**Main Points**

- **Learned Functions of Problem Behavior**
- **Approaches to Assessment**
  - Indirect methods
  - Descriptive analysis
  - Functional (experimental) analysis
- **Functional analysis methodology**
  - Key components
  - Variations and extensions
- **Implications for Treatment**
  - Elimination of establishing operations (EOs)
  - Elimination of maintaining contingencies
  - Behavioral replacement
Why do people engage in problem behavior?

Biology: Physiological predisposition
- Genetic endowment ➔ behavioral capacities
- Physiology does not produce specific problem behavior

Personality: Mental or emotional disorder
- Behavioral symptoms ➔ clinical diagnosis
- Clinical diagnosis ≠ explanation for symptoms

Environment: Learning history
- Experience ➔ new behavior
- Certain experiences ➔ problem behavior
Structural vs. Functional Analysis

- **Structural analysis:**
  - Identification of parts or components
  - General: Of what is this thing made?
  - Environment & behavior: What events are happening?

- **Functional analysis:**
  - Identification of uses or purpose
  - General: What does this thing do?
  - Environment & behavior: Why are these events happening?

Functional Analysis of Behavior

- **Purpose:**
  - To identify the variables of which behavior is a function; to discover "cause-effect" relationships (Skinner, 1953)

- **Goals:**
  - Understanding
  - Treatment
  - Prevention
Learned Functions of Behavior Disorders

- Assumptions
  - Most behavior problems are learned
  - Adaptive and maladaptive behavior have common functions

- Positive Reinforcement (Sr+, reward)
  - Social (attention, access to tangible materials)
  - Automatic (sensory stimulation)

- Negative Reinforcement (Sr-, escape or avoidance)
  - Social (escape from task demands)
  - Automatic (pain attenuation)

Social-Positive Reinforcement (Social Sr+)

Antecedent event
(Deprivation from attention)
↓
Behavior
(SIB, AGG, PD, etc.)
↓
Consequent event
(Blocking, reprimand, comfort, leisure items, snacks, etc.)
<table>
<thead>
<tr>
<th>Function</th>
<th>Antecedent (EO)</th>
<th>Consequent (Sr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Positive Reinforcement</td>
<td>Deprivation (no attention)</td>
<td>Attention</td>
</tr>
<tr>
<td>Automatic Positive Reinforcement</td>
<td>Deprivation (no sensory stimulation)</td>
<td>Sensory stimulation</td>
</tr>
<tr>
<td>Social Negative Reinforcement</td>
<td>Aversive stimulation (task demands)</td>
<td>Removal of task</td>
</tr>
<tr>
<td>Automatic Negative Reinforcement</td>
<td>Aversive stimulation (pain or discomfort)</td>
<td>Alleviation of pain</td>
</tr>
</tbody>
</table>

**Self-Injurious Behavior (SIB)**

*Behavior that produces injury to the individual’s own body*

- **Biting:** Closure of upper / lower teeth on the skin (also mouthing and sucking)
- **Eye Gouging:** Finger insertion into the ocular area
- **Head Banging:** Forceful contact of the head with a stationary object
- **Hitting:** Forceful contact of one body part with another or with a stationary object
- **Pica:** Ingestion of inedible substances
- **Rumination:** Regurgitation and reswallowing of previously ingested food
- **Scratching:** Raking-like or picking movement of fingernails on the skin
Functional Behavioral Assessment

**Precision**                      **Simplicity**

*Least*  Anecdotal (Indirect) Methods  *Most*

Descriptive (Naturalistic) Analysis

Functional (Experimental) Analysis

- **Terminology**
  - Functional behavioral assessment (**FBA**): Any systematic attempt to identify sources of reinforcement for problem behavior
  - Functional analysis (**FA**): Use of the experimental model to identify cause-effect (environment-behavior) relations

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**Kahng et al. (AJMR, 2002)**

Cumulative Number of Data Sets by Type of Assessment

- Experimental Analysis
- Descriptive Analysis
- Indirect Assessment
Indirect (Anecdotal) Methods

