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Accelerative and Reductive behaviors
Behavior Analysis Intervention Decision Making Framework

- Label/Define Behavior
- Determine Function
- Create Intervention
- Apply Intervention
- Measure/Record Behavior
- Visual Display

Behavior
Behavior Analysis Intervention Decision Making Framework

- Label/Define Behavior
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- **Visual Display**
- Visual Analysis
- Decision Making
Behavior Analysis Intervention Decision Making Framework

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- Visual Display
- Visual Analysis
- Decision Making

Behavior
Visual Analysis - History

Where it all began
Light turns on

Purina Rat Chow

Lights

Bar

Food magazine

Light turns on

Press bar
Consequences select behavior

Light turns on
Press bar
Access to food

Where it all began
Cumulative recorder

Where it all began

“We make important aspects of behavior visible. Once this has happened, our scientific practice is reduced to simple looking” (Skinner, 1956, p. 229).
Visual analysis led to the discovery of all principles of behavior.
Visual analysis involves “(a) the extent and type of variability in the data, (b) the level of the data, and (c) trends in the data” (Cooper, Heron & Heward, 2007, p. 149).
"Visual analysis of graphic displays of data is a cornerstone of studies using a single case experimental design (SCED). Data are graphed for each participant during a study with trend, level, and stability of data assessed within and between conditions (Lane & Gast, 2014, p 445)."

Visual Analysis

1. Stability of baseline
2. Variability within phases
3. Variability between phases
4. Overlap between scores of adjacent phases
5. Number of data points in each phase
6. Changes in trend within phases
7. Changes in trends between adjacent phases
7.1 Type of trend changes between phases
8. Changes in level between phases
8.1 Types of changes in level between phases
9. Analysis of data across similar phases
10. Evaluation of overall pattern of the data

Where does visual analysis occur?
Theses and Dissertations

Where does visual analysis occur?

Conferences
Where does visual analysis occur?

Journals
Where does visual analysis occur?

Applied settings
Where does visual analysis occur?

Reports to Payors and Stakeholders
Visual analysis dominates behavior analysis as a means to determine intervention effects.
the visual display.

Line graph

Ethics
“Ethics is based on well-founded standards of right and wrong
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“Ethics is based on well-founded standards of right and wrong that prescribe what humans ought to do, usually in terms of rights, obligations, benefits to society, fairness, or specific virtues” (Velasquez, Andre, Shanks, & Meyer, 2010).
Professional and Ethical Compliance Code for Behavior Analysts

The Behavior Analyst Certification Board's (BACB's) Professional and Ethical Compliance Code for Behavior Analysts (the "Code") consolidates, updates, and replaces the BACB's Professional Disciplinary and Ethical Standards and Guidelines for Responsible Conduct for Behavior Analysts. The Code includes 10 sections relevant to professional and ethical behavior of behavior analysts, along with a glossary of terms. Effective January 1, 2016, all BACB applicants and certificate holders will be required to adhere to the Code.

In the original version of the Guidelines for Professional Conduct for Behavior Analysts, the authors acknowledged the codes from the following organizations: American Anthropological Association, American Educational Research Association, American Psychological Association, American Sociological Association, California Association for Behavior Analysis, Florida Association for Behavior Analysis, National Association of Social Workers, National Association of School Psychologists, and Utah Association for Behavior Analysis. We acknowledge and thank these professional organizations that have provided substantial guidelines and clear models from which the Code has evolved.

Approved by the BACB's Board of Directors on August 7, 2014.

This document should be referred to as: Behavior Analyst Certification Board (2014). Professional and ethical compliance code for behavior analysts. Lethbridge, CO: Author.

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1.0 Responsible Conduct of Behavior Analysts.

Behavior analysts maintain the highest standards of behavior of the profession.

1.01 Reliance on Scientific Knowledge.
Behavior analysts rely on professionally derived knowledge based on science and behavior analysis when making scientific or professional judgments in human service provision, or when engaging in scholarly or professional endeavors.

