

- 1 One-way ANOVA
- 2 Factorial ANOVA
- 3 Example
 - Assume you have 4 different lab sections with 10 students each. Are there any differences in the grades between the different sections?
 - How do we find out if there is a difference?
- 4 - Care to guess?
- 5 One-Way ANOVA: Excel
- 6 One-Way ANOVA: SPSS
- 7 One-Way ANOVA: Jmp
- 8 Follow-up/post hoc tests
 - Tukey's LSD
 - Used following a significant F-test
 - t-tests on all possible pairs
 - G1 vs G2, G1 vs G3, G2 vs G3
 - Hold experiment-wise error rate constant
- 9 Between vs Within Subjects ANOVA
 - Similar to between subjects ANOVA
 - Except, follow-up/post hoc t-tests are a little different
 - A repeated measures or *correlated* t-test has a different measure of error that takes into account the within subject correlation among scores.
- 10 MANOVA
 - *Multivariate* ANOVA
 - Test for differences between conditions on several dependent variables simultaneously.
 - Used for several related dependent variables
 - Often combine these DVs to create a new composite or canonical variable
 - Inflate Type I error
 - Reject null when it is true
- 11 Non-experimental ANOVA
 - Just because ANOVA is used doesn't mean it's a 'true experiment'
 - Subjects are not randomly assigned to groups, but are categorized in some way.
 - ANOVA still appropriate if assumptions are met.
- 12 ANOVA Assumptions
 - DVs are normally distributed
 - ANOVA is a parametric test
 - Homogeneity of variance
 - Equal variance between groups
 - Simulation studies suggest that ANOVA is fairly robust to violations of assumptions.
 - But, use at your own risk.

- 13 Ch. 13
Single-Case Research
- 14 Different rationales for experimental design.
- Nomothetic – establish general principles and broad generalizations
 - Idiographic – seek to describe, analyze, and compare individual subject behavior
- 15 Single-subject Design
- Sometimes called small-*n* design
 - Often conducted under the rubric of the *Experimental Analysis of Behavior* (APA Div. 25)
 - Similar to within subjects design
 - All subjects experience every IV and/or each level of an IV
 - Only a few subjects
 - 4-6 subjects are very typical
 - Reversals
 - repeated administration of IV(s)
- 16 What's the problem with Group Designs?
- “Hides” data
 - The “average individual” may not be similar to any subject.
 - Class average on exam.
 - e.g., 2.1 children per family?
- 17 Criticisms of Group Designs
- *Error variance* - includes differences within and between individuals
 - *Generalizability* – difficult to extend findings based on average group performance to individual performance
 - *Reliability* – often one-time observation of the effect of an IV
- 18 Basic Single Subject Designs
- ABA designs
 - Simple baseline - reversal – baseline of IV
 - Multiple-I or ABC designs
 - Compare multiple levels of an IV
 - Multiple Baseline designs
 - Across subjects
 - Across behaviors
 - Across situations
- 19 A-B-A Reversal Designs
- Common single subject experimental design. (esp. in applied settings)
 - Phase **A** – “Baseline”
 - DV measured without manipulating IV
 - Phase **B** –
 - DV measured after manipulating IV
- 20 ABA Reversal Design
- 21 Stable Baselines
- Assessing the effect of an IV depends critically on a stable baseline.
 - In single-subject design, a stable baseline is effectively the *control* condition.
 - Variability and trends make conclusions based on the effect of an IV difficult.

- 22 Example of baseline trend
- 23 Example of variability in baseline
- 24 Multiple-I Or ABC Designs
- Common single subject experimental design in laboratory research.
 - Phase **A** – “Baseline”
 - DV measured without manipulating IV
 - Phase **B** –
 - measure effects of IV-B
 - Phase **C** –
 - measure effects of IV-C
 - Phase D,E, & ...
- 25 Multiple-Baseline Designs
- Appropriate when reversals are not possible.
 - Across subjects
 - Introduce IV to different subjects at different times
 - Across behaviors
 - Introduce IV to a single individual's behavior while monitoring other behavior
 - Across Situations
 - Introduce IV in one setting and monitor/introduce IV in other settings
- 26
- 27 Graphical Analysis
- Visual inspection – researchers rely on graphs of data from each subject. Therefore, the differences due to IVs must be large to conclude that an effect is present.
 - Most often, only the strongest effects will be accepted as real.
 - Single subject researchers are more likely to make Type II errors.
- 28 Direct Replication in Small N Designs
- Within-Subjects
 - Each reversal (AB) of an ABA design provides a within subject replication
 - Between-Subjects
 - Each subject provides a direct replication of the results
- 29 Criticisms/Limitations of Single Subject Designs
- Doesn't tell us anything about average performance.
 - Number of IVs that can be studied.
 - Unstable baselines.
 - Order/carryover effects.
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- 31