From Stereotypic to Appropriate Vocalizations: A Practical Review of Effective Procedures

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Using research to inform best practice

- Research into teaching procedures
  - What works
    * The best procedure?
- Stages of best practice
  - What do we know
  - How many things work?
  - Comparative studies!
  - Prediction of effective practice
  - Identifying crucial “pre-requisites”
EIBI: Best Practice!

- Lovaas, 1987; McEachin, Smith, & Lovaas, 1993
- Meta-analyses
  (e.g., Eldevik, Hastings, Hughes, Jahr, Eikseth, and Cross, 2009)
- Cochrane review
  (Reichow, Barton, Boyd, & Hume, 2013)
- AAP (2001); NIMH (2007); Surgeon General (1999)
Common elements of effective programs (Dawson & Osterling, 1997)

- Curricula focus in major deficit areas
  - Becoming aware of world around them
  - Imitation
  - Communication
  - Play skills
  - Social interaction
- Establish/generalize these skills
- Functional Tx of problem behavior
  - Self-injury/Stereotypy/Aggression/Etc.
MacDonald et al. (2007)
A Case History in Best Practice

- Stereotypic behavior circa 2000
- Function-based TX?
Stereotypy: Etiology

- Sensory processing problem
  (e.g., Ringman & Janovic, 2000)
Sensory Integration

• “Sensory diet” (Wilbarger, 1993)
  – Therapeutic use of sensation in daily contexts
  – Brushing and Deep Pressure Therapy (DPT)

• Behavioral Perspective
  – Use with automatically reinforced behavior
  – SD performing an abolishing operation
    • Global/Local effects
Moore, Cividini-Motta, Clark, & Ahearn (2015; BIN)

• Experimental analysis of Sensory Integration
  – If SI effective, should reduce automatically maintained motor stereotypy

• Expose participants to sensory diet of competing items and/or brushing hourly
  – Measure stereotypy at specific times during day
Method

• Participants
  – 5 adolescents with ASDs
  – All attended school for children with autism
  – Automatically maintained vocal/motor stereotypy with no treatment or ineffective treatment in place

• Setting
  – Assessments in 1.5 m x 3 m research room
  – Treatments in students’ classrooms
Procedure

• Materials
  – Consulted with OT and trained SI therapist

• Staff Training
  – All direct care staff in Experiment 3 trained in brushing protocol
Pre-intervention Assessments

• Functional Analysis of motor/vocal stereotypy (Iwata et al., 1982/1994)
  – All indicated automatic reinforcement
• Competing Items Assessment with sensory diet items (Piazza et al., 2000)
Experiment 1

• Purpose: to examine whether access to the SD during school hours would effect stereotypy across the day
• Dependent Variable: motor stereotypy
• Independent Variable: SI treatments
• Design
  – Pat: ABABA
  – Luke: ABAB'A
Sensory Diet Treatment Analysis

- Baseline sessions
  - 2-3 times per week
  - 10 min alone sessions in AM and PM
  - Measure motor stereotypy
  - No consequences for target behavior
Treatment Analysis

• Treatment (sensory diet)
  – Access to competing sensory items first 10 min (or 15 for one participant) of every hour in school
  – No consequence for stereotypy
  – 10 min alone sessions in AM and PM to measure stereotypy
Sensory Diet Only - Luke

% Intervals with Motor Stereotypy

Sessions

Baseline 10 m SD Baseline 15 m SD Baseline
Discussion

• No global effect with sensory diet as treatment
  – Ineffective at reducing motor stereotypy when participants given access to sensory diet items throughout the day

Strike 1!
Experiment 2

• Purpose: to determine if SI has any local effects on stereotypy

• Direct response competition assessment (Piazza et al., 1998)
  – 10 min session with toys, followed by 10 min session alone
  – Measure stereotypy during direct competition and immediately after
Discussion

- No local effect on stereotypy
- SD items only worked when participant in direct contact
- Stereotypy resumed baseline levels immediately after SD items removed
- Effects of SD items waned quickly

