Is Ergonomics a Design Issue or is it a Safety Issue?

- Ergonomics is an Engineering/Design issue, it’s not a Health and Safety issue
- Managing injuries is a Human Resource Issue!
- The majority of Ergonomic Issues are about Process and Design!

Eliminate Design Mismatches & Technique Mismatches

- How can we expect people to work injury free if we don’t design tools/workstations to allow them to fit their body stature and encourage less demanding techniques?
- Employees feel that 85% of injuries are due to unsafe conditions
- Management feel that 85% of injuries are due to unsafe acts
Design & Technique Mismatches - Cont.

☐ So…who’s right…Employees/Management?
☐ Their both right – Unless Management creates “what’s in it for them”, provides middle management/supervisor training and then creates clear expectations, accountabilities and consequences!

☐ Then – 80% is unsafe acts, 20% is unsafe conditions…& ergo design manages the 20%

Ergonomics & The Aging Workforce

☐ An unprecedented 25% of our work population has reached the age of 65 & older

☐ Considering current birth rates, economic forecasters predict that the number of new workers will comprise only about half of the 58 million workers needed by 2025

☐ This leaves a huge gap that must be filled by older workers, many over the age of 65

50 percent of Boomers plan to work into their 70s. They’d like a phased retirement
~AARP 2008

2/3 of Boomers expect to do paid work after 60.
~Employee Benefit Research Institute 2008
The Effects Across Industry

- Workplace productivity, across all industries, will continue to become increasingly dependent on the health and safety of older employees.
- So, what type of effect will that have on the aging workforce as it relates to workplace injuries and musculoskeletal disorders?

Causes of Work Related Injury & Disability

- Musculoskeletal disorders are the most common causes of work-related disability among an aging workforce.
- The most disabling illnesses are cardiovascular diseases, diabetes, cancer and the effects of obesity.
- The key to boosting the health, safety and productivity of this experienced workforce segment is to understand the physiology of aging and how to integrate ergonomics with wellness interventions geared toward addressing their special needs.

Maximizing RTW for the Aging Worker Population

- 2 of 5 workers currently age 50 to 64 plan to continue working beyond age 65.
- 31% said they would work past 65 if their employer allowed them to work flexibly.
- Prolonged stress and sleep deprivation will cause un-repairable changes in brain & decrease short term memory.
Work Place Preferences
- **Shift Preference**: Aging workers tolerate shift work less than younger co-workers
- **Time Preferences**: Older employees are at their sharpest in the early morning
- **Learning New Skills**: After age 50, more time is required to learn high speed, very repetitive tasks than younger workers

The Effects of Increased Stress
- Prolonged stress and sleep deprivation will cause un-repairable changes in brain and decrease short-term memory
  - If you have 3 days with < 6 hours of sleep you are functionally intoxicated
- NOTE: Job Dissatisfaction is the #1 reason for Workers Compensation claims/disability

Physical Capacity with Aging
- Strength peaks between 25-35 years old, it plateaus between 35-50 years old and we experience 12% loss of strength every 10 years after 30 years old.
- Women have 50% of upper body strength and 80% of lower body strength as men
- As people age, endurance decreases, physical and mental fatigue increases and “Presenteeism” impacts productivity
Key Physiological Changes with Aging That Effect Work Performance

- **Loss of Flexibility**: With age, there is a progressive loss of cartilage in joints.
- **Joint Receptors** decrease with age and can affect balance, coordination & reaction times.
- **Joint degeneration** can lead to Total Joint Replacements.
- **Hip & Knee Replacement** can affect ability to perform the job safely.

Changes In Vision & Hearing Loss

- **Declining Visual Acuity**: Cataract, Glaucoma and Macular Degeneration.
- **Glare Recovery and Night Vision** worsens with age - Remove trip hazards & improve lighting.
- **Presbycusis**: Age related hearing loss.
- **Noise – Induced hearing loss**.
- **Both…Greatly Affect Communication**.
- **Greatest Risk of Litigation - Poor Communication!**

Low Vision

- **Assistive Device**: “Candy Grip”.
- **21.5 Million Adults 18 & Over Experience Vision Loss**.
- **Rate Of Visual Impairment Increases with Age**:
  - 15% 45 – 64 Y.O.
  - 17% 65 – 75 Y.O.
  - 26% 75 & Older.

