B. F. Skinner’s Analysis of Verbal Behavior

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Alfred North Whitehead and “No Black Scorpion”

We dropped into a discussion of behaviorism which was then still very much an “ism” and of which I was a zealous devotee [1934]. Here was an opportunity which I could not overlook to strike a blow for the cause.... Whitehead... agreed that science might be successful in accounting for human behavior provided one made an exception of verbal behavior. Here, he insisted something else must be at work. He brought the discussion to a close with a friendly challenge: “Let me see you,” he said “account for my behavior as I sit here saying ‘No black scorpion is falling upon this table.’” The next morning I drew up the outline of the present study (Skinner, 1957, p. 457).
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Chapter 1 of *Verbal Behavior* is titled “A Functional Analysis of Verbal Behavior”

Etymological sanctions and terminology in VB

Language is learned behavior under the functional control of environmental contingencies

“What happens when a man speaks or responds to speech is clearly a question about human behavior and hence a question to be answered with the concepts and techniques of psychology as an experimental science of behavior” (Skinner, 1957, p. 5)
Skinner’s (1957) Book
Verbal Behavior

- Definition of verbal behavior: “Behavior reinforced through the mediation of other persons” (who are trained to do so)
- The speaker and the listener (“The total verbal episode”). The speaker and listener can be in the same skin
- Form and function
- “Our first responsibility is simple description: what is the topography of this subdivision of human behavior? Once that question has been answered in at least a preliminary fashion we may advance to the stage called explanation: what conditions are relevant to the occurrences of the behavior--what are the variables of which it is a function?” (p. 10).
The analysis of verbal behavior involves the same behavioral principles and concepts that make up the analysis of nonverbal behavior. **No new principles of behavior** are required. There are some new terms.

In Chapter 2 of VB Skinner presents the independent and dependent variables of verbal behavior.
A Functional Analysis of Verbal Behavior: The Basic Principles of Operant Behavior

Stimulus Control ($S^P$)
Motivating Operation (MO)

Response

- Reinforcement
- Punishment
- Extinction
- Conditioned reinforcement
- Conditioned punishment
- Intermittent reinforcement
Skinner’s (1957) Book
Verbal Behavior

• “Technically, meanings are to be found among the independent variables in a functional account rather than as properties of the dependent variable” (p. 14)
• What constitutes a “unit of verbal behavior?” (sounds, words, phrases, sentences)
• “...a response of identifiable form functionally related to one or more independent variables” (p. 20)
• What is the unit of analysis in language?
• In Chapter 2 of VB Skinner also presents a VB research methodology and suggests several advantages of using his analysis of verbal behavior as a foundation for language research
A common misconception about Skinner’s analysis of verbal behavior is that he rejects the traditional classification of language. However, it is not the traditional classification or description of the response he finds fault with, it is the failure to account for the causes or functions of the verbs, nouns, sentences, etc.
The analysis of how and why one says words is typically relegated to the field of psychology combined with linguistics; hence the field of “psycholinguistics.”
Skinner noted that “A science of behavior does not arrive at this special field to find it unoccupied (p. 3)”
How is Language Measured in a Behavioral Analysis?

The **verbal operant** is the unit of analysis (e.g., mands, tacts, & intraverbals)

\[ \text{MO/S}^D \rightarrow \text{Response} \rightarrow \text{Consequence} \]
Skinner’s Analysis of Verbal Behavior

• The traditional linguistic classification of words, sentences, and phrases as expressive and receptive language blends important functional distinctions among types of operant behavior, and appeals to cognitive explanations for the causes of language behavior (Skinner, 1957, Chapters 1 & 2)

• In Chapters 3-5 of *Verbal Behavior* Skinner presents the “elementary verbal operants”
At the core of Skinner’s analysis of verbal behavior is the distinction between the **mand**, **tact**, and **intraverbal** (traditionally all classified as “expressive language”)

Skinner identified three separate sources of antecedent control for these verbal operants:

- EO/MO control\(\rightarrow\)Mand
- Nonverbal \(S^D\)\(\rightarrow\)Tact
- Verbal \(S^D\)\(\rightarrow\)Intraverbal

Established body of empirical support for this distinction (Sautter & LeBlanc, 2006)
How is the Tact Different from the Mand, Echoic, & Intraverbal?

<table>
<thead>
<tr>
<th>Antecedent</th>
<th>Behavior</th>
<th>Consequence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonverbal S(^D)</td>
<td>Tact</td>
<td>Generalized reinforcement</td>
</tr>
<tr>
<td>Motivation (MO)</td>
<td>Mand</td>
<td>Specific reinforcement</td>
</tr>
<tr>
<td>Verbal S(^D)</td>
<td>Echoic</td>
<td>Generalized reinforcement</td>
</tr>
<tr>
<td>(w/ a match)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Verbal S(^D)</td>
<td>Intraverbal</td>
<td>Generalized reinforcement</td>
</tr>
<tr>
<td>(w/o a match)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These are all called “expressive language” in traditional treatments.
The Mand Relation

MO: Child wants the Dora video

Response: “Dora”

Specific Reinforcement: “Here it is”
The Importance of the Mand

- Mands are the first type of verbal behavior acquired by typical children
- Manding allows a child to get what he wants, when it is wanted
- Manding allows a child to get rid of what he does NOT want, when it is not wanted
- A parent or caretaker is paired with the delivery of reinforcement related to a mand
The Importance of the Mand

- Manding brings about desired changes or conditions
- Manding is the only verbal operant that directly benefits the speaker
- Manding training can decrease negative behaviors that serve the mand function
- Manding is essential for social interaction
- Excessive manding is a burden on the listener
The Tact Relation

