

“We tried reinforcement, but it didn’t work.”

Analyzing Contingency Failures
in Instructional Settings

Iser DeLeon, Ph.D., BCBA-D



General Outline

- *Behavior Analysts say the funniest things*
 - *Reflections on the value of conceptual coursework in relation to loose talk in behavior analytic practice*
- *Reinforcement failures:*
 - *Problems with preference assessment*
 - *Problems with the stimulus*
 - *Problems with contingency or context*
- *Closing comments on:*
 - *A general approach to reinforcer selection*
 - *The value of conceptual coursework for behavior analysts*

First, a disclaimer.

Towards Higher Standards of Training

• *Upcoming changes on BACB® task list*

- » The task list was reorganized to feature two main sections: Foundations and Applications
- » The basic and theoretical content was moved from the Foundational Knowledge appendix of the prior version into the task list
- » The entire *Professional and Ethical Compliance Code for Behavior Analysts* was incorporated as a section
- » Two new sections (Selecting and Implementing Interventions; Personnel Supervision and Management) were added by relocating existing relevant tasks and adding new ones
- » Tasks were removed, added, or reworded to improve clarity

Towards Higher Standards of Training

• *Upcoming changes in BACB® educational standards*

BCBA: The applicant must complete graduate-level instruction in the following content areas and for the number of hours specified.

Fifth Edition (Implementation: 2022)		Fourth Edition (Implementation: 2015)	
BACB Compliance Code and Disciplinary Systems; Professionalism <i>Note: The content must be taught in one or more freestanding courses.</i>	45 hrs	Ethical and Professional Conduct <i>Note: The content must be taught in one or more freestanding courses.</i>	45 hrs
Philosophical Underpinnings; Concepts & Principles <i>Note: 45 hours must be taught as one freestanding course on concepts and principles.</i>	90 hrs	Concepts and Principles of Behavior Analysis	45 hrs
Measurement, Data Display and Interpretation; Experimental Design <i>Note: The content must be taught in one freestanding course.</i>	45 hrs	Measurement (including data analysis)	25 hrs
Behavior Assessment	45 hrs	Experimental Design	20 hrs
Behavior-Change Procedures; Selecting and Implementing Interventions	60 hrs	Identification of the Problem and Assessment	30 hrs
		Fundamental Elements of Behavior Change and Specific Behavior Change Procedures	45 hrs
		Intervention and Behavior Change Considerations	10 hrs
		Behavior Change Systems	10 hrs
Personnel Supervision and Management	30 hrs	Implementation, Management, and Supervision	10 hrs
		Discretionary	30 hrs
Total	315 hrs	Total	270 hrs

**Some presidents spend too much time
on social media.**

Online Chatter about Standards Changes

- **Who is chattering?**
 - Changes do not impact current behavior analysts
 - Changes impact, but do not trouble, future behavior analysts
 - The changes do impact those that administer training programs.

Online Chatter about Standards Changes

- **What are they saying?**
 - *Hardship for some university programs*
 - *Will reduce the number of future BCBA's in the face of increasing demand*
 - *Unnecessary for work as an applied behavior analyst*

Behavior Analysts say the funniest things...

“The kiddo didn’t generalize it”

- The translation: “Stimulus conditions that differed from the training condition failed to exert control.”
- The concern:
 - A matter of agency; betrays our essential assumptions of causation; the causes of behavior are to be found in the environment.
 - There seems little we could do about a “non-generalizer,” but there is probably a lot we could do about an environment that fails to capture a behavior change established in a different context.
- “It is simpler, in both theory and practice, to restrict ourselves to the fact that consuming salty hors d’ouevres leads to drinking.”
(Skinner, 1953)

Behavior Analysts say the funniest things...

“Extinction isn’t effective with him.”

- The translation: “We arranged what we thought was an extinction contingency, but the behavior did not decrease.”
- The concern:
 - Again, a matter of agency
 - There seems little we could do about an individual whose behavior does not extinguish
- More accurate accounts:
 - The withheld stimulus was not the reinforcer
 - Extinction is impracticable; it isn’t extinction when the target behavior continues to be reinforced.

Behavior Analysts say the funniest things...

“We conducted a functional analysis, but it didn’t tell us anything.”

- The translation: “We followed a process known to be effective in uncovering functional relations under other circumstances, but it wasn’t”
- The concerns:
 - Surrenders to the conclusion that the relevant variables are unknowable.
 - Fails to acknowledge that functional analysis is a process, not a procedure
- It is not difficult to learn how to conduct a conventional functional analysis (e.g. Wallace et al., 2004); it’s a very different thing to understand:
 - *How to interpret a functional analysis*
 - *How to interpret ambiguous results*
 - *What to do if your functional analysis is not clear*
 - *What variables to manipulate to clarify it, etc.*

*INITIAL FUNCTIONAL ANALYSIS OUTCOMES AND
MODIFICATIONS IN PURSUIT OF DIFFERENTIATION:
A SUMMARY OF 176 INPATIENT CASES*

LOUIS P. HAGOPIAN, GRIFFIN W. ROOKER, JOSHUA JESSEL, AND ISER G. DeLEON

KENNEDY KRIEGER INSTITUTE AND JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE

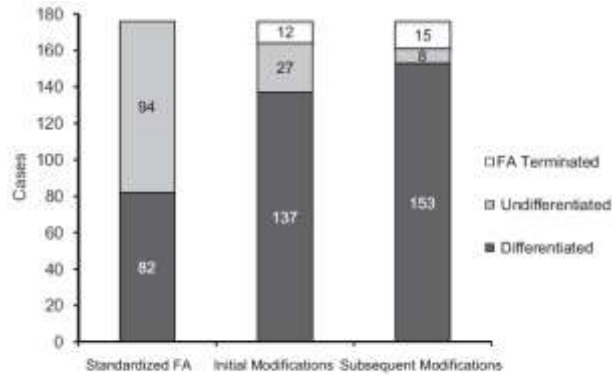


Figure 1. Summary of FA results.

*FUNCTIONAL ANALYSIS OF PROBLEM BEHAVIOR: A SYSTEMATIC
APPROACH FOR IDENTIFYING IDIOSYNCRATIC VARIABLES*

EILEEN M. ROSCOE

NEW ENGLAND CENTER FOR CHILDREN

AND

KEVIN J. SCHLICHENMEYER AND WILLIAM V. DUBE

UNIVERSITY OF MASSACHUSETTS MEDICAL SCHOOL, SHRIVER CENTER

<p>1. Problem Behavior</p> <p>2. Setting</p> <p>3. Time</p> <p>4. Antecedents</p> <p>5. Consequences</p> <p>6. Functional Analysis</p> <p>7. Interventions</p> <p>8. Outcomes</p>	<p>9. Problem Behavior</p> <p>10. Setting</p> <p>11. Time</p> <p>12. Antecedents</p> <p>13. Consequences</p> <p>14. Functional Analysis</p> <p>15. Interventions</p> <p>16. Outcomes</p>	<p>17. Problem Behavior</p> <p>18. Setting</p> <p>19. Time</p> <p>20. Antecedents</p> <p>21. Consequences</p> <p>22. Functional Analysis</p> <p>23. Interventions</p> <p>24. Outcomes</p>	<p>25. Problem Behavior</p> <p>26. Setting</p> <p>27. Time</p> <p>28. Antecedents</p> <p>29. Consequences</p> <p>30. Functional Analysis</p> <p>31. Interventions</p> <p>32. Outcomes</p>	<p>33. Problem Behavior</p> <p>34. Setting</p> <p>35. Time</p> <p>36. Antecedents</p> <p>37. Consequences</p> <p>38. Functional Analysis</p> <p>39. Interventions</p> <p>40. Outcomes</p>
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Behavior Analysts say the funniest things...

“We tried reinforcement, but it didn’t work.”

- *The translation: We arranged a response-consequence contingency, but failed to produce a meaningful change in the behavior or aspect of behavior*
- *The concerns:*
 - *Gives up on a given stimulus, or worse, a contingency*
 - *Agency: the child, not the environment*
 - *Ignores the myriad reasons why this could have occurred and how it could be rectified.*

Sources of Contingency Failures

➤ Problems with Preference Assessment

1. *You did not try to systematically identify a reinforcer*
2. *Your preference assessment did not identify a preferred stimulus*
3. *You identified a “preferred stimulus,” but it was a false positive*

➤ Problems with the Stimulus

4. *The stimulus is not a reinforcer for this response*
5. *The stimulus is not a reinforcer right now*
6. *The economy is open*
7. *The stimulus is no longer a reinforcer*

➤ Problems with the Contingency or Context

8. *The reinforcer serves other stimulus functions in this context*
9. *The stimulus is not valuable when it’s segmented*
10. *The stimulus delivery is too delayed*

You did not try to systematically identify a reinforcer.

Table 1. Commonly Used SPAs

Name of Assessment (Citation)	Description of Assessment
Single-stimulus (SS) (Pace et al., 1985)	Across a series of trials, stimuli are presented one at a time. Approach responses (e.g., moving hand or body toward the item) are recorded. Preference hierarchies are established by calculating the percentage of approach responses per stimulus.
Paired-stimulus (PS) (Fisher et al., 1992)	Across a series of trials, stimuli are presented two at a time; individuals can approach (i.e., select) only one item on a trial. Approach responses are recorded. Preference hierarchies are established by calculating the percentage of approach responses per stimulus.
Multiple-stimulus-without-replacement (MSWO) (DeLeon & Iwata, 1996)	At the start of each session, multiple stimuli are placed in front of the individual, who can select one. Approach responses are recorded. The selected item is not replaced, and the positions of the remaining stimuli are changed. Then, the individual selects from the remaining items. Continue in this manner until all items have been selected or the individual stops selecting items. Typically, several sessions are conducted. Preference hierarchies are established by calculating the percentage of approach responses per stimulus across all sessions.
Brief Free Operant (FO) (Rouse et al., 1998)	Multiple stimuli are placed on a tabletop, and participants are free to engage with any of the items for 5 min. Duration of engagement with each object (e.g., manipulating objects) is measured. Preference hierarchies are established by ranking items according to the duration of object manipulation for each stimulus.

Graff & Karsten, 2012, Behavior Analysis in Practice

Do we need more preference assessment research?



We are done.

Table 6. Frequency of Conducting Full-scale* and Mini Preference Assessments** by Certification Status

Frequency	Percentage of Responses			
	BCBA: Full-scale preference assessment	Non-BCBA: Full-scale preference assessment	BCBA: Mini-preference assessment	Non-BCBA: Mini-preference assessment
Hourly	0	0	23.0	8.6
Several times a day	2.9	1.5	29.0	19.3
Once a day	3.8	1.0	9.0	1.0
Several times a week	2.9	2.6	7.0	5.6
Once a week	4.6	1.0	7.0	4.1
More than once a month	12.5	8.2	10.0	4.1
Once a month	18.3	4.1	2.0	4.6
Less than once a month	44.2	24.0	9.0	9.6
Never	10.6	57.7	4.0	43.1

* Full-scale preference assessments were defined as using multiple stimuli and presenting items on repeated trials in one sitting.

** Mini preference assessments were defined as offering a choice between two or more items immediately before a teaching session.

Graff & Karsten, 2012, *Behavior Analysis in Practice*

Table 3. Types of SPA Training Received

	Percentage of Responses				
	I have never received training on SPAs	Topic addressed during In-service training	Topic addressed during college coursework	I attended a workshop on SPA	I have independently read published manuals or research articles
All Respondents	49.5	18.5	20.7	11.8	26.6
Certified behavior analysts	13.5	37.5	66.3	21.1	47.7
Non-certified educators and practitioners	66.0	20.3	16.0	3.3	18.0
Individuals with a degree in behavior analysis	14.4	35.1	71.6	21.6	47.3
Individuals with a degree in psychology	23.6	45.5	45.5	14.6	45.5
Individuals with a degree in special education	52.3	27.5	27.5	12.8	26.6

Graff & Karsten, 2012, *Behavior Analysis in Practice*

Table 9. Type of Assessment Procedures Used by Degree

Method	Respondents With a Degree in Behavior Analysis	Respondents With a Degree in Psychology	Respondents With a Degree in Special Education
Percentage who reported using only indirect preference assessment methods	11.5	22.7	25.5
Percentage who reported using at least one indirect preference assessment method	100	100	100
Internally observing the individual	75.3	70.7	78.8
Asking parents/caregivers/significant others what the individual likes	81.8	87.9	98.1
Informally asking the individual what he/she likes	84.8	87.9	83.1
Formal (i.e., published) parent/caregiver survey	48.1	46.6	75.4
Percentage who reported using at least one direct preference assessment method	88.5	77.3	44.3
Paired stimulus	76.6	34.5	19.5
Multiple stimulus with replacement	28.9	22.4	12.4
Paired/paired stimulus	56.4	50.8	17.4
Free operant	35.8	36.2	22.1
Single stimulus	23.4	10.3	8.8
Verbal paired stimulus	22.1	25.5	11.5
Multiple stimulus without replacement	17.2	17.4	11.2

*Each respondent could select multiple preference assessment methods.

