Single Subject Designs

Psychology 280 Lecture
5/22/2006

Justifications for Single Subjects Designs

- Summarizing large group data can lead to results that don't characterize the performance of any single individual in the group
- Rare cases or small populations of study (e.g. rare neurological disorders)
- Applied and clinical settings where behavior modification or interventions applied
- Some studies (e.g. research using animal surgery or language learning in apes) require intense study of just a few subjects over an extended time period

Single Case Experimental Designs

- Traditionally called single-subject designs
- Also called Small N Designs
- Now referred to as single case and single participant designs
- Focuses on changes in one subject over time & stimulus conditions
  - replicate effect in a small number (2 or 3) of subjects
  - often ideally suited to measuring interventions
  - does not require reversible effects
Case Studies versus Single Subject Design

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Treatment</th>
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<tbody>
<tr>
<td>Y₁ → X → Y₂</td>
<td>A₁ → B → A₂</td>
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Baseline 1 Baseline 2

Case Study Single Subject Design

Single-Subject versus Within-Subject

- In a traditional within-subject design, each subject is exposed to each treatment or value of the independent variable one time (also called repeated measures).
- In contrast, the single-subject design is exposed to each treatment or value of the IV MANY times – repeated exposures.
- A relationship between IV and DV is established for that individual and the IV/DV relationship for several individuals is compared.

Focus of Single Case Experimental Designs

- The individual’s performance, not the group average, is the focus of analysis.

Single Case Experimental Designs (cont’t)

- Types of designs
  - Reversal designs
  - Multiple baseline designs
Baseline Design

• The Behavioral Baseline
  • Establishes the level of the dependent variable through repeated sampling
  • Assesses the amount of uncontrolled variability of DV

Behavioral Baseline Illustration

- Record number of responses or DV in the absence of treatment
- Use the repeated measures to establish baseline to compare intervention phase or treatment

Intervention Phase

- A treatment is applied during the intervention phase, for example, the rat’s pressing of a lever now has an effect and changes the schedule of shocks....
Reversal Designs - ABA

Number of Responses

Baseline 1 | Intervention 1 | Baseline 2

A₁ | B₁ | A₂

Single Case Experimental Designs (con’t)

- Improving the ABA design
  - ABAB design (treatment is tested twice)
  - ABABAB design (treatment is tested three times)
    - Why is it necessary to extend the basic ABA design?
      - Single reversal is not powerful evidence for the effectiveness of the treatment
      - Ethics – sequence ends with the treatment rather than the withdrawal of the treatment

Reversal Designs - ABAB

Number of Responses

Baseline 1 | Intervention 1 | Baseline 2 | Intervention 2

A₁ | B₁ | A₂ | B₂

Reversal Designs - ABAB Treatment

Number of Responses

Baseline 1 | Intervention 1 | Baseline 2 | Intervention 2

A₁ | B₁ | A₂ | B₂

Reversal/Withdrawal
Treatment Effect Description

- When reversal to baseline responding occurs when treatment is withdrawn, shows systematic change in behavior based on treatment status.
- Treatment effect only assumed if behavior changes immediately in B conditions and returns to baseline or reverses in all baseline conditions.
- If behavior does not revert to baseline level of responding when treatment withdrawn, may be effect of maturation (see next slide).

Confounding or Carryover

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No Reversal

Single Case Experimental Designs (con’t)

- May include multiple levels of IV
  - ABACBC
  - E.g. amount of time between warning and scheduled shock
- Limitations of reversal designs
  - Usually used only with reversible treatments
  - Some are not practical and/or ethical

Multiple baseline designs

- Effectiveness of the treatment demonstrated when the behavior changes ONLY after the manipulation is introduced
  - Necessary because reversal of some behaviors is impossible or unethical
  - Some treatments might produce a long-lasting change that is not reversible
Single Case Experimental Designs (con’t)

- Multiple baselines (con’t)
  - Multiple baseline across subjects
  - Multiple baseline across behaviors
  - Multiple baseline across situations

Generalizability & Replications

- To whom do research results apply? To whom can we generalize?
- Replications demonstrate generalizability in single subject experiments
  - Replications over people and testing situations are commonly used
- In some ways, single subject designs have less generalizability issues than traditional group-level analyses
  - at least single subject studies tell about individuals, which is usually the relevant level
  - Ironically, many fail to see this and assume n=1 studies have more problems with external validity

The End