Some Observations

- Reinforcers that maintain behaviors of typically developing children?
  - Verbal behavior
  - Social interactions
  - Independent play
- SOME children with autism
  - Social interactions come to function as reinforcers
  - Imitate others “spontaneously”
  - Playing with toys becomes reinforcing
Contrived and natural reinforcement

**Definitions**

- Application 1: Verbal behavior
- Application 2: Imitation
- Application 3: Play

Getting to natural reinforcer control

- Maintenance issues
- Establishing conditioned reinforcers

Contrived and Natural Reinforcement

- The power of reinforcement
- May be described as
  - Conditioned and unconditioned
  - Positive and negative
  - Social and automatic
  - Natural and contrived
**Contrived and Natural Reinforcement**

- **Natural reinforcer** is “independent of the behavior analyst’s or practitioner’s efforts” (Cooper, Heron, & Heward, 2007, p. 623)
- **Contrived reinforcer**
  - Part of a practitioner’s efforts to change behavior
  - Something other than the reinforcer in the natural environment for that response

---

**Practice**

<table>
<thead>
<tr>
<th>Consequence</th>
<th>Contrived for…</th>
<th>Natural for…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attention</td>
<td>Turning page of a book</td>
<td></td>
</tr>
<tr>
<td>Lollipop</td>
<td>Building with blocks</td>
<td></td>
</tr>
<tr>
<td>Token</td>
<td>Doing a puzzle</td>
<td></td>
</tr>
</tbody>
</table>
Why Do We Use Contrived Reinforcers with Children with Autism?

- Need for many teaching trials
- Teaching skills with no natural counterpart
- Behavior “trapping” (Baer & Wolf, 1970)
- Consequences function differently
  - Social stimuli (Spradlin & Brady, 1999; Vollmer & Hackenberg, 1999)
  - Automatic reinforcement during play (and powerful reinforcement of rituals, sameness, stereotypy)

Benefits of Natural Reinforcer Control

- We know we can change behavior!
- Challenge is to bring responses under control of natural reinforcers
- Benefits
  - Similarity to peers, maintenance
  - Klintwall & Eikeseth (2011): significant positive correlation between having more socially mediated reinforcers and better outcomes of EIBI
- Requires analysis of what maintains responses for typically developing children
  - Consider 3 types of skills…
Natural Consequences for...

- Verbal behavior
- Imitating peers
- Independent play

Verbal Behavior

- Skinner (1957) - analysis of natural reinforcer control of different types of language
- Teaching children with autism
- Proper antecedent and consequence control

Mands

- Reinforcer: specific to the response
- For items – relatively easy to teach with natural reinforcers
- For information – Where, What, When, How, Why?
Establishing Concurrent Mands for Items and Mands for Information about Location in Children with Autism

Alexis Somers • Tina M. Sidener • Ruth M. DeBar • David W. Sidener

Verbal Behavior

- Nonspecific; generalized conditioned Sr
- Bids for joint attention?

**EO:**
Child sees novel/interesting object

**SP:**
Someone else is present

Child looks at person, points at item
Says, "Look"
Says, "An (item)"

Reinforcer?
Verbal Behavior

Intraverbals

- Nonspecific; generalized conditioned Sr
- What type?

Imitating Peers

- Imitation often delayed or absent in individuals with autism (Leaf & McEachin, 1999)
- Effective behavior analytic technology
  - Contrived antecedents and reinforcers (e.g., Baer, Peterson, & Sherman, 1967; Lovaas, 2003; Maurice, Green, & Luce, 1996;)

"Do this" + Model Claps
Observer Claps
“Great!” + Token

- May result in generalized imitation repertoire
- Does not necessarily result in imitation in the natural environment
What’s the Natural Reinforcer?