Graff & Karsten, 2012, *Behavior Analysis in Practice*

Reinforcement Survey

Please help us identify reinforcers for use with your child. Please take a few minutes to tell us the things your child likes so we will have an idea of what they will want to work for at school.

Toys		Activities	
<p>Does your child like to play with toys? Yes No</p> <p><input type="checkbox"/> cars <input type="checkbox"/> marionettes</p> <p><input type="checkbox"/> puzzles <input type="checkbox"/> Barbie</p> <p><input type="checkbox"/> dolls <input type="checkbox"/> play dough</p> <p><input type="checkbox"/> blocks <input type="checkbox"/> _____</p> <p><input type="checkbox"/> Legos <input type="checkbox"/> _____</p> <p><input type="checkbox"/> character toys <input type="checkbox"/> _____</p> <p>What characters? <input type="checkbox"/> _____</p> <p>_____ <input type="checkbox"/> _____</p> <p>_____ <input type="checkbox"/> _____</p> <p>_____ <input type="checkbox"/> _____</p>	<p><input type="checkbox"/> blowing bubbles <input type="checkbox"/> cutting papers</p> <p><input type="checkbox"/> painting <input type="checkbox"/> visiting school stuff</p> <p><input type="checkbox"/> cleaning <input type="checkbox"/> sliding</p> <p><input type="checkbox"/> playing ball <input type="checkbox"/> swimming</p> <p><input type="checkbox"/> swinging <input type="checkbox"/> coloring/drawing</p> <p><input type="checkbox"/> art projects <input type="checkbox"/> singing</p> <p><input type="checkbox"/> going on a walk <input type="checkbox"/> _____</p> <p><input type="checkbox"/> reading books <input type="checkbox"/> _____</p> <p><input type="checkbox"/> listen to music <input type="checkbox"/> _____</p> <p><input type="checkbox"/> computer time <input type="checkbox"/> _____</p> <p><input type="checkbox"/> watching movies <input type="checkbox"/> _____</p> <p><input type="checkbox"/> help with chores <input type="checkbox"/> _____</p>		
Items		Food	
<p><input type="checkbox"/> stickers</p> <p><input type="checkbox"/> pencils</p> <p><input type="checkbox"/> stars</p> <p><input type="checkbox"/> pictures</p> <p><input type="checkbox"/> _____</p> <p><input type="checkbox"/> _____</p> <p><input type="checkbox"/> _____</p> <p><input type="checkbox"/> _____</p> <p><input type="checkbox"/> _____</p> <p><input type="checkbox"/> _____</p> <p><input type="checkbox"/> _____</p>	<p>Is your child allowed to be reinforced with food? Yes No</p> <p><input type="checkbox"/> carrots <input type="checkbox"/> gum</p> <p><input type="checkbox"/> raisins <input type="checkbox"/> cheese</p> <p><input type="checkbox"/> pretzels <input type="checkbox"/> popcorn</p> <p><input type="checkbox"/> goldfish <input type="checkbox"/> grapes</p> <p><input type="checkbox"/> graham crackers <input type="checkbox"/> water</p> <p><input type="checkbox"/> apple slices <input type="checkbox"/> milk</p> <p><input type="checkbox"/> juice <input type="checkbox"/> candy</p> <p><input type="checkbox"/> chips <input type="checkbox"/> orange slices</p> <p><input type="checkbox"/> crackers <input type="checkbox"/> _____</p> <p><input type="checkbox"/> M&M's <input type="checkbox"/> _____</p> <p><input type="checkbox"/> Skittles <input type="checkbox"/> _____</p>		

The RAISD
Reinforcer Assessment for Individuals with Severe Disabilities

from Fisher, W.F., Piazza, C.P., Bowman, L.G., & Amari, A. (1996)
 Integrating Caregiver Report with a Systematic Choice Assessment to Enhance Reinforcer
 Identification. *American Journal on Mental Retardation*, Vol 101, No. 1, 15-25.

Client Name: _____ **Date:** _____
Caregiver Name: _____

The purpose of this structured interview is to get as specific information as possible from the parent (or caregiver) as to what they believe would be useful reinforcers for the client. After the parent has generated a list of preferred stimuli, ask additional probe questions to get more specific information on the reinforcer and these stimulus conditions under which the object or activity is most preferred (e.g., what specific TV shows are his favorite? What does she do when she plays with a mirror? Does she prefer to do this alone or with another person?).

We would like to get some information on _____ preferences for different items and activities.

Fisher, Piazza, Bowman, & Amari, 1996, American Journal on Mental Retardation

4. Some children really enjoy certain food or snacks such as ice cream, pizza, juice, graham crackers, cookies, McDonald's hamburgers, etc. What are the things you think _____ most likes to eat?

Response to probe questions:

5. Some children really enjoy physical play or movement such as being tickled, wrestling, running, dancing, swinging, being pulled on a scooter board, etc. What are the activities of this kind that you think _____ most enjoys?

Response to probe questions:

6. Some children really enjoy touching things of different temperatures, cold things like snow or an ice pack, or warm things like a hand warmer or a cup containing hot tea or coffee. What are the activities of this kind that you think _____ most enjoys?

Response to probe questions:

Fisher, Piazza, Bowman, & Amari, 1996, American Journal on Mental Retardation

After completion of the survey, select all the stimuli which could be presented or withdrawn contingent on target behaviors during a session or classroom activity (e.g., a toy could be presented or withdrawn, a walk in the park could not). Write down all of the specific information about each selected stimulus on a 3x5 index card (e.g., "having a female adult read him the Three Little Pigs"). Then have the parents select the top 16 stimuli and rank order them using the cards. Then list the ranked stimuli below.

1. _____	9. _____
2. _____	10. _____
3. _____	11. _____
4. _____	12. _____
5. _____	13. _____
6. _____	14. _____
7. _____	15. _____
8. _____	16. _____

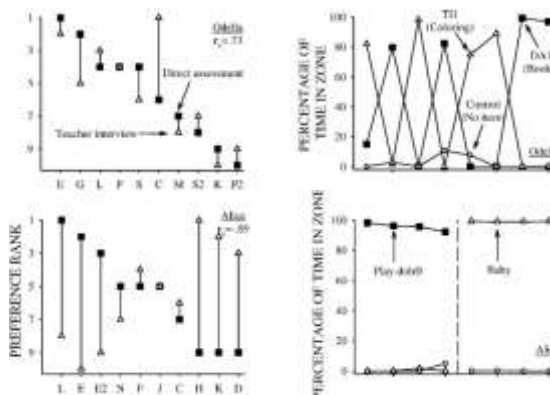
Are there any items (from the above list) that you would not want to use?

Are there any items (from the above list) that you would not want to limit your child's access?

Fisher, Piazza, Bowman, & Amari, 1996, American Journal on Mental Retardation

Accuracy of Caregiver Rankings

- Compared teacher & SPA rank hierarchies; 9 typically developing preschoolers
- Strong positive correlation between rankings in 1/9 cases
- Negative correlation between rankings in 5/9 cases
- Presented HP stimuli contingent upon occurrence of a response



Conclude: Direct observation methods are more accurate in determining reinforcer effectiveness than self-, parent-, or care-giver report.

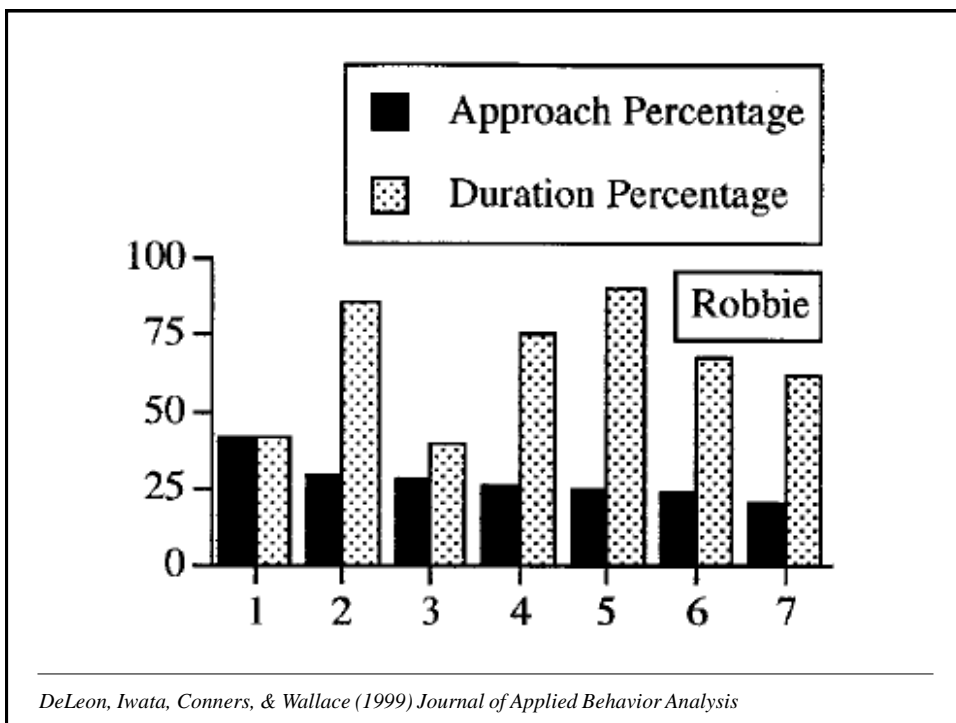
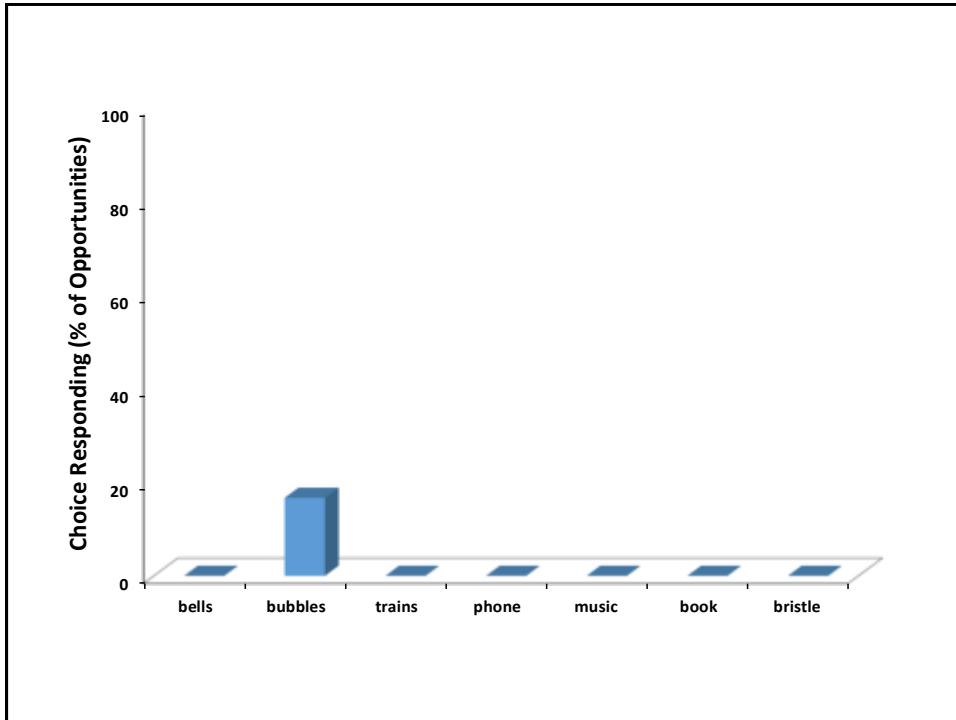
Cote et al., 2007, Journal of Applied Behavior Analysis

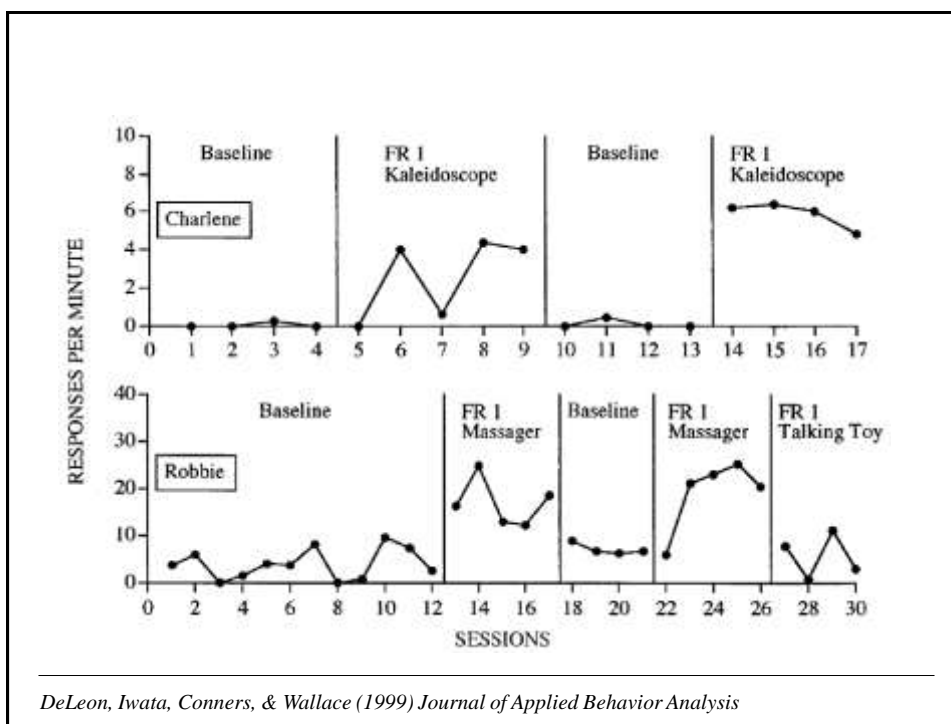
Detection & Repair

- Repair
 - Conduct preference assessment in a manner consistent with your aims

Your preference assessment did not identify a preferred stimulus.

