

Designing Research Studies

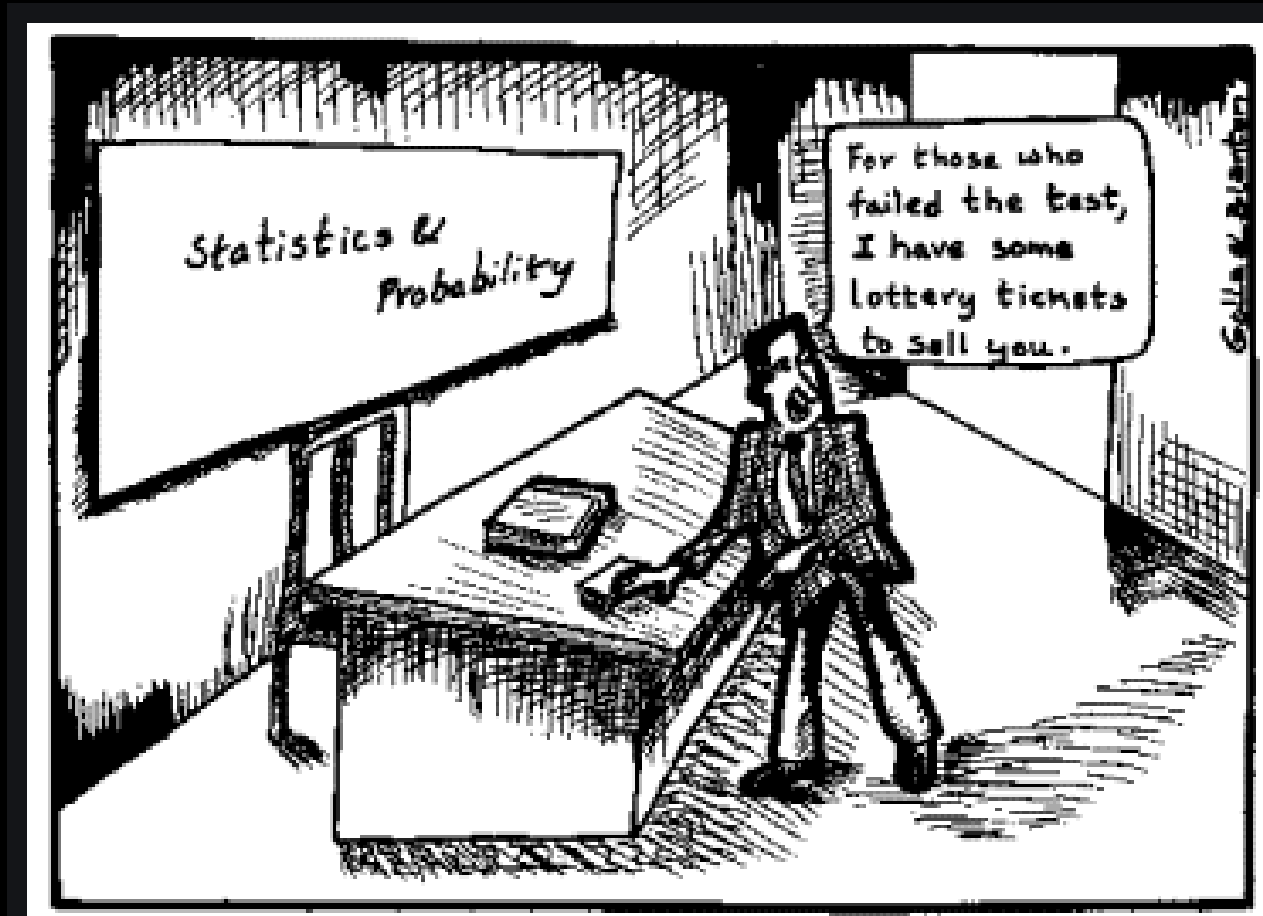
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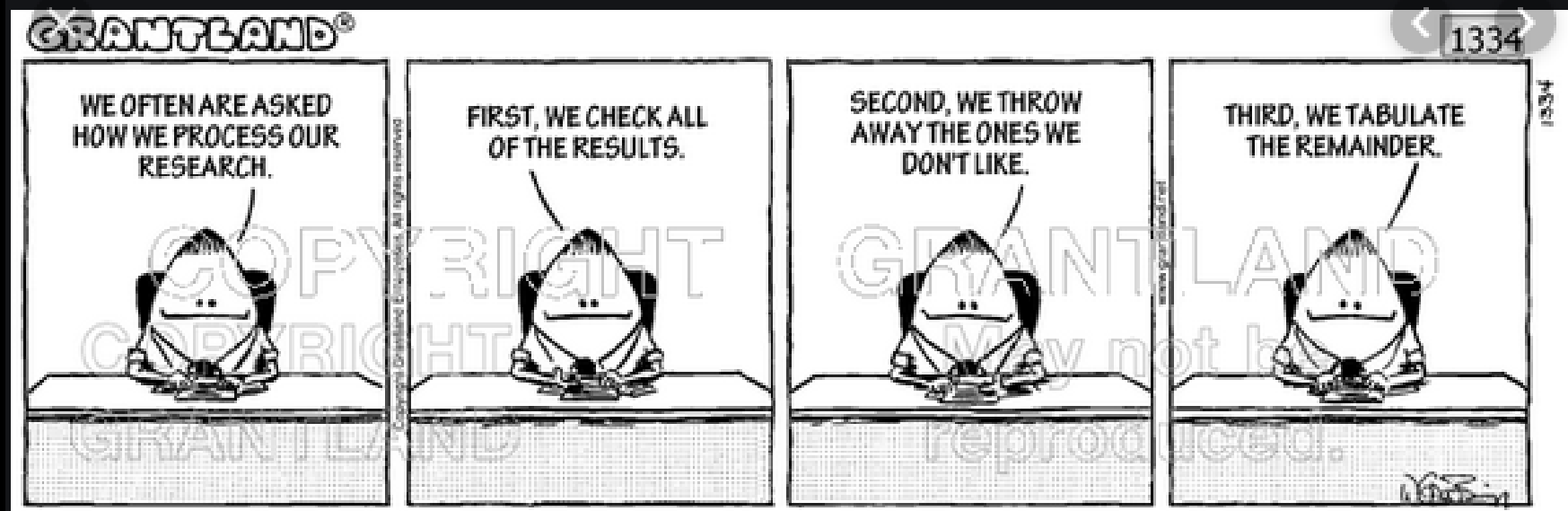
Baseline Questions

- What designs have you heard of?
- How does each one work?
- What questions is each good for?
- Have you helped with a research study?

