Research on Verbal Behavior and its Clinical Applications

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Skinner, 1957
“An exercise of interpretation rather than a quantitative extrapolation of experimental results” (p.11)

“...inherently practical and suggests immediate technological application's at almost every step” (p.12)

**Purpose**

- Describe fundamental concepts and illustrate how they have been employed in understanding and teaching language.
- Relate the current research with components that define the VB approach to EIBI.
- Provide clinical examples derived from the most current VB research
Verbal Behavior

- The behavior of an individual that has been reinforced through the mediation of another person’s behavior (the listener).
- Listener must have learned to respond in order to reinforce the behavior of the speaker.

Verbal Operants

- Speaker emits operant behavior that affects the behavior of others.
- Listener is affected by stimuli generated by the speaker’s behavior.

"Can I have some water?" — receives water — "Thank you"
Mand

• VB in which the response form is controlled by the speaker's motivation. The consequence for the mand is specific.
  • “Water” when water deprived.
  • “I want a hazelnut latte” when tired/caffeine
  • “It is quite hot here” when wanting to cool off.
  • “Would you mind taking the garbage out?”
Tact

- VB in which the response form is controlled by an immediately prior nonverbal stimulus. The consequence for the tact is non-specific.
- “Water” when seeing a bottle of water.
- “I feel thirsty” when describing a private event.
- “Look at his purple tie!” when seeing one.

Intraverbal
• VB occasioned by what someone says, signs or writes. No point-to-point correspondence between stimulus and response.
• Saying “vehicle” as a result of hearing “car”
• Saying “Caio” as a result of hearing “what’s your name?”
• Saying “drive” as a result of hearing “what do

**Duplic and Codic**

- Duplic: Echoic and copying a text.
- Codic: Textual, taking dictation.

[Michael, 1982]
Echoic

- VB in which the response form produces similar sound patterns as the verbal antecedent stimulus.
- “Water” when hearing “Water”

Textual/Taking Dictation
• VB consisting of response patterns under control of verbal stimuli in the form of text (reading aloud).
• VB consist of writing what is heard.

Exercise 1

• Provide one example of each verbal operant (mands, tacts, intraverbals, echoics, textual, taking dictation). Make sure to specify all the terms in the contingency (antecedent, behavior, and consequence)

Why focus on Verbal Operants?
• Distinction between requests and mands, or labels and tacts may seem semantic.

• Verbal operants however, are defined on their function rather than topography.

• A therapist teaches a child to ask for a break in the presence of a boring task by providing access to a preferred item.

• The request is not a mand controlled by motivation to escape the task, but to acquire the item.

• All elements of a mand relation need to be taken into consideration.

• Same applies for all verbal operants (Partington, Sundberg, Newhouse, and Spengler, 1994)

• Definition may guide the analysis.
Skinner's analysis has stimulated considerable research such that a technology of effective language intervention has emerged (Marcon-Dawson, Vicars, & Miguel, 2009; Sautter & LeBlanc, 2006).

**Teaching Procedures**

- **Mand**
  - Mand is the most studied verbal operant (Sautter & LeBlanc, 2006).
  - Numerous studies suggesting that mand training may reduce problem behavior in individuals with disabilities (Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998).
  - Second generation studies have focused on the underlying mechanisms related to the selection of the alternative response and how the selected topography can influence the efficacy of FCT (Harding, Wacker, Berg, Winborn-Kammerer, Lee, & Ibrahimovic, 2009).
Mand Training

- Variables to consider when selecting the alternative response topography are: 1) response effort, 2) novelty of the topography, 3) history of reinforcement with previous topographies, and 3) preference.
Mand Training

• Several studies on how to teach mands for items and information via interrupted chain (e.g., Sundberg, Loeb, Hale, & Eisenheer, 2002)