- You conducted a preference assessment, but no stimulus was identified as highly preferred
- Several forms of troublesome outcomes:
 - Failure to choose
 - Flat distributions
 - Position biases



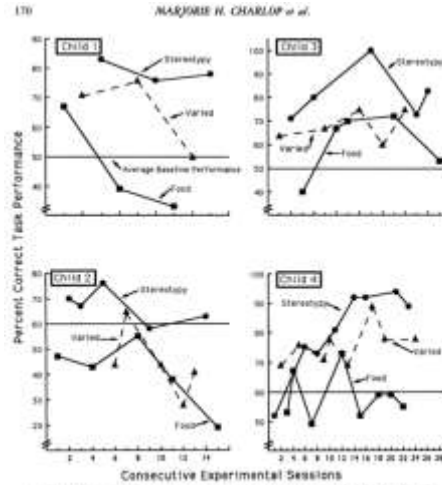


Detection & Repair

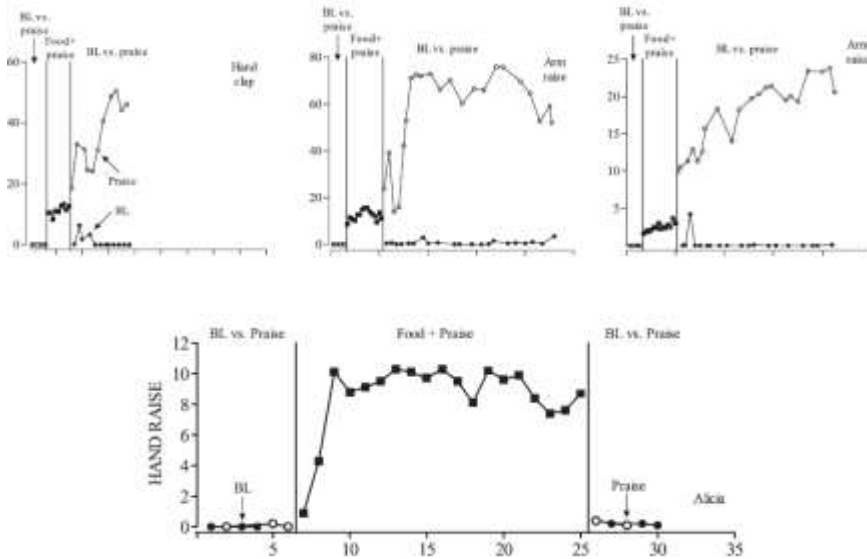
- *Detection*
 - Failure to choose
 - Flat distributions
- *Repair*
 - Establish a choice repertoire
 - Switch assessment format; “Premackian” strategies
 - Free-operant assessment in natural or baited environments
 - Use of high-strength responses as reinforcers
 - Teach functional play skills; establishment of neutral stimuli as reinforcers

USING ABERRANT BEHAVIORS AS REINFORCERS FOR AUTISTIC CHILDREN

MARJORIE H. CHARLOP



Establishing Reinforcers & Transferring Control

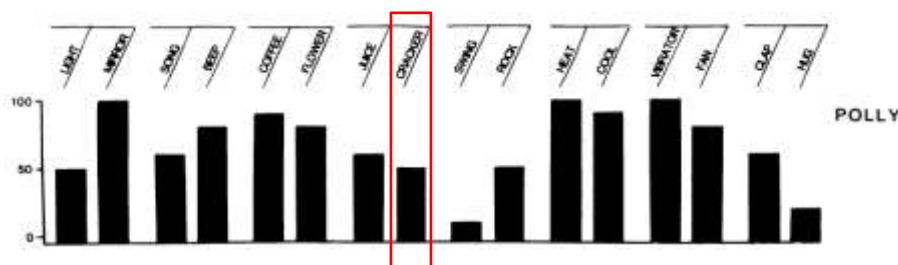


Dozier *et al.* (2012) *Journal of Applied Behavior Analysis*

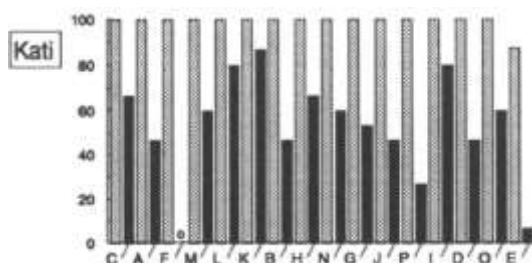
*You identified a preferred stimulus,
but it was not a reinforcer*

- False positives in preference assessment
 - Used preference assessment methods with little sensitivity to relative preferences
 - Used preference assessment methods ill-matched to learner abilities
 - “Saving the last for best” phenomena

False Positives in Preference Assessment



Pace et al., (1982) *Journal of Applied Behavior Analysis*

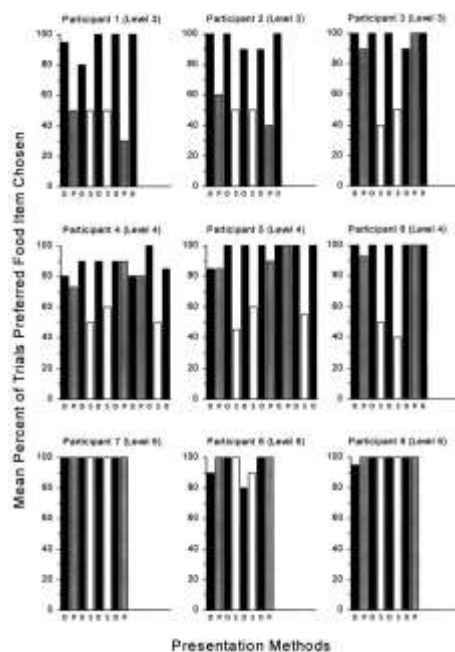


Fisher et al., (1985) *Journal of Applied Behavior Analysis*

SPA: Inclusion of activities

- Level 3 = 2 choice visual discriminations
- Level 4 = a two-choice visual quasi-identity match-to-sample discrimination
 - E.g., a yellow cylinder in the yellow can and a red cube in the red box)
- Level 6 = a two-choice auditory-visual combined discrimination
 - E.g., place a piece of foam into the container that was verbally requested by the tester (e.g., “yellow can” or “red box”, not necessarily matched on color).

Conclude: Verbal and pictorial SPAs can be accurate, but reserve them for individuals with established discrimination abilities.



Conyers et al., 2002, *Journal of Applied Behavior Analysis*

Detection & Repair

- Detection
 - High-preference stimulus fails to strengthen target behavior
 - High-preference stimulus fails to strengthen maintenance responses
- Repair
 - Conduct preference assessment consistent with learner abilities
 - Conduct preference assessment in a manner consistent with your aims

Matching Methods to Purpose & Circumstance

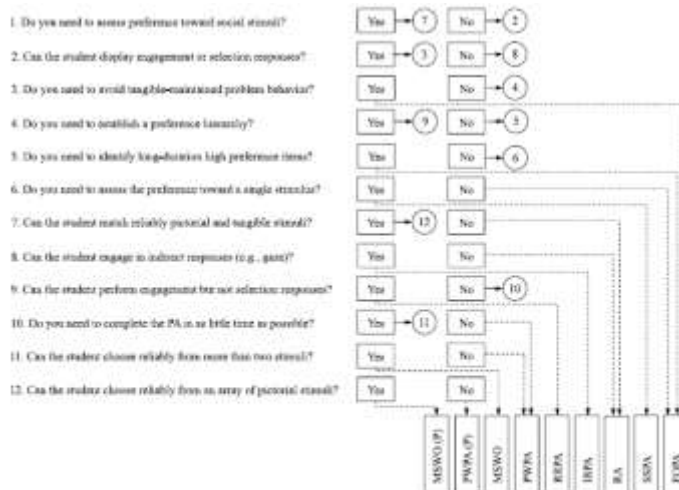


Figure 4. Decision tree for the selection of preference assessment methods.

Notes. FOPA = Free operant preference assessment; IRPA = Indirect/idiosyncratic response preference assessment; MSWO = Multiple-stimulus without replacement; PA = Preference assessment; PWPA = Pairwise preference assessment; (P) = Pictorial stimuli; RA = Reinforcer assessment; RRPA = Response-restriction preference assessment; SSFA = Single stimulus preference assessment.

Virues-Ortega et al. (2014) American Journal on Intellectual and Developmental Disabilities

The stimulus is not a reinforcer for this response or amount of responding

- Preference assessments, conducted under low response requirements, do not always predict the utility of the reinforcer:
 - Under greater response requirements
 - For more difficult responses

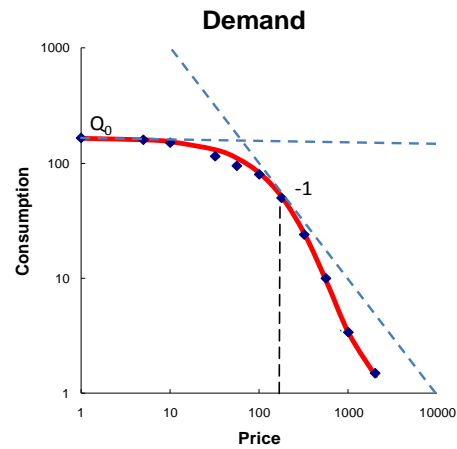
Behavioral Economics

Demand curves relate:

- *Unit price of the commodity*
- *Amount of the commodity consumed*

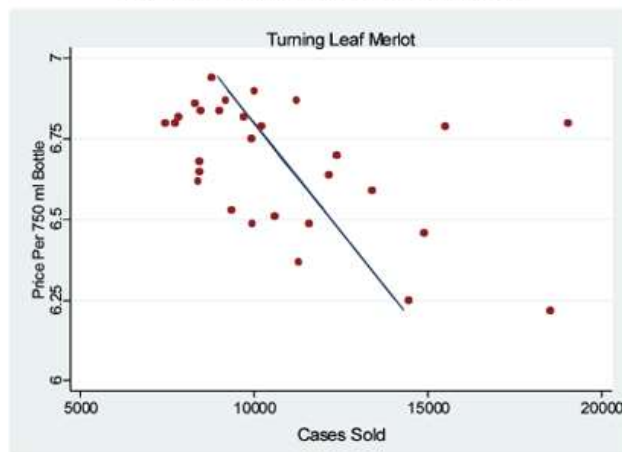
Law of Demand:

- All else being equal...
 - *As unit price increases*
 - *demand (consumption) decreases*
 - *and vice versa*