1 point: Spontaneously follows peers or imitates their motor behavior 2 times
Purpose: evaluate effects of
A differential observing response (DOR) and prompting
On the differential motor imitation
Of 2 boys with autism
Kenny (4), Kepler (11)
Matched pictures to objects, objects to pictures
Imitated when instructed
Spontaneous imitation (VB-MAPP) = 0
9 trials, 3 types of trials (3 of each)

- **High-Preference Trial**
  - Preferred edible delivered contingent upon model's motor response

- **Neutral Trial**
  - Neutral item delivered contingent upon model's motor response

- **No Consequence Trial**
  - No consequence delivered contingent upon model's motor response

---

- **High Preference Item** → **Imitation** → **Correct**

- **Neutral item / No Consequence** → **NO imitation** → **Correct**
Also Check Out

JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2015, 48, 800–816

TEACHING OBSERVATIONAL LEARNING TO CHILDREN WITH AUTISM

JACQUELYN MACDONALD AND WILLIAM H. AHEARN
WESTERN NEW ENGLAND UNIVERSITY, THE NEW ENGLAND CENTER FOR CHILDREN

What is Play?
Play in Children with Autism

- Substantial delays in development of play
- Persistent deficits in social communication/interaction
- Restrictive/repetitive patterns of behavior, interest, or activities

(DSM-5; American Psychiatric Association, 2013)

Literature Review of Play Interventions

- Search
  - PsycINFO
  - Peer-reviewed journals
- Search terms
  - Play and autis*

Inclusion Criteria:
- Participants diagnosed with autism/PDD-NOS
- Dependent variable: play skill
- Demonstrated experimental control
- English

- 1593 articles
- 57 met criteria

Exclusion Criteria:
- Not replicable
- Board/video games
- Outdoor/recess play
### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Preference assessment</th>
<th>Skill assessments</th>
<th>Toys used</th>
<th>Dependent variable</th>
<th>Data collection</th>
<th>Generalization</th>
<th>Social validity</th>
<th>Treatment integrity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of publication</td>
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<td></td>
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<tr>
<td>Age/number of participants</td>
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<tr>
<td>Setting</td>
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<tr>
<td>Stimuli used as reinforcers</td>
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<tr>
<td>Type of play (functional/symbolic)</td>
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<tr>
<td>Independent variable</td>
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<td></td>
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<tr>
<td>Design/experimental control</td>
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<tr>
<td>Maintenance</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Interobserver agreement</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

### Preference Assessment of Toys: 8 studies

- Systematic Assessment: 2
- Informant-based Assessment: 4
- Observation: 2
Currently no research on teaching block building to children with autism

Survey: included in most programs

Bronstein, Sidener, Reeve, Hoch, & Kaplan-Reimer

Select targets by developmental level


Evaluate effects of automatic reinforcement alone

Data on engagement and preference

---

How do behavior analysts do this?

Teach with natural reinforcers only

Teach with contrived - remain in place

Teach with contrived - remove later…
Survey: >70% of behavior analysts use intermittent reinforcement to program for maintenance

**ENHANCING & ASSESSING MAINTENANCE EFFECTS IN BEHAVIORAL INTERVENTIONS: A REVIEW OF THE LITERATURE**

Erin Richard White, M.A., BCBA  
Tina M. Sidener, Ph.D., BCBA-D  
Kenneth F. Reeve, Ph.D., BCBA-D  
Bridget A. Taylor, Psy.D., BCBA-D  
Jason C. Vladescu, Ph.D., BCBA-D
Literature Review Search

- Searched JABA website using terms: *maintenance, maintain, & follow-up*
- 2002-2011
- Secondary search using PsycINFO
- Individually examined articles for inclusion criteria

83 Experiments

- Strategies for enhancing maintenance
- Strategies for assessing maintenance
Strategies to Enhance Maintenance

<table>
<thead>
<tr>
<th>Method</th>
<th>Acquisition</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thinning schedule of reinforcement</td>
<td>7.9%</td>
<td>40%</td>
</tr>
<tr>
<td>Increasing the delay to reinforcement</td>
<td>1.6%</td>
<td>5%</td>
</tr>
<tr>
<td>Use of natural reinforcers</td>
<td>12.7%</td>
<td>0%</td>
</tr>
<tr>
<td>Use of booster sessions</td>
<td>11.1%</td>
<td>5%</td>
</tr>
<tr>
<td>Use of self-management</td>
<td>11.1%</td>
<td>5%</td>
</tr>
<tr>
<td>Other</td>
<td>4.8%</td>
<td>10%</td>
</tr>
<tr>
<td>None</td>
<td>61.9%</td>
<td>45%</td>
</tr>
</tbody>
</table>

Malott (2008): “the myth of intermittent reinforcement”

Why would this happen?
Establishing Conditioned Reinforcers

- If natural stimuli don’t function as reinforcers, how do we make it so?
- Survey: No technology for establishing conditioned reinforcers, but would like one!