How well do you need to know statistics?



Ethics



Standard deviation

Savage Chickens

by Doug Savage



LOVE LETTER FROM A STATISTICIAN

Popular research methods



Paralysis by analysis



Grants



Activities

- Design a study to answer my research question
 - To what extent is the quality of college teaching related to interns' practices?
- Design a single-subject study to answer my efficacy question
 - How effective is email feedback to college teachers on student engagement?
- Design a qualitative study to answer the question
 - How do early interventionists feel about the supervision and coaching they receive?
- McWilliam and Associates: Your research idea

Videos

- Fuzzy research designs:

https://www.youtube.com/watch?v=eK1ZV_5E5u0

Top 9 Things You Need to Know

- Correlation: rank order
- Regression: correlation (line), continuous data
- Single-subject: replication
- Group difference: Cohen's d
- Qualitative: garden path
- Mixed methods: Both good
- Experimental: RCT *and* SCRD
- Interesting study: triangle
- ANOVA: discrete data

Correlation : Rank Order

- In our group,
- Average daily time watching TV
- 1-10 interest in in politics
- Show rank order
- Show scatter plot

Regression: Correlation

- R family
 - Continuous data
 - Predictors and outcomes
- D family
 - Discrete data
 - Differences

Single-Subject: Replication

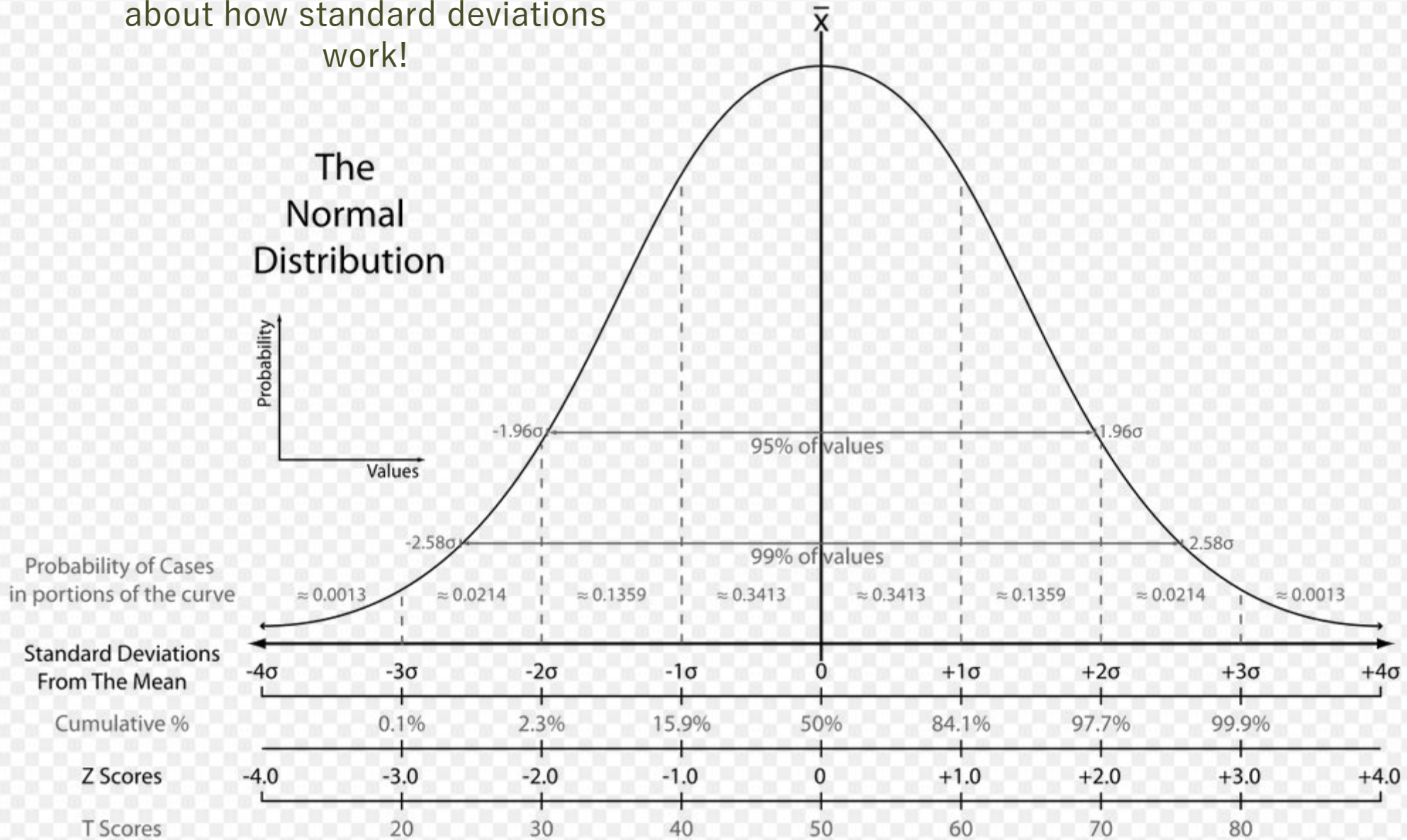
- It all begins with an L and a dashed line
- Each subject is his or her own control
- Time series data
- Experimental
 - Experimental control, or “functional relationship”
- Visual analysis and other methods
- Extremely tight control
- Often 1 IV and 1 DV
- Underappreciated by non-special-educators

Group Difference: Cohen's d

- Mean
- Standard deviation
- $(M2 - M1) / SD_{\text{pooled}}$
 - Pooled = averaged
 - $(SD1 + SD2) / 2$

You do actually have to know a bit about how standard deviations work!