- General Characteristics
  - Focus on circumstances under which behavior occurs
  - Based on informant recall (no direct observation)
- Examples
  - MAS (Motivational Assessment Scale)
  - QABF (Questions about Behavioral Function)
  - FAST (Functional Analysis Screening Tool)
- Advantages
  - Simplicity, efficiency
- Limitations
  - Poor reliability, questionable validity
- Suggestion for implementation
  - Use only as a preliminary guide

Descriptive (Naturalistic) Analysis

- General Characteristics
  - Direct observation of circumstances under which behavior occurs
- Examples
  - Scatter plot: Temporal recording of behavior
  - ABC analysis: Recording of interactional sequences
  - Interval recording: Temporal recording of rapid sequences
- Advantage
  - More reliable than indirect methods
- Limitations
  - Structural analysis only; no information about function
### Scatter Plot

Data Grid
- Rows: 30-min intervals
- Columns: days
- Summary at bottom

Record at end of 30-min intervals
- Blank: No PB
- / (yellow): A little PB
- X (red): A lot of PB

Summary
- # intervals with PB

---

### A-B-C Analysis

**Purpose**
- To identify naturally occurring, observable antecedents and consequences of behavior

**Typical procedure**
- Define target behaviors (B)
- Specify criteria for antecedent (A) and consequent (C) events
- Occurrence of B ➔ Record A, B, and C
- Organize A-C clusters
- Generate hypothesis based on A-C correlations with B
**A–B–C Form**

**Layout**
- Client info
- Time
- Location
- Antecedent: Precedes PB
- Behavior: Target PB
- Consequence: Follows PB

**Record**
- Occurrence of PB serves as occasion for recording

**Summary**
- Organize A & C events into functional groupings

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**Functional (Experimental) Analysis**

- **General Characteristics**
  - Systematic exposure to controlled assessment conditions
    - Test: Suspected antecedent and consequent present
    - Control: Suspected antecedent and consequent absent
- **Variations**
  - BFA, single-function, trial based, latency, precursor
- **Advantage**
  - Most precise method of assessment
- **Limitation**
  - Most complex approach
**Some Key Terms**

- **Antecedent event: Establishing operation (EO)**
  - **Alters the effects of a reinforcer**
  - **EO present: Sr more valuable**
  - **EO absent: Sr less valuable**
  - **Example: Food deprivation ➔ food more valuable**

- **Antecedent event: Discriminative stimulus (SD)**
  - **Stimulus in whose presence reinforcement is more likely**
  - **SD present: Sr available**
  - **SD absent: Sr unavailable**
  - **Example: Traffic light ➔ Stop/go more likely to be reinforced**

- **Consequent event: Reinforcement contingency (Sr)**
  - **If-then relation between a response and a consequence**
  - **Contingency present: Behavior maintains**
  - **Contingency absent: Behavior extinguishes**

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**Functional Analysis Protocol**

<table>
<thead>
<tr>
<th>Condition</th>
<th>SD</th>
<th>EO</th>
<th>Consequence</th>
<th>Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Attention</strong></td>
<td>Th 1</td>
<td>Th. ignores Cl.</td>
<td>Th. attends to beh. problem</td>
<td>Positive rfmnt (attention)</td>
</tr>
<tr>
<td><strong>Demand</strong></td>
<td>Th 2</td>
<td>Th. presents learning trials</td>
<td>Timeout for beh. problem</td>
<td>Negative rfmnt (escape)</td>
</tr>
<tr>
<td><strong>Alone</strong></td>
<td>N/A</td>
<td>No stimulation</td>
<td>N/A</td>
<td>N/A (Automatic reinf?)</td>
</tr>
<tr>
<td><strong>Play</strong></td>
<td>Th 3</td>
<td>N/A</td>
<td>N/A</td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Attn: Free</td>
<td>Demands: None</td>
<td>Toys: Free</td>
</tr>
</tbody>
</table>
Typical Response Patterns