Shillingsburg & Valentino (2011), TAVB

Table 1

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Description</th>
<th>Demonstration of EO</th>
<th>Therapist response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>Sound muted while playing</td>
<td>Samuel says he can’t hear his game</td>
<td>Therapist tells Samuel to remove the computer</td>
</tr>
<tr>
<td>Walkie talkies</td>
<td>Talk button not pressed</td>
<td>Samuel talks without pressing talk button</td>
<td>Therapist tells Samuel to press the button</td>
</tr>
<tr>
<td>Swing</td>
<td>Gate to playground locked</td>
<td>Samuel attempts to open gate, asks for swing</td>
<td>Therapist tells Samuel to open the gate</td>
</tr>
<tr>
<td>Computer 2</td>
<td>Computer monitor not plugged</td>
<td>Samuel asks to play the computer</td>
<td>Therapist tells Samuel to plug in the monitor</td>
</tr>
<tr>
<td>TV</td>
<td>Remote missing</td>
<td>Samuel attempts to use remote to turn on TV</td>
<td>Therapist tells Samuel to replace remote</td>
</tr>
<tr>
<td>Stack</td>
<td>Stack closet locked</td>
<td>Samuel attempts to open locked closet</td>
<td>Therapist tells him to unlock the door</td>
</tr>
</tbody>
</table>

There are some limitations to the current study that warrant discussion. Because only one participant was included, replication of these procedures with other participants is needed. As previously noted, Samuel had a history of emitting the mand “how” in two different scenarios.
Mand Training

- Mand training is more likely to generalize to other operants such as tacts (e.g., Petursdottir, Carr, & Michael, 2005; Finn, Miguel, & Ahearn, 2012).

- Finn, Miguel, & Ahearn, 2012, JABA of correct mands, Stephen emitted the mand frame inconsistently. It was not until mand training of CT 2 that he started to use the autoclitic frame consistently to mand for items in both tasks. During mand training of CT 2 (noted on the bottom panel), Stephen required 50 trials to learn the topographies, dashboard, whisper, and kig. He met the untrained tacts in all opportunities across three consecutive sessions. He also continued to emit the trained mands and all corresponding autoclitic frames.

- Figure 4 depicts the number of correct mands, tacts, mand frames, and tact frames across construction tasks for Jeff. During pretraining, he never tacted or manded the pieces correctly. He did, however, emit the autoclitic mand frame in almost all testing trials across both construction tasks, and he emitted the autoclitic tact frame three times during the pretests for CT 2 (Trials 1, 2, and 3) and four times during the pretests for CT 1 (Trial 2). These frames were followed by incorrect topographies that consisted of made-up words.

- Mand Training
  - Mand training should be a priority in every client's program
  - Types of mands: Simple mands and Informational mands
  - Initial training should establish a robust repertoire of simple mands across settings and people
  - Mand training can be 1) contrived and/or 2) captured
Mand Training

- Mand form should be under MO control (not intraverbal, or tact control)
- Use shaping
- Use errorless teaching (prompts) to transfer control

Exercise 2

- Give examples of Contrived and Captured Mands

Tact

- Tacts are typically studied in relation to other verbal operants
- Some studies suggesting how trials should be arranged (e.g., Miguel, Pasterski, Carr, & Michael, 2008)
Tact Training

- Used to teach other verbal behavior such as intraverbals (e.g., Goldsmith, LeBlanc, & Sautter, 2007)
- Used to teach nonverbal behavior (e.g., Mahoney, Miguel, Ahearn, & Bell, 2011)
- Training tacts of preferred items can sometimes generate mands (Wallace, Hanley, & Iwata, 2006)
**Tacts**

- Tacts should be under control of SD (not MO). So be careful about using specific SR+
- Training should focus on (LeBlanc, Dillon, & Sautter, 2009):
  - Familiar 3D objects and people
  - Familiar 2D representations
  - Features of objects (sizes, colors, shapes)
  - Location, actions, functions, and classes
  - Relational tacts

- Preparation (Successful x Simultaneous)
- Prompting hierarchy (Most-to-least x Least-to-Most)
- Prompting procedure (Prompt delay x within stimulus fading)
- Type of prompt (Echoic prompts)
- Error correction (Trial repetition, Independent opportunity, etc.)
- These decisions should also be evidence-based.
Exercise 3

• Johnny is an EIBT client who has tact training in his program. He is learning to tact three familiar/functional items but his performance has been quite (low) stable for two weeks (no increasing trend).
• What steps do you take to solve this problem?