The Normal Distribution



Cohen's d

<i>M</i> Score 1	<i>SD</i> Score 1	<i>M</i> Score 2	<i>SD</i> Score 2	<i>d</i>
85	10	105	8	
7	.5	8	.6	
19	3	14	9	
3.5	.4	3.9	.6	

Qualitative: Garden Path

- “The following themes emerged”
- Peonies, daffodils, cone flowers, roses
- Headline method
 - Hypotheses
 - Confirming and disconfirming tables

Mixed Methods: Both Good

- Qual first
- Qual second

Experimental: RCT *and* SCRD

- Causality
 - Ruling out other explanations for effects
 - RCT: Randomization and lack of systematic bias
 - SCRD: Design (graph) shows experimental control, or “functional relationship”

Interesting Study: Triangle Method

- <http://naturalenvironments.blogspot.com/search/label/triangle%20method>
- Mediator or moderator

ANOVA: Discrete Data

- Main effect (High vs. low)
- Main effect (Group 1 vs. Group 2)
- Interaction effect

To Review: Top 9 Things You Need to Know

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Activity

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 - To what extent is the quality of college teaching related to interns' practices?

Big Four

5th: Mixed methods

6th: Psychometric

Group
comparison

Correlational/
Regression

Single-
Subject

Qualitative

Quantitative Overview

- Between-subjects approach
 - Pretest & posttest designs
 - Posttest designs
- Regression-discontinuity approach
- Within-subjects approach
 - Repeated-measures approach
- Factorial designs (e.g., ANOVA)

Between-Subjects Approach

Diagram 2.1 Pretest and Posttest Control Group Design

<i>Group</i>	<i>Pretest</i>	<i>Treatment</i>	<i>Posttest</i>
1	O ₁	X	O ₂
2	O ₁	—	O ₂

Time ►

Note: In regard to design notations, a dashed line (- - -) would separate Groups 1 and 2 in the design structure if the participants were not randomly assigned to conditions, which indicates quasi-experimental research.

Posttest Only

Diagram 2.7 Posttest Control Group Design

<i>Group</i>	<i>Treatment</i>	<i>Posttest</i>
1	X	O ₁
2	—	O ₁

Time ►

Randomized Control Trials

- Equality of groups
- How different are they?
- How about mediators and moderators?

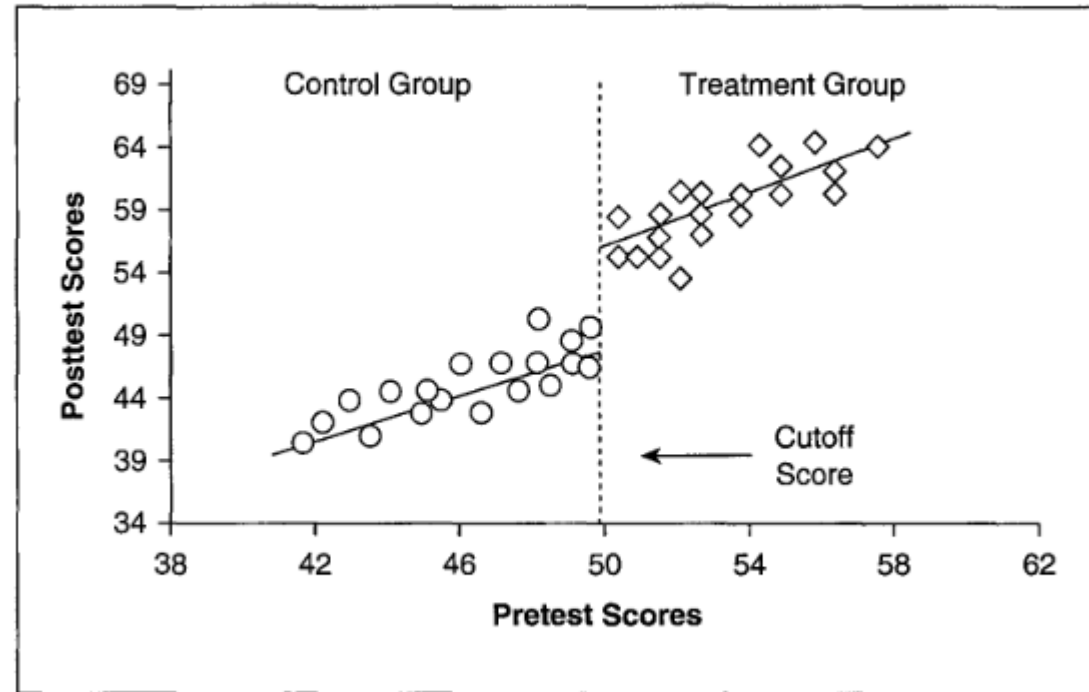
Establishing Cause & Effect (Cook & Campbell, 1979)

- Covariation (the change in the cause must be related to the effect)
- Temporal precedence (the cause must precede the effect)
- No plausible alternative explanations (the cause must be the only explanation for the effect)

Regression-Discontinuity Approach

Assign to treatment or control based on pretreatment scores

Figure 3.1 Sample of a Cutoff Score



Factorial Designs

- 2 x 2
- 2 independent variables
- 2 levels
- DV: MEISR score in $M\%$ (SD)

Severity of Disability	High SES	Low SES
Severe-Profound	58	26
Mild-Moderate	69	42

