Chapter 2

Human Factors Research

Overview

- Descriptive Studies
  - Characterize a population in terms of certain attributes
- Experimental Research
  - Test the effects of some variables on behavior
- Evaluation Research
  - Similar to experimental research but specifically tests a system or product

Overview

- Descriptive Studies: characterize a populations in terms of attributes
  - Anthropometrics
  - Population stereotypes

Overview

- Experimental Research: test the effects of some variable on behavior
  - Functional reach while wearing a seatbelt
  - Cell phone use while driving

Overview

- Evaluation Research: similar to experimental research but specifically tests a system or product
  - Assess the "goodness" of designs (e.g., new software for word processing, new human-machine interface for users' performance)
  - Challenging and frustrating (often not easy to quantify)

Research settings

- Laboratory versus field (i.e., real world)
- Laboratory research
  - Pros
    - Experimental control
    - Replication
    - Precision
  - Cons
    - Realism
    - Generalizability
- Field research
  - Pros
    - Realism
    - Better generalization
  - Cons
    - Safety
    - Cost
    - Experimental control
    - Replication
    - May be disruptive to work environment

Variable selection

- Independent variables (stratification variables) or “predictor” variables
  - Task-related variables (e.g., lever length, type of display, box size) and
  - Procedural variables (e.g., work-rest cycles, instructions)
  - Environmental variables (e.g., noise, illumination levels, vibration)
  - Subject-related variables (e.g., sex, height, age, and experience)

Variable selection

- Dependent variables (criterion variables)
  - Physical characteristics (arm reach, body weight)
  - Performance data (reaction time, error rate)
  - Subjective data (preferences, opinions)
  - Physiological indices (heart rate, body temperature, skin conductivity)
  - Terminal versus Intermediate criteria

Subject choosing

- Descriptive studies
  - Representative sample
  - Random sampling
  - Sample size
- Experimental Research
  - Random sampling
  - Sample size
- Evaluation Research (similar to descriptive studies and experimental research)

Data analysis

- Standard deviation
- Correlation
- Percentiles (5% percentiles, 95% percentiles)
- Statistical significance
  - significant results can still be due to chance (e.g., alpha=0.05)
  - IV's not significant may still influence the DV's (e.g., power)
  - statistical significance is not always related to importance
  - statistical analysis results say nothing about experimental design
- Association ≠ causation

Requirements for research criteria

- Reliability
  - Consistency/stability, free from random errors (e.g., archery)
- Validity
  - Face validity
  - Content validity (samples domain)
  - Construct validity (measure what we want to measure)
- Contamination and confounding factors
- Sensitivity (e.g., 3-point rating scale to measure various chairs)