Technology:
- The specific methods, materials, and devices used to solve practical problems

A Technology for Establishing Conditioned Reinforcers

Benefits

- Increase variety of toys, reinforcers
- Establish social stimuli as reinforcers
- Better maintenance than contrived reinforcers?

Why don’t we have one?
Establishing Conditioned Reinforcers

- A stimulus that is a reinforcer because it has been paired with another reinforcer
- Skinner (1938): formal beginning
  - Demonstrated producing conditioned reinforcers with rats
  - After consistently presenting a click with food, used the click sound alone to train lever pressing
  - Lever pressing increased but then decreased as the click lost its effectiveness without food pairing

Neutral stimulus (click)  Unconditioned reinforcer (food pellet)

After repeated pairings … The click is then delivered as a consequence for a new response

Rat presses lever  Conditioned reinforcer
Temporal Arrangements (SSP and RSP)

- **Delay**
- **Simultaneous**
- **Trace**
First study demonstrating development of a conditioned reinforcer with humans:
- Hubbard (1951) - Typically developing adults

Most subsequent research conducted with typically developing preschoolers
- Few studies with clinical populations

Considerations
- Type of pairing
  - each time, at the same time, paired with, every time, whenever, accompanied, followed, right before, contiguous, preceded
- Demonstration of neutral stimulus, reinforcing stimulus, and reinforcement effect resulting from pairing

Identified neutral stimulus, reinforcing stimulus

Demonstrated reinforcement effect resulting from pairing

Excluded studies on token systems/generalized conditioned reinforcers

Steinman (1968)
- Children; MR
- Discrimination training
- Praise

Birbrauer (1971)
- Children; MR
- Delay or trace
- Nonsense words

Dozier et al. (2012)
- Adults; DD
- Delay or trace
- S-S and R-S
- Praise
Advantages of DT as a Pairing Procedure

- **Number of pairings**
  - SSP and RSP: arbitrary
  - DT: until discrimination is demonstrated

Research with Children with Autism

- Issues in autism may warrant different procedures
- “Stimulus overselectivity”: Children with autism often respond to some parts, but not all parts, of a complex stimulus
  - Lovaas, Schreibman, Koegel, and Rehm (1971)

- When parts of the stimulus were then presented alone…
  - Typically developing children responded to the complex stimulus and single stimuli similarly
  - Children with autism responded primarily to only one of the stimuli (it differed across children which one)
## Research with Children with Autism

|---|---|---|
| • After simultaneous pairing failed  
  • “Good” established as $S^D$ for food  
  • Delivering “good” contingent upon lever pressing | • Established smiles and nods as $S^D$s  
  • Used as reinforcers during joint attention training | • Compared DT to delay pairing  
  • Responding increased in both  
  • DT more responses for 5 out of 7 of the participants |

### Considerations
- Limited experimental control
- Lack of reinforcer assessments (to identify neutral and reinforcing stimuli)

### Purpose
- Evaluate DT to establish conditioned reinforcers with children with autism
- 3 boys with autism: 6

### Address limitations of previous research
- Reinforcer assessments
- Interspersal of $S^A$s
- Enhance discrimination
- Serve as control
**Reinforcer Assessment**

![Graph showing the frequency of responses over sessions for different reinforcers.](image1)

**Response Assessment**

![Bar graph showing the number of responses for different switches over time.](image2)

- **Responses in last 30 s**
- **Responses in first 4 min 29 s**
<table>
<thead>
<tr>
<th>Stimulus Type</th>
<th>Icon</th>
<th>Pre-Test</th>
<th>Discrimination Training</th>
<th>Post-Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S^D$</td>
<td><img src="image" alt="Switch Icon" /></td>
<td><img src="image" alt="Response Icon" /></td>
<td><img src="image" alt="Response Icon" /></td>
<td><img src="image" alt="Response Icon" /></td>
</tr>
<tr>
<td>S-Delta</td>
<td><img src="image" alt="Icon" /></td>
<td><img src="image" alt="Response Icon" /></td>
<td><img src="image" alt="Response Icon" /></td>
<td><img src="image" alt="Response Icon" /></td>
</tr>
</tbody>
</table>

**Pre-Pairing**
Pre-Pairing

“Do whatever you like, but please stay in your chair”