ANOVA

- Main effect for SES
- Main effect for severity
- SES x Severity interaction

Severity of Disability	High SES	Low SES
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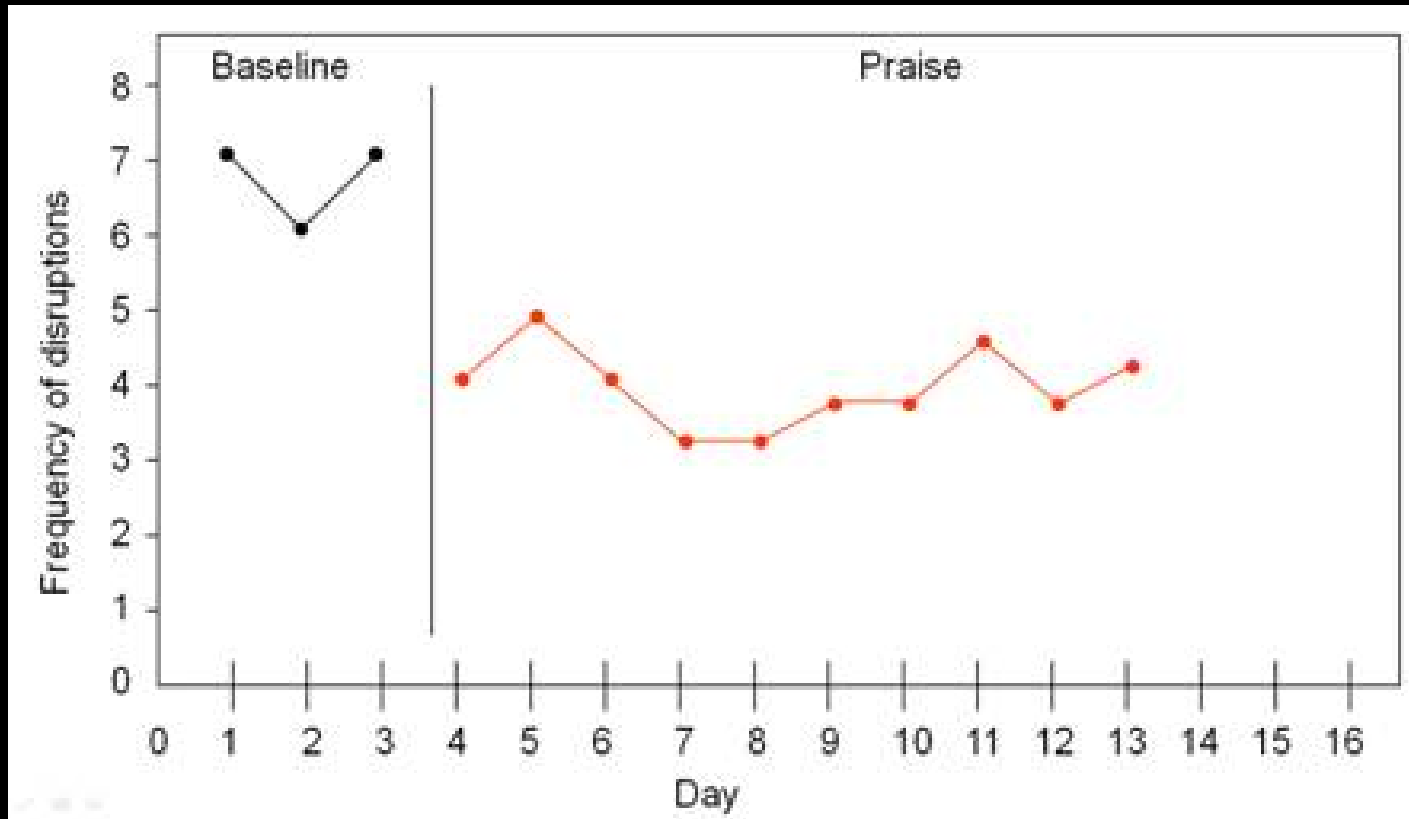
Within-Subjects Designs

