Chapter 3: Using Data and Research Methods in Behavior Analysis

How we Use Data

- When we conduct experiments, we measure the data before and after an intervention is made.
    - An **Intervention** is a program or period of time in which action is taken to alter an existing situation, such as a target behavior.
- The data collected before the intervention begins is referred to as the **baseline**.
    - The period of time during which those data were collected is also referred to as the baseline.
- Data tells us the current status and history of **variables** (characteristics of people, objects, behavior, etc…)

Organizing Data

- Using arithmetic calculations, we take discrete or continuous values (23, 5, 9, 18, 21) and calculate central tendencies for the values (mean or average).
- We can use tables to systematically arrange data or other information in rows and columns for easy examination.
- **Graphs** are drawings that display variations within a set of data, typically showing how one variable changes with the manipulation of another variable. There are three main types of graphs:
    - **Line** graphs use straight lines to connect successive data points that represent the intersects of point values for the variables scaled along the horizontal and vertical axis.
    - **Bar** graphs use vertically arranged rectangles to represent data points scaled along the vertical axis.
    - **Cumulative** graphs are line graphs in which the measure of behavior accumulates across units scaled along the horizontal axis.
- There are five main components to every graph:
    - Axes
    - Axes scaling and levels
    - Data Points

- Phase lines and Labels
- Caption

Using Graphs and Basic Research Methods

- **Graphic Analysis** is the process in which behavior analysts inspect graphed data to evaluate whether the behavior changed substantially when intervention techniques were implemented.
- Graphic Analysts assess the trends and differences between the baseline to intervention and the slope of difference during intervention.
- **Trend lines** are best 'fits' or representations of all the data points in a time period.
- Ideally, data points in the baseline do not overlap with data points with the intervention.
    - For a behavioral excess, the lowest data point in baseline would be lower than the lowest data point in intervention.
    - For a behavioral deficit, the highest data point in baseline would be lower than the lowest data point in intervention.

Data Problems in Graphic Analysis

- **Excessive variability**: difficult to draw a trend line with extremes in the data
- We expect:
    - Decreasing baseline trend (for a behavioral excess)
    - Increasing baseline trend (for a behavioral deficit)

Basic Research Designs

- Types of variables: independent variable / dependent variable
    - From these variables, we seek to find the cause-effect answer. To do this, we must control all **extraneous variables** – factors, that could affect the dependent variable by holding them constant across baseline and intervention conditions.
- **Single-subject designs** examine the target behavior of a person across time, while an intervention is either in effect or absent.
- **AB Designs** are the simplest type of single-subject research.
    - The A represents the baseline period.
    - The B represents the phase in which the intervention was in effect.

- **Reversal (ABA or ABAB) designs** have a series of phases in which an intervention is alternately absent and present, usually with either three or four phases.
    - The reversal is the last phase that withdraws the intervention, reinstating the baseline conditions.
    - There are three problems with reversal designs:
        - The effect of the intervention may not be fully or substantially reversible.
        - Reversal designs must decide what conditions would constitute a reversal of the intervention.
        - It may be considered undesirable or unethical to withdraw an intervention that appears to have produced a beneficial effect.

Advanced Research Designs in Behavior Analysis

- In **multiple-baseline designs**, more than one AB design is conducted with all baselines starting at about the same time and proceeding together for a while. There are two distinct characteristics:
    - There are no reversal phases.
    - Introduction of the intervention is staggered across the separate AB designs so that a baseline phase in at least one AB design overlaps an intervention phase in at least one other AB design.
- **Multiple-baseline-across-behaviors design** uses separate AB designs for each of two or more different behaviors for a single individual in a particular setting. More than one behaviors are monitored simultaneously.
- **Multiple-baseline-across-subject designs** uses separate AB designs for each of two or more individual participants for a particular behavior in a particular setting.
- **Multiple-baseline-across-situation designs** uses separate AB designs for each of two or more different situations, typically for a single individual and a specific behavior.
- A common limitation of multiple-baseline designs is that changes may occur during a baseline phase, before the intervention has been introduced.

Changing-criterion and Alternating-treatment Designs

- **Changing-criterion designs** are useful approaches for demonstrating that intervention techniques caused changes in a behavior.
    - Criterion – successful performance changes over time, usually becoming more rigorous.

- **Alternating-treatment designs** (simultaneous-treatment or multi-element designs) examine the effects of two or more treatments, each of which is conducted within the same intervention phase with the same person. There are two advantages with this design:
    - No reversal phases are needed
    - Two or more treatments can be compared to see if one is more effective than another

Evaluating the Resulting Changes in Behavior

- There are three dimensions that relate to the behavioral changes by intervention:
    - **Generalization** and Durability of the Changes: improved behavior must be generalized to the target person's natural environment and must be durable.
    - Amount of Importance of the Changes: how critical are the changes to the behavior
        - **Clinical significance** refers to the degree to which the change in behavior is meaningful to the target person's life and functioning.
        - How do we determine a *norm* range in our studies? There are two ways:
            - Identify a norm for the behavior – its usual level among a large population
            - Identify and test comparison groups, which is measured by social validity.
        - **The Cost-benefit ratio** is the extent to which the costs of providing the treatment are outweighed by the money saved in the long run.