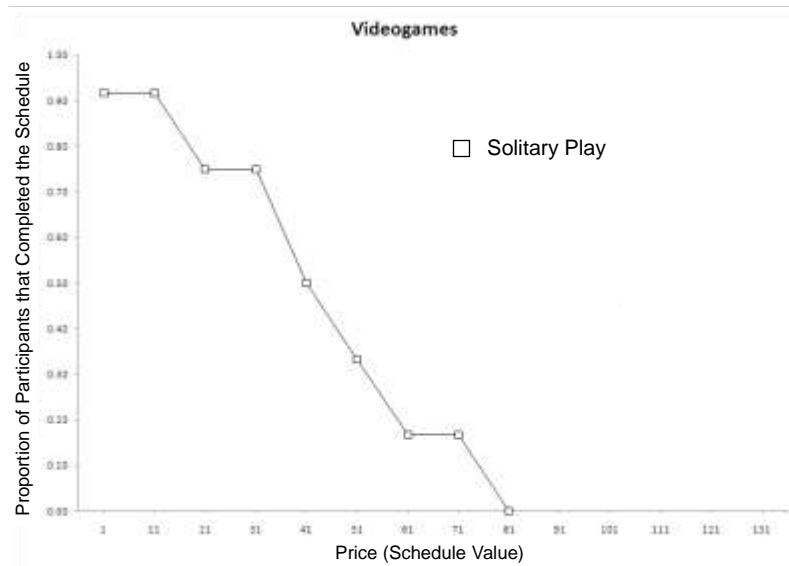
Population Demand Curve

Estimated demand curve based on scan data



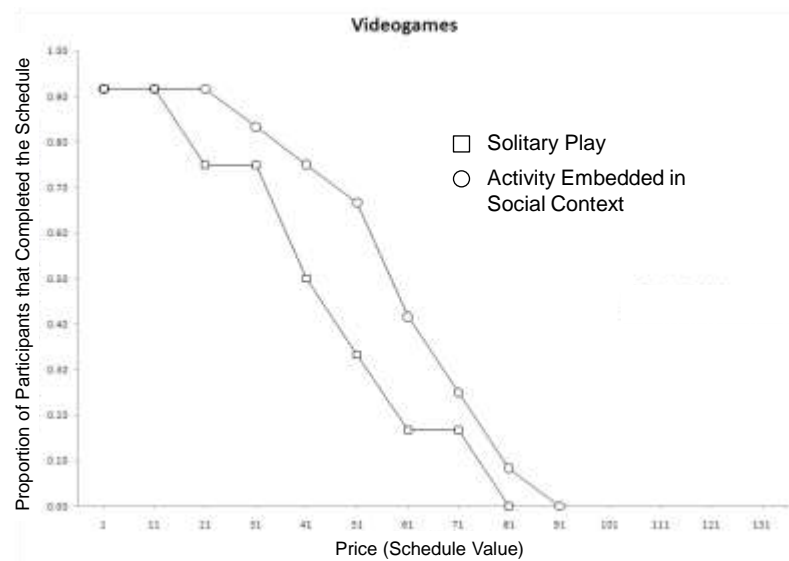
Above, the estimated demand curve of Turning Leaf Merlot illustrates the inverse relationship between price and quantity.

Group Demand Curve



Goldberg, Allman, Hagopian, Triggs, Frank-Crawford, Mostofsky, Denckla, & DeLeon (2016), Autism

Group Demand Curve



Goldberg, Allman, Hagopian, Triggs, Frank-Crawford, Mostofsky, Denckla, & DeLeon (2016), Autism

Individual Demand Curve

The same sort of relations influence consumption on the individual level.

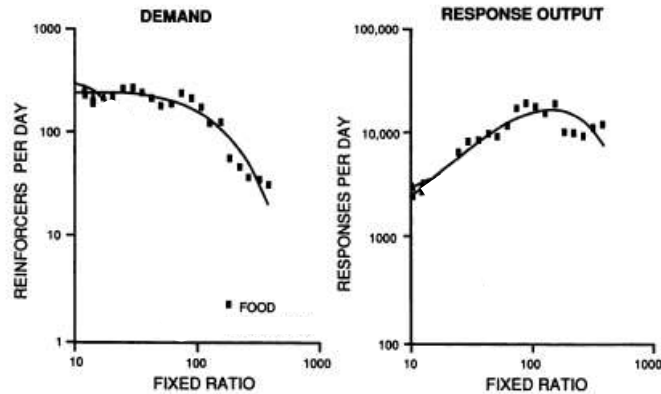
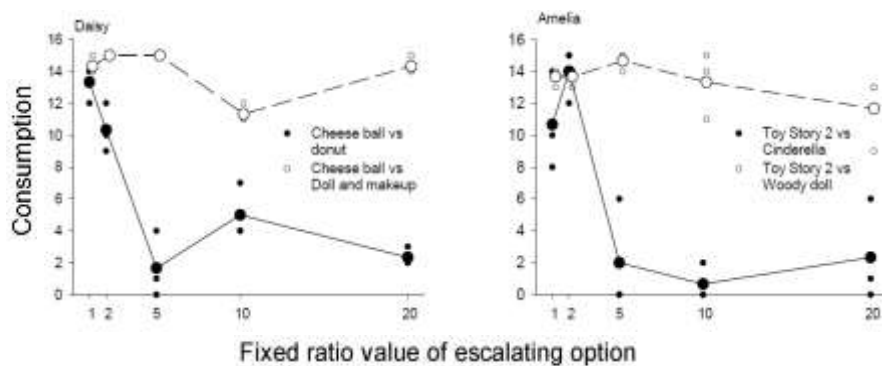


Fig. 4. Left panel: Daily consumption of food or saccharin as a function of FR schedule, in log-log coordinates. Right panel: Total daily lever presses for either food or saccharin as a function of FR schedule, in log-log coordinates. Data from a representative rhesus monkey.

Hursh (1991) JEAB

Individual Demand Curve

Individual demand curves in children with ASD

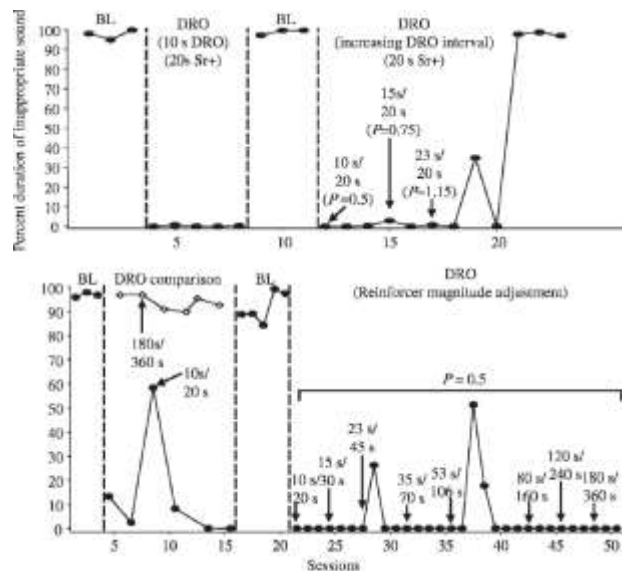


- Stimuli with equivalent initial consumption under low cost conditions may have very different demand profiles
- More “durable” (less elastic) demand for a reinforcer, as the price increases, when it is dissimilar from the available alternatives.

DeLeon, Hursh, Frank-Crawford, Bullock, Triggs, & Carreau-Webster (accepted), JEAB

Detection & Repair

- Detection:
 - Observed decrements in reinforcer effectiveness during reinforcement thinning
- Repair
 - Conduct preference assessment in a manner consistent with your aims (e.g. greater effort)
 - Conduct reinforcer assessments under increasingly more stringent requirements
 - Adjust unit price



Roane, Falcomata, & Fisher (2007), JABA

The stimulus is not a reinforcer right now.

- Chosen stimulus is momentarily ineffective
- Too much of the reinforcer; reinforcement schedule is too dense

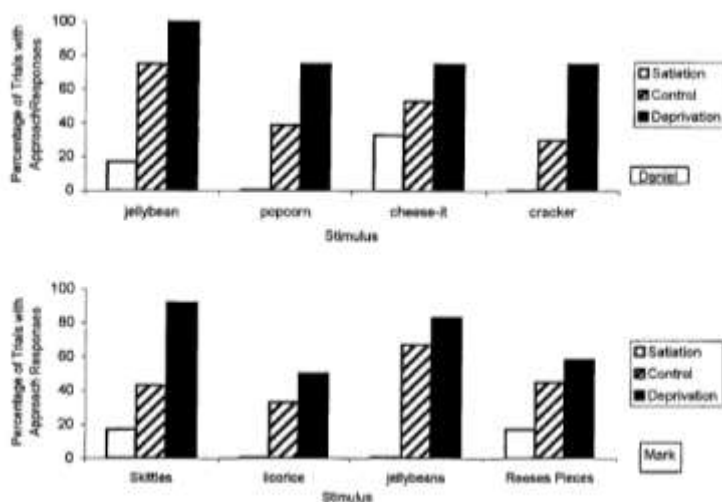
Motivational Operations

Q: Do relative states of deprivation and satiation impact the effectiveness of common reinforcers?

- Establishing operation (e.g. deprivation)
 - Momentarily increases the reinforcing effectiveness of that stimulus.
 - Momentarily increases the frequency of behavior that produce the stimulus as a consequence.
- Abolishing operation (e.g., satiation)
 - Momentarily decreases the reinforcing effectiveness of the stimulus.
 - Momentarily decreases the frequency of behaviors that have produced the stimulus as a consequence.

Motivational Operations

- Gottschalk, Libby, & Graff (2000)
 - Deprivation & satiation effects with food on preference assessment outcomes
 - Control: Regulated (premeasured) access for 24 hr before assessment
 - Deprivation: 48 hour deprivation for one stimulus at a time; regulated access for others
 - Satiation: 10 min free access before assessment; regulated access for other
 - Paired-choice preference assessment following manipulations



Gottschalk, Libby, & Graff (2000) *Journal of Applied Behavior Analysis*

Motivational Operations

***Q: Satiation can influence preference rank;
does satiation similarly influence performance?***

- Vollmer & Iwata (1991) - Examined rates of simple responses under conditions of deprivation and satiation for various stimuli:
 - Food
 - Dep: 30 min before lunch
 - Sat: 15 min after lunch + 10 min of free feeding
 - Leisure activity
 - Dep: No access for at least 30 min
 - Sat: Continuous access for 30 min
 - Attention (effects on praise)
 - Dep: 15 min with no interaction
 - Sat: 15 min of continuous interaction

Table 1
Overall Mean Response Rates: All Stimuli

Stimulus	Baseline	Satiation	Deprivation
Food			
Craig	0.36	0.68	2.62
Sam	0.93	2.80	4.64
Lonny	2.65	0.42	9.48
Music			
Rich	2.16	1.54	8.24
Donny	5.88	2.48	5.06
Social			
Donny	2.48	10.36	17.78
Sam	1.34	3.99	5.32

Vollmer & Iwata (1991) *Journal of Applied Behavior Analysis*

Motivational Operations

- Zhou, Iwata, & Shore (2002)
 - Deprivation and satiation for food reinforcers under less contrived arrangements
 - Dep: 30-min before lunch
 - Sat: 30-min after lunch
 - No additional exposure, unlike Vollmer & Iwata (1992)

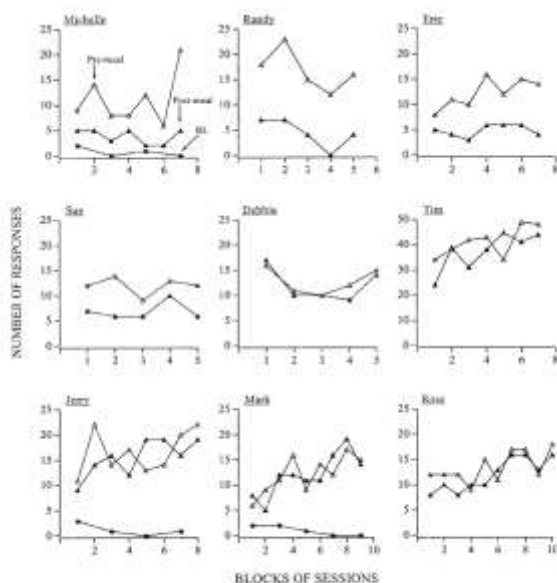


Figure 1. Number of responses exhibited when a high-preference food was used as a reinforcer during sessions conducted prior to and following lunch (all participants) and when no reinforcement was available (Michelle, Jerry, and Mark only).

Zhou, Iwata, & Shore (2002) *Journal of Applied Behavior Analysis*

Motivational Operations

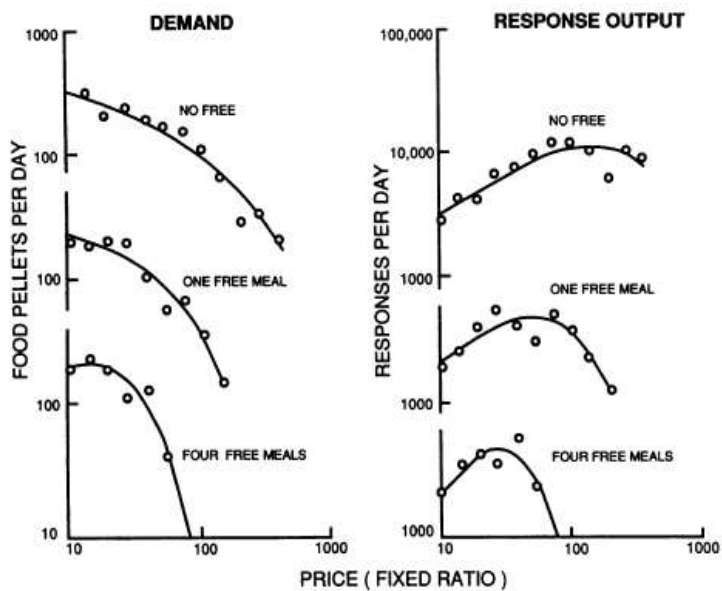
- Conclusions on Motivational Operations
 - Can influence preference assessment results
 - May influence reinforcer value, but not necessarily under naturalistic conditions
 - Are there different “kinds” of satiation?