1.02 Boundaries of Competence.
(a) All behavior analysts provide services, teach, and conduct research only within the boundaries of their competence, defined as being commensurate with their education, training, and supervised experience.
(b) Behavior analysts provide services, teach, or conduct research in new areas (e.g., populations,
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(b) Behavior analysts provide services, teach, or conduct research in new areas (e.g., populations, techniques, behaviors) only after first undertaking appropriate study, training, supervision, and/or consultation from persons who are competent in those areas.

1.03  Maintaining Competence through Professional Development.
Behavior analysts maintain knowledge of current scientific and professional information in their areas of practice and undertake ongoing efforts to maintain competence in the skills they use by reading the appropriate literature, attending conferences and conventions, participating in workshops, obtaining additional coursework, and/or obtaining and maintaining appropriate professional credentials.

1.04 Integrity.

Do behavior analysts have an ethical obligation to use the best visual display system for analysis of data and subsequent decision making?
Linear Graphs vs Ratio Graphs
Linear Scale vs Ratio Scale
Ratio comparisons offer a proportional view thereby showing behavior changing relative to one another.
How many more mands emitted in 20 minutes?

5 more

1 yesterday,

6 today
How many more mands emitted in 20 minutes?

5 more        20 yesterday,        25 today
How many more mands emitted in 20 minutes?

1 to 6 = +5 difference  
20 to 25 = +5 difference

Who did the intervention work better for?

Sara  
Will

How many more mands emitted in 20 minutes?
How many more mands emitted in 20 minutes?

5 more  x 1.25  20 yesterday,  25 today

25% increase
Who did the intervention work better for?

**Linear graph**

Intervention worked equally well.

**SCC (Ratio graph)**

Intervention worked better for Sara than Will.

- x1.25 (25% increase)
- x6.0 (500% increase)
Who did the intervention work better for?

**Linear graph**

+5

**Linear Thinking**

+5

**SCC (Ratio graph)**

x1.25

25% increase

**Proportional Reasoning**

x6.0

500% increase

**Magnitude Perspective**
Ratio charts show and provide important statistical information to behavior analysts not present in linear graphs.
500 to 501
0.2% increase
4% reduction

56% reduction

Says tact of food items
"The fact that many aspects of our world operate..."
according to proportional rules makes *proportional reasoning abilities* extremely useful in the interpretation of real world phenomena." (Post, Behr & Lesh p. 79)


**Proportional View of Data**

A proportional view of behavior better serves behavior analysts than a linear visualization.
Qualification vs Quantification
Slope magnitude “is qualitatively estimated as high, medium, or low” (Kennedy, 2005, p. 197-198).

Qualification vs Quantification of Trend

Accelerating trend

x2.0  100% weekly growth

x1.8  80% weekly growth
Qualification vs Quantification of Trend

Qualified trend
Rapidly increasing

Quantified trend
x2.0 per week
Criticisms of Visual Analysis

Visual analysis is unreliable.

Visual analysis lacks decision rules (is subjective).

Visual analysis needs statistics.
“Although visual analysis remains the most widely used analysis for SCRD (Smith, 2012), visual analysis can be supplemented with an ES to provide standardized and reliable results that contribute to evidence-based practices” (Vannest & Ninci, 2015).
Quantifying behavior change with suitable individual statistics is superior to subjective estimation.

Nonstandard vs Standard
Nonstandard and Standard

Standard “...an agreed-upon way of doing something” (Spivak & Brenner, 2001, p. 1).

Nonstandard and Standard

Nonstandard: Not standard.
Nonstandard: Not standard. Different from the usual version or type of that thing.

