Automatic reinforcement and stereotypy: From a conceptual analysis to practical application

William Ahearn, Ph.D., BCBA-D
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• Eileen Gambrill, Hutto Patterson Charitable Foundation Professor in Child and Family Studies, University of California, Berkeley
• E. Scott Geller, Alumni Distinguished Professor and Director of the Center for Applied Behavior Systems, Virginia Tech
• Mark Dixon, Professor and Coordinator of the Behavior Analysis and Therapy program at Southern Illinois University

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Context: Presence of others

EO/AO → R

SD

???

APP Beh.

Sr+

R

Automatically Reinforced Behavior

Sr+

Sensory consequences

Socially-mediated consequences
Wither Automatic Reinforcement?

- Skinner (e.g., 1957)
  Technical term? Concept!
- Vaughan & Michael (1982)
  Perceiving
  Producing
  Problem solving
Why is it important?

- Because BFS says so?
- Acquisition vs. maintenance
  CRF vs. INT
- Complex behavior
  An echoic without an audience
- Consequences not always apparent
Does it actually exist?
What is it exactly?

- Conceptual & applied phenomenon
- Does it have pragmatic value?
  Are we further along acting on it?
- What kind of behavior is it?
  Vollmer (RIDD; 1994)
  Operant?
Ahearn, Clark, Gardenier, Chung, & Dube (2003)

• Concerned about the longer term effect of noncontingent reinforcement as treatment for automatically maintained problem behavior
Does it actually exist?
Exp. 1 – Pigeons. Average data all phases – note more rapid elimination of BT with DRA than with NCR in Phase 2, all conditions; higher average target response rates during extinction with $rT$ than no $rT$; rapid acquisition and extinction of alternative behavior BA, all conditions; modest reinstatement in Phase 4, all conditions; no effect of $rT$ on baseline (Phase 1) or C1 Phase 2.

Cond 1 – with $rT$
Cond 2 – no $rT$
Cond 3 – rep $rT$

Responses per min

Five-session blocks
Exp. 2 – People. Average data all phases – note difference in y-axis scales; in Phase 2 note rapid elimination of \( BT \) with DRA, relatively little effect of NCR, ordinally similar to Experiment 1.
Conclusions: With pigeons and humans with IDD,

- DRA was always more effective in reducing target behavior than NCR with the same reinforcer rate.

- Analog sensory reinforcers rT:
  1. Did not affect baseline response rates
  2. Increased variability during treatment
  3. Increased post-treatment resistance to extinction
  4. Increased resurgence at onset of extinction after DRA in Experiment 1; no reliable effect in Experiment 2.

Overall consistent with Ahearn et al. (2003) where sensory, intrinsic, automatic reinforcers were inferred.
Does it actually exist?

BECAUSE FUCK YOU

THAT'S WHY
Stereotypy: Prevalence

- During typical development
  - Children
  - Adults (e.g., Rojahn et al., 2000)
- Sensory impairment
  - Blind (e.g., Fazzi et al., 1999)
- IDD/MR
  - (Berkson et al., 1999)
- ASD
  - (Lewis & Bodfish, 1998)
  - (Cuccaro et al., 2003)
Why is it important?

- Occurs in typical development
- Skill acquisition (e.g., Dunlap et al., 1983)
- Socially unacceptable (e.g., Wolery et al., 1985)
  (e.g., Jones et al., 1990)
MacDonald et al. (2007)
Behavioral interventions for Auto SR+

- Establish appropriate behavior  
  (Schreibman & Carr, 1978; Matson et al., 1993)

- Response competition  
  (Vollmer et al., ’94; Piazza et al., ’98/00)

- Differential consequences  
  (Palyo et al., ‘79; Steege et al., ‘89)

- Response blocking (interruption)  
  (Ahearn et al., ’07; Reid et al., ‘93)
Establish Appropriate Behavior

- Social interaction (via prompting)
  (e.g., Odom & Strain, 1986; MacDonald et al., 2009)
- Play skills (via prompting & whatever)
  (e.g., Libby et al., 2009; Tereshko et al., in press)
- Collateral effects → Less stereotypy
VM videos

