PRACTICAL AND ETHICAL ISSUES IN CURRENT FUNCTIONAL ANALYSIS METHODOLOGY: POTENTIAL SOLUTIONS

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Functional Analysis

“the external variables of which behavior is a function provide for what may be called a causal or functional analysis. We undertake to predict and control the behavior of the individual organism” (Skinner, 1953, p. 35)
Functional Analysis of Problem Behavior

Research identified different contingencies of reinforcement maintaining problematic behaviors:

**(1) Socially mediated**

**(2) Automatic reinforcement** (does not depend on the behavior of someone else Skinner, 1957)
Functional Analysis in Practice

Conducting functional analysis prior to intervention is becoming standard best clinical practice and a requirement for interventions targeting behavior reduction.

*BACB Professional and Ethical Compliance Code for Behavior Analysis*

3.01 Behavior-Analytic Assessment.

(a) Behavior analysts conduct current assessments prior to making recommendations or developing behavior-change programs. The type of assessment used is determined by client’s needs and consent, environmental parameters, and other contextual variables. When behavior analysts are developing a behavior-reduction program, they must first conduct a functional assessment.

(b) Behavior analysts have an obligation to collect and graphically display data, using behavior-analytic conventions, in a manner that allows for decisions and recommendations for behavior-change program development.
Functional Assessment Methodology

• At least two-step process:
  – Raising Hypotheses
  – Direct (Experimental) Testing
    • Typically called “Functional Analysis”
    • Tests often designed based on the hypotheses raised
Raising Hypothesis

• *Indirect data*
  – Unstructured Interview
  – Structured Interview
    – Motivation Assessment Scale (MAS)
    – Functional Analysis Screen Tool (FAST)

• *Direct Observation*
  – Descriptive
  – Antecedent-Behavior-Consequence (ABC)
Toward a functional analysis of self-injury

Brian A. Iwata, Michael F. Dorsey, Keith J. Slifer, Kenneth E. Bauman, and Gina S. Richman

TOWARD A FUNCTIONAL ANALYSIS OF SELF-INJURY

The John F. Kennedy Institute and
The Johns Hopkins University School of Medicine
Direct (Experimental) Testing

Procedure

Manipulations of antecedents and consequences across 4 conditions:

- Attention
- Escape
- Play
- Alone
## Direct (Experimental) Testing

### Procedure

<table>
<thead>
<tr>
<th>Condition</th>
<th>Antecedent</th>
<th>Behavior</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td>Removal of attention</td>
<td>SIB</td>
<td>Access to verbal and physical attention</td>
</tr>
<tr>
<td>Escape</td>
<td>Introduction of high rates of demand</td>
<td>SIB</td>
<td>Removal of the demand</td>
</tr>
<tr>
<td>Play</td>
<td>Access to toys and delivery of attention in the absence of SIB</td>
<td>SIB</td>
<td>Ignore</td>
</tr>
<tr>
<td>Alone</td>
<td>No social environment or toys</td>
<td>SIB</td>
<td>Ignore</td>
</tr>
</tbody>
</table>
Outside of the “Laboratory”...

- Conclusions for the majority of functional assessments outside of highly specialized environments rely primarily on indirect data

**Problems**

a. Known to be inaccurate (describes the perception of an untrained observer)

b. Extrapolation of the results as if it is the identified function (misuse of the instrument)

c. Conclusions are susceptible to the influence of factors unrelated to the actual function


Sturmey (1994)
Outside of the “Laboratory”...

- Conclusions may also rely on direct observation but those often provide limited treatment value

**Problems**

a. Descriptions do not always rely on actual facts

b. Little to no summarization statements of the data occur
Outside of the “Laboratory”...

- Direct (Experimental) Tests as described are concerning
  - Ethical concerns
    - Reinforcement of problematic behaviors even if it is for short periods of time
  - Practical concerns (specially when used on typical environments such as schools, home, community)
    - Requires specialized training, environment, monitoring
    - Social acceptance (parents, other service providers)
    - Conditions of testing do not typically match those of natural environment
  - Theoretical Concerns
    - Antecedent conditions are not manipulated independently of the consequence conditions (e.g., Instruction signals attention vs. escape)
Symposium Presentations

Presentation 1
Introduce an alternative solution for raising hypotheses using a direct-observation structured instrument

Presentation 2
Describe three alternative procedures to test hypotheses regarding the function of problematic behaviors
DIRECT OBSERVATION OF CONSEQUENCES TOOL FOR RAISING HYPOTHESIS ABOUT FUNCTION OF PROBLEMATIC BEHAVIORS

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Goals

Phase 1
Evaluate and compare hypotheses regarding function of problematic behaviors from the FAST and MAS to a tool that relies on direct observation of consequences that follow problematic behaviors (Beacon Consequence Analysis Form - BCAF)

Phase 2
Evaluate accuracy of predicted hypotheses from FAST, MAS, and BCAF by contrasting the hypothesized function with results from a discrimination training functional assessment test.
Method

Participants

Twenty-two children diagnosed with ASD ranging in age from 3-8 years old. The participants engaged in one or more topographies of problematic behavior, including but not limited to tantrum, property destruction, self-injury, and elopement.