Detection & Repair

- Detection
 - *Performance decrements across the day, across sessions, or within session*
- Repair
 - *Intermittent schedules*
 - *Reinforcer variation*
 - *Frequent preference assessment; pre-trial preference assessment*

The economy is open

- The stimulus is available freely or more cheaply outside of the instructional context
 - Access to the reinforcer outside of the instructional context can make the reinforcer less effective within the instructional context.



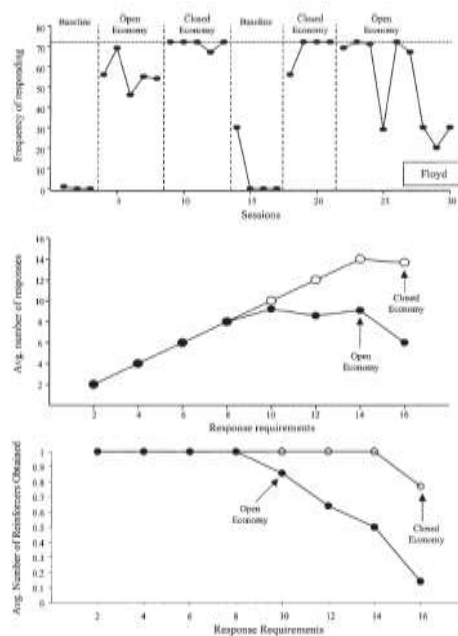
Hursh, S. R., Raslear, T. G., Bauman, R., & Black, H. (1989). The quantitative analysis of economic behavior with laboratory animals. In K. G. Grunert & F. Olander (Eds.), *Understanding economic behaviour* (Theory and Decision Library, Series A, Vol. 2, pp. 393-407). Dordrecht, Netherlands: Kluwer.

Open/Closed Economy Effects

- PR Schedules
 - Access to video
 - Constant UP, 10s per response
- Conditions
 - Open = up to 6 min free access after sessions
 - Closed = no free access

Result: Greater defense of consumption for same reinforcer under closed economy

Roane, Call, & Falcomata (2005) JABA

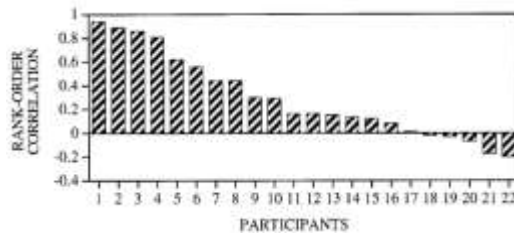


Detection & Repair

- Detection
 - High engagement with the stimulus outside of instruction
 - Use of the stimulus for multiple purposes; multiple situations
- Repair
 - Identify reinforcers that can be restricted to instructional use

The stimulus is no longer a reinforcer

- Temporally extended motivational effects (i.e. long-term changes in stimulus value)
 - Preferences, and hence reinforcer effectiveness, is not necessarily stable over time



- A different kind of “satiation”?
- How does the way a stimulus is used over time influence its effectiveness?

Contingency

The relation between the amount of work required to earn a reinforcer and the subsequent value of that reinforcer

- *How does simply arranging a response-reinforcer contingency influence subsequent “value”*
- *How does the amount of work required to earn a reinforcer influence subsequent value*
- ***Not: The Law of Least Effort***

Contingency: Cost and Subsequent Value

- *Possibility 1*
 - Stimuli historically associated with greater effort, by virtue of being paired with an aversive event (i.e. greater effort), lose value over time and experience
 - A negative relation between “how much one has to work” for a reinforcer and how it is subsequently valued
- *Possibility 2*
 - Stimuli historically associated with greater effort, once current effort is equated, are “on sale.”
 - A positive relation between “how much one has to work” for a reinforcer and how it is subsequently valued

Contingency: Cost and Subsequent Value

“..such are the Tempers and dispossessions of Seamen in general that **whatever you give them out of the common way**, altho it be ever so much for their good yet it will not go down with them and you will hear nothing but murmurings gainest the man that first invented it; **but the Moment they see their superiors set a Value upon it**, it becomes the finest stuff in the World and the inventor an honest fellow.”

Captain James Cook, *Diaries*, 1769



"The harder the conflict, the more glorious the triumph. What we obtain too cheap, we esteem too lightly."

Thomas Paine, *The Crisis*, 1776

"The more you suffer, the more it shows you really care."

The Offspring, *Self-Esteem*, 1995



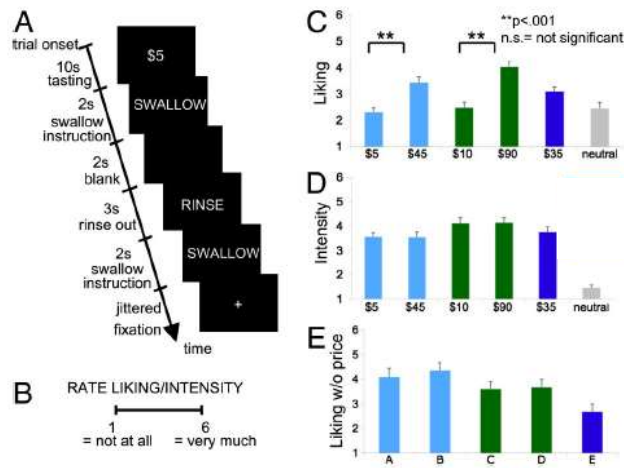
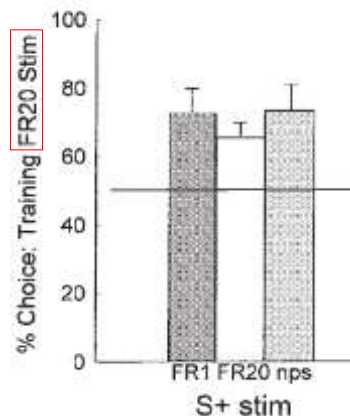
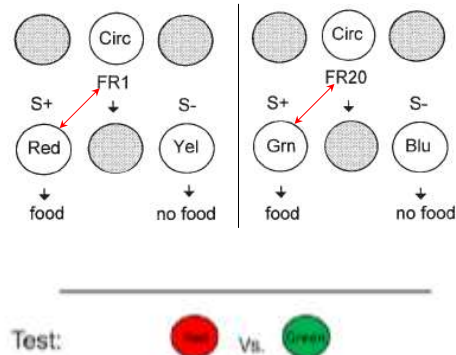


Fig. 1. Experimental design and behavioral results. (A) Time course for a typical trial. (B) Reported pleasantness and intensity rating scales. (C) Reported pleasantness for the wines during the cued price trials. (D) Taste intensity ratings for the wines during the cued price trials. (E) Reported pleasantness for the wines obtained during a postexperimental session without price cues.

Plassman, O'Doherty, Shiv, & Rangel (2008) *Proceedings of the National Academy of Sciences*

Contingency: Cost and Subsequent Value

- Clement et al. (2000)
 - Pigeons exposed to chain schedules
 - Training: Two types of trials



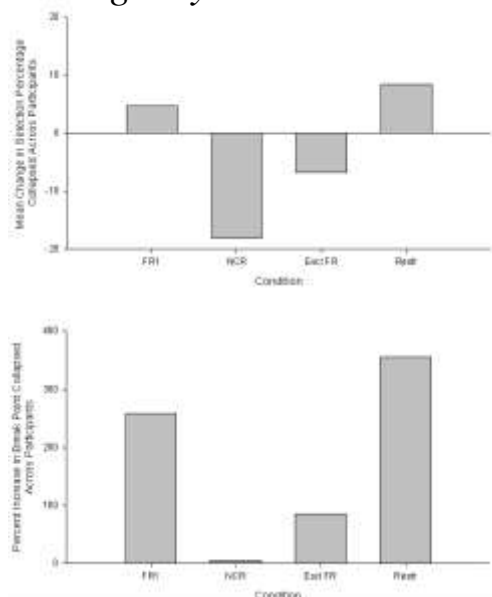
Clement, Feltus, Kaiser, & Zentall (2000) *Psychonomic Bulletin & Review*

Contingency: Cost and Subsequent Value

Q: Does the amount of work required to earn a reinforcer alter the value of that reinforcer?

- Children with ASD ($n = 8$)
- Pre-test:
 - Preference assessment
 - Progressive-ratio schedule for 4 moderately preferred items
- Middle 4 items assigned to one condition for 4 weeks:
 - FR1 delivery for academic tasks
 - Escalating (FR1 → FR10) delivery for academic tasks
 - Yoked noncontingent delivery
 - Restricted
- Post-test: Preference assessment and PR schedule analysis

Contingency: Cost and Subsequent Value



- Earned reinforcers retained their value to a greater extent than free reinforcers
- Are interventions that involve contingent reinforcers more durable than interventions that involve noncontingent reinforcers?
- Is the loss of earned reinforcers more potent than the loss of free reinforcers?

DeLeon, Gregory, Frank-Crawford, Allman, Wilke, Carreau & Triggs (2011), *Journal of Applied Behavior Analysis*

Free Group



Miller, DeLeon, Toole, Lieving, & Allman (2016), *The Psychological Record*

Contingency: Cost and Subsequent Value

Test of Sensitivity to Loss

- Variation of the “Miami Door-Opening Task” (Daugherty & Quay, 1991)
- 2 responses:
 - Response “D”: Open the chest – produces either:
 - Another token
 - Loss of one token; ratio of gains to losses decreases across blocks of 10 trials
 - Response “K”: Cash out
- Primary D.V.: How many D responses before cashing out?



Miller, DeLeon, Toole, Lieving, & Allman (2016), *The Psychological Record*

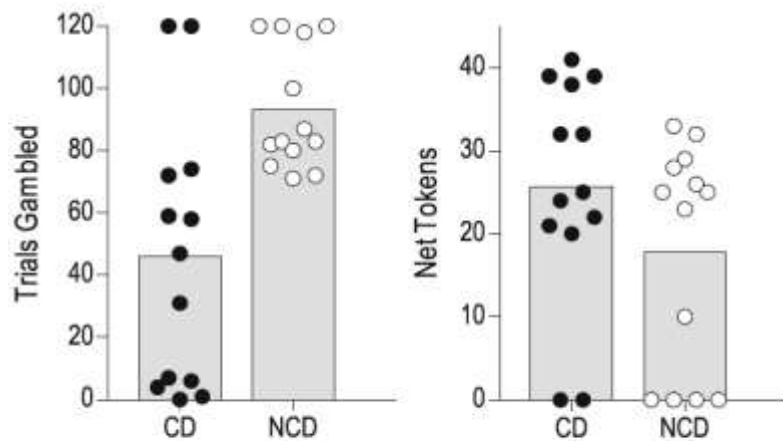


Fig. 1 Number of trials gambled (left panel) and net tokens (right panel) for contingent delivery (CD) and noncontingent delivery (NCD) participants in Phase 2. Each circle represents a value for one participant; the bars represent the group mean

Miller, DeLeon, Toole, Lieving, & Allman (2016), *The Psychological Record*

Contingency: Cost and Subsequent Value

- Earners were more sensitive to token loss
- Same effects obtained across all manipulations of effort and value – a robust effect
 - *Differences in token value*
 - *Differences in level of effort*
- Sensitivity in college students; less in children with IDD?
 - *Discrepancy related to earned vs. lost reinforcers?*
 - *Effects dependent on ability to form rules?*

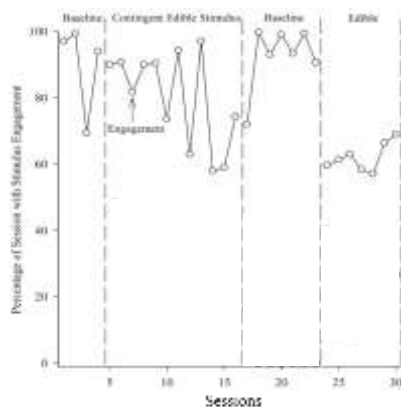
Detection & Repair

- Detect
 - Initially effective stimulus seems ineffective across extended time
 - Observe engagement outside of instructional context
- Repair
 - Frequent preference assessment
 - Daily preference assessment
 - Reinforcer restriction and rotation
 - If feasible, avoid noncontingent delivery of reinforcers?