• Rise in research on the intraverbal relation
• Question answering (e.g., Ingrsson, Tiger, Hurley, & Stephenson, 2007).
• Prompting strategies (e.g., Finkel & Williams, 2001; Coon & Miguel, 2010).
• Early research suggested the use of visual prompts (Finkel & Williams, 2001)
• Later research suggested the use of auditory prompts
• Are participants “visual” or “auditory”
Exercise 4

Johnny is undergoing intraverbal training with functions. He already mastered the function of 9 items (e.g., what do you do with car? “drive”/What do you do with a fork? “eat with”, etc. When you ask Johnny what do you drive or what do you eat with, he cannot say “car” or “fork”, respectively? Why? How do you teach him that?
You decide to teach Johnny new complex intraverbals such as “what’s your mom’s name?” and “what color is your car.” Despite all of your efforts, he continues to make mistakes. When asked “What is your mom’s name?” He says “Johnny” and when asked “What color is your car?” he says “drive.”

What is the source of the problem? How can you fix it, and could you have prevented it?

Procedures for teaching echoic behavior have been available for many years (Kymissis & Poulton, 1990).

Recent attention has been given on using echoic to generate other kinds of operants (Kokai & Clements, 2009; Coon & Miguel, 2010).
Many studies on textual behavior with reading comprehension to children (e.g., Daly & Martens, 1994; de Rose, de Souza, & Hanna, 1996)

Current focus on stimulus control technology to produce textual behavior in children with autism (Groskreutz, Karsina, Miguel, Groskreutz, 2009)

RESULTS AND DISCUSSION
For all 6 participants, training using a complex auditory-visual sample produced trained and emergent relations among the individual elements, suggestive of equivalence class formation. During pretest sessions, participants responded to the relations at chance levels, except Lyle during the AC and AB pretests (Figure 1), but inspection of his data revealed no consistent pattern of accuracy. Posttest performances indicated conditional relations were evident for all stimuli tested.

Figure 1. Percentage of independent correct responses during pretest, training, and posttest sessions for Lyle (upper left), Derrick (upper right), Josh (middle left), Kara (middle right), Roy (lower left), and Keith (lower right).
Table 1

<table>
<thead>
<tr>
<th>Participant</th>
<th>Training Condition</th>
<th>CDT</th>
<th>SP</th>
<th>SIP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Text</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Louis</td>
<td>coloring</td>
<td>sticker</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>puzzle</td>
<td>eating</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>books</td>
<td>paste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virginia</td>
<td>machine</td>
<td>music</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>sing</td>
<td>stickers</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>drawing</td>
<td>puzzle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 2. Source of seizure-elicited activity onset (LAE), visual behavioral (VB) and emergent stimulus effects. Behavior included matching pictures to printed words (C), and printed word to pictures if the words are grouped by matching procedure. Each seizure type and period are located directly above the corresponding bar. Period 1 was considered if participants performed above chance levels during period 1 (Virginia only). Period 2 (Louis only) was considered due to matching behavior over chance that resulted during period 1.
Assessment

- Standardized language assessments provide little information on verbal operants (Esch, Lalonde, & Esch, 2010).
- Boston Assessment of Severe Aphasia neglects the mand
- Kaufman Speech Praxis Test for Children only assesses the Echoic Relation
- Expressive Vocabulary Test only assesses tact and intraverbal relations

Experimental evaluations:

- Mand assessment: no mands, idiosyncratic topographies, or prompt dependent (e.g., Bourret, Vollmer & Rapp, 2004).
- Functional analysis: maintaining variables are arranged (e.g., LeFrance, Wilder, Normand, & Squires, 2009)
- Assessment of Basic Language and Learning Skills - Revised (ABLLS-R, Partington, 2006)
  - Criterion-referenced assessment for 25 specific domains.
  - Comprehensive, yet time consuming.
  - Poor interobserver agreement and treatment validity (add reference)

- Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP, Sundberg, 2008)
  - Comprehensive criterion-referenced assessment.
  - Four different assessments: 1) Milestones assessment, 2) Echoic skills assessment, 3) Barriers assessment, and 4) Transition Assessment.
  - No data on psychometric properties.

