

Case Studies & Single-Subject Data, Part 1

Evidence-Based Practice in Speech-Language Therapy (SHSC 2033)

Session 6

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Outline

1. Case studies
2. Single-subject designs
3. Group discussion

Case Studies

Case studies

- Clinical cases are described, along with assessment and/or intervention information.
- These tend to be **observational**, not experimental, studies.
- Rare, unusual or interesting cases are written up and published in journals.
- See Crystal (1987) for an excellent article related to communication disorders.
- Note where case studies fall on the evidence hierarchy.

Simple hierarchy of intervention evidence¹

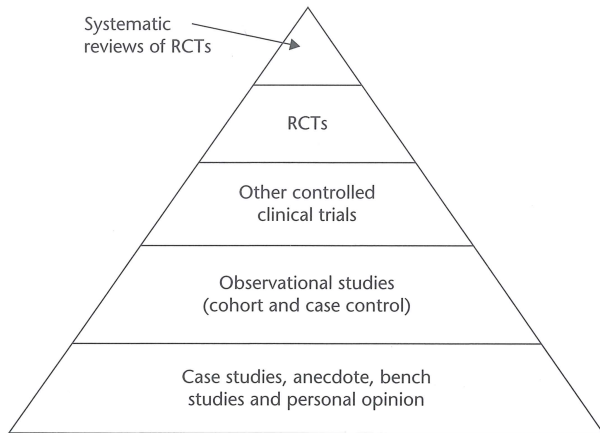


Figure 2.1 A simple hierarchy of evidence for assessing the quality of trial design in therapy studies.

¹Greenhalgh (2010, p. 18)

Critically appraising case studies

- Available at University of Adelaide's Joanna Briggs Institute
- See <http://joannabriggs.org/research/critical-appraisal-tools.html>

Single-Subject Designs

Judging intervention effectiveness

Two questions to ask:

1. Was there a change?
2. Was the change due to intervention?

Single-subject designs

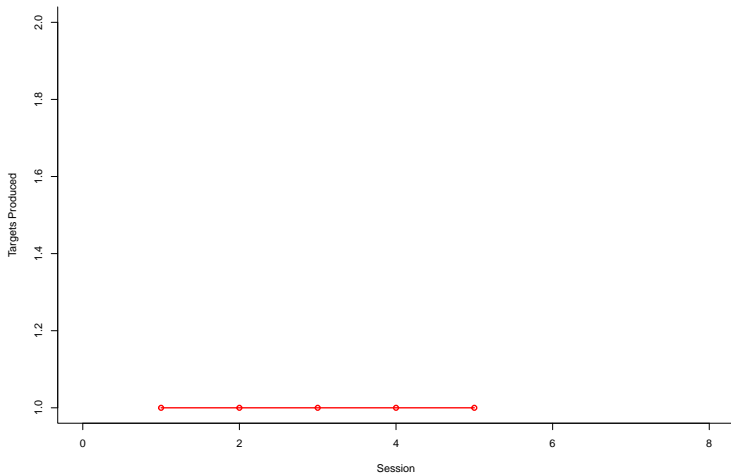
- Unlike case studies, these are **experimental** rather than observational designs.
- Far more convincing in terms of demonstrating intervention effectiveness since experimental control is built in.
- Minimum of one client needed, but most studies have more than one, since replicated evidence is always more convincing than evidence from a single client.
- Also known as *single-subject experimental designs (SSED)* or simply, *single-subject data (SSD)*
- Can offer a practical approach to objectively judging whether intervention works in everyday clinical settings

Single-subject designs

- Can be used to answer questions like:
 - Was the therapy approach effective?
 - How effective was the therapy (effect size)?
 - Which therapy approach was more effective/efficient?
- Use data collected from one individual (or more) to establish cause-and-effect relationships
- Permit detailed descriptions of intervention progress in a single individual
- Involve observations (measurements) made repeatedly over time

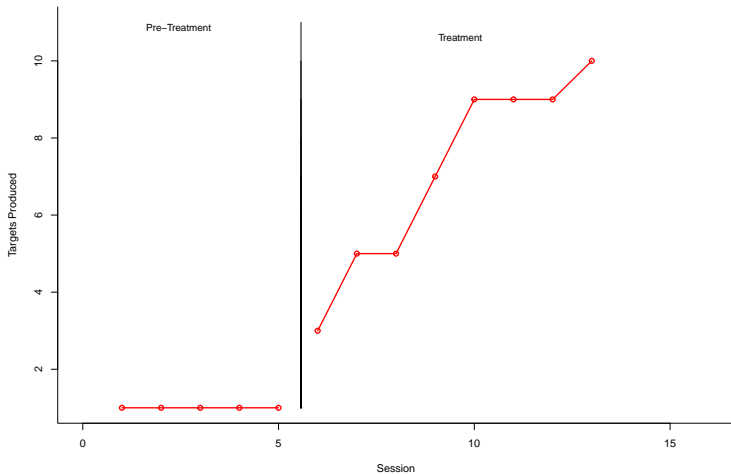
Example: measure behaviour **before** intervention

Hypothetical Data (Dollaghan, 2007, p. 40)



Example: measure behaviour **during** intervention

Hypothetical Data (Dollaghan, 2007, p. 40)



Single-subject design features

- **Independent variable:** the variable being manipulated by the investigator
- Examples: intervention vs no intervention; type of intervention provided; type of feedback provided during intervention; type of stimuli (e.g. phonemic vs semantic) used during intervention (e.g. for word retrieval); intensity of intervention