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Hearing Loss

- Assistive Device: “Pocket Talkers”
- 36 Million Americans Have Hearing Loss
- This Includes 17% of Our Adult Population!

Changes In Balance, Coordination and Reaction Times

- Balance disorders are one reason older people have higher risk of falls
  - About 9% of older workers ≥ 65 have balance problems due to neurological aging and inner ear disorders
  - ¼” difference in step height increases fall risk by (3x’s)
- Good balance is required to control & maintain body’s position, while moving & being still
- Reaction time to correcting a loss of balance is critical to fall prevention

Work Demands That Require Spinal Flexion are more Stressful for Older Workers

- Degenerative Disc Disease (DDD) is common in the USA
- 90% of Americans have it by age 50
- 50% of Work Comp. injuries due to trunk flexion!
- (DDD) reduces ability to work in prolonged standing
- (DDD) usually occurs at C5-C6 & C6-C7 levels of the neck and L4-L5 & L5-S1 of the low back
### Spine Postures

- ![Spine Postures Image]  

### Neck & Vertebral Artery Issues

- The neck shortens as DDD develops with age.  
- This can cause constant mechanical irritation of the vertebral artery which can cause plaque build up.  
- It is important to keep employees out of a bi-focal posture...it can create a midline stroke.  
- Rate of strokes has increased 50% since the mid 80’s.  
  - What happened?...Introduction of Computers!  
- Rotation of the neck will compress blood flow within the neck up to 100%.

### Age Related Shoulder Injuries

- Ergonomic redesign to eliminate overhead work is critical past age 40.  
- Rotator Cuff injuries peak between 42 - 46 years of age.  
- Subacromial space narrows with age secondary to postural challenges.  
- Leading Cause: Working with arms above shoulder level...It is key to design work between knuckle to shoulder (27” – 48”
Shoulder Injuries > 40 years old

Ergonomic Interventions to Prevent Musculoskeletal Disorders

- Reduce Force: By providing 2-4 wheel carts, overhead hoists/counter balances, rotating scissor lift tables or roller transfer tables
- Modify Posture: Locate tools/products and storage within the “strike zone”: vertical heights of 33” - 43” preferred, 27” - 48” acceptable.
  - Use Sit/Stand workstations
- Limit horizontal reach: 1” – 16” two-handed, 1” – 18” one-handed and up to 22” rarely

The Effects of Sitting/Standing

- Sitting is less demanding, but it increases disc pressure
- Younger workers should get up every 45 minutes & Older workers should get up every 30 minutes
- Standing is more demanding on hips, knees & feet, but it decreases disc pressure
- Every 1# gained above ideal weight adds 3#-4# at lumbar discs, at knees & at feet
- Older workers don’t tolerate prolonged standing
Cognitive Changes With Aging

- **Two Types of Fatigue:** Physiological Stress and Mental Stress

- **Physiological Stress:** Due to overstressed muscles at work, and a decrease in aerobic capacity
  - Avoid late shifts (i.e. 2nd & 3rd shifts), 12 hour shifts, overtime and engineer out high strength & high aerobic demands

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Half of This Group Will Continue to Work > 65 yrs. Old

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Cognitive Changes – Cont.

- **Mental Stress:** Caused by design induced stress (i.e. complexity of work task, high accuracy demands and environmental implications, such as noise and poor lighting)
  - It’s important to understand the capacities of older workers
  - Norepinephrine & Cortisol is elevated after 50 years old – “Increased Stress”
  - Older workers handle less stress & they are not able to concentrate as well
Worrying – Interferes with Executive Functions of the Brain

- Take advantage of crystallized intelligence – (memories/experience)
- Limit Multi-Tasking
- Add: Checklists for Jobs to be done
- Avoid prolonged heat/cold
- Improve Lighting

Greatest Risk of Litigation – Poor or No Communication!