If responding occurred…

Post-pairing was identical to pre-pairing
Discrimination Training

Phase 1

Neutral stimulus
(SD)

Behavior

Consequence

Phase 2

Neutral stimulus
(SD)

Behavior

Consequence

Neutral stimulus
(SA)

Behavior

Consequence

(SA)
A DISCRIMINATION TRAINING PROCEDURE TO ESTABLISH PRAISE AS A CONDITIONED REINFORcerer FOR CHILDREN WITH AUTISM

Erin L. Sainsbury, M.A., BCBA
Tina M. Sidener, Ph.D., BCBA-D
Kenneth F. Reeve, Ph.D., BCBA-D
Catherine Taylor-Santa, M.A., BCBA
David Sidener, Ph.D., BCBA-D

Purpose

- Systematically replicated Taylor-Santa et al. (2014)
- Evaluated DT to establish praise statements as conditioned reinforcers
- 3 boys with autism (11-15 yrs old)
  - Praise did not appear to function as a reinforcer
- Bluetooth® speaker behind participant, remotely controlled
A Comparison of Pairing Procedures to Establish Visual Stimuli as Reinforcers for Adolescents with Autism

Christina Slaten, M.A.
Tina M. Sidener, Ph.D., BCBA-D
Catherine Taylor-Santa, MA, BCBA
Kenneth Reeve, Ph.D., BCBA-D
Danielle Gureghian, Ph.D., BCBA-D
Dozier, Iwata, Thomason-Sassi, & Wilson (2012)

2 Experiments

Exp 1
SSP

- Trace pairing
- Ineffective

Exp 2
RSP

- Simultaneous pairing
- Effective for 4/8 participants

Considerations

- Different participants in each experiment
- Praise statements
  - 10 of various lengths
  - Variations in presentation?
- Same response during pairing and post-pairing
- Did not incorporate an S-
Purpose

- Compare the effectiveness of **STIMULUS-STIMULUS PAIRING (SSP)** and **RESPONSE-STIMULUS PAIRING (RSP)**
- Replicated some aspects of Dozier et al. (2012)
- Adolescents with ASD
  - George & Andy: 12 yo
  - Chad & Todd: 15 yo
- Address previous research
  - Different response during pairing and post-pairing
  - Interspersal of S-trials
  - Conditions counterbalanced

Visual Stimuli

- Diamonds
- Squares
- Radius
- Tree
- Flames
- Wave
- Blinds
- Flowers
- Lines
Programming for Stimulus Generalization to Conditioned Reinforcers with Children with Autism

Benjamin D. Rhodes
Tina M. Sidener
Ken F. Reeve
James E. Carr
Catherine Taylor-Santa

Purpose

· Evaluate multiple exemplar training during discrimination training on generalization to novel stimuli
· 2 S\text{D}s and 2 S\text{A}s during DT
· Probe generalization to stimulus similar to the S\text{D}s
<table>
<thead>
<tr>
<th>SD 1</th>
<th>SD 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SD 1- Happy (82.43%)</strong></td>
<td><strong>SD 2- Happy (91.26%)</strong></td>
</tr>
<tr>
<td><img src="SD1Happy.png" alt="Image" /></td>
<td><img src="SD2Happy.png" alt="Image" /></td>
</tr>
</tbody>
</table>

**Generalization- Happy (91.08%)**

<table>
<thead>
<tr>
<th>S-delta 1</th>
<th>S-delta 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>S-delta 1- Neutral (87.54%)</strong></td>
<td><strong>S-delta 2- Neutral (81.39%)</strong></td>
</tr>
<tr>
<td><img src="SD1Neutral.png" alt="Image" /></td>
<td><img src="SD2Neutral.png" alt="Image" /></td>
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</tbody>
</table>

**Generalization**

<table>
<thead>
<tr>
<th>SD 1</th>
<th>SD 2</th>
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<tbody>
<tr>
<td><img src="SD1Generalization.png" alt="Image" /></td>
<td><img src="SD2Generalization.png" alt="Image" /></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>S-delta 1</th>
<th>S-delta 2</th>
</tr>
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<tbody>
<tr>
<td><img src="SD1Neutral.png" alt="Image" /></td>
<td><img src="SD2Neutral.png" alt="Image" /></td>
</tr>
</tbody>
</table>
Conclusions

tsidener@caldwell.edu