BASICS OF HYPOTHESIS TESTING IN SPSS

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Today's Agenda

Time	Topic	Details
11:00-11:15am	Intro to the Workshop & Our Data	• Review agenda & learning objectives • Information on the GSS and the variables being used
11:15-11:30am	Data Types & Research Questions	• Categorical vs quantitative data • Categorical factors & quantitative outcomes = t-tests and ANOVA • Quantitative predictors & outcomes = correlation & regression • Strictly categorical = chi-squared
11:30-11:45am	Hypothesis Testing	• Null and alternative hypotheses • P-values and statistically significant findings
11:45am-12:10pm	Independent Samples t-Tests	• Null and alternative hypotheses • Assumptions (normality, homogeneity of variance, and independence) • SPSS procedures and interpretation
12:10-12:30pm	One-way ANOVA	• Null and alternative hypotheses • Assumptions (normality, homogeneity of variance, and independence) • SPSS procedures and interpretation
12:30-12:50pm	Correlation & Regression	• Null and alternative hypotheses • Assumptions (normality, homoscedasticity, and independence) • SPSS procedures and interpretation
12:50-1:05pm	Chi-squared Goodness of Fit	• Null and alternative hypotheses • Assumptions (expected frequencies/sample size and independence) • SPSS procedures and interpretation
1:05-1:15pm	Activity Introduction	• Instructions & group division
1:15-1:45pm	Independent Work	
1:45-2:00pm	Conclusion	• Groups report findings • Last questions • Wrap-up

Our Variables

- Multiple demographic variables
- Items related to income, happiness, health, job characteristics, and job satisfaction

Variable Types

- Two basic types:
  - Categorical/Qualitative: May be assigned numbers, but numbers are essentially arbitrary
    - Ex: Male/Female, Democrat/Independent/Republican, Ages 18-24/25-30
  - Quantitative: Numbers correspond to actual measure or amount of something
    - Ex: 18 years versus 19 years, Attitude on Scale of 1-7
- Watch out for overlap!
  - Ex: How happy are you? Not very, Somewhat, or Very? Hmm..
    - Rule of thumb: Need at least 4 choices to be useful as a quantitative variable
    - Combining “small” variables into composite scores leads to more useful results

Research Questions & Hypothesis Tests

- One categorical variable (two groups) and one quantitative variable: Independent Samples T-Test
- One categorical variable (three or more groups) and one quantitative variable: One-Way, Between-Subjects ANOVA
- Two quantitative variables: Correlation & Regression
- One categorical variable: Chi-Squared Goodness of Fit

What is Hypothesis Testing? Trial by Jury! (Sort of.)

- Null Hypothesis (H0): The thing we presume to be true. (**Innocent** until proven guilty.)
- Alternative Hypothesis (H1): The thing we're actually interested in learning, usually. The opposite of the null. (**Guilty** beyond a reasonable doubt.)
- Every hypothesis test will give you a p-value. This p-value represents the likelihood of finding your sample data, assuming that the null hypothesis is true. A SMALL p-value indicates a significant result; if this person weren't guilty, we probably wouldn't find this evidence. We can no longer assume that they're innocent.
  - Remember: big p-value = Ford Taurus; small p-value = gold Lamborghini/bags of money

The Independent Samples t-test

- How does one categorical variable (with two groups) influence or relate to a quantitative outcome?
- Hypotheses:
  - H0: Mean outcomes are the same for each category.
  - H1: Mean outcomes are different between the categories.
- Assumptions:
  - Independence of Observations
  - Normality
  - Homogeneity of Variance

Procedure

- Normality:
  - Analyze -> Descriptives -> Explore. Ask for plots and statistics. Be sure to ask for normality plots, as well!
- Transform:
  - Transform -> Compute Variable -> Log10
- Procedure:
  - Analyze -> Compare Means

One-Way Analysis of Variance (ANOVA)

- How does one categorical variable (with three or more groups) influence or relate to a quantitative outcome?
- Hypotheses:
  - H0: The mean outcomes are the same for all categories.
  - H1: The mean outcomes are different for at least one category.
- Assumptions:
  - Independence of Observations
  - Normality
  - Homogeneity of Variance

Procedure

- Analyze -> Compare Means -> One-way ANOVA
  - Ask for Bonferroni adjustment (Post Hoc)
  - Ask for Descriptives & Homogeneity of Variance Test (Options)

Correlation & Regression

- How are two quantitative variables related to one another?
- Hypotheses:
  - H0: These two variables are unrelated. Using one does not allow you to predict the outcome on the other.
  - H1: These two variables are related. Using one allows you to make predictions about the outcome of the other.
- Assumptions
  - Independence of Observations
  - Normality
  - Linearity*
  - Homoscedasticity*

Procedure

- Linearity
  - Graphs -> Legacy Dialogs -> Scatter/Dot
- Homoscedasticity
  - In regression dialog, ask for plot with zresid on vertical axis and z-pred on x axis
- Analyze->Regression->Linear

Chi-Squared (χ^2) Goodness of Fit Test

- Is there a pattern in the way subjects are spread across the groups in a single categorical variable?
- Hypotheses
  - H0: Subjects are spread evenly across categories
  - H1: Subjects are not spread evenly across categories
- Assumptions
  - Independence of Observations
  - Sample Size (“Expected Frequency”)

Procedure

- Analyze -> Non-parametric Tests -> Legacy Dialogs -> Chi-square
  - Ask for Descriptives in Options

Activity

- For each research question:
  - What are the types of variables being used?
  - What is the appropriate test?
  - What are the assumptions of the test?
  - Check your assumptions and run the appropriate analyses.

Research Questions

1. Are participants evenly spread among “happiness” categories?
2. Is Job Satisfaction related to Not Having Worked as Hard as You Should Have?
3. Is Relationship Type related to Relationship Happiness?
4. Is Happiness related to Hrs of Relaxation After Work?
5. Do People Who’ve Been Through A Stress Reduction Program at Work report Different Job Satisfaction?
6. Do People with Hypertension Report Different Job Satisfaction?