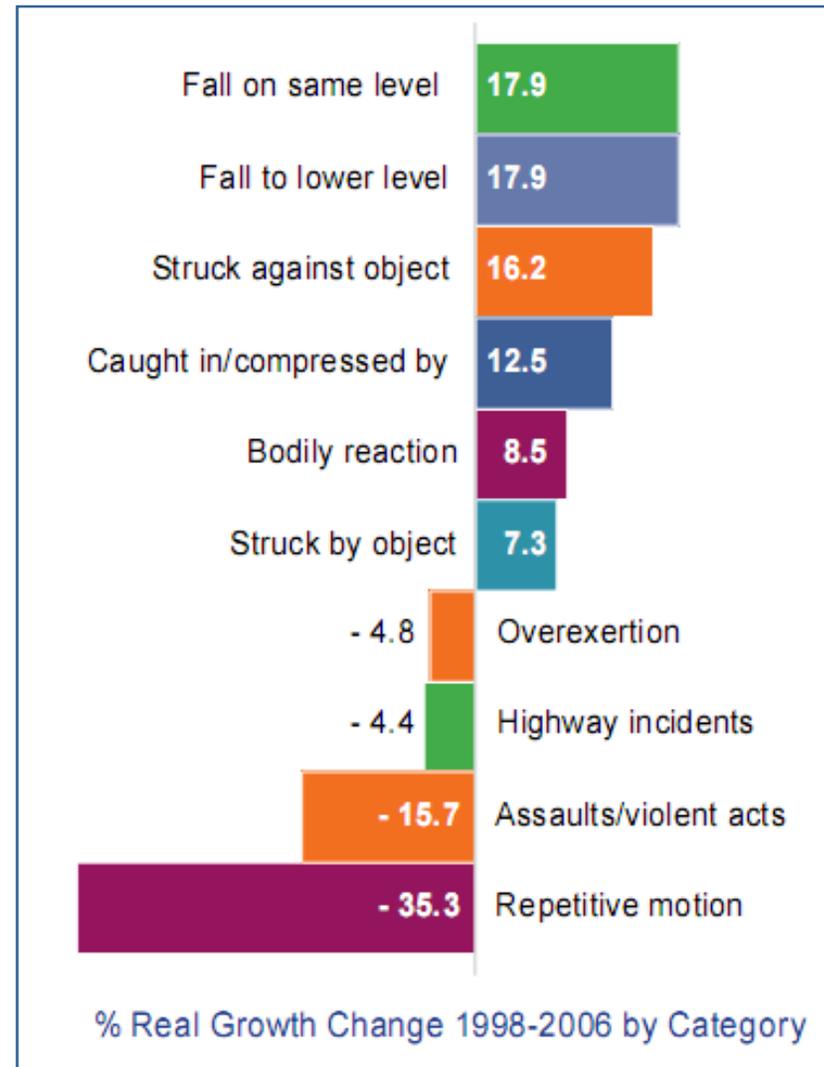
Overexertion – Injuries caused from excessive **lifting, pushing, pulling, holding, or throwing**

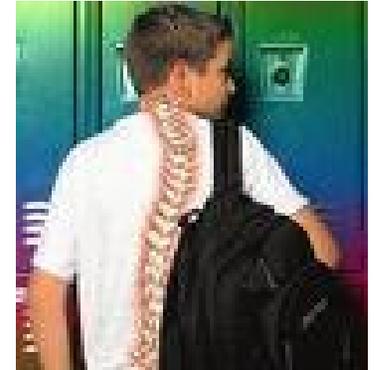
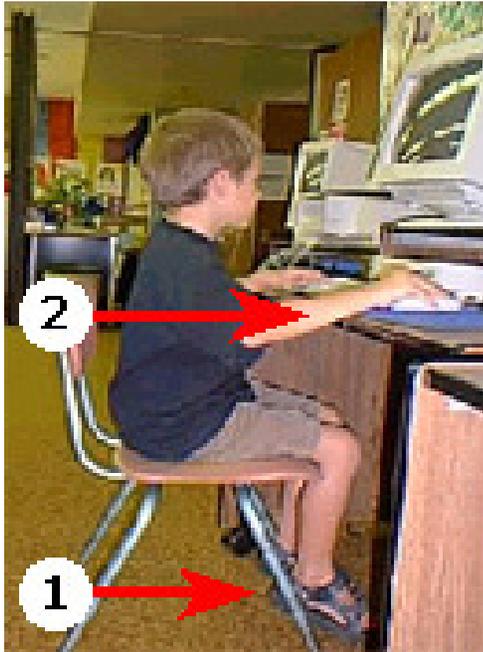
Source: 2008 Liberty Mutual Workplace Safety Index