Tests and Materials

Hypothesis development tools: FAST, MAS, BCAF
Functional Assessment Screening Tool (FAST)

Iwata & DeLeon, 2005; Iwata, DeLeon, Roscoe, 2013

• Sixteen yes/no questions

1. Does the client usually engage in the problem behavior when he/she is being ignored or when caregivers are paying attention to someone else?
   [ ] Yes

2. Does the client usually engage in preferred activities [game] when they are taken away?
   [ ] Yes

3. When the problem behavior occurs, does the client down or try to engage and calm the client down or try to engage?
   [ ] Yes

4. Is the client usually well if they get attention or when preferred it?
   [ ] Yes

5. Is the client resistant when group activities?
   [ ] Yes

6. Does the client usually engage in the problem behavior when asked to perform a task or to participate in group activities?
   [ ] Yes

Scoring Summary - Circle the number from above of each question answered “Yes”.

<table>
<thead>
<tr>
<th>Items circled “Yes”</th>
<th>Total</th>
<th>Potential Source of Reinforcement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4</td>
<td>4</td>
<td>Attention/Preferred Items [Social]</td>
</tr>
<tr>
<td>5 6 7 8</td>
<td>8</td>
<td>Escape [Social]</td>
</tr>
<tr>
<td>9 10 11 12</td>
<td>12</td>
<td>Sensory Stimulation [Automatic]</td>
</tr>
<tr>
<td>13 14 15 16</td>
<td>16</td>
<td>Pain Attenuation [Automatic]</td>
</tr>
</tbody>
</table>
Functional Assessment Screening Tool (FAST)

Iwata & DeLeon, 2005; Iwata, DeLeon, Roscoe, 2013
Motivation Assessment Scale (MAS)

Durand & Cummins, 1988

- Sixteen questions about the likelihood an individual may behave in certain ways scored on a 0 (never) to 6 (always) scale

<table>
<thead>
<tr>
<th>Question</th>
<th>Sensory</th>
<th>Escape</th>
<th>Attention</th>
<th>Tangible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Would the bel person were l several hours</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>2. Does the beha difficult task?</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>3. Does the beha other persons</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>4. Does the beha this person ha</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>5. Would the behavior occur repeatedly, in the same way, for very long periods of time, if no one were around? (For.</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
</tr>
</tbody>
</table>

- Total Score =

- Mean Score = (divide the total score by 4)

- Relative Ranking (high score to low score)
Motivation Assessment Scale (MAS)

Durand & Cummins, 1988

* If there is a tie for the highest score or if the means of the top two categories are within 0.25 to 0.50 points (and you have clearly specified the behavior and setting), then both are considered as influences that may be causing the problem behavior to continue.
Beacon Consequence Analysis Form (BCAF)

- Direct-observation of objective and pre-determined list of consequences following each instance of the problem behavior

- Goal is to narrow the scope of consequences to be observed reducing training and increasing accuracy
BEACON CONSEQUENCE ANALYSIS FORM (BCAF)

Target Behavior: __________________________
Operational Definition (must be observable and measurable with clear onset and offset criteria): ____________________________________________________________

Record whether or not the behavior specified below occurred immediately after the target behavior occurred:

<table>
<thead>
<tr>
<th>Consequence Description</th>
<th>Occurrence of the Target Behavior's Immediate Effect on the Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

1A. Did a person speak to them during or within 20 seconds after the behavior occurs?

1B. Did a person speak to them using 1-5 words?

1C. Did a person speak to them using 6 or more words?

<table>
<thead>
<tr>
<th>Consequence Description</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

6A. The behavior resulted in a task/materials not being completed.

7A. A tangible (e.g., toys, electronics, edibles) item is presented immediately following the behavior.

7B. The behavior results in the person obtaining and keeping a tangible item for more than 1 minute.

7C. The behavior results in the person obtaining and keeping a tangible item for less than 1 minute.

8A. No one touched, talked to, looked at them or moved any items or materials in the environment (0-60 seconds) after the behavior occurred and the behavior did not END with an intervention.

