Perception, Expectancy, and Belief: Barriers to Measurement and Standards of Evidence?

Janet S. Twyman, Ph.D., BCBA

Applied Behavior Analysis: Evidence-based Solutions for Helping People
The Cambridge Center for Behavior Analysis and The Chicago School, Los Angeles
April 17, 2010
Applied Behavior Analysis

Applied Behavior Analysis is the science in which procedures derived from the principles of behavior are systematically applied to improve socially significant behavior to a meaningful degree and to demonstrate experimentally that the procedures employed were responsible for the improvement in behavior.
Cornerstone of Behavior Analysis

- Quality behavioral programming requires ANALYSIS.

- ANALYSIS requires ongoing, direct, frequent, pervasive measurement (data).

- ANALYSIS with validity, reliability, replicability, sustainability, and parsimony builds EVIDENCE.
Weights and Measures may be ranked among the necessaries of life to every individual of human society. They enter into the economical arrangements and daily concerns of every family. They are necessary to every occupation of human industry; to the distribution and security of every species of property; to every transaction of trade and commerce; to the labors of the husbandman; to the ingenuity of the artificer; to the studies of the philosopher; to the researches of the antiquarian; to the navigation of the mariner, and the marches of the soldier; to all the exchanges of peace, and all the operations of war. The knowledge of them, as in established use, is among the first elements of education, and is often learned by those who learn nothing else, not even to read and write. This knowledge is riveted in the memory by the habitual application of it to the employments of men throughout life.

JOHN QUINCY ADAMS

*Extract from the Report on Weights and Measures by the Secretary of State, made to the Senate on February 22, 1821.*
A Brief History of Measurement

The Ancient Greeks developed the “foot”...
and yards were measured chin to hand...
The Romans identified paces, and the “mile”...
Thus, confusion and disagreement ensued, until...
Simple, logical, effective STANDARDS of measurement were determined.
Determining Standard Measures

Constancy & Permanence are essential to any measurement system.
Behavior Analysis as a Science

Measurement is the cornerstone of all scientific activity.

Without measurement science is indistinguishable from natural philosophy.

To the extent that events allow for measurement, they become the subject matter of scientific inquiry.

Johnston & Pennypacker, 1980
Why Isn’t Everyone Measuring?

- Measurement is complex and complicated
- Data collection takes too much time
- Too hard to do, too hard to teach
- Training staff to measure is fruitless
- Staff not interested or accustomed to it
- High staff turnover
- Insufficient history with data/behavior analysis
- Measurement reduces creativity
- Measurement makes things cold and robotic
- Measurement interferes with teaching
- Teachers aren’t paying attention to students
- Measurement forces accountability
Why Isn’t Everyone Measuring?

Rick McKee AUGUSTA CHRONICLE

BOWL CHAMPIONSHIP SERIES:

1. Polls (25%)
2. Computer Rankings (25%)
3. Strength of Schedule (25%)
4. Losses (25% or 4)
5. Wind Direction (MPH) (25%)

COMPONENTS:

UNIFIED FIELD THEORY

FRA CHER

DOPPLER EFFECT

RED SHIFT

LETTER GRADE

EVEN, MEW, MUH, MEE (BEAT UNTIL FIRM)

BOWL RANKS

LURNING (25+1)

SQUARE OF THE HYPOTENUSE

START

1. Polls (25%)
2. Computer Rankings (25%)
3. Strength of Schedule (25%)
4. Losses (25% or 4)
5. Wind Direction (MPH) (25%)

NATIONAL CHAMPS

LISTEN UP!...

‘CAUSE I’M ONLY GONNA EXPLAIN THIS ONE MORE TIME!!...

"You call that sharing your feelings?"

Copyright © 2002 Creators Syndicate, Inc.
Why Isn't Everyone Measuring?

1. The ad campaign was a huge, huge success! Wow!
2. Define "huge, huge success." How much did sales increase? We don't track those numbers.
3. But I know the ad created huge buzz because of all the e-mail I got the next day.
4. How many messages did you get? Six. But that's a lot for one topic. Wow! Six!
5. How many of the six were from your own employees? Who invited the Behavior Analyst? I thought he was with you.
The Importance of Measurement

"Life is all memory, except for the one present moment that goes by so quick you hardly catch it going."

Tennessee Williams

Observation alone is not enough...
The Importance of Measurement
(Observation Alone Is Not Enough)

All Humans Are Subject to Bias

- Faulty Perceptions
  (Selective Perception, Perceptual and Memory Construction)

- Impact of Expectancy & Belief
  (Selective Attention)
Perception
...the process of attaining awareness or understanding of sensory information

Perceptual Construction

- light flash
- electric shock
- cooking eggs
Perceptual Construction

We frequently make errors in visual and auditory perception.

When people expect to perceive a certain stimulus, they often perceive it—even when no stimulus is present.

This is even more frequent when the stimulus is vague or when clear observation is difficult.
Perception: Color Constancy

Are squares A and B the same color?

http://en.wikipedia.org/wiki/Same_color_illusion
Perception: Color Constancy

Are squares A and B the same color?

http://en.wikipedia.org/wiki/Same_color_illusion
Perception: Size Constancy

Look at the people at the near and far end of the path.