# Top 10 Causes of Most Disabling Workplace Injuries

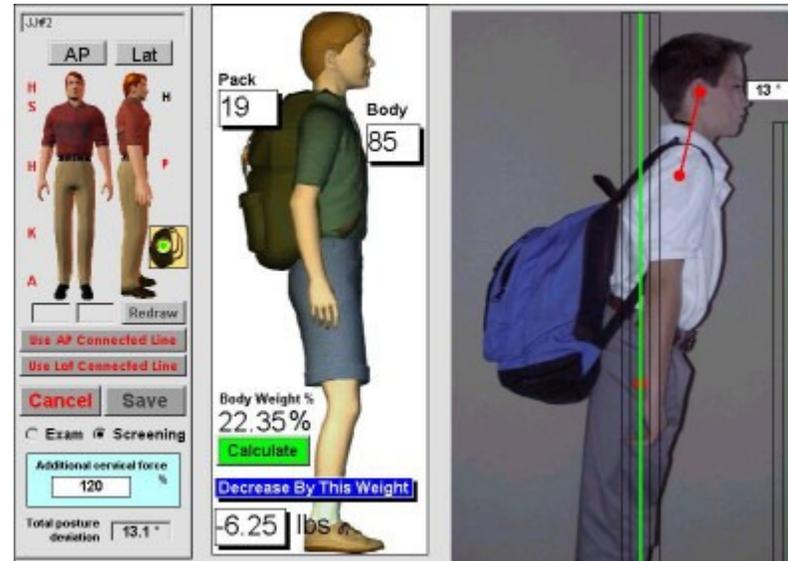
- Repetitive motion shows 35% reduction in 9 years
- Overexertion only shows 4.8% reduction

*Source: 2008 Liberty Mutual Workplace Safety Index*





Need to Know... or, What's In It for Us (WIIFU)



# Adult Learning Theories:

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- 3. The Role of the Learners' Experiences.** Adults come into an educational activity with different experiences than do youth (Knowles et al., 2005; Merriam & Caffarella, 1999). There are individual differences in background, learning style, motivation, needs, interests, and goals, creating a greater need for individualization of teaching and learning strategies (Brookfield, 1986; Silberman & Auerbach, 1998). The richest resource for learning resides in adults themselves; therefore, tapping into their experiences through experiential techniques (discussions, simulations, problem-solving activities, or case methods) is beneficial (Brookfield, 1986; Knowles et al., 2005; McKeachie, 2002; Silberman & Auerbach, 1998).
- 4. Readiness to Learn.** Adults become ready to learn things they need to know and do in order to cope effectively with real-life situations (Knowles et al., 2005). Adults want to learn what they can apply in the present, making training focused on the future or that does not relate to their current situations, less effective.

# Experience Matters...

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Ergonomics is fitting the person to the job.  
**the job to the person.**



# Ergonomics in the Somerset Middle School



- “At a stand-up desk, I’ve never seen students with their heads down, ever. It helps with being awake and they can choose stand or stand. And for me as a teacher, I can stand at their level to help them. I’m not bent over”

# Adult Learning Theories:

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- 5. Orientation to Learning.** Adults are life-centered (task-centered, problem-centered) in their orientation to learning (Knowles et al., 2005). They want to learn what will help them perform tasks or deal with problems they confront in everyday situations and those presented in the context of application to real-life (Knowles et al., 2005; Merriam & Caffarella, 1999).
- 6. Motivation.** Adults are responsive to some external motivators (e.g., better job, higher salaries), but the most potent motivators are internal (e.g., desire for increased job satisfaction, self-esteem). Their motivation can be blocked by training and education that ignores adult learning principles (Knowles et al., 2005).



# Adult Learning Theories:

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- Adult education should focus on experiential techniques that tap into the experience of learners, such as group discussion, problem-solving, case methods, simulation exercises, games, and role-play, instead of primarily using transmittal techniques such as lecture
  - **Lectures** should be used in 15- to 20-minute sections spaced with active learning activities to reenergize participants for the next wave of information
  - **Problem-Based Learning** encourages critical thinking and problem-solving skills. Participants confront contextualized, ill-structured problems and strive to find solutions. The trainer is in the role of a facilitator to stimulate, guide, integrate, and summarize discussions.

# What Do We See? – Challenge #1

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## Ergonomics is about...

- Looking at something familiar (e.g., your own work area) and observing it in a new way
- As a result, you are able to make continuously improve the process...so that it is safer, more efficient, and enables a higher quality product to be assembled that is make valuable to your customer.



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# Do you See the Arrow?