- Time series
- Random or nonrandom

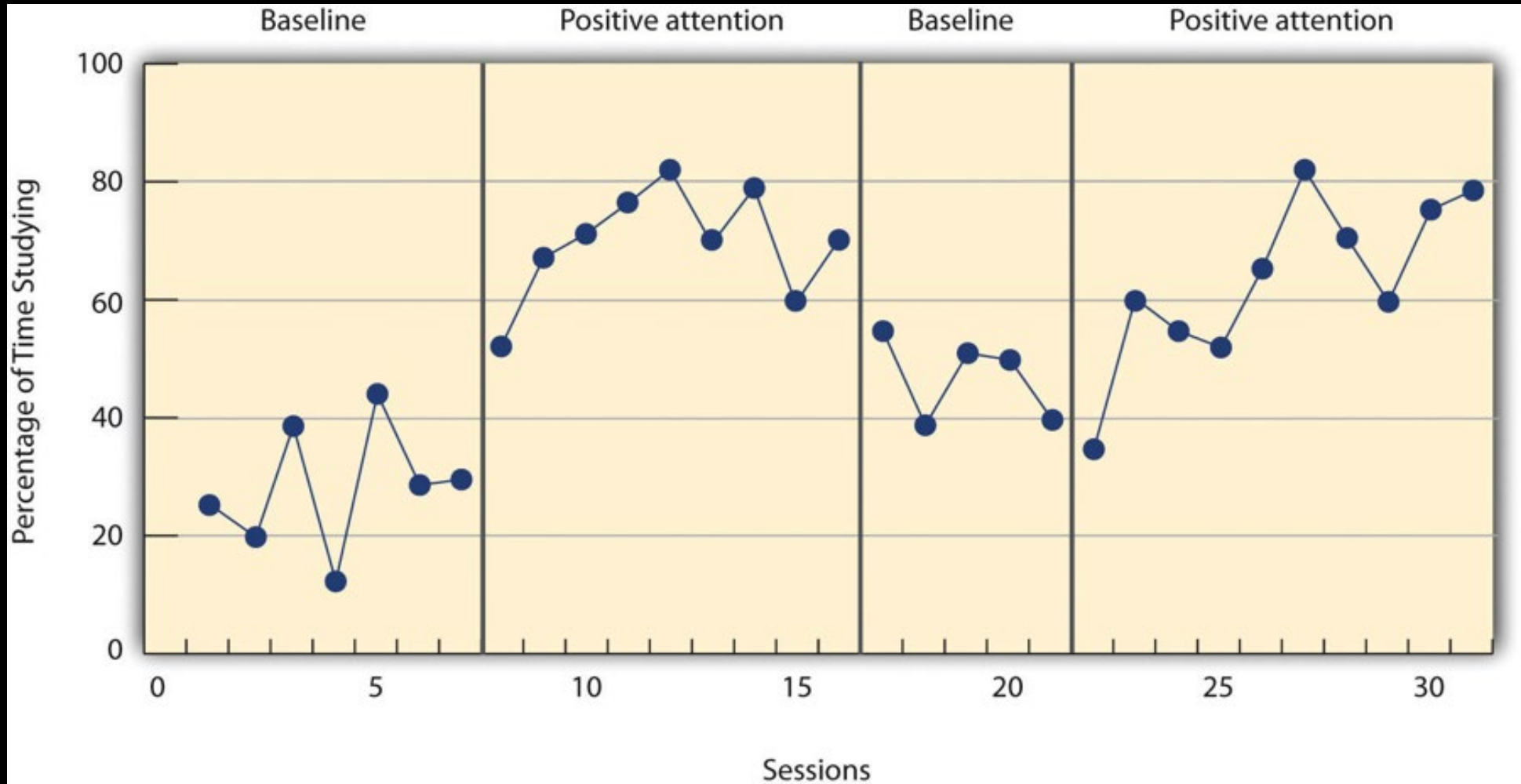
Single-Case Research Design

- AB design
- ABAB design
- Multiple-baseline design
- Changing-criterion design
- Alternating-treatments design