Now look at the man in the white shirt, he’s exactly the same size.

http://psych.hanover.edu/Krantz/SizeConstancy/index.html
Perception: Size Constancy

Look at the people at the near and far end of the path.

Now look at the man in the white shirt, he's exactly the same size.

http://psych.hanover.edu/Krantz/SizeConstancy/index.html
Perception: Visual Stimuli

Are the horizontal lines parallel or sloped?

http://www.washburn.edu/cas/psychology/pmacdonald/perceptiontricks.html
Perception: Visual Stimuli

Which inner circle is larger?

http://www.washburn.edu/cas/psychology/pmacdonald/perceptiontricks.html
Perception: Visual Stimuli

How many black dots are there?

http://www.washburn.edu/cas/psychology/pmacdonald/perceptiontricks.html
Perception: Visual Stimuli

What do you see?

http://dragon.uml.edu/psych/illusion.html
Perception: Auditory Stimuli

- Subliminal messaging (advertisements)
- Hidden messages in songs played backwards
- Skinner's Verbal Summator
In Teaching...

Be aware of:

- Hearing vocal verbal behavior that may not have occurred, or not occurred at that topography

- Perceiving behavior to be of different intensity or magnitude than it was ("tantrums")
Memory Construction

Research has shown that memories are constructive, or even creative, a process that is inherently INEXACT.

- visualizing yourself in a scene
- video of a car accident

Anecdotal reports may be especially prone to memory construction.
Expectancy, Belief, and Selective Attention

We tend to see relationships that often aren’t there...

- a friend’s phone call
- buying a new car
- planning a special event
- horoscopes (Foyer effect)
Expectancy, Belief, and Selective Attention

Some things happen on a level that seems larger than us...

- Lincoln-Kennedy
- Birthdays
- New Jersey Lottery

The occurrence of a specified coincidence is unlikely...however, that some astonishing coincidences will occur is certain.
Expectancy, Belief, and Selective Attention

- Humans notice some things and ignore others.
- We tend support beliefs through subjective attention and be drawn to supporting evidence and away from contradictory evidence.
- It's an empirical fact that "incredible" coincidences do occur.
Expectancy

- Attention influences the perceived order of events.
- If two events occur simultaneously, the event drawing the most attention is often perceived as occurring first.
Expectancy

Humans tend to fill in incomplete events or objects into a familiar pattern.

http://www.visualexpert.com/Resources/perceptionfooled.html
Expectancy

Humans have the capacity to (and frequently do) construct a scenario based upon incomplete information.
Constructing a Scenario

http://www.washburn.edu/cas/psychology/pmacdonald/perceptiontricks.html
The Problem with Bias

Bias promotes faulty evidence

Faulty evidence results in:

- Wasted time
- Lack of effect
- Potential harm
In Teaching...

- We may attribute causal events to things that are not related to the behavior.

- When taking incomplete or random data, we may inadvertently record mostly corrects; or mostly responses to a certain stimuli
Measurement Reduces Bias

- Immediate, ongoing, pervasive measurement reduces the limitations of observational bias
- It captures “fleeting” behavior

Measurement promotes:

- objectivity (not subjectivity)
- corroboration of observations (reliability)
- public evidence open to public scrutiny (not personal confirmation)
Measurement Builds Evidence

Measurement helps us know how and why...and thus promotes replication of effects (EVIDENCE).

Measurement decreases ambiguity (and ambiguity can get us into trouble).

"Relax... he says the warnings about Little Big Horn are vague and general..."

© 2002 United Feature Syndicate Inc.
Measurement Builds Evidence

Measurement helps us know how and why...and thus promotes replication of effects (EVIDENCE).

"I think you should be more explicit here in Step Two."
What's Going on in the Field?

Various Approaches to Measurement in “Behavior Analysis”

☐ Measure Everything
☐ Measure Nothing
☐ Measure Something
☐ Measure and Ignore
Measure to Know

“We are drowning in information, but starved for knowledge.”

John Naisbitt
Measure Learning and Outcomes

Data should be collected to answer specific questions...

☐ What do I need to know?

☐ Will these data tell me that?

☐ Can these data direct my course of action, reliably, over time?
Some Data Collection Tools

- Direct Measures
  - occurrence/non-occurrence
  - frequency/rate
  - duration
  - latency
  - inter-trial interval
  - inter-response
  - time (duration)

- Indirect Measures
  - interval recording (partial/whole)
  - time sampling
  - trials to criterion,
  - # of objectives met
  - rating scales
  - anecdotal notes
  - “percent correct”
Reducing Barriers to Measurement

- Materials Developed by Others
- Textbooks, Publications
- Websites with data sheets
- Automated Measurement Systems
- Instructional programs (curriculum) with built in data-collection and reporting
Reducing Barriers to Measurement

- Good Instructional Curriculum
- Appropriate Tools for Measurement & Display
- Thorough Training
- Contingencies to Reinforce Analysis
Quality Behavioral Programs

A quality education program is derived from a thorough understanding of behavior analysis, stresses individualization of student curriculum, and is continually evaluated and redesigned based upon learner performance.
In parting...

“The question we ask determines how we measure;
How we measure determines what we see;
What we see determines how we behave.”

Johnston and Pennypacker, 1980