Effectively Managing the Injured Older Worker

- Communicate, communicate, communicate
- Have a definitive return to work plan with policies and procedures in place
- Have a detailed and written functional job description in place
- Know what reasonable accommodations can be offered – (usually very simple solutions)
- Conduct a functional capacity evaluation and fitness-for-duty evaluation to assess abilities

Administrative Interventions

- Establish shift work patterns that are least intrusive on the normal sleep patterns
- Avoid shifts of more than 8 hours
- Assign older workers to day shifts

Confine older workers’ schedules to the earlier part of the day
- This is generally highly valued by older workers and improves retention efforts
Administrative Actions

- Allow for additional practice time when learning new skills to increase familiarity
- Provide frequent refresher training and reinforce task priorities
- Reduce the need to simultaneously perform multiple tasks, or design the system to be operated with low sensitivity to task order
- Transfer work demands that require a lot of concentration and memory to younger workers

Wellness Interventions

- Exercise Reduces the effects of stress!

  - Three Keys…
  - Exercise – Increase movement - increases O2
  - Improve nutrition and eating habits
  - Reduce the effects of stress

Exercise for Older Workers

- Promote low impact aerobic exercises
  - walking
  - elliptical
  - swimming or water aerobics
- Strengthening is essential
  - Strengthening exercises help build muscle and prevent osteoporosis
Utilize the F.A.S.T. Approach

- F – Flexibility
- A – Aerobics
- S – Strengthening
- T – Time: Schedule It!

Nourish the Body & the Brain

- Avoid saturated fats and trans fats
- Increase lean protein to your menu
- Avoid high glycemic processed foods
- Avoid sugary beverages
  - Drink more water
- Avoid simple carbs
  - Eat complex carbs like whole grains, fruits and vegetables

Summary of Key Objectives

- Develop / promote / fitness & wellness programs
- Adjust for altered mental capacities with age
- Engineer out design mismatches and limitations that may exist do to a decrease in strength, endurance and flexibility
- Accommodate training, work hours and work flexibility for the older worker
Physiological Effects of Shift Work

- 1/5 of employees have an adverse work schedule
- Which includes: Shift work from 6 PM – 6 AM or Night Work from 10 PM – 6 AM

- Adverse Work Schedules: causes increased fatigue, disturbed sleep patterns, decreased productivity/quality, impoverished family/social life, increased errors/safety

The Effects of Shift Work

- There is an additional 4%-5% drop in productivity for every 5hrs/week/worker > 40 hours
- If there is not enough rest break time it will equal a decrease in productivity level

- Study: meat cutters were provided 9 min. breaks/hour – there were measurable physiological/psychological benefits

Additional Effects...

- Obesity rates are 14% higher among shift workers

- 40% higher cardiovascular risk of employees working > 50 – 60 hours/wk.

- Note: 37% of adults pose a greater risk and cause more MVA by falling asleep than driving impaired by alcohol/drugs
Humans are Designed to Sleep at Night

- Circadian rhythms = 24-25 hours/day
- Ultradian rhythms = several times/day
  - You feel energized for 1 ½ - 2 hours followed by 20 min. of less focus

- Circannal rhythms = Yearly – animal migration
- There is an interplay between external (exogenous) cues called Zeitgebers (time givers-daylight) and our internal clock (endogenous) pacemaker

Harvard Healthy Sleep Website

- Increased levels of melatonin make you sleepy & melatonin can be quite beneficial
- There is a key relationship between a Sleep Drive – Alertness Level - Alert Drive
  - Key: Sleep -11 PM - (7 hours sleep) - 6 AM
- Sleep/Wake cycle changes when we sleep in later on weekends and wake later which effects alertness on Mon/Tue mornings