Types of Graphs
Linear Graph

Nonstandard

Standard

Ratio Graph

Nonstandard

Standard

Nonstandard linear graph
Standard linear graph
Nonstandard ratio graph

Standard ratio graph
A Critical Review of Line Graphs in Behavior Analytic Journals

Richard M. Kilina Jr., Douglas E. Konrizer, Kathlyn M. Brennan, Seth A. King

Abstract: Visual displays such as graphs have played an instrumental role in psychology. One discipline relies almost exclusively on graphs in both applied and basic settings, behavior analysis. The most common graphic used in behavior analysis falls under the category of line graphs. The line graph represents the most frequently used display for visual analysis and subsequent interpretation and communication of experimental findings. Behavior analysis, like the rest of psychology, has opted to use non-standard line graphs. Therefore, the degree to which graphical quality occurs remains unknown. The current article surveys the essential structure and quality features of line graphs in behavioral journals. Four thousand three hundred and thirteen graphs from 11 journals served as the sample. Results of the survey indicate a high degree of deviation from standards of graph construction and proper labeling.
Rules for Line Graph Construction

- American Statistical Association, 1915
- American Standards Association, 1938
- Scientific Illustration Committee 1988
Rules for Line Graph Construction


How well do selected visual graphics follow the *essential structure* and *quality features* of line graph construction?
Selected 11 behavioral journals

Line graph construction study

Behavior Modification
Line graph construction study

Behavior Therapy
Line graph construction study

Child and Family Behavior Therapy
Cognitive and Behavioral Practices

Line graph construction study

Journal of Applied Behavior Analysis
Line graph construction study

Journal of Behavior Therapy and Experimental Psychiatry
Line graph construction study

*Education & Treatment of Children*
Line graph construction study

Journal of Behavioral Education

Line graph construction study
Line graph construction study

Learning & Behavior
(formerly called Animal Learning & Behavior)
Line graph construction study

The Analysis of Verbal Behavior
Line graph construction study

4,313 graphs met criteria.
Graph had a vertical and horizontal axis
Graph had a vertical and horizontal axis

Results: 98% had a vertical axis
Results: 96% had a vertical axis

97% had a horizontal axis

2% and 3% respective error rate
Figure 1. Acquisition and maintenance of skills taught by the teacher.
Results: 83% of vertical axes had a label
17% vertical axes had no label
32% had a proper label on the horizontal axis
34% horizontal axes had no label

Horizontal axes must have a unit of time
Horizontal axes must have a unit of time

The International System of Units (SI)

Unit of Time = Seconds
Minutes
Hours
Days
Weeks
Months
Year
Horizontal axes must have a unit of time

Results: 34% of remaining horizontal axes had a non-time unit label

Summary: 68% of horizontal axes had no label or a non-time unit label

Proportional Construction rule

Vertical axis 5/8 to 3/4 size of horizontal axis
Vertical axis 5/8 to 3/4 size of horizontal axis

7.9 inches

11.8 inches \times 0.63 = 7.4 \text{ inches}

\text{Unit of Time} \times 0.75 = 8.9 \text{ inches}

Proportional Construction rule

Vertical axis 5/8 to 3/4 size of horizontal axis
Proportional Construction rule

Quantitative

11.8 inches \times 0.63 = 7.4 \text{ inches}

7.9 \text{ inches}

Unit of Time \times 0.75 = 8.9 \text{ inches}
Proportional Construction rule
Proportional Construction rule

Results: 15% of graphs had proportional construction
85% of graphs did not have a proportional construction

Does it matter?
Graphs have tick marks

[Graph with points plotted on a Cartesian plane with labeled axes: Quantitative Value on the y-axis and Unit of Time on the x-axis.]
Fig. 2. Frequency of arrests for three saturated zones versus three control zones.
Results: **78%** of graphs had ticks marks

**22%** of graphs had no tick marks or missing tick marks on either the vertical or horizontal axis.
Results: 86% of data points were legible

14% of data points were illegible
Of the 4,313 surveyed graphs, **85%** contained at least 1 construction error.
Nonstandardization increases time to understand data. Negatively affects analysis. Contributes to interpretative errors. Hampers communication.
Physical proportions and scale never changes

Person 8

Same interpretation
Standardization Better than Nonstandardization
Standard graphs are better than nonstandard graphs.
Behavior analysis has serious limitations with *nonstandard* linear graphs.
Do behavior analysts have an ethical obligation to use the best visual display system for analysis of data and subsequent decision making?
Thank you!