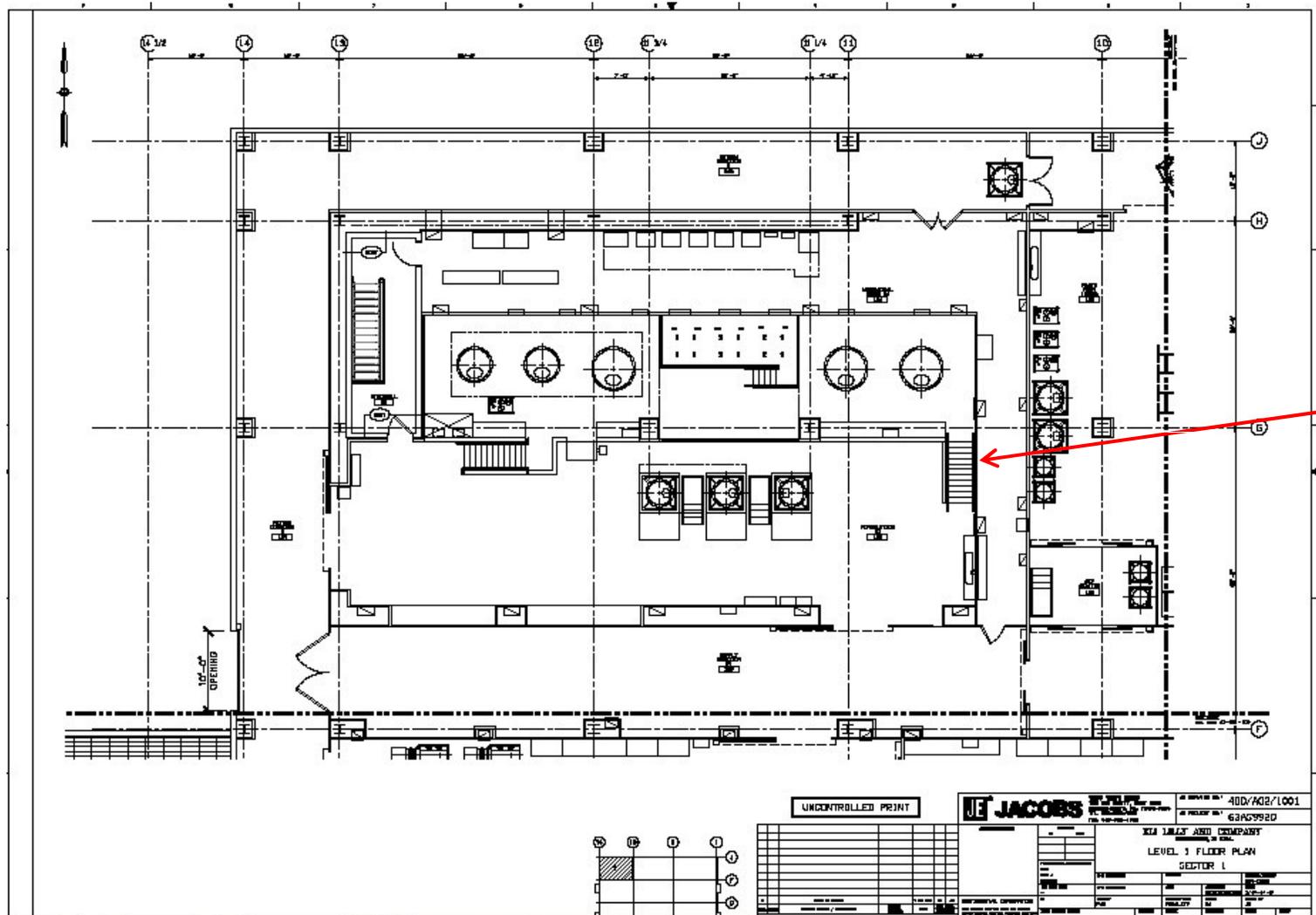
# Do you See the Arrow?



# High-Lift Adjustable Pallet Jack



# Do you See the Axle?



# Adult Learning Theories:

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- **Case Studies** are narratives, situations, data samplings, or statements that present unresolved and provocative issues, situations, or questions. Cases challenge adults to analyze, critique, make judgments, speculate, and express opinions
- **Educational games** involve students in competition or achievement in relationship to a goal; the game teaches and is fun (McKeachie, 2002). Many games are simulations with the goal of modeling real-life problems or crisis situations. One advantage of games and simulations is they encourage participants to confront their own attitudes and values (Silberman & Auerbach, 1998) through involvement in making decisions, solving problems, and reacting to results of their decisions (McKeachie, 2002).