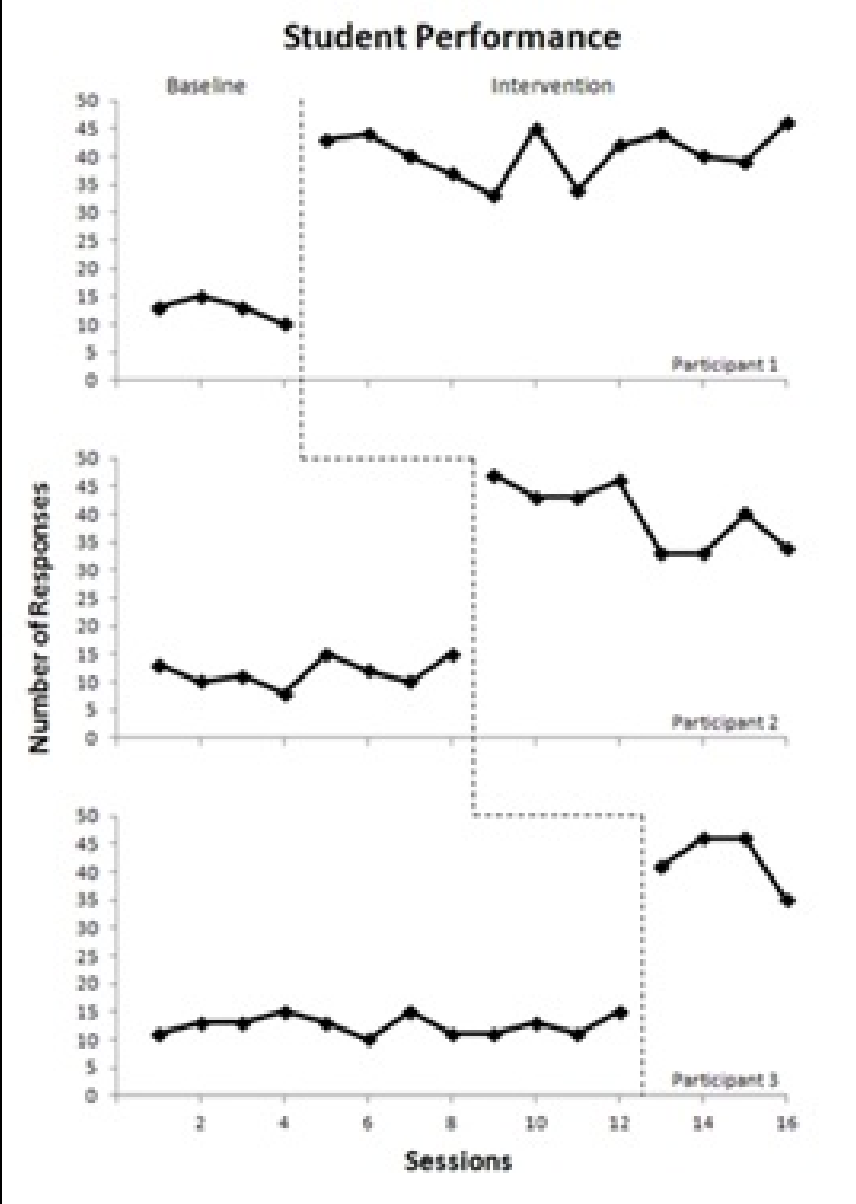
AB Design



ABAB Design



Multiple-Baseline Design



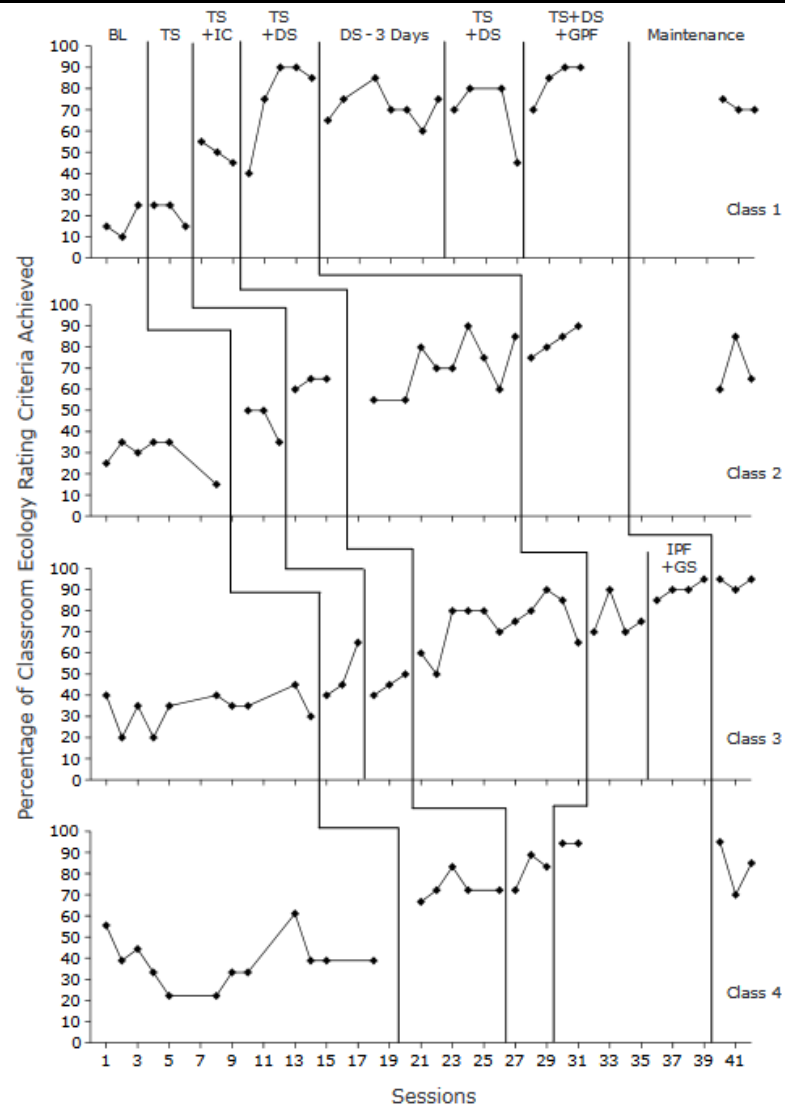
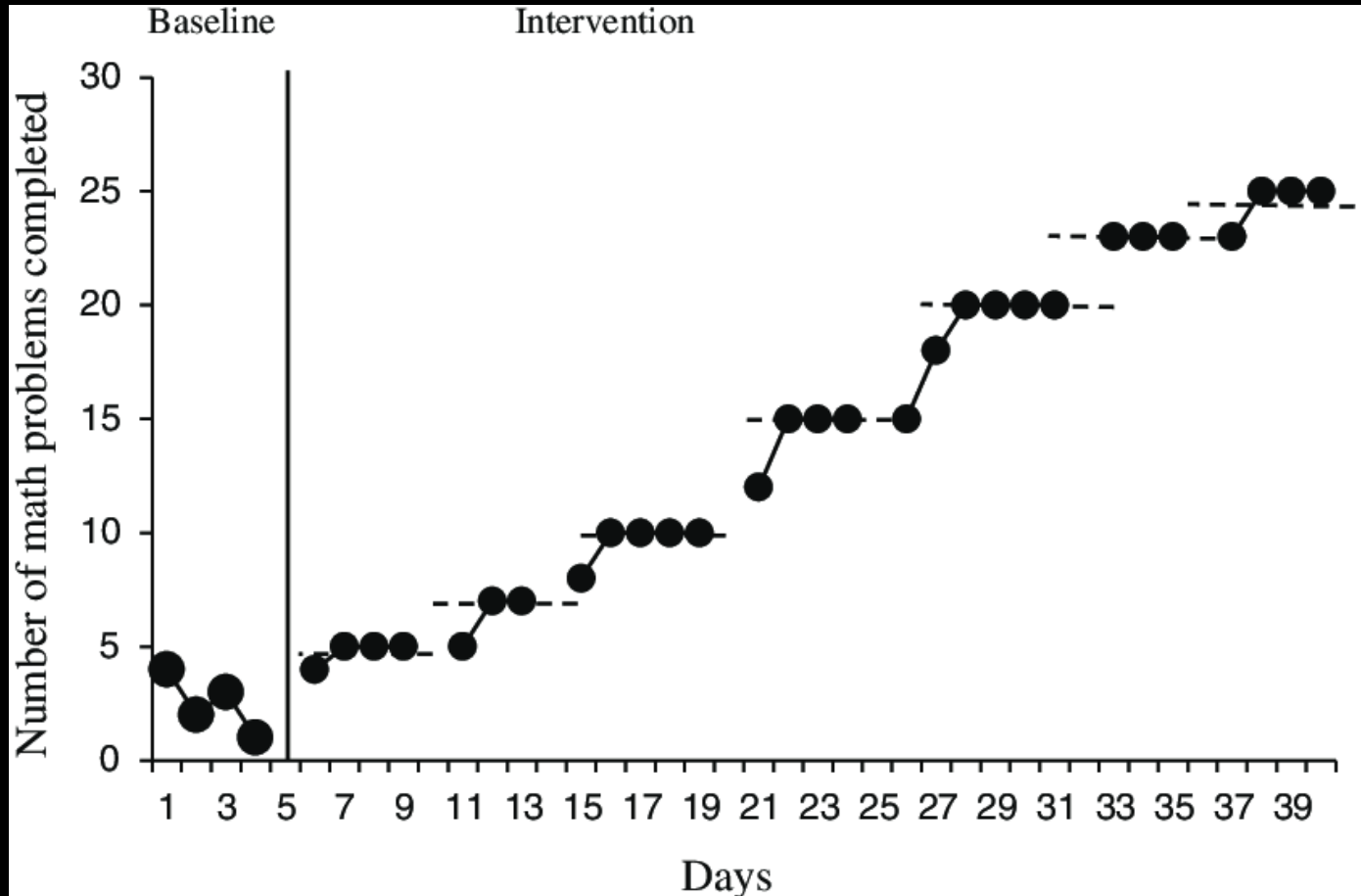


Figure 2. Percentage of achieved CEC ratings (BL = Baseline, TS = Tip Sheet, IC = Intensive Consultation, DS = Daily Supervision, GPF = Graphic Performance Feedback, IPF = Immediate Performance Feedback, GS = Goal Setting).