- Identify targets for language intervention.
  - Developmental norms (VB-MAPP) help determine if target is developmentally appropriate.
- Practitioners should carefully select their assessment tools.
- VB-MAPP may be the most comprehensive one.

Modes of Communication

- Vocal and signs
- Symbolic systems
• Multiple strategies for teaching topography based (speech and signs) and selection-based (picture selection/exchange) language systems to individuals with disabilities (Mirenda, 2003).

• Which form should be used is still debated among researchers with no clear consensus emerging (Shafer, 1994; Sundberg & Michael, 2001; Tincani, 2004; Ziomek & Rahfeld, 2008).

• Recent studies suggest that children with autism acquire SB more quickly and with better accuracy (Adkins & Axelrod, 2002; Tincani, 2004; Vignes, 2007, Ziomek & Rahfeld, 2008).

• No clear conclusion. Need more data.

• Practitioners should match proper topography to individual and environment.
Transfer across Operants

- Elementary verbal operants are functionally independent in the developmental period.
- Functional independence appears likely in the youngest children and those with language delays.

- Certain strategies may increase the likelihood of such emergence.
  - Mands more likely produce tacts (Petursdottir et al., 2005; Finn et al., in press).
  - Teaching tacts for preferred items (Wallace, Iwata, & Hanley, 2006).
  - Task interspersal (Arntzen & Almas, 2002; Carroll & Hesse, 1987; Sidener et al. 2010)
• One repertoire may be used to teach another.

• Receptive-to-tact (Whynn & Smith, 2003).

• Tact-to-intraverbal (Goldsmith et al., 2007).

• Echoic-to-intraverbal (Caan & Miguel, 2011).

• Intraverbal-to-tacts (Sundberg, Endicott, Eigenheer, 2000).

• Mand-to-echoics (Drash, High, & Tudor, 1999).

• Several books recommend a receptive-expressive sequence

• This recommendation has little empirical support and some evidence suggest that the reverse sequence may be more efficient (Petursdottir & Carr, 2011).

• More likely to obtain transfer from Speaker to Listener (Expressive-Receptive; Whynn & Smith, 2003; Sprinkle & Miguel, 2012).
Alternative recommendations include teaching receptive and expressive skills simultaneously (Sundberg & Partington, 1998) and multiple exemplar training (Greer & Ross, 2008).
Table 4. Example of an MEI Learn Unit Sequence for a Training Set (Learn Unit Presentations Proceeded from Left to Right in the Following Training Set Example):  

<table>
<thead>
<tr>
<th>First LU</th>
<th>Second LU</th>
<th>Third LU</th>
<th>Fourth LU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tact Diamond</td>
<td>Impure Tact Safire</td>
<td>Impure Tact Ruby</td>
<td>Match Emerald</td>
</tr>
<tr>
<td>Point to Diamond</td>
<td>Tact Safire</td>
<td>Tact Amethyst</td>
<td>Impure Tact Emerald</td>
</tr>
<tr>
<td>Impure Tact Diamond</td>
<td>Point to Ruby</td>
<td>Point to Amethyst</td>
<td>Tact Emerald</td>
</tr>
<tr>
<td>Match Safire</td>
<td>Tact Ruby</td>
<td>Match Amethyst</td>
<td>Point to Emerald</td>
</tr>
</tbody>
</table>

- Empirical support for these recommendations is limited.
- Further evaluation for the potential benefits of multiple-exemplar training is needed.
- Practitioners should carefully select the order of verbal operant training based on the current research.
- Task interspersal and mixed VB training may be appropriate for children with more advanced verbal skills.
Stimulus-Stimulus Pairing