Clip 1 - BL

Clip 2 - Trg
An aside on vocal stereotypy

- VS observed to increase after vocal imitation trg
  (Lovaas et al., 1977/1987)
- Developmentally appropriate
  (Nakanishi & Kenjiro, 1973)
- Interfering, stigmatizing, communicative?
  (Schreibman & Carr, 1978)
- Elimination or control
  (Charlop, 1983; Luce & Dyer, 1996)
Response Interruption + RD – Ahearn et al. (2007)

- 5-minute sessions
  - No interaction baseline
  - Reinforce requesting/app speech
- Contingent upon vocal stereotypy
  - Establish attention (eye contact)
  - Ask social questions (hi-p compliance)
  - Reinforce requesting/app speech
- TX session extended to obtain 5-min w/out intervention application
Session

Percentage of intervals - Vocal Stereotypy

Response interrupt + redirect (RI+RD)

BL

RI+RD

BL

Stereotypy

Session

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60

0 20 40 60 80

Cal
Session 0 2 4 6 8 10 12 14 16

Percentage of intervals - Vocal Stereotypy

BL  RI+RD  BL

Response interrupt + redirect (RI+RD)

Frequency appropriate speech

Percentage of intervals - Vocal Stereotypy

appropriate

BL  RI+RD  BL

Response interrupt + redirect (RI+RD)

Frequency appropriate speech

Session

Ali
Sessions:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

Percentage of Intervals

Baseline (BL)  RI+RD  BL  Response Interrupt + Redirect (RI+RD)

Hand-Flapping

Engagement

LOU
Findings

- Interruption = decrease in AutoSR+
- Appropriate behavior more probable
- Adding to Tx package may be helpful
- Intervention requires 1:1 staffing

Requires high integrity
Effortful
Aggression/noncompliance
RIRD video

Clip 4 - BL

Clip 5 – RIRD 1st session
Response Blocking

- Ahrens, Lerman, Kodak, Worsdell, & Keegan (2011)
  - RIRD-v may not be a possible treatment option for students that are noncompliant or have a limited vocal verbal repertoire
  - RIRD-v vs. RIRD-m
Figure 1. Percentage of intervals with vocal stereotypy (top left) and appropriate vocalizations (bottom left) for Bobby during the treatment comparison. Percentage of session time with vocal stereotypy (top right) and frequency of appropriate vocalizations (bottom right) for Hal during the treatment comparison.
RIRD variations
## Procedural concerns - RIRD

### Table 2
RIRD Percentage of Time Spent in Treatment

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<th>Overall Average</th>
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## Procedural concerns - CI

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Context: Presence of others

EO/ AO

SD

???

EO/ AO

R

APP Beh.

Sr+

R

Automatically Reinforced Behavior

Sr+

Sensory consequences

Socially-mediated consequences
Verbal Operant Training
Colon, Ahearn et al. (2012)

- Produce decreased levels of vocal stereotypy and increased levels of appropriate vocalizations
  - Evaluate effect of tact training on occurrence of appropriate vocalizations & vocal stereotypy
  - Evaluate effect of a response interruption/redirection procedure on vocal stereotypy
Tact Training

- 4 stimuli trained (2 high preference items from preference assessment & 2 contextually relevant items)
- Progressive prompt delay w/ echoic prompt
- Response modeled, “I see chip”
- Appropriate student response → social praise & tokens exchanged for edible
- Tact training until 90% accuracy
Response Interruption & Redirection (RIRD) with in vivo tact training

Anna

Post Tact Training (PTT) RIRD PTT

Frequency of Appropriate Vocals

Sessions

Jeff

removed primer

Post Mand Training with in vivo tact training

Mands

Parker

Unspecified

Tacts
Results-Summary

- VOT effective in increasing VB, decreasing vocal stereotypy
- RIRD decreased vocal stereotypy further
- Some mands seen in Post-tact Training and RIRD sessions
Torres-Viso, Sloman, & Schulman (Douglass Developmental Disabilities Center)

- **Negative Reinforcement Assessment**
  - Five minute sessions
  - Five conditions (“I see” program, singing tasks, motor tasks, vocal tasks, play condition)
  - Demands presented until Amy requested to stop, then removed for 20 seconds

- **Dependent Measures:**
  - Rate of “stop” requests
  - Inappropriate behavior (aggression, SIB, crying)
  - Latency to first “stop” response or instance of problem behavior
*Context: Presence of others*

- **SD**: ???
- **EO/AO**: R
- **APP Beh.**: Sr+
- **R**: Automatically Reinforced Behavior
- **Sr+**: Sensory consequences
Moving on past RIRD

Clip 6 – Teaching social reciprocity

Clip 7 – Generalization
DRO

• Most commonly used treatment for aberrant behavior (Marcus & Vollmer, 1996)

• Effective treatment
  - e.g., Wacker et al. (1990); Taylor et al., (2005)

• Resetting vs. non-resetting (e.g., Himle, Woods, & Bunaciu, 2008; Roane, Falcomata, & Fisher, 2007).