Changing-Criterion Design



Changing-Criterion Design

Using daily behavior report cards during extended school year services for young students with intellectual and developmental disabilities (Taylor & Hill (2017))

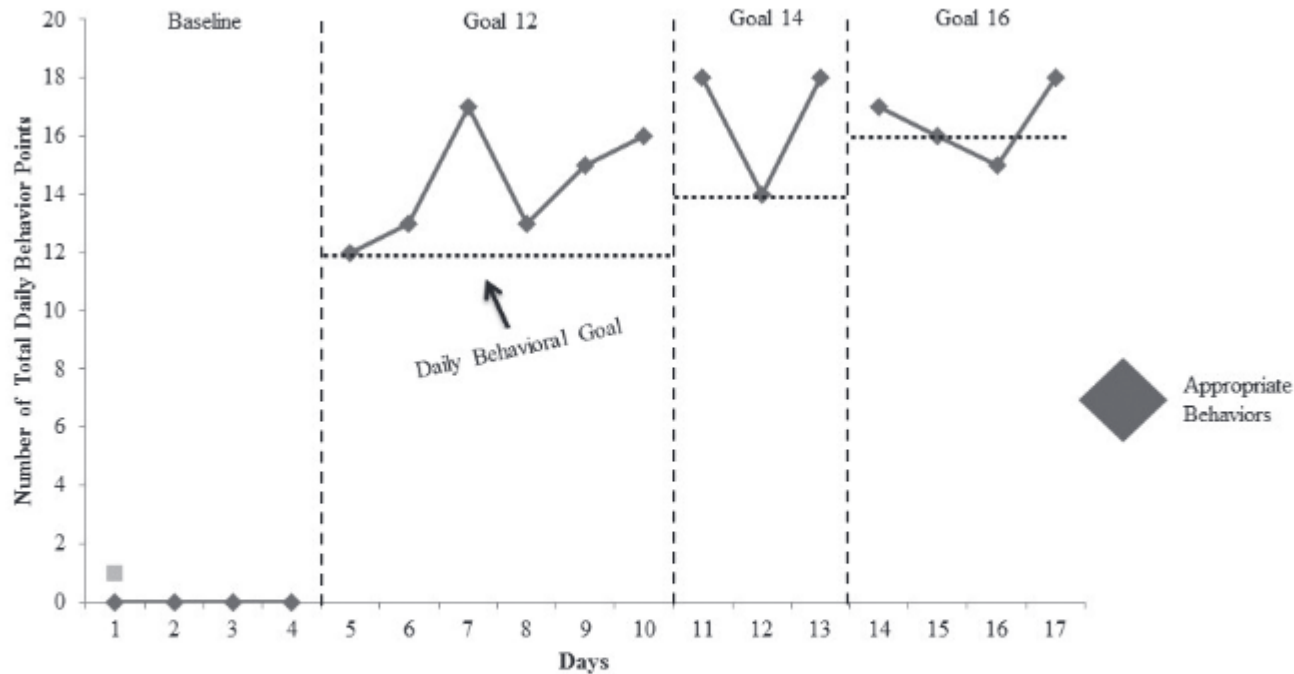
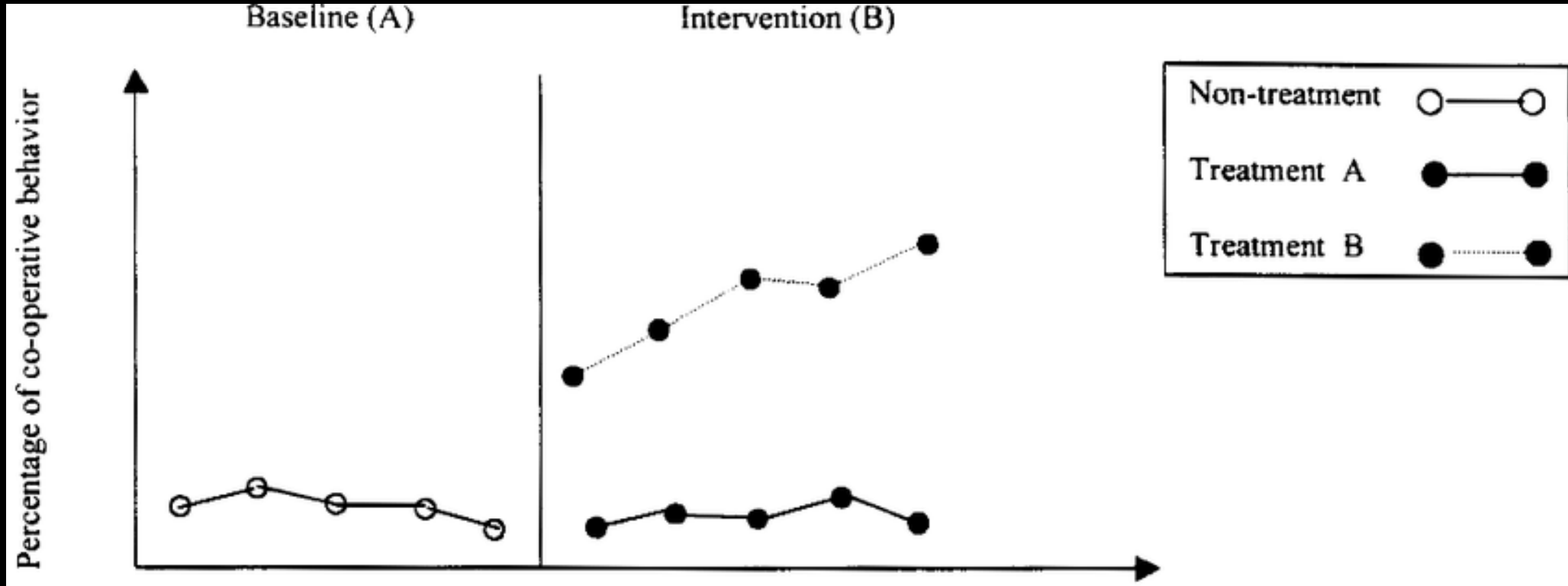


Figure 3. Tim's daily point goals and number of total daily points earned in a changing criterion design for daily behavior report card.

