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RESEARCH DESIGN & ANALYSIS – SEM 1 2013

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MUST KNOW CALCULATIONS FOR EXAM

- degrees of freedom
- mean squared deviations (MS) → ss/df
- F-ratios → MSbetween treatments /MSwithin treatments

Lecture 1: research processes, hypothesis testing & intro to t-tests

Revision:

Ways of acquiring knowledge (Gravetter & Forzano)

1. Tenacity – drawing on long-accepted facts/superstitions
2. Intuition – drawing on instincts/hunches
3. Authority – drawing on experts
4. Rationalism – drawing on logical reasoning
5. Empiricism – drawing on observations directly experienced by senses

Scientific method of gathering knowledge

- Gathered through empirical, systematic, objective & controlled explorations of nature
- Uses relatively precise measures to test predictions & draw inferences
- Draws upon methods of acquiring knowledge by using them in conjunction to minimize drawbacks of using one on its own
- Approach to acquiring knowledge that involves formulating specific questions & systematically finding answers
- 5 steps involved in scientific method (Gravetter & Forzano)
  1. Observe behaviour/phenomena
  2. Form tentative answer/explanation (hypothesis)

3. Use hypothesis to generate testable prediction
4. Evaluate prediction by making systematic, planned observations
5. Use observations to support/refute/refine original hypothesis

Research process (Gravetter & Forzano)

1. Find research idea
2. Determine how to define & measure variables
3. Identify participants for study
4. Select research strategy
5. Select research design
6. Conduct study
7. Evaluate data
8. Report results
9. Refine/reformulate research idea

- Experimental study design: participants are randomly assigned to one of two conditions
- Quasi-experimental: no random assignment of participants

Z-test

- Used to determine whether mean of sample of data does/doesn't differ from population mean
- Only can be used when population mean & standard deviation are known

Probability & samples: distribution of sample means

- Sampling error: natural discrepancy/amount of error between sample statistic & its corresponding popular parameter
- Distribution of sample means: collection of sample means for all possible random samples of particular size (n) that can be obtained from population
- Sampling distribution: distribution of statistics obtained by selecting all possible samples of specific size from population
- Expected value of M: mean of distribution of sample means is equal to mean of population of scores (μ)
- Standard error of M: standard deviation of distribution of sample means - provides measure of how much distance is expected on average between sample mean (M) & population mean (μ) by chance
- Law of large numbers: states that the larger the sample size (n) the more probable it is that sample mean will be close to population mean
- Larger the sample size: likelihood of rejecting null hypothesis increases & measures of effect size (r^2, Cohen's d) remain relatively unchanged
- 2 types of tests:
  - parametric tests
    → interval/ratio data

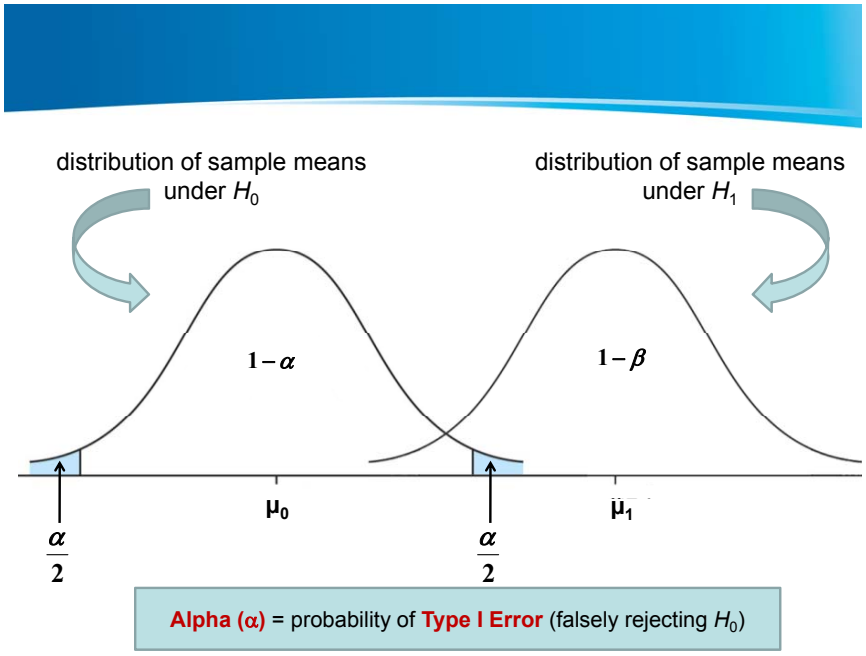
→ more sensitive
→ more powerful
→ eg. t-tests, Pearson r correlation

- non-parametric tests
  → nominal/ordinal data
  → eg. Chi-square, Wilcoxon test

- Types of data:
  - nominal: no known order
  - ordinal: ordered by interval size not known
  - interval/ratio: ordered & intervals quantified

Introduction to hypothesis testing

- Null hypothesis (Ho): states that in general population there's no change/difference/relationship
  - predicts that IV has no effect on DV
  - eg. there is no difference between men's & women's mean reaction times in general population
- Alternative hypothesis (H1): states that there is a change/difference/relationship for general population
  - predicts that IV does have effect on DV
  - eg. in general population men's & women's mean reaction times aren't equal
- Alpha level/level of significance: probability value that's used to define very unlikely sample outcomes if null hypothesis is true



- Critical region: composed of extreme values that are very unlikely to be obtained if null hypothesis is true

- boundaries are determined by alpha level
- if sample data fall in critical region → null hypothesis is rejected

- p-value: probability of getting obtained value (or more) if null hypothesis is true
- Cohen's d: tells us degree of separation between 2 distributions (how far means of null hypothesis & alternative hypothesis are in terms of sd)
  - how far apart in standardized units means of 2 distributions are
  - mean difference/standard deviation

Magnitude of *d*	Evaluation of effect size
d= 0.2	Small effect (mean diff around 0.2 sd)
d= 0.5	Medium effect (mean diff around 0.5 sd)
d= 0.8	Large effect (mean diff around 0.8 sd)