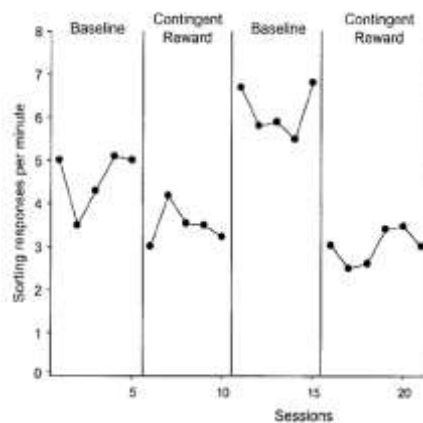
The stimulus is a reinforcer, but serves other stimulus functions in this context

- *The stimulus is usually effective, but in the current context can be punitive*
- *The stimulus is usually effective, but in the current context serves as a discriminative stimulus for competing behavior*

A Tale of Two “Failures”



Frank-Crawford, Borrero, Nguyen, Leon, Carreau-Webster & DeLeon (2012), *Journal of Applied Behavior Analysis*



Roane, Fisher, & McDonough (2003), *Journal of Applied Behavior Analysis*

Detour: Overjustification Effects in IDD

Q: Do extrinsic rewards decrease intrinsic motivation in persons with IDD??

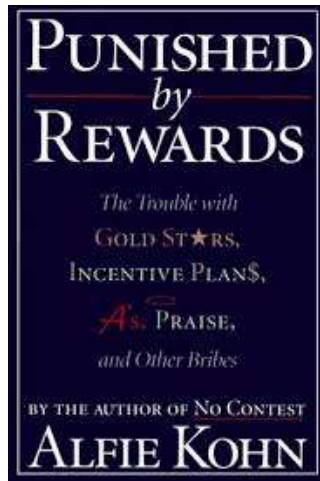
TABLE 1
MEAN NUMBER OF SECONDS SPENT WORKING ON THE
PUZZLE DURING THE EIGHT-MINUTE
FREE CHOICE PERIODS

Group	Time 1	Time 2	Time 3	Time 3 - Time 1
Experimental (<i>n</i> = 12)	248.2	313.9	198.5	-49.7
Control (<i>n</i> = 12)	213.9	205.7	241.8	27.9
$E(T_3 - T_1)$ - $C(T_3 - T_1)$				-77.6 sec.* (<i>SE</i> = 58.5)

Note.—The higher the score, the higher the motivation.
* $p < .10$, $df = 22$, one-tailed *t* test.

Deci (1971), *Journal of Personality and Social Psychology*

Overjustification Effects in IDD



“...extrinsic motivators—including A’s, sometimes praise, and other rewards—are not merely ineffective over the long haul but counterproductive with respect to the things that concern us most: desire to learn, commitment to good values, and so on.”

Alfie Kohn
Educational Leadership

Overjustification Effects in IDD

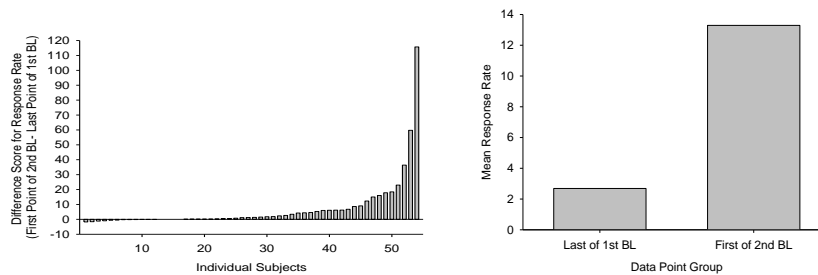
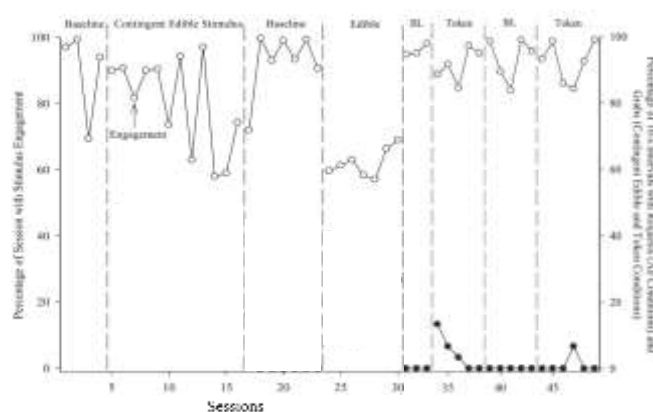


Figure 2. Distribution of difference scores (left panel) and mean responding for the last point of the first no-reinforcement phase and first point of the second no-reinforcement phase (right panels).

Levy, Martinez, Sigurdsson, Frank-Crawford, & DeLeon (2017) *Journal of Applied Behavior Analysis*

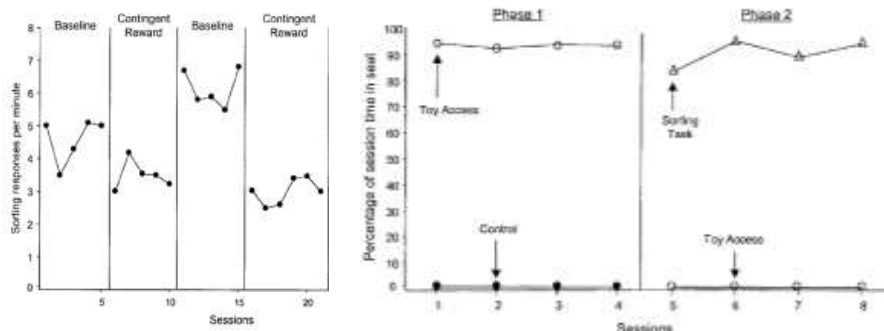
A Tale of Two “Failures”



- The discriminative properties of the reinforcer evoked incompatible responses

Frank-Crawford, Borrero, Nguyen, Leon, Carreau-Webster & DeLeon (2012), *JABA*

A Tale of Two “Failures”



- Negative hedonic shift (i.e., the stimulus was a reinforcer, but not for this response)

Roane, Fisher, & McDonough (2003), *Journal of Applied Behavior Analysis*

Detection & Repair

- Consider collateral (non-target) responses being impacted by reinforcer delivery
 - Escape/avoidance responses
 - Changes in other appropriate responses related to the stimulus

***The stimulus is less effective
when it's segmented***

- The manner in which the stimulus is delivered makes it less effective than it could be otherwise.
- “...unlike primary reinforcers, the reinforcing effectiveness of video depends at least partly on its continuity through time.”
– Hackenberg & Pietras (2000) *EAHB Bulletin*

Continuity & Stimulus Value

Q: Is delayed accumulated reinforcement, mediated through tokens, just as effective as immediate reinforcement in supporting responding?

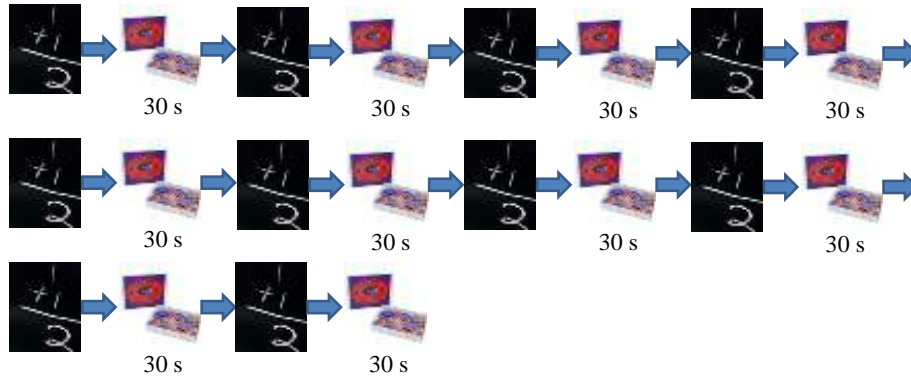
ABAB Reinforcer Assessment

- *A = no reinforcement BL*
- *B = Multielement comparison of accumulated vs distributed reinforcement conditions*

Measure: Rates of simple free-operant responses

Distributed Reinforcement

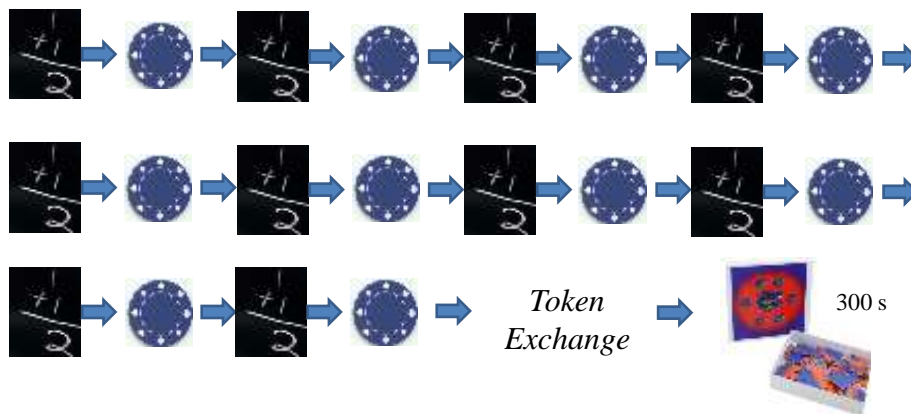
10 task completions and 10 reinforcers earned (30 s each) = 300 s total



Access is immediate for each response requirement, but interrupted

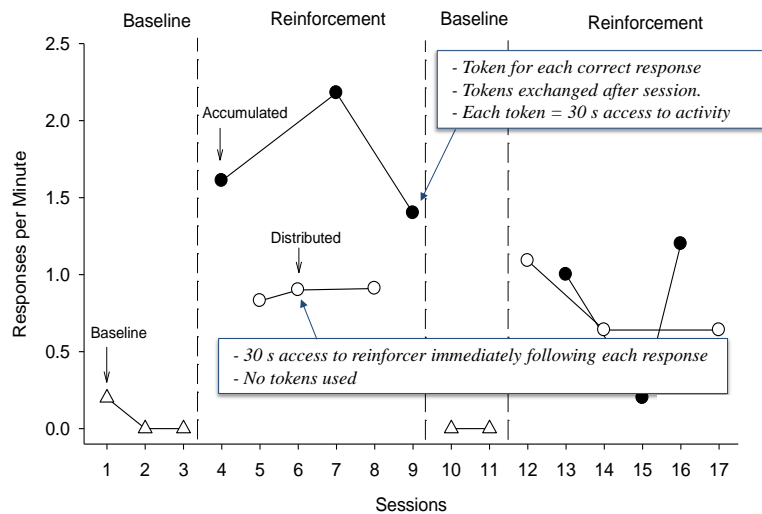
Accumulated Reinforcement

10 task completions and 10 reinforcers earned (30 s each) = 300 s total



Access is delayed until all work completed, but continuous

Continuity & Stimulus Value: Efficacy



DeLeon, Chase, Frank-Crawford et al. (2014), *Journal of Applied Behavior Analysis*

Continuity & Stimulus Value: Efficacy

<i>Mean rates of responding</i>				
Condition	Evan	Alice	Jillian	Sam
Baseline	0.04	0.00	1.49	N/A
Distributed	0.84	0.73	1.37	N/A
Accumulated	1.27	1.56	1.83	N/A

- The highest mean rates of responding were observed in the accumulated reinforcement conditions for all participants
 - May be added value in arranging accumulated reinforcement?
 - “Handling Costs”?

DeLeon, Chase, Frank-Crawford et al. (2014), *Journal of Applied Behavior Analysis*

Continuity & Stimulus Value: Preference

***Q: Does the delay inherent in accumulated reinforcement render it less preferred than distributed reinforcement?
Does the kind of reinforcer matter?***

Concurrent-chain reinforcer assessment

- *Initial link – choose accumulated or distributed*
- *Terminal link – complete 10 tasks under chosen arrangement*
- *5 choice trials per session*