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Beacon Consequence Analysis Form (BCAF)
Beacon Consequence Analysis Form (BCAF)

- **Attention**
  - Verbal Attention
  - Eye Contact
  - Physical Attention
  - Proximity

- **Verbal Attention**
  - 1-5 Words
  - > 5 Words

- **Physical Attention**
  - 1-5 Sec
  - > 5 Sec

- **Escape/Avoidance**
  - Percentage Occurrence
  - Escape
  - Avoidance

- **Tangible**
  - Percentage Occurrence
  - < 1 Min
  - > 1 Min

**Quality of Attention (Duration)**

**Type**

**Quality of Tangible (Duration)**
Method

Participants
Twenty-two children diagnosed with ASD ranging in age from 3-8 years old. The participants engaged in one or more topographies of problematic behavior, including but not limited to tantrum, property destruction, self-injury, and elopement.

Tests and Materials
Hypothesis development tools: FAST, MAS, BCAF

Procedure
Participant’s parents completed the FAST and MAS based on the most significant problem behavior occurring at home. Direct observation of consequences were collected and summarized by the staff on the case using the BCAF.
Method

Measures

Measures of specificity of predictions and correspondence across predictions from the 3 instrument were calculated.

They were:

- **Specificity**: Average number of predictions and percentage of a single prediction per administration of each instrument
- **Correspondence**: Percentage of times a number of instruments agreed on one common function or did not agree at all
Results

- Specificity

<table>
<thead>
<tr>
<th></th>
<th># of predicted functions per administration</th>
<th>% of times only 1 function was predicted</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAST</td>
<td>1.82</td>
<td>6%</td>
</tr>
<tr>
<td>MAS</td>
<td>1.45</td>
<td>14%</td>
</tr>
<tr>
<td>BCAF</td>
<td>1.36</td>
<td>14%</td>
</tr>
</tbody>
</table>
Results

• Correspondence
  – All three instruments predicted at least one common function 36% of the time.
  – Two instruments predicted at least one common function 55% of the time.
  – The percentage of times that the instruments had no agreements was 9%.
Goals

Phase 2
Evaluate accuracy of predicted hypotheses from FAST, MAS, and BCAF by contrasting the identified function from a discrimination training functional assessment test.
Method

Participants
Ten participants who had a functional analysis (test of hypothesized function) completed and at least one of the hypotheses generating tools completed were included in the analysis.

Tests and Materials
Hypothesis development tools: FAST, MAS, BCAF
Functional Analysis: Free-operant, Forced-choice, FCT
Method

Procedure

• Following the administration of the tests, an analysis of the hits, misses, false alarms, and correct rejections was conducted per instrument and per function
# Results

## Accuracy

<table>
<thead>
<tr>
<th>Instruments</th>
<th>FAST (n=8)</th>
<th>MAS (n=3)</th>
<th>BCAF (n=10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hits</td>
<td>75.0%</td>
<td>33.3%</td>
<td><strong>100.0%</strong></td>
</tr>
<tr>
<td>Correct Rejection</td>
<td>62.5%</td>
<td>77.8%</td>
<td><strong>93.3%</strong></td>
</tr>
<tr>
<td>Misses</td>
<td>8.3%</td>
<td>22.2%</td>
<td><strong>0.0%</strong></td>
</tr>
<tr>
<td>False Alarms</td>
<td>37.5%</td>
<td>22.2%</td>
<td><strong>6.7%</strong></td>
</tr>
</tbody>
</table>

* The highest score for Hits and Correct Rejection and lowest scores for misses and false alarms are in bold font to indicate the best instrument in each category.
Conclusions

• An ideal instrument should make the least number of predictions. Moreover the predictions need to be accurate. An analysis of accuracy should strive for high rates of hits and correct rejections and low rates of misses or false alarms.

• Both misses and false alarms lead the practitioner to pursue treatment in the wrong direction wasting clients and practitioners valued time and resources.
Conclusions

• Even though the FAST and MAS require less effort as they are obtained from interview and do not require direct observation, they had higher percentage of misses and false alarms

• The analysis supported the use of BCAF with the lowest number of predictions and the most accurate with higher rates of hits and correct rejections and lower rates of misses and false alarms
Extended use of BCAF

Analysis of *differential consequences* delivered. For example:

**Following Instructions**

<table>
<thead>
<tr>
<th>Hypothesized Function</th>
<th>Percentage Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td>High</td>
</tr>
<tr>
<td>Escape/Avoidance</td>
<td>Low</td>
</tr>
<tr>
<td>Tangible</td>
<td>Medium</td>
</tr>
<tr>
<td>Sensory/Automatic</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Disruptive Behaviors**

<table>
<thead>
<tr>
<th>Hypothesized Function</th>
<th>Percentage Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td>High</td>
</tr>
<tr>
<td>Escape/Avoidance</td>
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<td>Medium</td>
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<tr>
<td>Sensory/Automatic</td>
<td>Low</td>
</tr>
</tbody>
</table>
Extended use of BCAF

Analysis of *differential consequences* delivered. For example:

**Following Instructions**

**Disruptive Behaviors**
EXPERIMENTAL METHODS FOR ASSESSING FUNCTION WITHOUT DIRECT REINFORCEMENT OF PROBLEMATIC BEHAVIORS

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Introduction

Attempted to identify alternatives to conducting a functional analysis that involves teaching functional communication responses rather than reinforcing problematic behaviors.