Function: Social Positive Reinforcement (attention)

Function: Social Negative Reinforcement (escape)

Function: Automatic Reinforcement (self-stimulation)

Multielement Design

Key feature
- All conditions alternated rapidly

Advantages:
- Most efficient for multiple comparisons
- Limits exposure (sequence effect)

Limitation
- Requires rapid discrimination
Reversal Design

- **Key feature**
  - Repeated exposure to each condition
- **Advantage:**
  - Facilitates discrimination
- **Limitation**
  - Potential sequence effect

Pairwise Test-Control Design

- **Key features**
  - Single test and control conditions alternated
  - Test conditions arranged in reversal sequence
- **Advantage:**
  - Combines best features of multielement and reversal designs (facilitates discrimination, controls for sequence effect)
- **Limitation:** None
Challenges to Functional Analysis Methodology

- Complexity of assessment: It’s too difficult
- Time constraints: It takes too much time
- Setting constraints: I don’t have a controlled setting
- High-risk behavior: It’s too dangerous
- Low-rate behavior: I never see the behavior
- Uninterpretable results: I can’t identify the function

Complexity of Assessment: Logic & Data

- Logical analysis
  - What skills are required to conduct a functional analysis?
- Empirical analysis
  - Undergraduate students (Iwata et al., 2000)
  - B.A.-level therapists (Moore et al. 2002)
  - Teachers (Wallace et al., 2004)
  - Teleconferencing (Barretto et al., 2006)
Time Constraints
Brief Functional Analysis (BFA)

- Northup et al. (1991): One, 5-min session of each condition
- Derby et al. (1992): 50% functions identified (40/79)

![Graph showing Time Constraints: Single Function Tests]

![Graph showing Time Constraints: Single Function Tests]
Setting Constraints

❖ FA in the home?
  - Day et al. (1994), Harding et al. (2001), Nadjowski et al. (2008)

❖ Typical FA in typical classroom?
  - Berg et al. (2007); Derby et al. (1994); Dolezal & Kurtz (2010); Frea & Hughes (1997); Grauvogel & Wallace (2010); Lang et al. (2008, 2009, 2010); McComas et al. (2000, 2003); Mueller et al. (2003); O’Reilly et al. (2009)

Classroom-Specific, Trial-Based FA
(Bloom et al., 2011, 2013; Kodak et al., 2013; Lambert et al., 2013)

Classroom restrictions
  - Rapidly changing activities ➔ Brief sessions
  - Contiguous test-control comparison (control precedes test)
  - Capitalize on naturally occurring activities

Study arrangement (Bloom et al.): 4-min trial
  - 2-min control ➔ PB yes or no
  - 2-min test ➔ PB yes or no

Recommended arrangement: 5-min trial
  - 1-min control ➔ PB yes or no
  - 4-min test ➔ PB yes or no
FA Trials

- Attention (no tasks present)
  - Control: Stand near student; initiate pleasant conversation
  - Test: Stand near student but ignore; deliver attention only following problem behavior

- Task Demand
  - Control: Observe while no task demands are present
  - Test: Deliver frequent prompts to engage in difficult work; remove work following problem behavior

- Alone
  - Two consecutive test segments. Observe when student is not working, not interacting with others, and has no access to leisure items

Correspondence: Social Sr+

[Graph showing aggression levels and sessions]
High-Risk Behavior

- Latency FA *(Thomason, Iwata, Neidert, & Roscoe, 2011, Study 3)*
- \( N=10 \), SIB or AGG
- Latency FA
  - Deliver consequence for 1st response and terminate session (or if no response in 5 min)
  - Measure: # seconds to occurrence of 1st response
- Typical FA: Standard protocol, 10-min sessions
- Results: 9/10 correspondence
Correspondence: Social Sr+ (Attention)

Correspondence: Social Sr- (Escape)
Precursor Behavior & Response Classes

Definition
- Topographically different than target response
- Precedes and predicts occurrence of target