Measure

- *Cumulative choices*
- *Food and non-food conditions*

Continuity & Stimulus Value: Preference

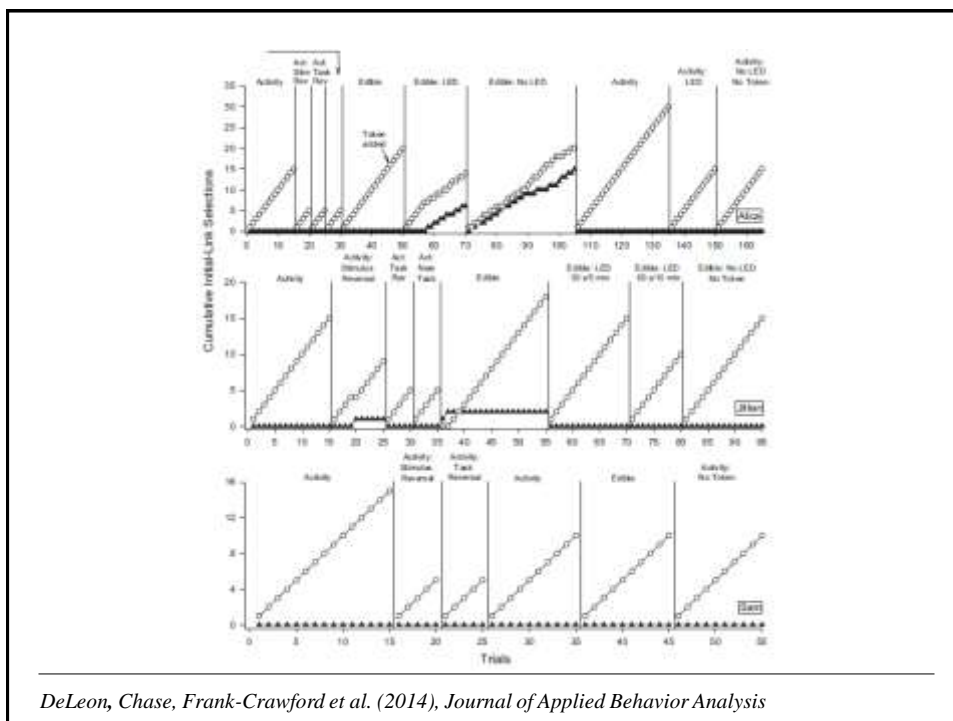
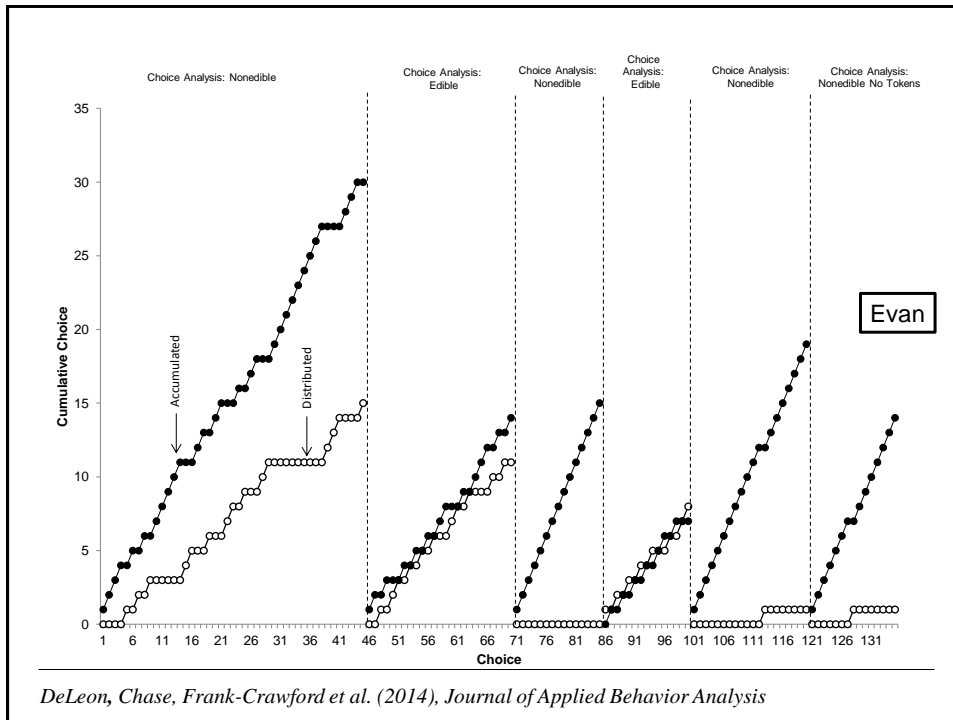


Accumulated

“Choose one.”



Distributed



Continuity & Value Interim Summary

- *Accumulated reinforcement seems preferred by learners with IDD despite the inherent delay*
- *Accumulated reinforcement mediated by tokens supports higher rates of free-operant responding despite the inherent delay*
- *But...*
 - *Is response rate really the most relevant measure?*
 - *What about the amount of behavior supported by the stimulus?*

Continuity & Stimulus Value: Amount of work

***Q:** Is demand for delayed, accumulated access more or less elastic as an equal amount of immediate, but distributed access?*

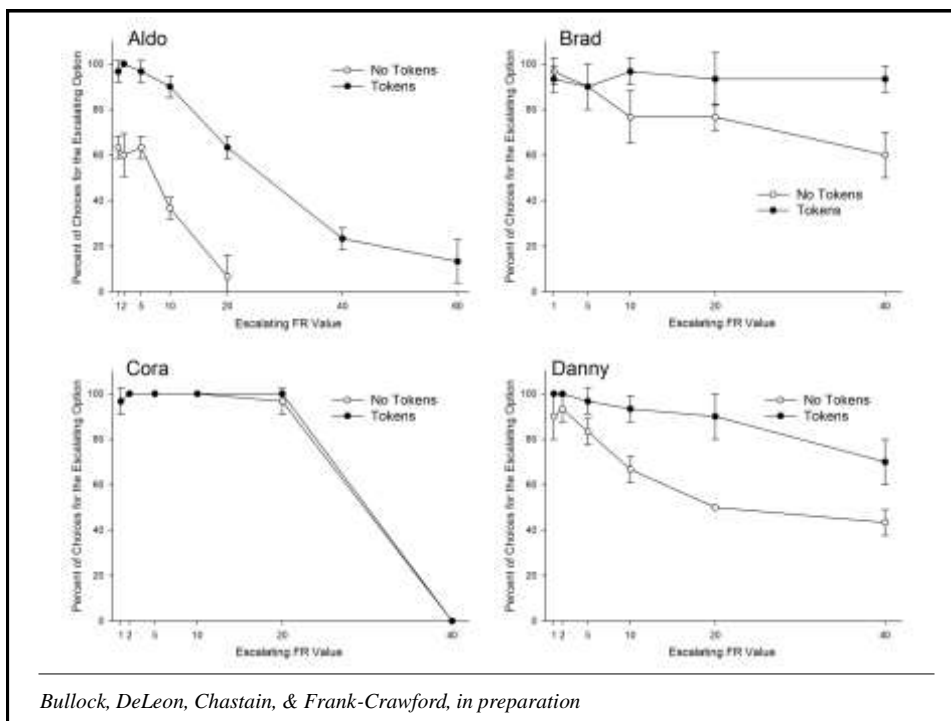
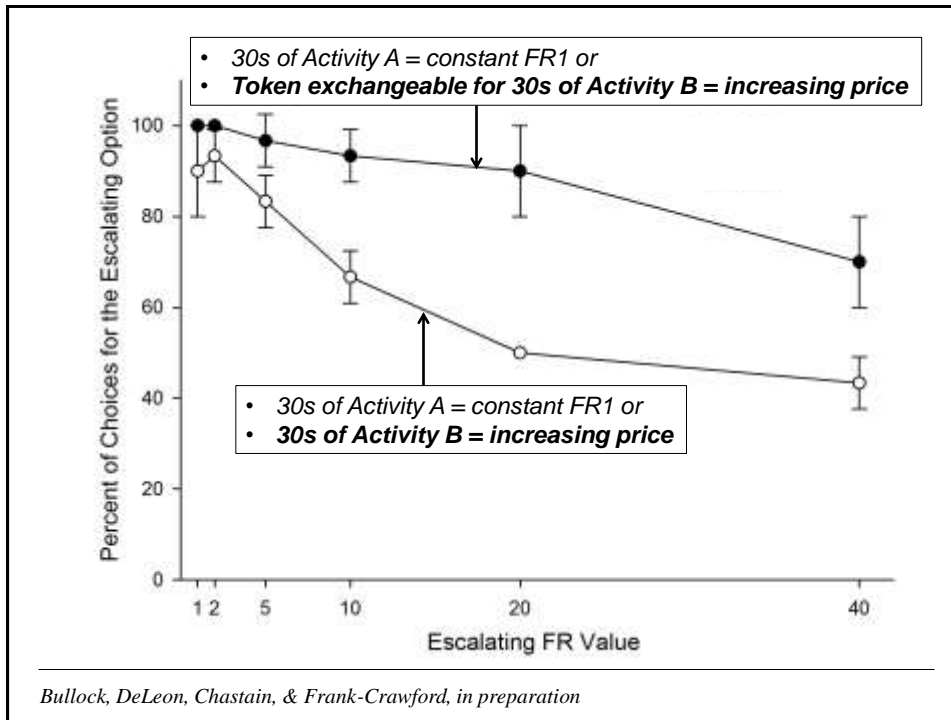
2 Concurrent-schedule demand curves

First series:

- *Test stimulus: Increasing FR across Phases (FR1, FR2, FR5, FR10, FR20, etc.)*
- *Second stimulus, constant FR1*

Second series:

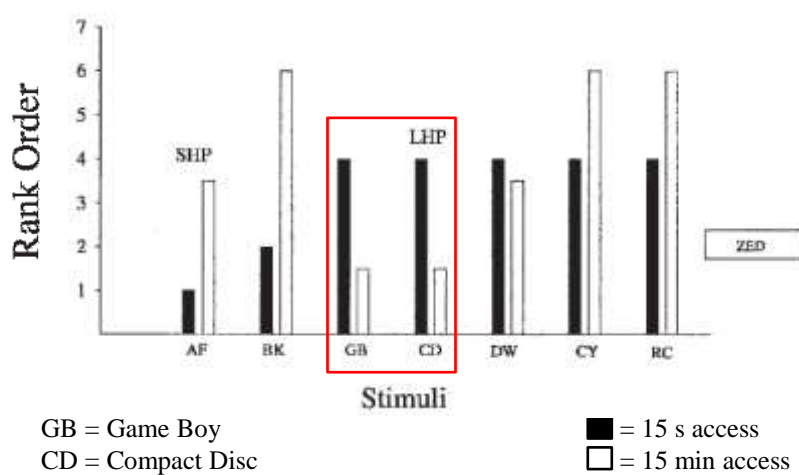
- *Token later exchangeable for test stimulus: Increasing FR across Phases (FR1, FR2, FR5, FR10, FR20, etc.)*
- *Second stimulus, constant FR1*



Detection & Repair

- *Individualized learning arrangements: Test for preference between distributed and accumulated reinforcement*
- *Arrange preference assessments consistent with “optimal unit size”*

“Continuity?”



Steinheilber & Johnson (2007), *Journal of Applied Behavior Analysis*

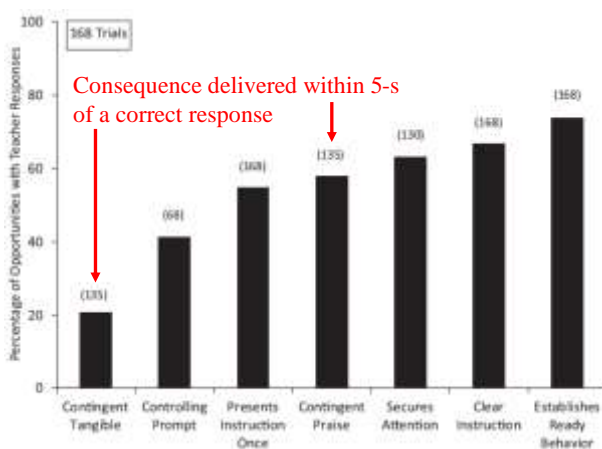
The stimulus delivery is too delayed

- The stimulus might not be delivered immediately after the appropriate response
 - Does reinforcer delay happen in applied settings?
 - Do delays matter for acquisition?
 - How much delay is tolerable?
 - Does the type of reinforcer matter?

Q: How often do teachers deliver reinforcers immediately following a correct response ?

Descriptive assessment of integrity errors

- Observed 168 teaching trials
- Across 5 children with ASD attending EIBI clinics
- 9 teachers or paraprofessionals delivering instruction



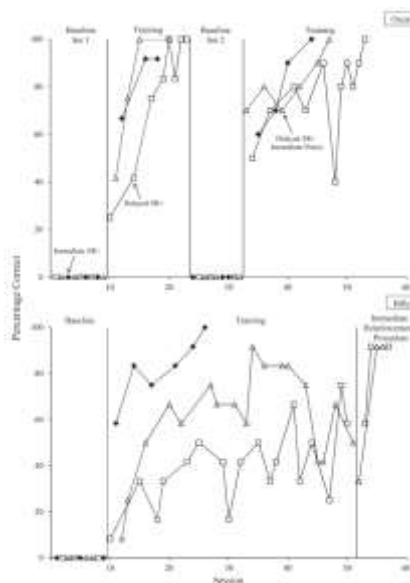
Carroll, Kodak, & Fisher (2013) *Journal of Applied Behavior Analysis*

Q: How do reinforcer delays impact reinforcer effectiveness during skill acquisition?

Effects of Reinforcer Delay on Acquisition

- ◆ Immediate SR+ (both praise and preferred item)
- △ Immediate Praise; Delayed SR+ (10-s delay to preferred item)
- Delayed SR+ (10-s delay to both praise and preferred item)

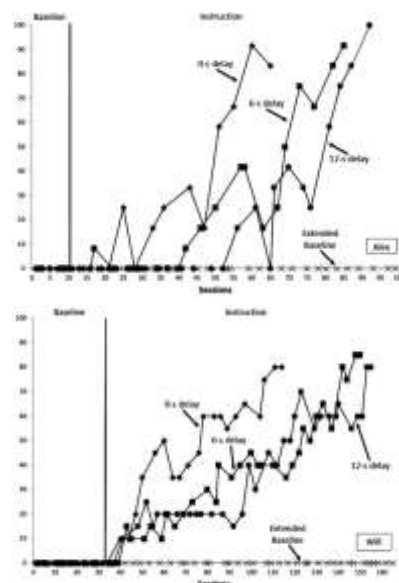
Result: Delays result in less rapid acquisition



Carroll, Kodak, & Adolf (2016) *Journal of Applied Behavior Analysis*

Q: How much a delay is tolerable before detrimental effects are observed in acquisition?

