Stress

Input → Information Processing → Performance

- Stressors
  - Direct
    - Physiological arousal
  - Indirect

Experience → Health

Environmental Stressors

- What would be additional environmental stressors?
- The level of the stressors determines the performance degradation.
- Can also talk about immediate effects versus long term.

Environmental Stressors

- Motion/vibration
  - High-frequency
    - Single part or whole body?
    - Limb vibration
      - Standard dosage levels for vibration.
      - Select tools that reduce vibration by design.
  - Whole body
    - Eye-hand coordination or visually dominate tasks can be affected
    - If handle such vibration need to increase target sizes (as well as text font).

- Thermal
  - Optimal temperature ranges
    - Summer: 73° - 79° F; Winter: 68° - 75° F
Environmental Stressors

- Thermal - Excessive heat
  - Affects
    - Decreased perceptual motor tasks.
    - Decreased information processing.
    - Long term: dehydration, heat stroke, heat exhaustion.
  - Mitigation
    - Clothing, air movement, reduced physical work, ample amounts of liquids.
    - May require task redesign.

- Thermal – Excessive Cold
  - Affects
    - Information processing affected by distraction of discomfort and keeping warm.
    - Long term: hypothermia, frostbite, health endangerment.
  - Mitigation
    - Wear appropriate clothing.

Environmental Stressors

- Air quality
  - Causes: poor ventilation, anoxia, dust storms, smog, etc.
  - Operator not typically aware there is a problem.
  - Decreased perceptual, motor, and cognitive performance.

Psychological Stressors

- What is a psychological stressor?
Psychological Stressors

- Appraisal/measurement
  - Individual differences: different threats for different people.
  - Differences in cognitive appraisal
    - Fail to perceive a risk.
    - Over confidence in own abilities.
    - If individual feels in control of situation, then less stress than if someone else is in control of the situation.

- Arousal levels
  - Physiological indicators

Psychological Stressors

- Affects
  - Perceptual/attentional.
  - Cognitive tunneling.
  - Loss of working memory.
  - Long-term memory.
  - Strategic shifts.

- Mediation
  - Simplified displays, controls, and procedures.
  - Don’t require working memory.
  - Provide explicit instructions that are compatible with well-learned patterns for actions and mapping displays to controls.
  - Training.

Life Stressors

- Corporate or personal life stress
  - Poorer performance due to lack of attention, resources, or effort.
  - Eliminate the stress rather than deal with the consequences.
    - Address and/or remove the stressor.
    - Provide stress management.
    - Provide individual counseling.
Fatigue/Sleep Depravation

- Moderate stressors and workload can cause fatigue which then causes reduced performance and inability maintain attention.
  - What is mental fatigue?

Vigilance
- Sustained attention in low arousal environments is fatiguing.
- Environmental factors
  - Time.
  - Event salience.
  - Signal rate.
  - Arousal level.

Sleep Depravation

- Always some performance loss when one is tired.
- Tiredness causes increased blinking, eye closures, and nodding off.

Consequences
- Reduced task performance when task has low arousal level or limited motor activity.
- Impaired decision making, innovation and creation, learning and storing new material, situational awareness, and planning.
- Results in reduced performance for highly visual tasks.

Sleep Disruption

- Three factors
  - Sleep deprivation or sleep loss.
  - Performance at the low point of the circadian rhythms in early morning.
  - Jet lag or shift work.
Circadian Rhythms

- The natural day-night cycle of the body.
- The variables correlated with body temp.
  - Sleepiness.
  - Sleep duration.
  - Performance.
- Sleep quality.

Circadian Rhythms

- How does disruption to the rhythm occur?

Jet lag
- East bound flights suffer the most.
- How do you mitigate?

Shift work
- Strategies to mitigate
  - Permanent assignments to particular shifts.
  - Continuous rotation of shifts.
  - Alter shifts but infrequently.
  - Clockwise shift changes.
- What about shift duration?
Sleep Disruption

- Mitigation
  - Get more sleep
  - Take naps.
  - Sleep credits.
  - Sleep management.
  - Stimulants – caffeine.
  - Don’t require work during late night-early morning.

- What does this imply about system design?