Healthy Sleep cont…

- We compromise our ability to cope in the short term…Phase Advance: rise earlier or Phase Delay: by going to bed later
- If we experience 3 consecutive days with < 5 hours sleep per night, we can become functional intoxicated
- On average it takes approximately 3 days to adjust to 12 hour shifts
The Effects of Sleep…

The Relative Risk of Injury…

- **1st Shift**: 7 AM – 3:30 PM - Lowest Injury Rate
- **2nd Shift**: 3:30 PM – 11:30 PM – 15% Higher Rate of Injury as Compared to 1st Shift
- **3rd Shift**: 11:30 PM – 7:00 AM - >30% Rate of Injury as Compared to 1st Shift

Recovery From Injury Due To Work Related vs. Non-Work

The Effects of the Work Week…

The Relative Risk of Injury…

- 66% of U.S. workforce starts work on Monday and ends on Thursday-Saturday
- Highest injury rates are noted on Sunday, followed by Saturday and then Monday
- Why do you think that there are greater risk of injury on the days noted above?
The Effects of the Work Week…

- More Overtime, Less Experience, Younger Workers, Traditionally a 2nd Job
- Fewer Supervisors/Managers
- There is an increased alcohol/drug use on weekend by employees young and old

The Effects of the Work Week…

- Stover Snook Study: There is a greater morning risk of soft tissue symptoms due to trunk flexion which became more noticeable on Mondays!
- Key: Provide heavy/high force material handling after the 1st hour of work!
- There was also an increased absenteeism and fewer available workers

Lombardi Study – 2010
Chronobiology International

- Highest Injury Rates = <5 hours of sleep
- Relatively Flat Rates = 7 – 7.9 hours
- Lowest Injury Rates = 9 – 9.9 hours

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| 2.65   | 1.79      | 1.40      | 1.00      | 1.06      | 0.92      | 1.82    |
Reducing Shift Work Risks…

- Day (morning) shifts are to be preferred over (afternoon) or (night) shifts
- 12 hour shifts – preferred rotation = 2 days on, 2 nights on followed by 4 days off
- Key Rotation: Days > Afternoons > Nights
- Schedule work to have at least 2 rest days off

Reducing Shift Work Risks…

- Take a 2 hour nap in the afternoon prior to working a night shift
- If employees work day shifts or afternoon shifts, naps are good for 20 minutes... >20 minutes will affect sleep inertia
- Keep schedules regular and predictable
- Ensure that there are at least 11 net hours off between shifts (long-commutes) an issue!

Reducing Shift Work Risks…

- Consider alternative schedules to permanent night shifts
- Provide 24-48 hours off after a week of night shifts
- Highly repetitive (i.e. >2000/reps/hr) and/or highly strenuous (i.e. Heavy or Very Heavy) work, you should provide breaks more frequently than (1x/hour)
Reducing Shift Work Risks…

- Change over time between night shift and morning shift should ideally be between 7 AM – 8 AM
- Key Recommendations: Good quality mattress, establish sleep routine (i.e. diet, exercise, alcohol, nicotine), use blackout drapes, phone off, fan-white noise, eye mask and ear plugs

Summary of the Physiological Effects of Shift Work

- Adverse Work Schedules: have a clear and predictable impact on injury risk
- Adverse Work Schedules: contribute to lost productivity levels
- Adverse Work Schedules: have also contributed to an increase in errors and catastrophic events
- Adverse Work Schedules: greatly affects social and family schedules

Building Resilience in Challenging Times

- Maximize productivity by minimizing fatigue and discomfort
- If we would not drive our car out of gas? How come we drive ourselves out of gas?
- Resilience: The capacity of a strained body to recover…caused by comprehensive stress and the ability to recover from that stress!
“Personal Care Units”
6 - PCU’s Per. Week

- Pro-Active Strategies: “Mommy came out better than she went in”
- We all have wellness set points…some high & some low
- Increase the set point by writing down (3) things that we were grateful for that day & think about those things as you go to sleep!
- After 20-30 days, your world takes on a different look and feel!

Grumpy Old Men…
Could Be A Safety Issue!


4/9/2015