- Parametric analysis of effects of delay to acquisition
- 3 children with ASD (2 shown)
- Discrete trials for mand acquisition
- Preferred edible + praise for correct responding with:
 - 0-second delay
 - 6-second delay
 - 12-second delay

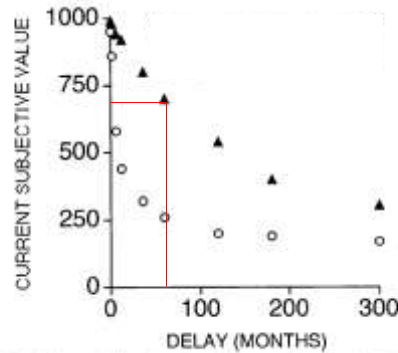


Majdalany, Wilder, Smeltz, & Lipschultz (2016) *Journal of Applied Behavior Analysis*

Delay Discounting

- *Delay discounting* - how the present subjective value of a given reward declines as the delay to its receipt increases

\$1000 now or \$1000 after 5 yrs?
 \$900 now or \$1000 after 5 yrs?
 \$800 now or \$1000 after 5 yrs?
 \$700 now or \$1000 after 5 yrs?
 \$600 now or \$1000 after 5 yrs?



- *Steeper discounting* = value declines more rapidly given delays, immediacy is more important
 - Discounting of same commodity across differing populations
 - Discounting of different commodities in the same individual

Delay Discounting

- *Delay discounting* – the subjective value of money declines less steeply across delays than the subjective value of alcohol and food

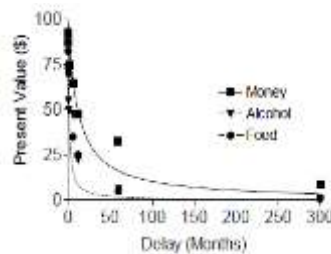


Fig. 1. Temporal discounting functions for money, alcohol, and food. Points show median indifference points as a function of delay. Lines show best fitting discount functions generated by the hyperbolic model (Eq. (1), see text).

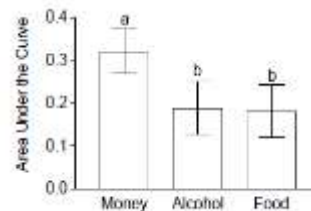


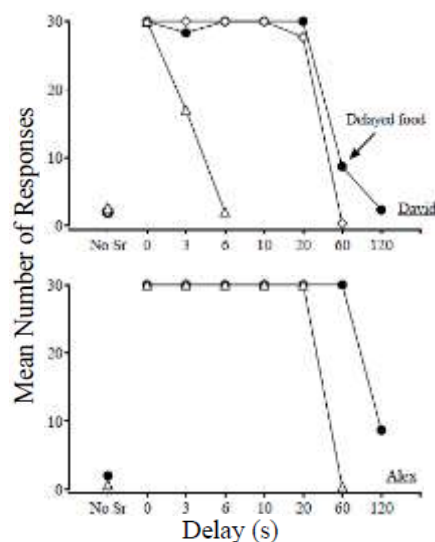
Fig. 2. Mean area under the curve for money, alcohol, and food. Vertical lines indicate one standard error above and below means. The means of conditions marked with the letter 'a' are significantly different from the means of conditions marked with the letter 'b'; the means of conditions marked with the letter 'b' are not significantly different from each other.

Contiguity & Stimulus Value

Q: Do reinforcer delays impact token reinforcers in a way that differs from other reinforcers?

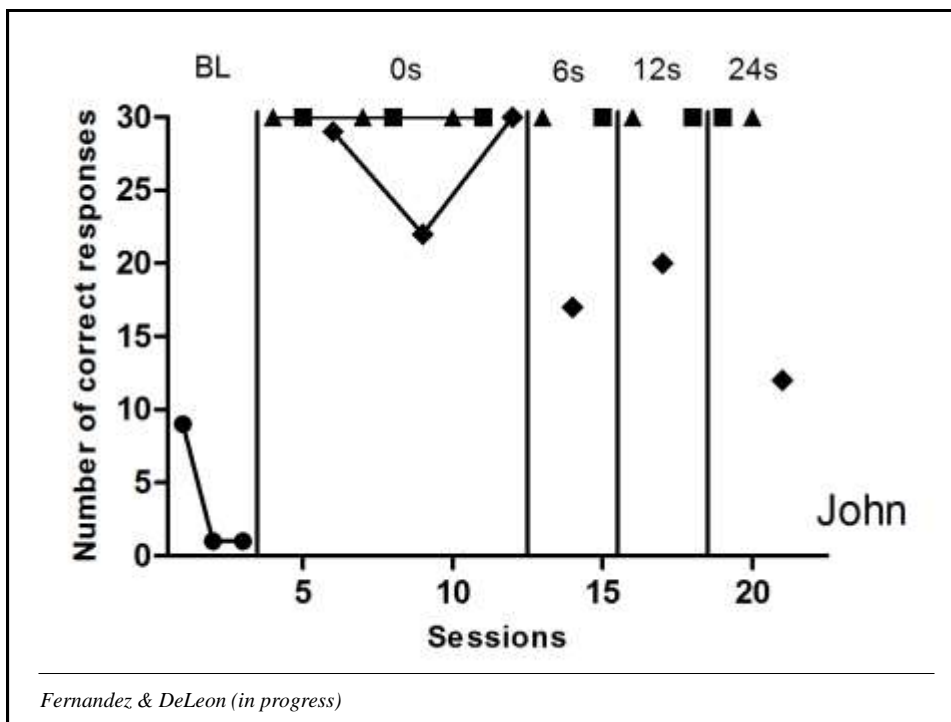
- Children with ASD completing simple free-operant responses (max of 30)
- Increasing delays to reinforcement across phases
- Three reinforcement conditions:
 - Delayed food
 - Delayed token - exchangeable after session for the primary reinforcer
 - Delayed exchange - Immediate token with delayed exchange for the primary reinforcer (2 participants)
- Delays continue to increase until performance deteriorates relative to no-delay condition

Q: How do delays impact the effectiveness of primary reinforcers vs tokens?



- Token reinforcers lose their effectiveness at shorter delays
- But...
 - Not generalized tokens
 - Does the type of terminal reinforcer matter?

Leon, Borrero, & DeLeon (2016) *Journal of Applied Behavior Analysis*



Detection & Repair

- *Examine procedural integrity in your instructors*
- *Consider reinforcers that can be delivered immediately and with little “handling costs”*
- *Consider tokens*

Other Considerations

- *Is your token economy is really a token economy?*
- *Did you immediately dismiss social reinforcers because the learner has an ASD diagnosis?*
- *Did you consider the broader context in which you are trying to use this stimulus?*
- *Did you consider the feasibility or “ecological fit” of the reinforcers in that context?*

Reinforcer Selection and Ecological Fit

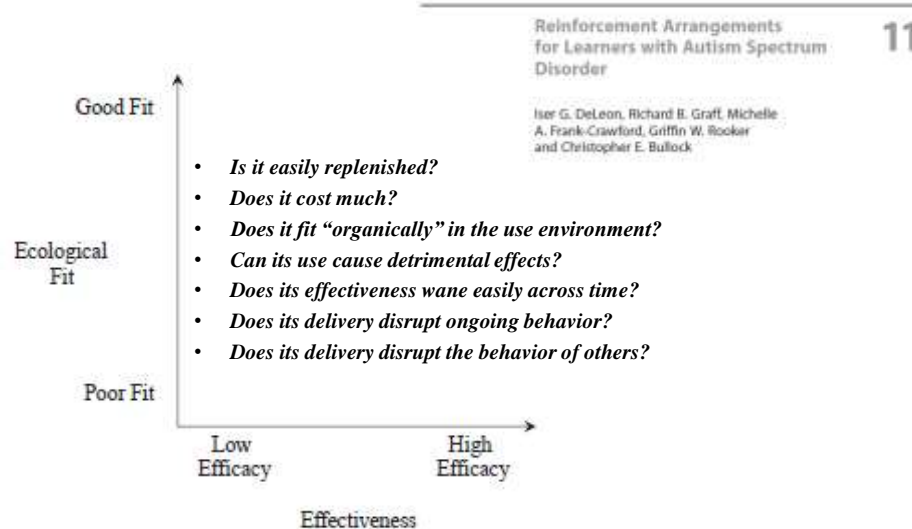
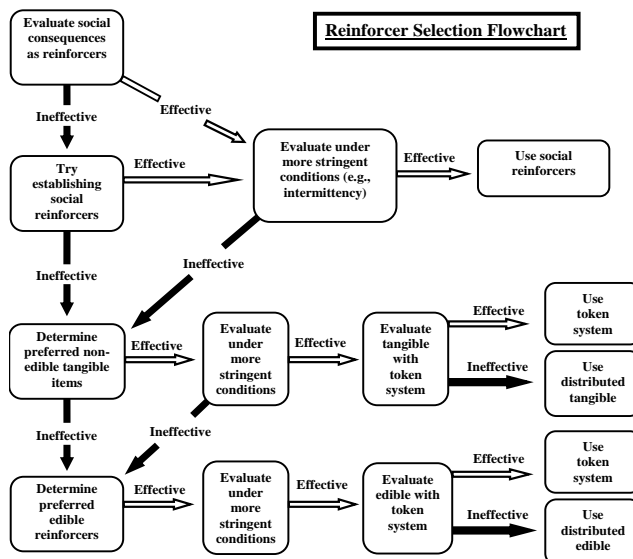


Fig. 11.2 Figure depicting the relation between ecological fit and effectiveness for reinforcer selection

Reinforcer Selection and Ecological Fit



DeLeon, Bullock, & Catania (2013), *APA Handbook of Behavior Analysis*, Vol. 2

Behavior Analysts say the funniest things...

- “The field of applied behavior analysis will probably advance best if the published descriptions of its procedures are not only precisely technological, but also strive for relevance to principle...This can have the effect of making a body of technology into a discipline rather than a collection of tricks. Collections of tricks historically have been difficult to expand systematically...” (Baer, Wolf, & Risley, 1968)*
- Conceptually connected vs. “bag-of-tricks” approach requires a thorough understanding of basic principles and concept*

Towards Higher Standards of Training

- *If you are a practicing behavior analyst*
 - *Consume basic behavioral research*
 - *Consume non-behavioral research if it demonstrates robust behavior change*
 - *Seek CEU's that expand your toolkit*
- *If you train future behavior analysts*
 - *Embrace increased standards for conceptual behavior analysis*
 - *Teach outside the box*

Towards Higher Standards of Training

Q: Could one be a good applied behavior analyst without:

- *A strong theoretical/conceptual grasp of behaviorism*
- *A strong understanding of our basic literature*

A: Probably...our applied canon is strong.

Q: Could one be a great applied behavior analyst without these things?

- *“Problem-solving may be defined as any behavior which, through the manipulation of variables, makes the appearance of a solution more probable (Skinner, 1953)”*
- *The tools required for creativity, innovation, and problem-solving in practice lie in knowing the fullest range of variables to manipulate and why and when to manipulate them.*

Towards Higher Standards of Training

Q: Has the rise of professional behavior analysis, and the proliferation of practitioner training programs, produced behavior analysts less connected to basic process and philosophy?

“I see the glass as half full (or more). It is probably true that the explosion of training programs is lowering the average, but some fraction of the new recruits get excited by the power and parsimony of behavior analysis and are as enthusiastic about the field as ever we were. I see them everywhere I turn, searching for a deeper understanding and steadily refuting the stereotypes of our field.”

David Palmer, TBA-L, April 2016

For Further Reading

DeLeon, I.G., Bullock, C.E., & Catania, A.C. (2013). Arranging reinforcement contingencies in applied settings: Fundamentals and implications of recent basic and applied research. In G. Madden, W.V. Dube, G. Hanley, T. Hackenberg, and K.A. Lattal (Eds.) *American Psychological Association Handbook of Behavior Analysis*. Washington, DC: American Psychological Association.

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Hursh, S.R., Madden, G.J., Spiga, R., DeLeon, I.G., & Francisco, M. T. (2013). The translational utility of behavioral economics: The experimental analysis of consumption and choice. In G. Madden, W.V. Dube, G. Hanley, T. Hackenberg, and K.A. Lattal (Eds.) *American Psychological Association Handbook of Behavior Analysis*. Washington, DC: American Psychological Association.

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