# Change the Workplace: Simple Controls

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**BEFORE**



**AFTER**



Change angle of handle to eliminate bent wrists

# Change the Workplace: Simple Controls

**BEFORE**



**AFTER**



Fabricated handles on cart to  
reduce back bent postures

# Adult Learning Theories:

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- **Role Play** is used to assist participants in experiencing feelings and practicing skills (Silberman & Auerbach, 1998). Role play is defined as an experience around a specific situation that contains two or more different viewpoints or perspectives. The situations should be realistic and relevant. The most successful scenarios develop a skill.
- **Discussion** is the prototypic teaching method for active learning (McKeachie, 2002). Discussion encourages students to discover solutions and develop critical thinking abilities (Teaching Concerns, 1993). Discussion allows learners to be active and experience personal contact (Indiana University Teaching Handbook, 2004; McKeachie, 2002). Trainers using discussion pose a problem, monitor discussion, and summarize when completed (Indiana University Teaching Handbook, 2004). Discussion methods are superior to lectures in adult learners' information retention; transfer of knowledge to new situations; problem solving, thinking, or attitude change; and motivation for further learning (McKeachie, Pintrich, Lin, & Smith, 1986).

# Challenge # 2: “Two by Four”

## Change the Workplace: Simple Controls

**BEFORE**



**AFTER**



Built stand over workstation to  
reduce reach distance

# Change The Workplace: Simple Controls

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**BEFORE**



**AFTER**



Raised the table 18" eliminate bent back and extended reach

# Change the Workplace: Simple Controls



- Find It
  - Moving 60-lb spools using high force, awkward postures



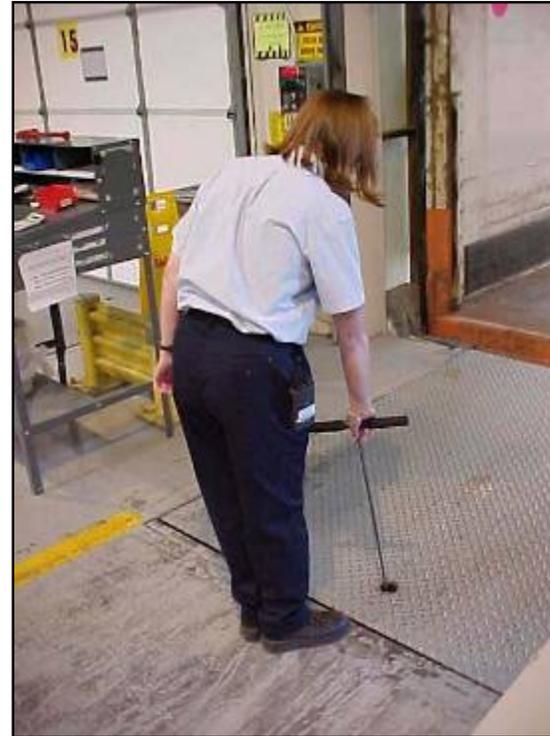
- Fix It
  - Provided C-handle to maneuver spools.

