Single-Subject (small n) Designs

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Historical use of small-n designs in psychology

- Early topics of research in psychology addressed by small-sample studies
  - *Psychophysics & Mental Chronography (Wundt, Fechner, Weber)*
  - *Memory Studies (Ebbinghaus)*
  - *Conditioning (Pavlov, Thorndike)*
- Modern studies take two forms
  - *Repeated measures designs on a few subjects (sensory processes)*
  - *Baseline designs (experimental analysis of behavior)*

Baseline Designs – ABAB Design

- Behavioral baseline
  - *Establish a set of pre-treatment observations*
  - *Continues until baseline meets a stability criterion*
- Intervention (treatment)
  - *Introduce a treatment or intervention*
  - *Obtain multiple behavioral observations*
  - *Continue observations until baseline restabilizes*

Baseline Designs – ABAB Design

- Reversal
  - *Withdrawal of treatment*
  - *Continue observations to document return to baseline*
  - *Demonstrates experimental control over the behavior*
- Reinstate treatment
  - *Creates an intrasubject replication of the intervention effect*
  - *Replication strengthens evidence for experimental control over behavior*
- Multiple subject variation
  - *Demonstrates generality of treatment*

Basic ABAB Design

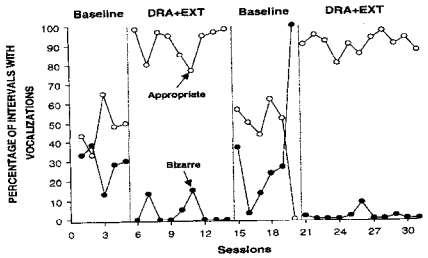

Figure 1. Percentage of intervals in which bizarre vocalizations occurred across all conditions of the brief functional analysis (top panel) and percentage of intervals in which bizarre and appropriate vocalizations occurred during baseline and treatment phases of the treatment evaluation (bottom panel).

Wilder, D. A., Masuda, A, O'Connor, C., & Baham, M. (2001). Brief functional analysis and treatment of bizarre vocalizations in an adult with schizophrenia. *Journal of Applied Behavior Analysis, 34,* 65-68

Variability in Baseline Designs

- Stability Criterion for baseline data
  - *Minimum variability across trials (e.g., 10%)*
  - *Absence of trend*
- Expect a transition period
  - *These data may be excluded from statistical analysis performed on data from each phase*

Problem Baselines

- Excess variability
  - *Identify & control extraneous sources of variability*
  - *Improve reliability of scoring procedure – training of observers*
  - *Increase number of observations made within a measurement interval (averages will be less variable)*
- Drifting baselines
  - *Trends in baseline data in absence of treatments*
  - *Can be adjusted in statistical analysis if drift cannot be controlled experimentally*

Problem Baselines

- Unrecoverable baselines
  - *Permanent effects of treatments (carry over effects)*
  - *Partially recoverable baselines may still allow a clear demonstration of experimental control*
  - *Completely unrecoverable baselines may require a multiple baseline design to demonstrate experimental control*
- Long intervals required to achieve stability
  - *Creates unequal exposures to treatments*
  - *Makes replication across subjects more difficult*

Problem Baselines

- Inappropriate baselines
  - *Low baseline levels for behaviors that are expected to decrease in frequency during intervention phase*
  - *High baseline levels for behaviors that are expected to increase in frequency during intervention phase*
  - *Adjust experimental conditions to produce appropriate levels of behavior*
    - *Train lever pressing to a high frequency before introducing manipulations that will suppress lever pressing*

Generalizing Results from Baseline Designs

- Replication within subjects
  - *Intrasubject replication*
- Replication across subjects
  - *Multiple baseline designs*
  - *Replication of studies with new subjects*

Multiple Baseline Designs

- Multiple baselines corresponding to different individuals
- Multiple baselines corresponding to different target behaviors
- Multiple baselines corresponding to different observation conditions/locations

Multiple Baseline Designs

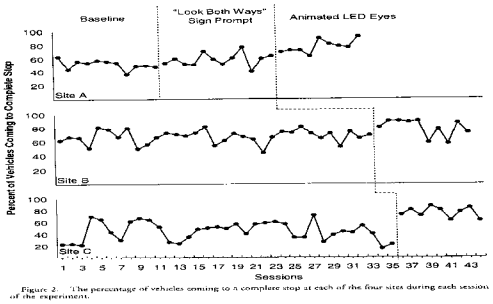

Figure 2. The percentage of vehicles coming to a complete stop at each of the four sites during each session of the experiment.

Houten, R. V., & Retting, R. A. (2001). Increasing motorist compliance and caution at stop signs. *Journal of Applied Behavior Analysis, 34*, 185-193.

Multiple Baselines – Multiple Behaviors

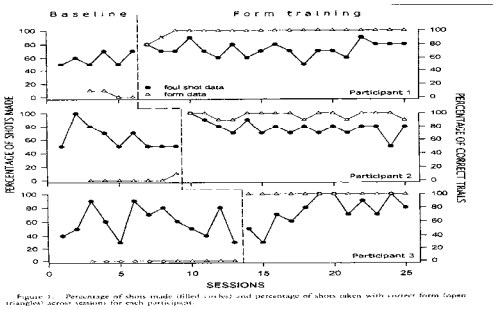

Figure 1. Percentage of shots made (filled circles) and percentage of shots taken with correct form (open triangles) across sessions for each participant.

Kladopoulos, C. N., & McComas, J. J. (2001). The effects of form training on foul-shooting performance in members of a women's college basketball team. *Journal of Applied Behavior Analysis, 34*, 329-332.

Data Analysis in Small-n Designs

- **Nonstatistical techniques**
  - *Experimental Criterion*
    - *Repeated demonstration that behavior changes when Tx is introduced or removed*
  - *Therapeutic Criterion*
    - *Clinical significance of perceived value of Tx*
    - *Social validation of Tx outcomes by others*
    - *Subjective evaluation*

Data Analysis in Small-n Designs

- **Difficulty of evaluating changes in behavior based on visual inspection of data**
  - *Gottman & Glass (1978) sent published ABA data to 13 expert judges*
  - *7 judges said a treatment effect was demonstrated*
  - *6 judges said there was no evidence for a treatment effect*