Alternating-Treatments Design



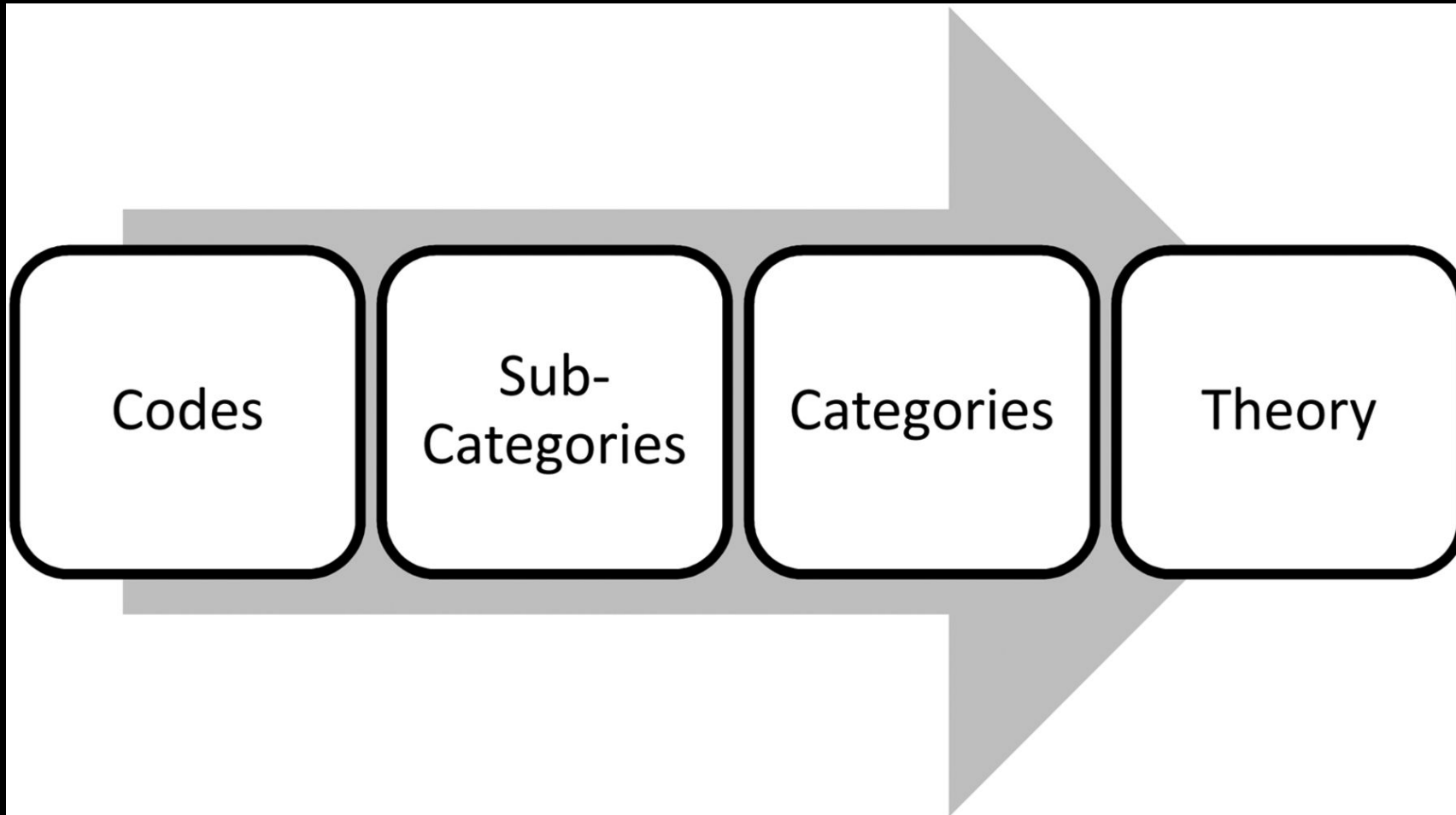
Activity

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Qualitative Research

- Data are narrative, verbal (including written), pictorial....
- Analysis is “grounded”
 - “Grounded theory is a method in the social sciences involving inductive reasoning, in contrast to the hypothetico-deductive model of the scientific method.”

Analysis



Qualitative Analysis

- Garden-path “findings”
- Verification
- Linkages

Sunday, December 14, 2014

Analyzing Qualitative Data

The Headline Method of Analyzing Qualitative Data
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December 2014

Special-education and psychology researchers still often emerge from their doctoral programs with little to no training in qualitative research. This document is a guide for analyzing qualitative data—data consisting primarily of words as opposed to numbers. I developed the headline method in part out of frustration with reviewing scores of manuscripts submitted for publication that had rich information but resulted in insipid so-called findings. These findings have often been called *themes*. A red flag was always when the results were reported as “four themes emerged.” Churchill once said, “Out of intense complexities intense simplicities emerge.” Although he was referring to the fact that difficult things can have simple solutions, it reminds me of weak conclusions apparently emerging from interesting words.

Electronic qualitative-analysis programs have probably been partial culprits in this content-analysis approach to analysis. Such programs are excellent for tagging data (like coding), for identifying the locations of data bits, and for synthesizing the most common words or phrases, whether at the raw-data level or at the data of codes or categories. For example, from a data set of early interventionists’ perceptions of a change in model and philosophy, it’s unsatisfactory to read that the themes of professionalism, identity, views of families, and training emerged. What about these so-called themes? To make matters worse, the results sometimes provide subthemes that are simply more topics. The headline method provides directional findings or hypotheses as alternatives to categorical findings or themes. According to grounded theory, hypotheses can be derived from the data and the analyses (Strauss, 1987).

The headline method is so named because the critical step in the analysis is proposing headlines or hypotheses. According to grounded theory, we are usually not testing hypotheses in qualitative research. In the headline method, we dissect the data to tag them and to help us become familiar with them. That familiarity leads us to arrive at potential conclusions about phenomena under study. We word those conclusions as hypotheses. We then go back to the data to see whether they really support these hypotheses. We edit the hypotheses as necessary, continuously returning to the data, which is called recursivity (LeCompte & Preissle, 1994) or constant comparison (Glaser & Strauss, 2009).

Data

Activity

- Design a qualitative study to answer the question
 - How do early interventionists feel about the supervision and coaching they receive?



Psychometric Studies

- Reliability of scores
- Validity of scores
- Item response theory
 - Factor analysis
 - Rasch analysis



Activity

- McWilliam & Associates
 - Your research ideas



Dev. & Innovation 4 yrs \$1,400,000
 Exploration - Primary data collection & analysis: 4 yrs Same \$
 ↳ Correlational!

Factors

9x20 = 180 ^N [Nested]
 Pros. L
 x 2 fams
 = 360

