

Yes, My Treatment Works! DEMONSTRATING THE EFFECT OF TREATMENT WITH SINGLE-SUBJECT DESIGNS

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Aims

- Describe four basic single-subject designs.
- Select an appropriate design to demonstrate treatment effect.
- Evaluate the strengths and weaknesses of single subject studies.

Course Agenda

- Overview of Designs
- Important Terms and Concepts
- Case Studies and Discussion
- Case Study Exercises
 - Apply a design to one case study
 - Use evaluation checklist indicating the strengths and weaknesses of the design that was applied

Evidence-Based Practice

- **Evidence-based practice** emphasizes that practice is driven by scientifically based models of clinical practice that are tested or testable in clinical research (Duncan, 2003).

Evidence-Based Practice

- **Efficacy** is the benefit expected when interventions are applied under ideal conditions.
- **Effectiveness** is the benefit expected under ordinary circumstances.

Why Do Single Subject Studies?

- **Power:** Make clinical decisions based on solid evidence
- **Accountability:** Provide evidence that what you do is valuable
- **Best Practice:** Feel confident that your client is benefiting from treatment
- **Knowledge:** Contribute to our understanding of what treatments are valid

Clinical Questions

- Is this treatment working for my client?
- Which treatment works better for this person?
- Which part of the treatment package is working?

Study Design Options

- Does this treatment work?
 - ABAB Withdrawal
 - Multiple Baseline Across Behaviors
 - Changing Criterion
- Which treatment is better?
 - Alternating Treatments Design
- Which parts are effective?
 - Interaction Design

Underlying Principles

- Establish a causal link between treatment and change in behavior :
 - Establish basis for comparison
 - Demonstrate temporal relationship
 - Demonstrate dependent relationship
 - Replicate relationship

Single Subject Study Checklist

- Stable baseline
- Control for experimenter bias
- Predetermined criteria for advancement of experiment
- Well-selected, appropriate targets
- Objectives stated in measurable terms
- Well-defined treatment procedure
- Predetermined data collection and interpretation procedures

Advantages of Single-Subject Designs

- Particularly appropriate where
 - the availability of a large numbers of individuals for the study of certain problems is limited and/or
 - large physical functional variations among subjects falling into such categories might confound the search for systematic treatment effects

Advantages of Single-Subject Designs

- Methods employed are more adaptable to many clinical research problems
- Methods promote *intrasubject control*, ruling out many sources of internal invalidity
 - History (education, exposure, other outside learning experiences)
 - Maturation (spontaneous development)
 - Spontaneous recovery

Advantages of Single-Subject Designs

- Well adapted for satisfying the goals of quality assurance established by public and private health care providers (Medicaid, Medicare, profit and non-profit insurance companies, etc.)
- Methods are flexible, responsive to important variables affecting individual performance

Limitations of Single-Subject Designs

- Ability to generalize the findings from a single subject to a larger number of individuals as they exist in a population (external validity) is problematic
- Ability to form decisive conclusions about general efficacy not possible
- Can be difficult to develop appropriate methods to study certain target behaviors

Analysis of Single Subject Data

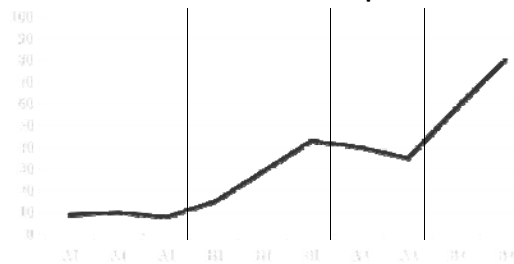
- Descriptive statistics possible for analysis
- Visual (graphical) analysis is the common method for determining effects
 - Dependent variable (frequency, duration, percentage, etc.) on vertical or Y axis (*ordinate*)
 - Time measures (sessions, days, weeks, etc.) on the X axis (*abscissa*)



A-B-A-B Withdrawal Design

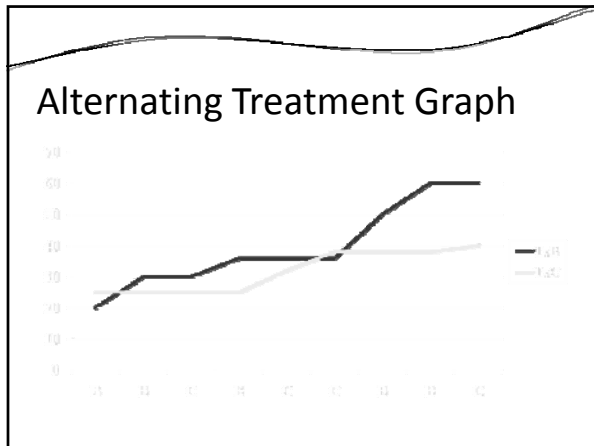
1. Baseline phase (A₁)
 2. Treatment (B₁)
 3. Treatment withdrawn (A₂)
 4. Treatment reinstated (B₂)
- Answers question, "Is this therapy effective for my client?"
 - Goal is to demonstrate a clear relationship between application of therapy and behavioral change