# Change the Workplace: Simple Controls



## Find It

- » High force lifting



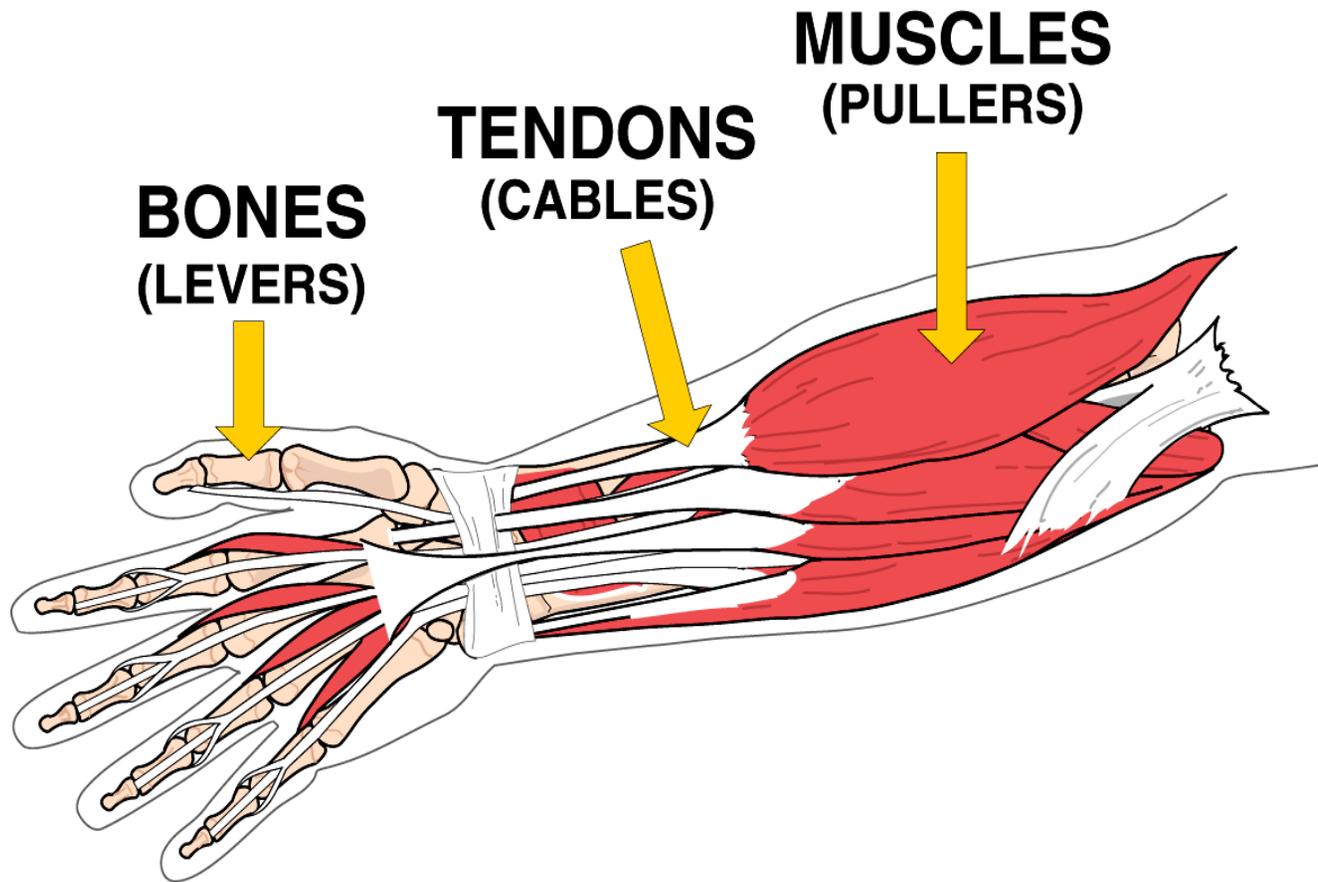
## Fix It

- » Dock plate tool
- » In-house improvement

# Demonstration #2 – “Get a Grip”

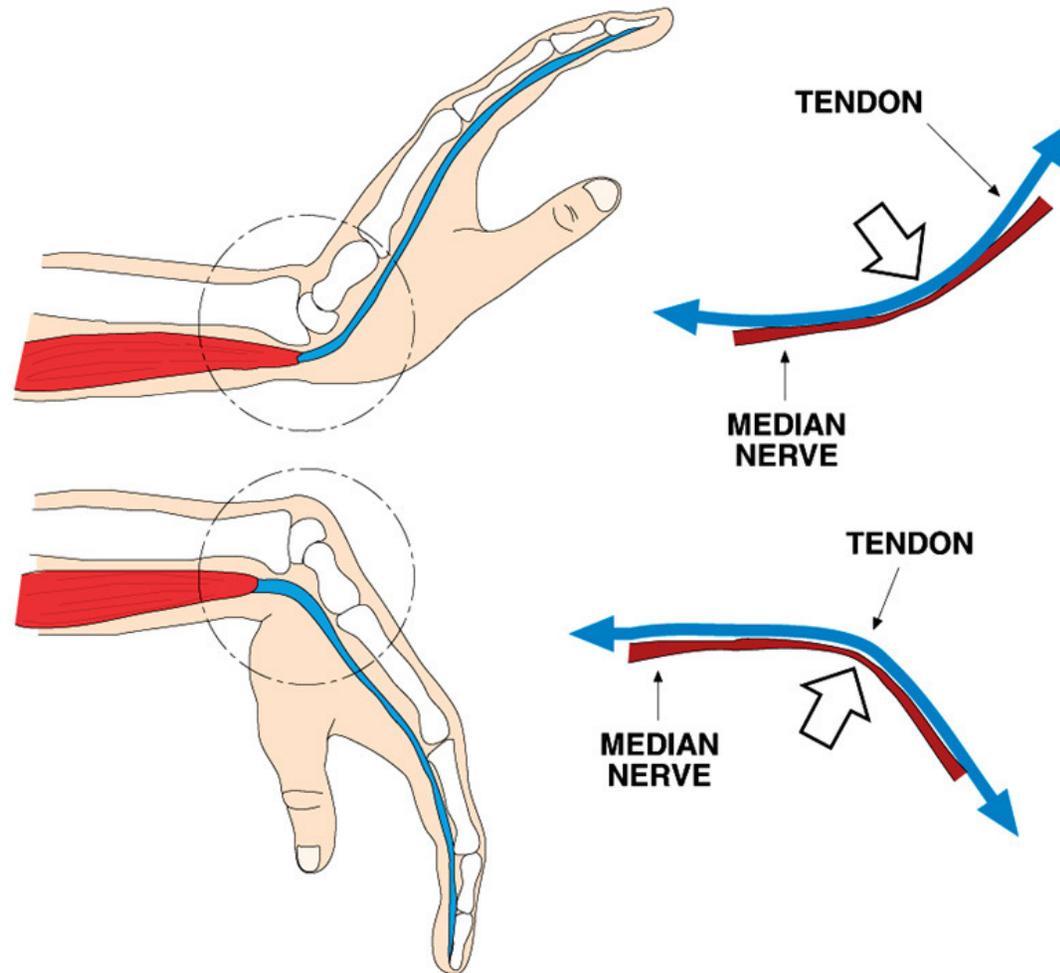