Strike 2!
Experiment 3

- **Purpose:** to determine whether brushing and DPT alone or in combination with the sensory diet would decrease stereotypy.
- **Procedure:** same as Experiment 1 with addition of brushing and DPT.
Discussion

• SI ineffective in all three studies
  – May increase stereotypy
  – Even when implemented more rigorously than standard treatments

• Concerns about time

• Social validity concerns

• Further research
  – Validate ineffectiveness
Stereotypy: Etiology

- Sensory processing problem (e.g., Ringman & Janovic, 2000)
- Operant behavior (Ahearn et al., 2003)
- Impoverished environment (e.g., Berkson, 1983)
Functional Hypotheses

- Automatically-reinforced response
  (Lovaas, Newsom, & Hickman, 1987)

- Related to demand
  (Mace et al., 1987)

- Suppressed by contingent isolation
  (Pendergrass, 1972)

- Multiply-controlled response
  (Kennedy et al., 2000)
Context: Presence of others

EO/AO  SD

???

EO/AO  R  APP Beh.

R  Sr+

R  Sr+

Automatically Reinforced Behavior

Socially-mediated consequences

Sensory consequences
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)
A Case History in Best Practice

- Stereotypic behavior circa 2000
  - Status as functional operant class
  - Manualized recommendations
  - Status of evidence

- Establish competing behavior! How?
- RB for Auto SIB (N=1-2)…
- NCR (Piazza et al. 1998/2000)?
  - Ahearn et al. (2003/2005)
- DRO! (but does not foster CB!)
- DRA?
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
Percentage of intervals - Vocal Stereotypy

Response interrupt + redirect (RI+RD)

BL
RI+RD
BL

Session

0 2 4 6 8 10 12 14 16 18 20

Stereotypy
A Best Practice Revealed

- Spurred a flurry of studies on this technique
  - Martinez & Betz (2013)
- Several variants of RIRD effective
- TX comparisons have favored RIRD (however!)
- Added components that target supporting adaptive skills likely superior to RIRD alone
  - Colon, Ahearn et al. (2012)

- Vanderkerken et al. (2013)
  - Meta-analysis of SCE for VCB (N=74)
  - Large TX effect (e.g., RIRD – VS+)
RIRD video

Clip 4 - BL

Clip 5 – RIRD 1st session
Best Practice is not RIRD

Clip 6 – Teaching social reciprocity

Clip 7 – Generalization
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., 2011)
- Collateral effects → Less stereotypy
VM videos

Clip 1 - BL

Clip 2 - Trg
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)
Behavioral interventions for Auto SR+

- Establish appropriate behavior
  (Schreibman & Carr, 1978; Matson et al., 1993)
- Differential consequences
  (Palyo et al., ‘79; Steege et al., ‘89)
- Response competition
  (Vollmer et al., ’94; Piazza et al., ’98/00)
- Response blocking (interruption)
  (Ahearn et al., ’07; Reid et al., ‘93)
Prompt + DRA Results - Doug

Move to response competition

- Matching sensory consequence
  (Piazza et al., 1998/2000)

- The role of preference
  (Ahearn et al., 2005; Vollmer et al., 1994)
Competing Items Assessment

Piazza et al. (1998/2000)

- Response competition is common approach for automatically maintained problem behavior
- Compared matched and unmatched stimuli effect on automatically maintained problem behavior
- Hypothesized that automatically reinforced problem behavior is less probable when levels of environmental stimulation are enriched
Figure 2. Aberrant behaviors per minute (solid bars), duration of item interaction with matched stimuli (hatched bars), and duration of item interaction with unmatched stimuli (dotted gray bars) during the stimulus preference assessments for Betsy (top panel), Brad (middle panel), and Tyrone (bottom panel). The items denoted with asterisks were used in the evaluation of matched and unmatched stimuli.

