The Participant Will Be Able To:

- Explain the significance of the MSD dilemma
- Describe the difference between acute and cumulative trauma
- Appreciate and understand the various work factors that contribute to MSDs (ABCs of Work Injury Prevention)
- Understand how comprehensive work preparation correlates with athletic enhancement
- Appreciate the practical value of the industrial athlete model in creating specific interventions to prevent injury

The MSD Dilemma

- 1.8 million workers suffer an MSD annually
- Musculoskeletal complaints are second only to upper respiratory complaints as the most common reason for Americans seeking medical services
- Total financial impact of injury costs is estimated to be as much as $240 billion (2002 Safety Index data!)
The MSD Dilemma

• Vast majority of MSDs do not involve visible signs of injury
• In addition to work factors, other issues can impact MSDs
  – Home/recreational activities
  – General health trends (i.e. lifestyle issues)
  – Job dissatisfaction
  – Aging workforce
• "No blood" dilemma with many negative reactions

The MSD Dilemma

• **Physician** recommends arbitrary restrictions ("transitional duty")
• **Employee** frustrated with unresolved symptoms
• **Supervisor** frustrated by balancing production issues related to an injury of vague circumstances
• **Therapist**, often unaware of the nature of the work, becomes indignant to and/or skeptical of the worker
• **Company health care staff** wonders why most people can perform the work without issue and becomes concerned about secondary gain

The MSD Dilemma

• Many MSDs are cumulative and, therefore, are much more difficult to track and solve
Acute Trauma

1. Definable Onset
2. Obvious Cause & Effect
3. Spontaneous Recovery

Cumulative Trauma

1. Variable Onset Reporting
2. Hidden Cause & Effect
3. Progressive Damage

ABC’s of Injury Prevention

A = Administrative Controls
B = Behaviors/Techniques
C = Capacity
D = Demands
**ABC’s of Injury Management**

- Early Intervention
- FJDs
- Job Matching
- FCEs

**Training Policies**

- **A** = Administrative Controls
- **B** = Behaviors/Techniques
- **C** = Capacity
- **D** = Demands

---

**The Triangle of Stress**

- Time
  - Freq & Duration
- Force
  - Lift, Push, Pull
- LEVERAGE
- Motion
  - Range & Posture

**Cumulative Trauma**

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**Triangle of Stressors**

- **Fuel**
- **Heat**
- **Oxygen**

*Fire requires three essential elements to be present...*

*Remove any one of the three to extinguish the fire!*
Worker Capacity and the Triangle of Function

Function

Endurance

SAID Principle

Is aging the whole story?

Can function be changed?

Strength

Flexibility

Function vs. Cumulative Trauma

Cumulative Trauma

Fitness

Time

Endurance

BIOERGONOMICS

ERGONOMICS

The Bucket Analogy
The Bucket Analogy

• What can we do to keep the bucket from overflowing?
  – Slow the drip
  – Open the valve
  – Get a bigger bucket

Slowing the Drip

• Ergonomics
  – Decrease the work demand
  – Shrink the triangle of stress
Opening the Valve

- Recovery
  - Rest/sleep
  - Hydration
  - Nutrition
  - Recovery stretching

Getting a Bigger Bucket or Triangle

- 3D Fitness
  - Fight force with greater strength
  - Fight time with greater endurance
  - Fight motion with motion... greater flexibility through dynamic warm-up

Does Stretching Work?

- Prevents injury?
- Alleviates back pain and other muscle pain?
- Increases performance?
- Reduces post-activity muscle soreness?
- Is the only way to improve flexibility and range of motion?
- Should be used in a warm up or a cool down?
Types of Stretching

- Static
- Ballistic
- Dynamic
- PNF – diagonal motions/functional movement patterns

Is There Evidence to Support Stretching?

  - 293 articles
  - 3 found that stretching was beneficial at reducing injuries (each included warm-up)
  - 5 found no difference
  - 3 suggested stretching was harmful

Potential Negative Effects?

- Reduces force generating capacity
  - By as much as 28% for up to 60 minutes
- Plastic deformation
Ballistic Stretching

- Ballistic stretching uses the momentum of a moving body or a limb in an attempt to force it beyond its normal range of motion.
- Commonly known to be dangerous – do not do!

