

Understanding Statistical Inferences

Chapter 10, pt 2



Practical Significance

- Practical significance is related to the importance and usefulness of the results
 - Even if a finding is not statistically significant, it may still be meaningful
 - Magnitude of the effect
- Estimates of practical significance
 - For correlations the coefficient of determination (r^2) is used
 - For comparisons an effect size is used
 - Effect size is the difference between two group means in terms of the control group standard deviation (i.e., Cohen's d , Hedge's g)
 - Evaluating effect sizes – small (.30), moderate (.50), and large (.75)



Practical Significance

- Required in all new research
- Practical significance tells us how much growth while statistical significance tells us if the difference obtained was greater than chance
- Statistical significance dependence upon sample size
- Important for low incidence populations



Inferential Tests

- Two types of inferential tests
 - Parametric - inferential procedures using interval or ratio level data
 - Non-parametric - inferential procedures using nominal or ordinal data



Parametric Tests

- T-test
 - A comparison of the means for two groups
 - Do the mean scores on the final exam differ for the experimental and control groups?
 - Independent samples t-test - compares the means of two separate groups on one variable
 - Posttest means for Group 1 and Group 2
 - Dependent sample t-test - compares the means of two variables for one group
 - Pre-test and posttest means for Group 1



Parametric Tests

- T-test (continued)
- Useful at pretest to determine if the two groups are significantly different before the intervention
 - Even if you sample randomly by chance the groups may be different
 - Employ ANCOVA at posttest to correct for this difference in groups
- Do Not run multiple t-tests if more than 1 group
 - Family wise error
 - .05 error for one test, error adds up every time you run a t-test



Parametric Tests

- Analysis of variance (ANOVA)
 - A comparison of the means for two or more groups
 - ANOVA with two groups will give the same exact result as a t-test
 - Indicates whether one of more pairs of means are different
 - Do the mean scores differ for the groups using co-operative group, lecture, or web-based instruction?



Parametric Tests

- ANOVA (continued)
- Multiple comparisons (i.e., post-hoc)
 - Procedures that indicate which specific pairs of means are different as a follow-up to a significant ANOVA result
 - Do the mean scores differ between the co-operative group and lecture, co-operative group and web-based, and lecture and web-based instruction?
- Two common tests
 - Tukey
 - Scheffe



Parametric Tests

- Factorial ANOVA
 - A procedure that analyzes the difference between groups across two or more independent variables
 - Do the mean scores differ for co-operative group, lecture, and web-based instruction for males and females?
- Effects
 - Main effects - differences between the levels of each independent variable
 - Interaction effects - differences between combinations of the levels of each independent variable
- Chapter 9 has additional explanation of these effects



Parametric Tests

- Analysis of covariance (ANCOVA)
- A procedure that compares means after statistically adjusting them for pretest differences between groups
- Very stringent assumptions that must be met to use this procedure
- Adjusts for small to moderate - not large - pretest differences



Parametric Tests

- Multivariate statistics
- Comparisons or relationships involving two or more dependent variables
- Comparison of means
 - Are there differences in the attitudes and performances of students being taught with lecture or web-based instruction?
- Specific tests
 - Multivariate ANOVA (MANVOA)
 - Multivariate ANCOVA (MANCOVA)
 - Hotelling's T



Parametric Tests

- Multivariate statistics (continued)
 - Relationships
 - Are students' affective traits (e.g., attitudes, self-esteem, preferences, etc.) predictive of their knowledge (i.e., test scores) and skills (i.e., performances)?
 - Canonical correlation



Non-Parametric Tests

- Chi-square - differences in frequencies across different categories
- Do mothers and fathers differ in their support of a year-round school calendar?
- Do the percentages of undergraduate, graduate, and doctoral students differ in terms of their support for the new class attendance policy?



Non-Parametric Tests

- Comparison of means
 - Mann Whitney U-test
 - Wilcoxon test
 - Kruskal-Wallis ANOVA
- Relationships
 - Spearman r



Summary

- Statistical significance
 - P value less than .05
 - Amount of error in rejecting the null hypothesis
- Practical significance
 - Effect size (d) measures the magnitude of the effect
- Type of statistic used depends upon
 - Level of measurement
 - Number of IV and DV