- Duration of engagement assessment
  - 8 min sessions
  - Continuous access
  - Matched/Unmatched items

- Measure engagement/stereotypy

- Items w/ high engagement in CIA typically compete
Problems with competition

- Engagement not incompatible with stereotypy
- Engagement not always functionally appropriate
- Appropriate speech and other app. behavior not addressed
Percentage of intervals - Vocal Stereotypy

Session
0 2 4 6 8 10 12 14 16 18 20

Response interrupt + redirect (RI+RD)

BL  RI+RD  BL

Stereotypy
Findings

- Interruption - quick decrease in VS
- Appropriate speech more probable
- Adding materials may be necessary to increase requesting
- Intervention requires 1:1 staffing

Requires high integrity
Effortful
Colon & Ahearn (in progress)
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 (with prompting)
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.
Figure 5. Percentage of each session with motor stereotypy for Eli during the treatment comparison. Percentage of session implementing RIRD indicated with bars.
Steinhauser & Ahearn (in prep)

Figure 6. Percentage of each session with motor stereotypy for Zeke during the treatment comparison. Percentage of session implementing RIRD indicated with bars.
Figure 7. Percentage of each session with motor stereotypy for Danny during the treatment comparison. Percentage of session implementing RIRD indicated with bars.
RIRD variations
Procedural concerns - RIRD

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### Procedural concerns - CI

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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
Frequency of Appropriate Vocals

Sessions

BL Post Tact Training (PTT) RIRD PTT Response Interruption & Redirection (RIRD) with in vivo tact training

Anna

Post Mand Training with in vivo tact training
removed primer
Mands

Jeff

RIRD PTT RIRD

Unspecified

Tacts

Parker
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
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
Percent of Intervals - Motor Stereotypy

Sessions

DRO
RIRD
BL
RIRD vs. DRO
BL
RIRD vs. DRO
Jake
Context: Presence of others

EO/AO

???

SD

R

APP Beh.

Sr+

R

Automatically Reinforced Behavior

Sr+

Sensory consequences

Socially-mediated consequences
Automatic Contingencies

Reinforcement
- Positive: add appetitive stimulus
- Negative: Escape: terminate aversive stimulus, Avoidance: avoids/delays aversive stimulus

Punishment
- Positive: Add aversive stimulus
- Negative: Terminate appetitive stimulus
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?
Automatic Reinforced Behavior

- Iwata et al. (1982/1994)
  Higher in alone sessions
  Persists in repeated alone sessions
- Alternative explanations (Vollmer, 1994)
  - Elicitation
  - Lean schedule of SR+
Is it operant?

- Conditioned seeing $\rightarrow$ Respondent

- Empirical demonstration difficult
  Lack of access to consequence

- Indirect evidence
  Convergent or divergent?
Contingent Access

- Reinforcing contingency in effect if alternative behavior increases
  - Charlop, Kurtz, & Casey (1990)
    - Edible, stereotypy, or both

- Hanley, Iwata, Thompson, & Lindberg (2000)
  - Response blocking and/or contingent stereotypy

- Potter, Hanley, Augustine, Clay, & Phelps (2013)
  - Shaped complex leisure skills
Environmental Enrichment

- Competing reinforcer
  - Piazza et al. (1998)

- Substitutable reinforcer
  - Piazza et al. (2000)

- Consequences not socially mediated
  - Similar appetitive sensory consequences
  - Members of the same operant class
Piazza et al. (1998)– Figures 3 & 4
Response Deprivation Hypothesis

- Deprivation increases value of reinforcer (Timberlake & Allison, 1974)

- Satiation decreases value?
  - McComas, Thompson, & Johnson (2003)
Behavior Momentum

- Environmental variables (contextual stimuli; reinforcer delivery) related to resistance to change of discriminated operant behavior (Nevin, 1984, 1988, & 1992)
  - Rate: response–reinforcer relation
  - Resistance: stimulus–reinforcer relation (Pavlovian)

- Added reinforcers = more persistence to disruption
  - Dube & McIlvane (2001)
  - Mace, Lalli, Shea, Lalli, West, Roberts, & Nevin (1990)
Ahearn et al. (2003)
Ahearn et al. (2003)
Ahearn et al. (2003)
Ahearn et al. (2003)
**Context: Presence of others**

- **EO/AO**
- **SD**
- **R**
- **Sr+**

**Automatically Reinforced Behavior**

**Socially-mediated consequences**

**Sensory consequences**

- **???**
Thank you!

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