## ”Tendon Mechanics

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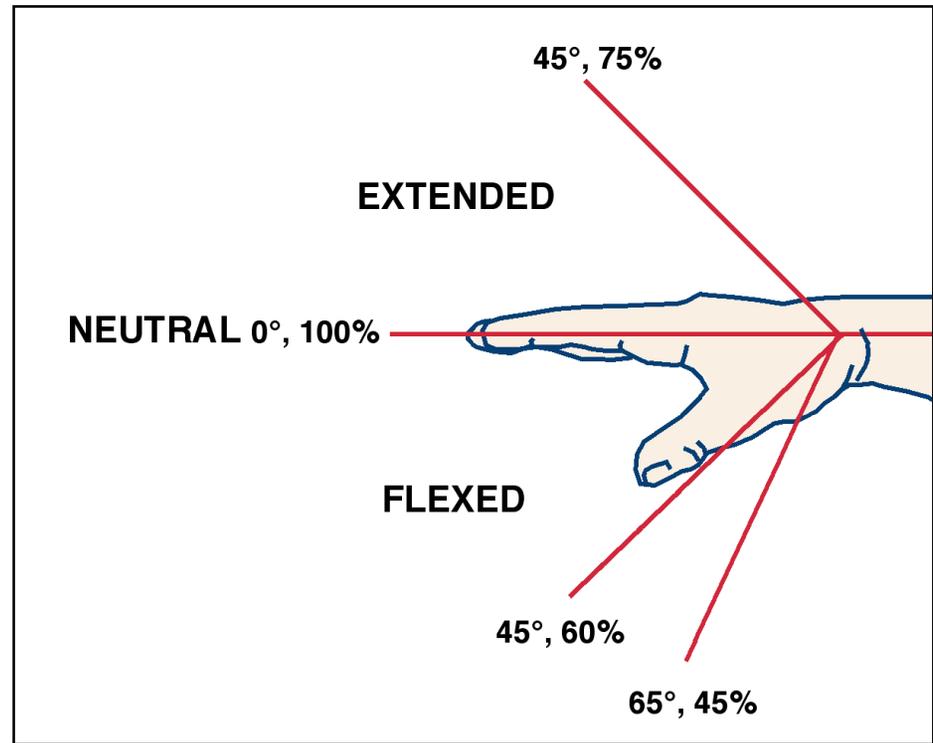
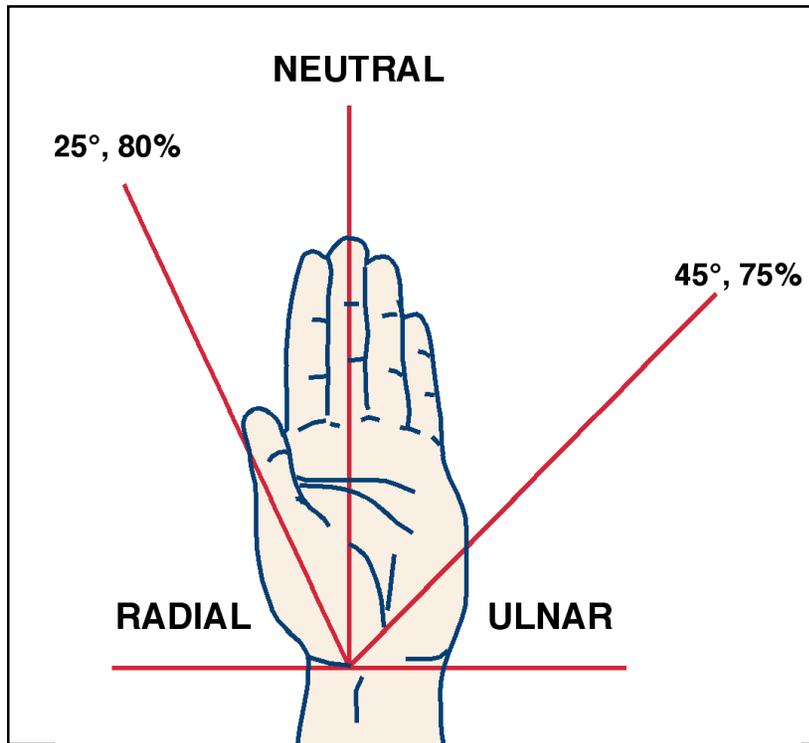
# Demonstration #2 – “Get a Grip”