ABAB Withdrawal Graph



Alternating Treatment Design

- Two treatments, A and B, are alternated randomly as they are applied to a single subject.
- Answers question, "Which treatment is more effective for my client?"
- If lines cross significantly, neither method has advantage
- If one line is consistently above the other, then that is the more effective method

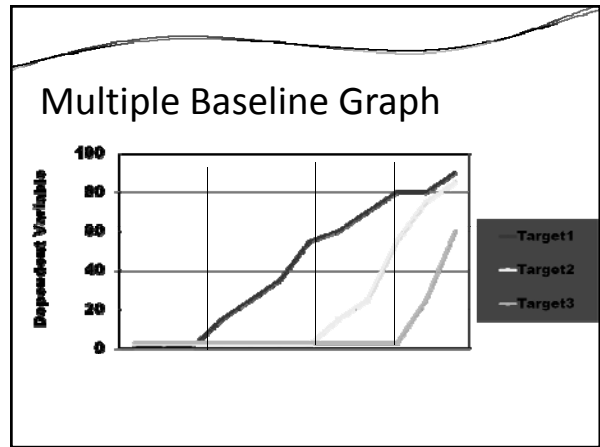


Multiple-Baseline Design

- Appropriate for the analysis of a treatment influence across different clients, behaviors, and settings
 - Across behaviors
 - Across clients
- Client remains in some type of treatment condition throughout the study

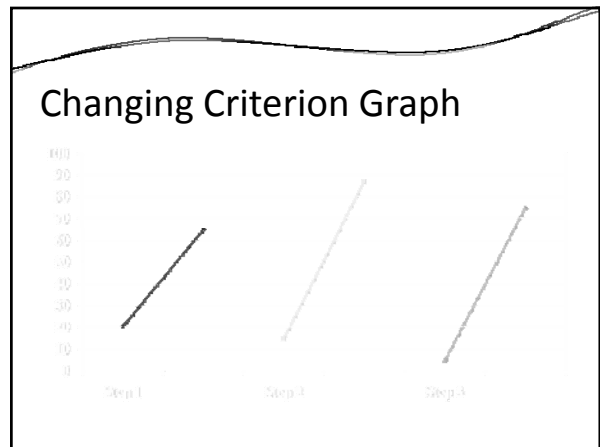
Multiple-Baseline Design

- Treated behavior or individual is compared to untreated behavior(s) or individuals
- Treatment is systematically applied to each behavior or individual in the set in sequence
- Goal is to demonstrate that only the treated behavior or individual makes gains



Changing Criterion Design

- Appropriate for studying skills that progress in a sequenced series of behavioral criteria
- Effectiveness is judged based on the response level of the target behavior relative to the criteria for each step



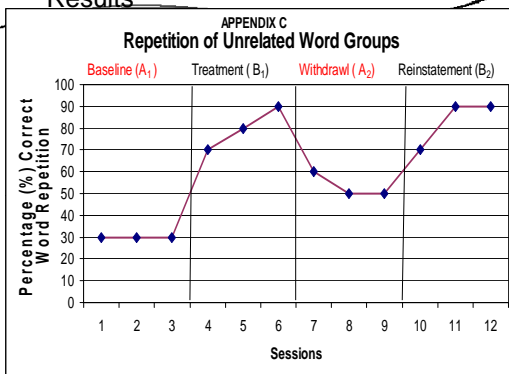
Single Subject Designs Applied

Case Study Exercises

Case #1

- Question: Does computer based software improve word recall?
- Goal: correctly recall four unrelated words with 80% accuracy.
- Design: ABAB Withdrawal
- Discussion:
 - How measure?
 - Reliability and bias issues?
 - When to switch phases?
 - Treatment defined?

