Statistics One

Lecture 24
Course Summary

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Four segments

- Research methods and descriptive statistics
  - Lectures 1 – 6
- Simple and multiple regression
  - Lectures 7 – 14

2

Four segments

- Group comparisons with t-tests and ANOVA
  - Lectures 15 – 18
- Procedures for non-normal distributions and non-linear models
  - Lectures 19 – 23

3

Lecture 24 ~ Segment 1

Research Methods and
Descriptive Statistics

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Research methods

- Descriptive research
- Experimental research
- Correlational research

Descriptive statistics

- Histograms
- Summary statistics
  - Measures of central tendency
    - Mean
    - Median
    - Mode
  - Measures of variability
    - Standard deviation
    - Variance

Descriptive statistics

- Correlation
- Covariance
- Scatterplots

Descriptive statistics

- Measurement
  - Classical true score theory
  - Reliability
  - Validity

END SEGMENT

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Lecture 24 ~ Segment 2

Simple and multiple regression

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Simple and multiple regression

- Simple regression equation has only one predictor variable (X)
- Multiple regression equation has multiple predictor variables

NHST

- NHST can be used to test statistical significance of individual predictor variables and to test statistical significance of the model

NHST

- Sampling
- Sampling error
- Sampling distribution
- Central limit theorem
- Problems with NHST
- Remedies

NHST

- Problems with NHST
  - BAYES
  - Biased by sample size
  - Arbitrary decision rule
  - Yokel local test
  - Error prone
  - Shady logic

NHST

- Remedies
  - Effect size
  - Confidence intervals
  - Model comparison
  - Replications
  - Power

Simple regression

- Regression equation
- Regression constant
- Regression coefficient (unstandardized and standardized)
- Residual

- Ordinary Least Squares

Mutiple regression

- Matrix algebra
- Regression equation (model)
- Regression constant
- Regression coefficients (unstandardized and standardized)
- Residual
- Model comparison

- Ordinary Least Squares

Mutiple regression

- Moderation
  - Dummy coding
  - Centering
- Mediation
  - Sobel test

END SEGMENT

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Lecture 24 ~ Segment 3

Group Comparisons
t-tests and ANOVA

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Group comparisons

- z-test
- Single sample t-test
- Independent t-test
  - Homogeneity of variance assumption
  - Levene's test
- Dependent t-test (paired samples)

Group comparisons

- ANOVA: One-way between groups
  - $F = MS_A = MS_{S/A}$
  - Homogeneity of variance assumption
  - Levene's test
  - Post-hoc tests

Group comparisons

- Factorial ANOVA
  - Main effects
  - Interaction effect
  - Simple effects
    - Homogeneity of variance assumption
    - Levene's test
    - Post-hoc tests

Group comparisons

- Repeated measures ANOVA
  - $F = MS_A = MS_{AxS}$
  - Sphericity assumption
  - Mauchly's test
  - Post-hoc tests

END SEGMENT

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Lecture 24 ~ Segment 4

Procedures for non-normal distributions and non-linear models

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Categorical outcome variables

- Chi-square tests
- Logistic regression

Non-normal distributions

- How to detect non-normal distributions
  - Histograms and scatterplots
  - Q-Q plots
- Common transformations
  - Square root
  - Logarithmic
  - Inverse

Non-parametric statistics

- Wilcoxan's ranking method
- Mann-Whitney U

Non-linear models

- Generalized Linear Model
  - Binomial
  - Multinomial
  - Poisson

END SEGMENT

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END LECTURE 24

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