## Tendon Mechanics



# Demonstration #2 – “Get a Grip”

## Tendon Mechanics



# The Science Behind Ergonomics - Discussion

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Anthro = people

metry = measurement of

- Optimize performance for most of the population
- Are based on studies of healthy, working-age adults

# Demonstration #3 – “Measure Up”

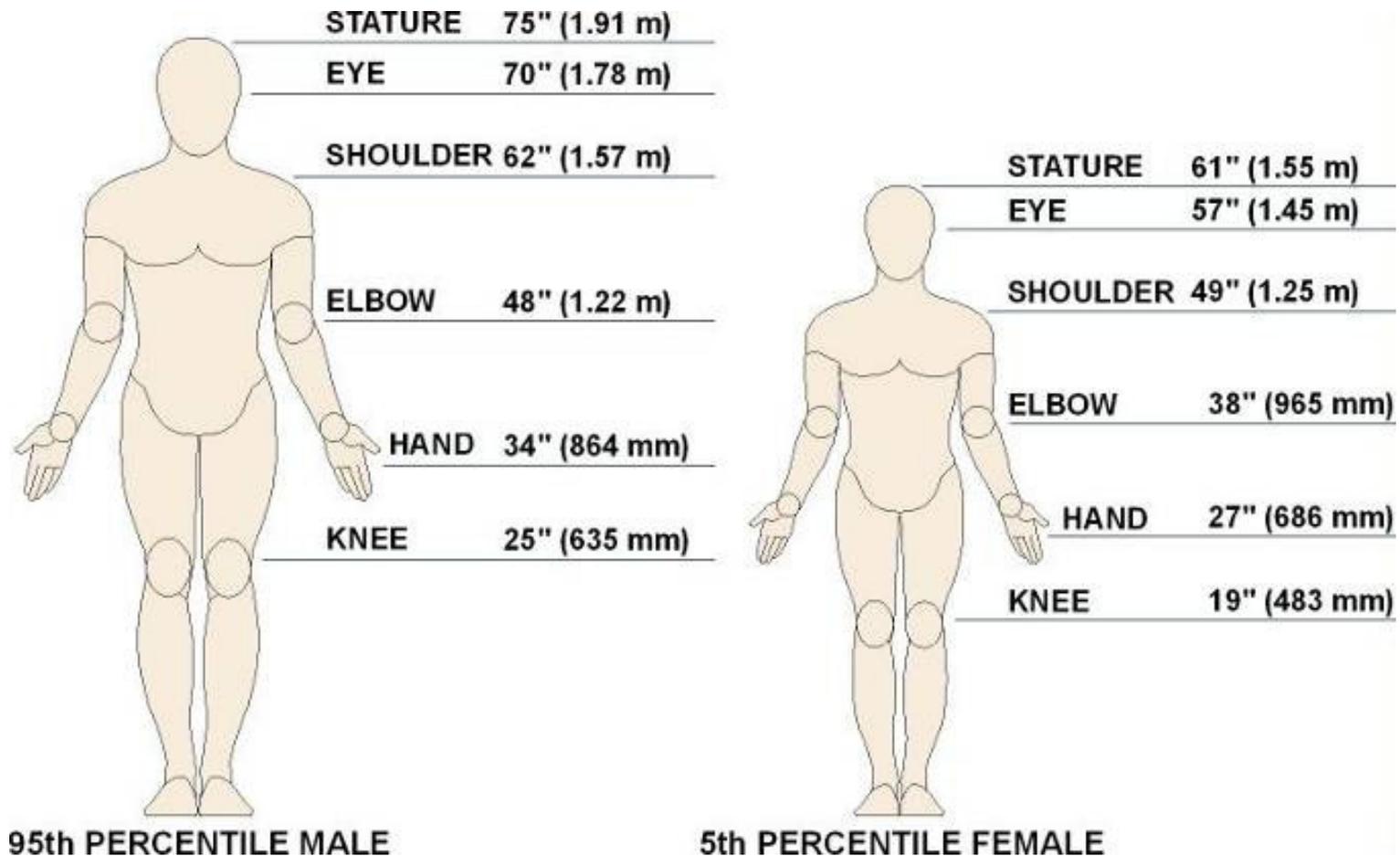
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An employee drills flange located on the floor, resulting in flexed back and extended arm postures. In an effort to control the ergonomic risk exposure, ergonomic design guidelines are consulted to find the correct work height range to minimize this risk.