- Designed to produce vocal responses.
- Therapist pairs a target sound with a preferred item.
- Individuals subsequently produces sound via automatic reinforcement

Miguel, Carr, & Michael (2002), TAVB
- Produced equivocal results (Carroll & Kloet, 2008; Esch, Carr, & Michael, 2005; Esch, Carr, & Grow, 2009; Miguel, Carr & Michael, 2002; Normand & Knoll, 2006).
- Possibly suboptimal conditioning procedures.

- Optimal conditions (Esch et al. 2009):
  - Attending to experimenter.
  - Present vocalization immediately prior to edible at unpredictable intervals.
  - Present non-target vocalization not followed by edible.

- These components have not been evaluated independently.
- More failures than successes.
• Practitioners should not rely solely on SSP to increase vocalizations.

Derived Verbal Relations

• What makes behavior truly verbal is its symbolic relation with other events.

• Saying “car” when hearing “car” should only be considered verbal (echoic) behavior if the dictated word “car” belongs to functional and equivalence classes.
- Emphasis on the relational property of verbal behavior to generate novel relations/behavior.

- Multiple exemplar training (Fiorile & Greer, 2007; Greer, Stolfi, & Pistaljovic, 2007).

- Verbal mediated categorizations (Horne, Hughes, & Lowe, 2006; Horne, Lowe, Harris, 2007; Mahoney, Miguel, Ahearn, & Bell, 2011; Miguel, Petursdottir, Carr, & Michael, 2008).

Miguel & Kobari-Wright (submitted)
Many verbal and non-verbal skills may require the emission of pre-current behavior.

These “problem-solving” strategies may be either overt or covert (Skinner, 1974).

Behavior analysis of cognitive processes.

The VB approach.
Alternative (more popular) version of EIBI (Lovaas, 1987) based on language interventions (Barbera & Rasmussen, 2007; Sundberg & Michael, 2001).

The most adopted curriculum is the VB based one developed by Sundberg & Partington (1998) (Love, Carr, Almason, & Petursdottir, 2009).

- Skinner's taxonomy.
- Comprehensive VB assessment.
- SSP procedures as necessary.
- Preference for topography-based VB.
- Mand training placed early in the curriculum.
- Mixed verbal operant teaching.
- Natural environment teaching.
- Discontinuous measure.
• Natural Environment Teaching
  • Not unique to VB approach (Charlop-Christy & LeBlanc, 1999).
  • Promotes generalization, maximizes antecedent conditions.
  • Poses challenges to measurement of learner progress.

• Discontinuous measurement
  • Outcomes seem comparable to continuous trial-by-trial when looking at acquisition (Cummings & Carr, 2009; Najdowsky et al., 2009).
  • No way of identifying error patterns or faulty stimulus control.
  • No data on treatment integrity.

• A new large-n case series has recently been presented showing successful outcomes (Miklos, 2010).
• Additional published evidence is still necessary.
• Case studies, case series, and randomized clinical trials.
Conclusion

• Skinner's analysis have made an enormous impact on language assessment and intervention.

• Scholarly work on VB has increased dramatically over the past few years.

• Current lines of research will likely be translated into successful applications.

• Some aspects of the “VB approach” are well-supported by research.

• Other VB interventions are not included in the package.
• The VB approach should not be used as a tact for a specific set of techniques but a description of an explanatory system (Miguel, 2009).

• If we decide to label the set of techniques and procedures used by practitioners we would end up with several “approaches.”

• Maybe all of them need to be independently evaluated.

Deep Thoughts

• How do you know that the set of techniques that you use is evidence-based?

• Would you be able to back them all up with its related literature?

• Despite all of your experience, are your decisions based on evidence?

• Are your decisions really behavioral? Can you explain why they would (or not) work?

Verbal Behavior Lab

www.caiomiguel.org

Thanks to current and previous VB Lab members!