Chain relation (sequence of responses, different reinforcers)
- Put on coat (stay warm) ➔ walk out door (go somewhere)
- Get out of chair (close to target) ➔ aggression (attn or escape)

Response class (substitutable responses, same reinforcer)
- Ask for water (water) ➔ go looking for water (water)
- Swear at teacher (escape) ➔ aggression (escape)

High-Risk Behavior

Analysis of precursor behavior (Smith & Churchill, 2002)
- N = 4 (3 SIB, 1 AGG)
- FA #1: Contingencies on SIB / AGG
- FA #2: Contingencies on precursor Rs
- Results:
  - 4/4 matched FAs
  - SIB lower during FA of precursor R
- Implications
  - If one can identify a precursor to PB, and
  - If precursor and PB members of the same functional class
  - FA of precursor ➔ function of PB
  - Treatment of PB based on function of precursor
**Why does Problem Behavior Occur at Low Rates?**

- **Insufficient exposure to test condition**
  - Lengthen sessions (Davis et al., 2012)
- **Idiosyncratic EO or reinforcer**
  - See reviews (Hanley et al., 2003; Schlechenmeyer et al., 2013)
- **Response class hierarchy**
  - Do not combine PBs (Richman et al., 1999)
- **Combined EOs (same maintaining contingency)**
  - Divided attention condition (Mace et al., 1986)
- **Combined contingencies (Sr+ and Sr- simultaneously)**
  - Escape to tangible condition (Zarcone et al., 1996)
- **Covert behavior**
  - Hidden observation (Ringdahl et al., 2002)
  - Response product measures (Maglieri et al, 2000)

**Undifferentiated Results: Case Analysis**

*(Hagopian et al., 2013)*

**Modifications to 82 undifferentiated FAs**

- Most effective: Design change (pairwise, extended “alone”)
- 2nd most effective: Separating aggregate responses
- Least effective: Antecedent changes (location, stimuli)

**Results**

- One modification: 55/82 cases clear
- Two modifications: 16/24 cases clear
- 8 cases unresolved
Summary of Functional Analysis Variations

<table>
<thead>
<tr>
<th>Limitation</th>
<th>Suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity</td>
<td>Sorry, I cannot help you</td>
</tr>
<tr>
<td>Time</td>
<td>BFA (extended), Single-function test</td>
</tr>
<tr>
<td>Setting</td>
<td>Trial-based FA</td>
</tr>
<tr>
<td>Risk</td>
<td>All approximations and occurrences, Protective devices, Latency or Precursor FA</td>
</tr>
<tr>
<td>Low-rate</td>
<td>Lengthen sessions, combine EOs or contingencies, unobtrusive observation</td>
</tr>
<tr>
<td>A mess</td>
<td>Simplify design, separate PBs</td>
</tr>
</tbody>
</table>

RECAP: Functional Behavioral Assessment

✧ Indirect Methods
  ♦ Simple but unreliable

✧ DA: Descriptive (Naturalistic) Analysis
  ♦ Reliable but time consuming; structural analysis only

✧ FA: Functional (Experimental) Analysis
  ♦ The gold standard but complex

✧ Common recommendations
  ♦ Three-stage assessment: Indirect ➔ DA ➔ FA
  ♦ Two-stage assessment: DA ➔ FA
  ♦ My suggestion: Neither
What about DA vs. Indirect Methods?

ABA based on scientific study of human behavior
- Emphasis on objective measurement
- Direct observation (DA) superior to opinion (indirect)

BUT
- DA: Objective approach to structural analysis
- Indirect: Subjective approach to functional analysis

And if you read the research carefully:
- Neither method identifies cause-effect relations very well
- DA much more complex than indirect
- DA takes about 15-20 times longer than indirect
- Clinical interview easily accommodates indirect assessment
- DA poses some risk; Indirect poses none
- Indirect errors probably random; DA errors probably biased

So . . . which would you use?