1. What fixed height do you set the work?
2. How much adjustment would be needed to accommodate 95% of workforce?

# Design for Adjustability, Extremes, or Average?



# Demonstration #4 – “Eye Spy”

Ergonomic design guidelines are based on studies of population capabilities.

The intent is to set criteria that will optimize performance for most, if not all, of the working population.

Anthropometry is defined as **the science of studying human body dimensions**. The word can be divided into two components:

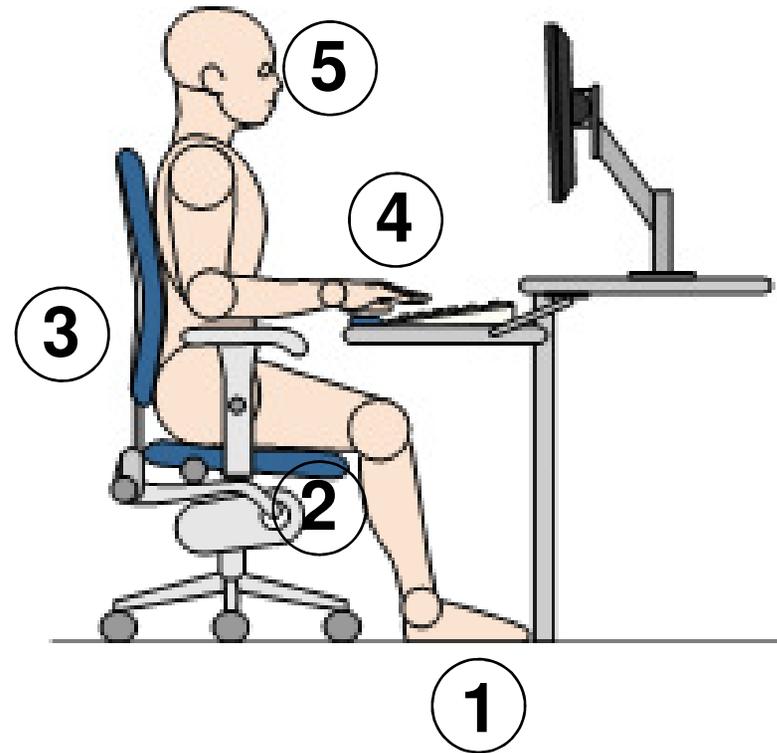
**Anthro** = people

**metry** = the measurement of



# Demonstration #5 – “Give Me 5” - Points of Contact

- Contact #1 – Feet firmly supported
- Contact #2 – Two fingers clearance behind the knee and chair
- Contact #3 – Lumbar support
- Contact #4 – Hands on the keyboard
- Contact #5 – Eyes at monitor height at arm’s length



# Do's and Don'ts of Adult Learning

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- **Do provide direct, concrete experiences in which they apply the learning in real work**
- **Do need allow people to participate in small-group activities**
- **Do remember that people bring their own props (i.e., body parts) to class**
- **Don't think that learning for adults is automatic as it must be facilitated**
- **Don't just lecture and read your slides (i.e. Death by PowerPoint)**
- **Don't dominate group discussions**
- **Don't be afraid to experiment with new techniques**



**People make productivity happen.**



**Questions?**

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# Continuing Nursing Education Disclosures

- **Goal:** To educate conference attendees on specific aspects of accident prevention and Ohio's workers' compensation system
- **Learning objectives:**
  - Explain the principles of adult learning theory;
  - Demonstrate techniques for audience engagement;
  - Describe the principles of biomechanics; and
  - Summarize control strategies for ergonomic risk factors.
- **Criteria for Successful Completion:** Attend the entire event and complete a session evaluation.
- **Conflict of Interest:** The planners and faculty have no conflict of interest.
- **Commercial Support:** There is no commercial support for this event.
- **Continuing Education:** Awarded 0.1 IACET general CEUs and 1.0 RN\* contact hour.

*\*The Ohio BWC (OH-188/01-01-2013) is an approved provider of continuing nursing education by the Ohio Nurses Association (OBNA-001-91), an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.*