• Effective in combination

• Adventitious reinforcement (Repp & Deitz, 1974)

• Satiation (Egel, 1981)
DRO/Negative Punishment
Farber, Ahearn et al.

• Identify high preference item (edible/activity-must engage 80%+)
  – Fellner, LaRoche, & Sulzer-Azaroff (1984)
  – DRO + DRI ineffective → added interruption procedure decreased behavior
  – However, when effective DRO is much less resource intense
  – Easy to thin
  – May work well in combination with other Ps
Competition & Motivation

- Matching sensory consequence
  AOS??? (Rapp, 2006; 2007)

- Is it better together?
  EOs (Ahearn et al., 2003)
Context: Presence of others

EO/AO

SD

???

EO/AO

R

APP Beh.

Sr+

Automatically Reinforced Behavior

R

Sr+

Sensory consequences

Socially-mediated consequences
Rapp (2007)

- Functionally matched: intervention may serve as an abolishing operation (AO)
- Functionally unmatched: intervention may actually serve as an establishing operation (EO)
Figure 3. Percentage of time Brian engaged in vocal stereotypy during the no-interaction and toys sequences (top). Percentage of time Nevin engaged in vocal stereotypy during the toys and toys and music sequences (bottom).
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Ahearn, Clark, Gardenier, Chung, & Dube (2003)

• Concerned about the longer term effect of noncontingent reinforcement as treatment for automatically maintained problem behavior
Multiple Schedule Assessments

Baseline (BSL) → Treatment (matched) → Baseline (BSL)
Baseline (BSL) → Treatment (matched) → Baseline (BSL)
Baseline (BSL) → Treatment (matched) → Baseline (BSL)

Baseline (BSL) → Treatment (unmatched) → Baseline (BSL)
Baseline (BSL) → Treatment (unmatched) → Baseline (BSL)
Baseline (BSL) → Treatment (unmatched) → Baseline (BSL)
Intervals of Motor Stereotypy and Engagement

Multiple Schedule Assessment - Fin (Matched)
<table>
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<th>Abolishing Effect</th>
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</table>
Session Average (Matched) - Fin

Percentage of Intervals with Motor Stereotypy and Engagement

Sequence: BSL, Slinky, BSL, BSL, Slinky, BSL, BSL, Slinky, BSL, BSL, Slinky, BSL
Intervals of Motor Stereotypy and Engagement

Multiple Schedule Assessment- Fin (Unmatched)
## Unmatched Stimulus

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<tbody>
<tr>
<td>3</td>
<td>7</td>
<td>2</td>
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</table>
Intervals of Stereotypy and Engagement

Competing Items Assessment - Tom

Stimulus:
- LeapPad
- Popcorn
- Putty
- Music Books
- Pin Toy
- Koosh
- Goldfish
- Picture Book

Engagement

Stereotypy
Intervals with Stereotypy and Engagement

Multiple Schedule Assessment - Tom (Matched)

Sequence

Engagement

Stereotypry
### Matched Stimulus

<table>
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Multiple Schedule Assessment - Tom (Unmatched)
<table>
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<td>7</td>
<td>1</td>
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Sequence Averages - Tom (Unmatched)

Intervals with Stereotypy and Engagement

Sequence

- BSL
- Goldfish
- BSL
- BSL
- Goldfish
- BSL
- BSL
- Goldfish
- BSL
Results

• Competing items assessment identified activities that effectively competed
  – The matched stimulus (leap pad) for the second participant did not compete effectively

• Multiple schedule analysis revealed whether a motivating operation could potentially be present immediately following response competition
<table>
<thead>
<tr>
<th>Participant</th>
<th>Matched/Unmatched</th>
<th>CI</th>
<th>Did the stimulus compete?</th>
<th>MO</th>
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<tr>
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<td>Musical Phone</td>
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