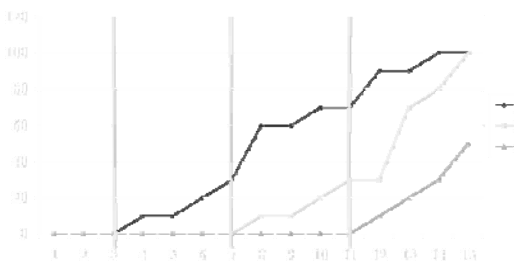
Results



Case #2

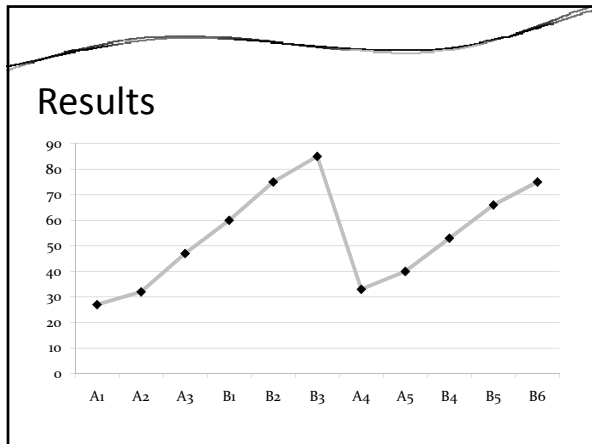
- Question: Will use of visual cues (LiPs) improve letter-sound identification?
- Goal: Improve sound-letter identification for p, l, f)
- Design: **Multiple baseline across behaviors**
- Discussion:
 - How measure? Control behaviors?
 - Reliability and bias issues?
 - When to switch phases?
 - Treatment defined?

Results



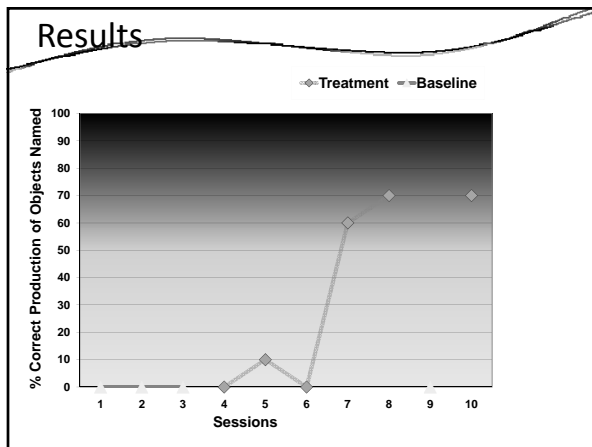
Case #3

- Question: Will priming increase rate of task completion?
- Goal: Increase rate of task completion with minimal disruptive behaviors
- Design: ABAB Withdrawal
- Discussion:
 - How measure? Control behaviors?
 - Reliability and bias issues?
 - When to switch phases?
 - Treatment defined?



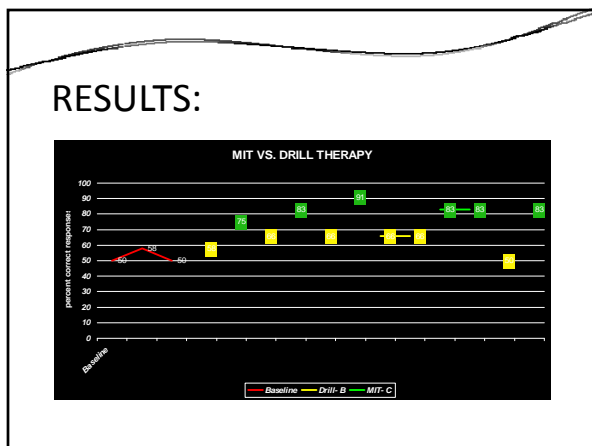
Case #4

- Question: Do verbal functional cues while using objects functionally increase the percentage of accurate object naming?
- Goal:
- Design: ABAB Withdrawal
- Discussion: name objects while performing ADL with 80% accuracy
 - How measure? Control behaviors?
 - Reliability and bias issues?
 - When to switch phases?
 - Treatment defined?



Case # 5

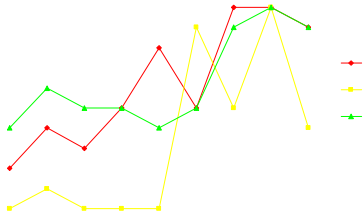
- Question: Will the addition of Melodic Intonation Therapy to a Drill regimen improve production of final consonants?
- Goal: Correctly produce final v, b, d and g in one-syllable CVC words
- Design: Alternating Treatment (BCBCBCCBCCBC)
- Discussion:
 - How measure? Control behaviors?
 - Reliability and bias issues?
 - When to switch phases?
 - Treatment defined?



Case # 6

- Question: Will the use of See the Sound Visual Phonics gestures reduce final consonant deletion in single and multi-syllabic words?
- Goal: produce final consonants /m/, /d/, & /k/ in single and multi-syllabic words with 80% accuracy
- Design: Multiple baseline across behaviors
- Discussion:
 - How measure? Control behaviors?
 - Reliability and bias issues?
 - When to switch phases?
 - Treatment defined?

Results



Conclusion

- Single subject designs are useful for answering common clinical questions
- Control over variables improves validity of causal inferences
- Planning and careful execution pay off
- Flexibility is allowed

Question/Answer Period

Participant cases!