Three alternatives used:

- Free Operant
- Forced Choice
- Teaching Functional Response
Free Operant Functional Assessment

Description:
Student is presented an opportunity to choose between two locations (one in which they access demands and attention and one where demands are not present and attention is not available).

Two Responses:
Choose to spend time in location with no demands (escape)
Choose to spend time in location with demands but attention available (attention)

Steps:
✓ Clearly discriminate boundaries of room
✓ Ensure environment can be as controlled as possible (distracting, competing variables stimuli, tangibles, siblings, parents, etc)
✓ Identify which location will have which consequence
✓ Identify measurement procedures and how data will be collected.
Beacon Consequence Analysis Form (BCAF)

Overall BCAF Results

<table>
<thead>
<tr>
<th>Hypothesized Function</th>
<th>Percentage Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td>100</td>
</tr>
<tr>
<td>Escape/Avoidance</td>
<td>20</td>
</tr>
<tr>
<td>Tangible</td>
<td>10</td>
</tr>
<tr>
<td>Sensory/Automatic</td>
<td>10</td>
</tr>
</tbody>
</table>
Free Operant Functional Assessment

No Demands + No Attention

Demands + Attention
Free Operant Functional Assessment

No Demands + No Attention: 33%

Demands + Attention: 66%
Free Operant Functional Assessment

Verbal Attention

Physical Attention

No Demands + No Attention

10% Verbal Attention

90% Physical Attention
Results

Attention vs. Escape Test

% Time Spent in Designated Area

Function

Sessions

Physical vs. Verbal Attention Test

Designated attention area divided

Physical

Verbal

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Force Choice Functional Assessment

Description:
Student is presented an opportunity to choose between two responses (compliance or non-compliance)

Two Responses:
• Choose with follow instruction
• Choose not to follow instruction

Steps:
✓ Identify target responses
✓ Ensure environment can be as controlled as possible (distracting, competing variables stimuli, tangibles, siblings, parents, etc)
✓ Identify which response (compliance or non-compliance) will have which consequence
✓ Identify measurement procedures and how data will be collected.
**Force Choice Functional Assessment**

“Sit Down”

Therapist provides physical prompting to sit and verbal praise for doing so.
Results

![Graph showing Results]

- Independent response
- Prompted Response
- Problem Behaviors

Cumulative Choice

Occurrence

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Force Choice Functional Assessment

“Sit Down”
Force Choice Functional Assessment

Therapist provides a gesture prompt and then verbal praise ONLY
Force Choice Functional Assessment

Therapist provides physical and verbal feedback

“Sit Down”
Results
Teaching Functional Response
Functional Assessment

Description:
Student is able to choose between three responses all of this

Three Responses
• Choose to use known functional response (tap/”excuse me”)
• Choose to use new functional communication response (“let’s go play”)
• Choose to engage in problematic behavior (grabbing, screaming, bumping, stealing seat)

Steps
✓ Identify target responses
✓ Ensure environment can be as controlled as possible (distracting, competing variables stimuli, tangibles, siblings, parents, etc)
✓ Identify which response will have which consequence (differential reinforcement)
✓ Identify measurement procedures and how data will be collected.
  • Collect baseline data of current rate for 3 responses
  • Expose to pre - teach new target
Beacon Consequence Analysis Form (BCAF)

BCAF Overall Results

Percentage Occurrence

Frequency / Occurrences of Behavior

Hypothesized Function

Attention
Escape/Avoidance
Tangible
Sensory / Automatic

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Teaching Functional Response

Functional Assessment

Tap and say “Excuse me”

Engage in Problem Behavior

“Let’s go play”
Teaching Functional Response
Functional Assessment

Tap and say “Excuse me”

Engage in Problem Behavior

“Let’s go play”
Teaching Functional Response

Functional Assessment

Tap and say “Excuse me”

Engage in Problem Behavior

“Let’s go play”
Results

Baseline

- Known FCR
- Problem Behavior
- New FCR

Functional Communication Training

Frequency (Instances)

Time

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Discussion

• Direct observation data versus subjective caregiver reports
  – Discredited for preference assessments yet still widely used for FA

• Hypothesis development versus identification of function – Why it testing the hypothesis omitted?

• Too many functions & missing actual function
  – Efficiency matters
Discussion

• Ethical Hypothesis testing
  – Determining if the consequence is a reinforcer for similar response should not require you to reinforce problem behavior
  – Testing consequence conditions that do not occur is inefficient and unrelated to function

• Our technology of application must continue to improve
  – Social validity (settings, procedures and implementers)
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