Single-subject design features

- **Dependent variable:** the variable being measured—the thing you think will change if intervention works.
- Examples: number or percentage of items correct on a **probe** task; number of behaviours observed; number of times child displays aggressive behaviour; heart-rate; blood pressure

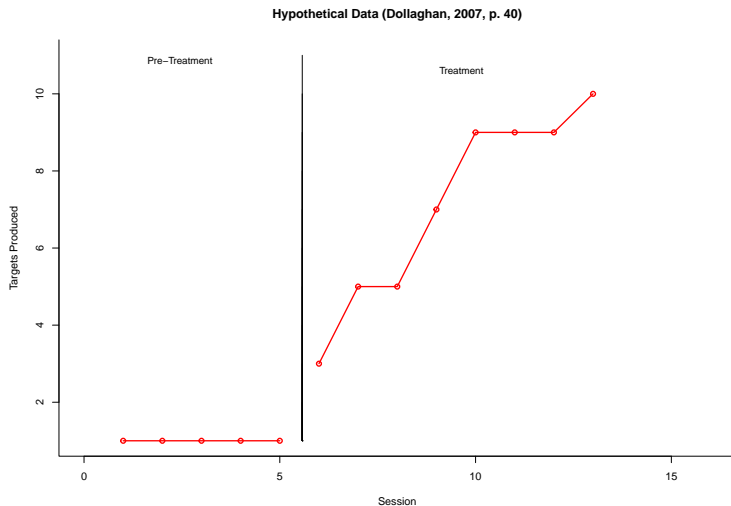
Probe tasks

- A **stable pre-treatment baseline** is essential. One rule-of-thumb: stability means 3 baseline probes that don't differ by more than 10%.
- Consider timing of probe tasks.
 - What's measured if they're done at the end of each session?
 - At the beginning?
- Consider randomly selecting probe items from a larger item-pool each time the probe task is given. This offers more experimental control than using the same items each time to indicate that learning has taken place.
- Probe task doesn't have to be administered each session.

SSD phases

- All SSDs consist of **phases**. A phase is a series of observations of the same individual under the same conditions.
- A **baseline phase** refers to a no-treatment period (“**A**” phase).
- A **treatment phase** refers to an intervention period (“**B**” phase).
- Some designs may involve a comparison with another intervention (“**C**” phase).

A simple AB design



Judging intervention effectiveness

Let's ask those two questions again:

1. Was there a change?
2. Was the change due to intervention?

More powerful kinds of SSDs

- Withdrawal (reversal) design (ABA)
- Multiple baseline designs
 - across behaviours
 - across settings
 - across subjects
- Alternating treatment design (ATDs)

Data analysis and interpretation

- By visually interpreting the data
 - Look for a change in the slope of the data points between phases.
 - Then plot the data without indicating where the phase changed.
 - Ask another person to indicate where on the x-axis the slope changes.
 - Compare these to the actual location of the phrase change.
 - It's unrealistic to expect improvement on the probe task as soon as treatment phase begins. Learning often takes longer than that!
 - **Replication** is important (a drawback of the AB design).
- By statistical analysis (next session)

Evidence quality²

- N-of-1 randomized trial
- SR of randomized trials
- Single randomized trial
- SR of observational studies addressing patient-important outcomes
- Single observational study addressing patient-important outcomes
- Physiological studies (studies of blood pressure, cardiac output, etc.)
- Unsystematic clinical observations

²Guyatt, Rennie, Meade, and Cook (2008)

Evidence quality

- Dollaghan (2007, p. 40) noted that Guyatt et al. (2000) “placed the N-of-1 randomized trial at the top of their evidence hierarchy for making treatment decisions about a particular patient.”
- Think about why that might be so.
- *Hint:* How do SSDs compare to RCTs?
- What advantages might these have over RCTs?

Group discussion

- Break up into your assigned groups.
- Critically appraise today's research using the SCED (http://www.psycbite.com/docs/The_SCED_Scale.pdf).
- For description of SCED items, see Tate et al. (2008, pp. 400–401).
- Document on the form *where* you found information in the research article addressing each point.

References

- Crystal, D. (1987). Meeting the need for case studies. *Child Language Teaching and Therapy*, 3, 305–310.
- Dollaghan, C. A. (2007). *The handbook for evidence-based practice in communication disorders*. Baltimore, MD: Paul H. Brookes Publishing Co.
- Greenhalgh, T. (2010). *How to read a paper: the basics of evidence-based medicine* (4th ed.). Chichester: Wiley-Blackwell BMJ Books.
- Guyatt, G., Haynes, R. B., Jaeschke, R. Z., Cook, D. J., Green, L., Naylor, C. D., . . . for the Evidence-Based Medicine Working Group (2000). Users' guides to the medical literature: XXV. Evidence-based medicine: principles for applying the users' guides to patient care. *Journal of the American Medical Association*, 284, 1290–1296. doi: 10.1001/jama.284.10.1290
- Guyatt, G., Rennie, D., Meade, M. O., & Cook, D. J. (2008). *Users' guides to the medical literature: essentials of evidence-based clinical practice* (2nd ed.). New York: McGraw Hill.
- Tate, R. L., McDonald, S., Perdices, M., Togher, L., Schultz, R., & Savage, S. (2008). Rating the methodological quality of single-subject designs and n-of-1 trials: introducing the Single-Case Experimental Design (SCED) Scale. *Neuropsychological Rehabilitation*, 18, 385–401.