Recommended Assessment Sequence

Step #1: Clinical interview + MAS, QABF, or FAST

Step #2: Brief (10-15 min) observation (or skip entirely)

Step #3: Functional analysis (FA, BFA, single function test, trial-based FA, latency FA, precursor FA)

Rationale: Clinicians may do #1 well but not #2 or #3. Compare the value of watching a client for 30 min (#2) vs. seeing what a client does when ignored, when presented with demands, etc. (#3)
Barriers to Implementation

Current status of FA methods
- The standard in clinical research and practice
- Still not the most common approach to assessment
- Why the 30+ year lag in widespread application?

Commonly mentioned limitations
- Practical constraints
- Ethical issues

The real barriers
- Most academics have never conducted an FA of PB
- Most graduate students never learn how to conduct an FA
- DA is an excellent structural analysis (A ➝ B ➝ C)
- Everyone knows how to conduct a DA

Implications for Intervention
Classification of Intervention Procedures

- Structural approach: Emphasis on procedures
  - Advantage: Well-defined practice guidelines
    - Time out, overcorrection
  - Disadvantage: Behavior chance mechanisms unknown
    (Same procedure ➔ different results)
    - Planned ignoring ➔ extinction vs. Sr-
    - Reprimand ➔ punishment vs. Sr+

- Functional approach: Emphasis on contingencies
  - Advantage: Generalizable across response functions
    - Extinction ➔ cessation of reinforcement
  - Disadvantage: Procedural details not well specified
    - Extinction ➔ what procedures?

Reinforcement-Based Approaches to Behavior Reduction

- Eliminate the behavior’s establishing operation or antecedent event (deprivation or aversive stimulation)
  - Noncontingent reinforcement (NCR)

- Eliminate the behavior’s maintaining contingency
  - Extinction (EXT)

- Replace the behavior with an alternative response
  - Differential reinforcement (DRA)
Function: Social Positive Reinforcement

- Establishing operation: Deprivation from attention
  - Noncontingent attention (NCR)

- Maintaining reinforcer: Attention
  - EXT (attention) or “planned ignoring”

- Behavioral replacement:
  - Establish an alternative attention-seeking response

Function: Social Negative Reinforcement

- Establishing operation: Aversive stimulation (e.g., demands)
  - Noncontingent breaks from work (NCR)
  - Maintenance tasks substituted for acquisition tasks
  - Reduced session duration
  - Demand fading (frequency or difficulty)
  - High probability (Hi-p) instructional sequence
  - Noncontingent Sr+

- Maintaining reinforcer: Escape
  - EXT (escape); EXT (attention) contraindicated

- Behavioral replacement:
  - Reinforce precursor behavior
  - Establish an alternative escape behavior
  - Strengthen compliance via Sr- and Sr+
Function: Automatic Positive Reinforcement

- Establishing operation: Generalized deprivation
  - Noncontingent stimulation (NCR)

- Maintaining reinforcer: Sensory stimulation
  - EXT (sensory); mechanical devices, blocking, etc.
  - Response effort interventions

- Behavioral replacement:
  - Establish an alt. self-stimulatory response

Multiple Control - Treatment

<table>
<thead>
<tr>
<th>Functions</th>
<th>Attention Seeking Response</th>
<th>Escape Response</th>
<th>Self-Stimulatory Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Sr+ Social Sr-</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Social Sr+ Automatic Sr+</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Sr- Automatic Sr+</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

The problem: Social Sr+ & Social Sr-

- Extinction procedurally incompatible across functions
  Sr+(terminate interaction) vs. Sr- (continue interaction)
- Use context as the determinant of intervention
- Demands absent: Assume Sr+; Demands present: Assume Sr-
Summary

You **SHOULD** conduct a functional analysis
- More reliable than a questionnaire or rating scale
- More efficient and precise than a DA

You **CAN** conduct a functional analysis
- Easy to do (control antecedent and consequent events)
- Procedural variations for almost all limiting conditions

Results of a functional analysis
- Identify effective reinforcement-based interventions