Benefits of a Warm-up

Muscular System
- Enhances blood flow to the muscles
- Improves economy of movement (less viscous resistance)
- Increased speed of contraction and relaxation
- Minimizes the risk of muscle and tendon tears
- Provides movement-specific conditioning

Nervous System
- Fine tunes the neuromuscular control system (proprioceptors)
  - Enhanced balance
  - More rapid and precise neural firing
- There is some scientific evidence that static stretching may temporarily inhibit the proprioceptors
Benefits of a Warm-up

- **Cardiovascular System**
  - Switches the aerobic energy system to maximum output
  - Hemoglobin releases oxygen more readily at higher muscle temperatures
  - Without a warm-up, oxygen burning will not optimize until 4 to 6 minutes into activity
- **Hormonal**
  - Gets the adrenalin and natural pain killer hormones (endorphines) flowing

Functional BioErgonomic Solution

- Athletic equivalent of sports-specific conditioning
- Stretch & Flex
  - Work Preparation Program that focuses on stretching that works (emphasis on dynamic) and the development of work-related strength needs

Worker Behaviors/Techniques

- Why do workers use inefficient or hazardous techniques?
  - Ergonomic design
  - Lack of knowledge
  - Perceived lack of risk
  - Physical limitations
- Why does one employee experience an injury and not another?
**Functional Training Solution**

- Athletic equivalent of fundamental skill development
  - Train the brain
- Boot Camp or Spring Training
  - Work Preparation Program that focuses on developing healthy habits and building the skills necessary to do the work
  - Habit requires both knowledge and implementation

**Case Study: Utility Company**

- Company A
  - Heavy work demands
  - Approximately 1400 employees in delivery service
  - Average age of employee = 50 years
  - Average length of employment = 20 years
  - Recent OSHA trends indicated injury improvement

**Company A: OSHA Trends**

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<td>Preventable Vehicle</td>
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Company A: OSHA Trends

• Two work groups identified as highest risk
  – Electric crews accounted for 29% of company's work injuries
  – Gas crews accounted for 22% of company's work injuries

• Nature of incident (all work groups)
  – Strain (36%), laceration (12%), contusion (10%), sprain (8%), fracture (8%)

Company A: OSHA Trends

• Injured body parts (all work groups)
  – Hand/Wrist = 19
  – Neck/back = 12
  – Shoulder = 10
  – Arm/elbow = 9
  – Leg/knee = 8

Analysis Strategy 1: Comfort Survey

• Do you experience problems of physical discomfort or difficulty associated with your normal job activities? Y/N
• How long have you experienced your problem? _____ weeks
Analysis Strategy 1: Comfort Survey

- What are the work activities that seem to contribute to your problem?
- Where do you experience your problem (body diagram)?
- What kind of problems do you experience?
  - Pain, soreness, stiffness, weakness, fatigue, swelling, numbness, tingling, awkwardness

Analysis Strategy 1: Comfort Survey

- How great is your problem?
  - Mood, concentration, intensity, quantity, quality, safety, leisure, and sleep
- How frequently does your problem occur?
  - Constantly, daily, weekly, monthly, or other

Comfort Survey: Bottom Line

- Occurrence: 85% of electric crew workers experienced discomfort to some degree
- Problem duration: Average of 301 weeks (nearly 6 years)
- Where: Top 3 body parts were neck/back, shoulder, and knee
- Kind of problems: Soreness, pain, stiffness, and fatigue
- Severity: Work intensity, sleep, mood, and work quantity
- Frequency: 67% had the problem at least daily
Analysis Strategy 2: Job Stressor Questionnaire

- Most stressful tasks for back/neck, shoulders, and knees
  1. Hand digging
  2. Bucket work (wrenching)
  3. Pulling/wire cable
  4. Lifting/carrying

Proactive Solutions

- Ergonomic Boot Camp (2005)
  - Hands-on training for wrenching, lifting, and hand digging
  - Emphasis on practical training (BEHAVIORS)

- Stretch & Flex Program (2006)
  - Emphasis on BioErgonomics
    - Strength
    - Flexibility
    - Endurance

Company A: Success!

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* Year of Ergonomic Boot Camp implementation
** Year of Stretch & Flex implementation
Comprehensive Work Injury Prevention:
The Industrial Athlete Model

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