Child sees a poster of Dora

“Dora”

“There’s Dora”
The Tact Relation

- Tacts are always under nonverbal stimulus control
- Nonverbal stimuli can be, for example,
  - Static (nouns)
  - Transitory (verbs)
  - Relations between objects (prepositions)
  - Properties of objects (adjectives)
  - Properties of actions (adverbs)
  - Private events (pain)
  - Involve multiple stimuli (noun & verb combinations)
  - Involve multiple responses (sentences)
The Echoic Relation

Verbal $S^D$
W/pt-pt correspondence
Formal similarity

Response

Generalized Reinforcement

Child hears “Dora”

“Dora”

“Right”
The Echoic Relation

- **Verbal stimulus control**: “Product of someone’s verbal behavior functions as a discriminative stimulus” (Michael, 1982)
- **Point-to-point correspondence**: “subdivisions or parts of the stimulus control subdivisions or parts of the response” (Michael, 1982)
- **Formal similarity**: “the controlling stimulus and the response product are (1) in the same sense mode (both are visual, or both are auditory, or both are tactile, etc.) and (2) resemble each other in the physical sense of resemblance” (Michael, 1982, p. 2)
The Echoic Relation

- **Motor Imitation** Motor imitation can have the same verbal properties as echoic behavior, as demonstrated by its role in the acquisition of sign language by children who are deaf.
- **Copying-a-text** also has the same defining properties as the echoic.
- Michael (1982) suggested the term “dupic” for these three verbal relations.
- The consequences for the echoic involve generalized conditioned reinforcement.
The Intraverbal Relation

Verbal $S^D$
W/o pt-pt correspondence
W/o Formal similarity

Response

Generalized Reinforcement

Child hears “Favorite cartoon”

“Dora”

“I like that too”
The Intraverbal Relation

- **NO Point-to-point correspondence:** The verbal stimulus and the verbal response do not match each other, as they do in the echoic relation.

- **NO Formal similarity:** The controlling stimulus and the response product can be in the same or different sense modes and do not resemble each other in the physical sense of resemblance.

- Like all verbal operants except the mand, the consequences for the intraverbal involve generalized conditioned reinforcement (Skinner also uses “non-specific reinforcement,” “educational reinforcement,” and “contiguous usage” to identify the consequences for the intraverbal.)
The Intraverbal Relation

- Verbal behavior evoked by other non-matching verbal behavior
- It prepares a speaker to behave rapidly and accurately with respect to verbal stimulation, and plays an important role in continuing a conversation
- There is a huge variation in speaker’s intraverbal repertoires, especially when compared to the mand and the tact
- Typical adult speakers have hundreds of thousands of intraverbal relations as a part of their verbal repertoires
- An intraverbal repertoire allows a speaker to answer questions and to talk about (and think about) objects and events that are not physically present
The Textual Relation

Verbal $S^D$ w/pt-pt correspondence w/o formal similarity

Response

Generalized Reinforcement

Child sees “Dora” written

“Dora”

“Right”
The Textual Relation

- Verbal stimulus control
- Point-to-point correspondence
- No formal similarity: The controlling stimulus and the response product are not in the same sense mode and do not resemble each other
The Transcriptive Relation

- **Verbal S^D w/pt-pt correspondence**
  - w/o formal similarity
  - Child hears “Dora” spoken

- **Response**
  - Writes “Dora”

- **Generalized Reinforcement**
  - “Right”
The Transcriptive Relation

- Verbal stimulus control
- Point-to-point correspondence
- No formal similarity: The controlling stimulus and the response product are not in the same sense mode and do not resemble each other
AS A RESULT OF... | ONE MIGHT... | THIS IS A(N)...  
---|---|---  
1. seeing a car | say “car” |  
2. wanting a ride | say “please” |  
3. hearing “What’s your favorite sport?” | saying “football” |  
4. hearing “mom” | say “mom” |  
5. hearing “stop” | stopping |  
6. seeing “tree” written | say “tree” |  
7. hearing “desk” | write “desk” |  
8. hearing a car | say “car” |  
9. smelling gas | say “gas” |  
10. tasting soup | say “pass the salt” |  
11. hearing “car” | sign “car” |  
12. hearing “car” | write “car” |  
13. hearing “car” | fingerspell “car” |  
14. hearing “car” | say “Ford” |  
15. see “car” signed | fingerspell “Ford” |  
16. see “car” signed | write “car” |  
17. hearing “car” | sign “Ford” |  
18. hearing “car” | fingerspell “Ford” |  
19. hearing “car” spelled | fingerspell “car” |  
20. seeing a full garbage can | saying “the garbage is full” |  
21. hearing a horn | say “look out” |  
22. seeing a dog start to take off | say “stay” |  
23. hear “what color” and shown a ball | say “orange” |  
24. hear “what shape” and shown a ball | say “round” |  
25. hear “what is it” and shown a ball | say “ball” |  
26. hear “what do you do with it” (ball) | say “shoot baskets” |  
27. read “name a fast animal” | say “cheetah” |  
28. hear “Golden lads and girls all must” as chimney-sweepers come to...” | say “dust” |  

29. Give an example of a disguised mand.  
30. Give an example of a tact of a private event.  
31. Give an example of a defective (rote) mand.  
32. Give an example of a defective (rote) intraverbal.  
33. Give an example of a tact involving multiple responses.  
34. Give an example of an intraverbal controlled by a complex verbal conditional stimulus.  
35. Give an example of a listener behavior involving writing as an antecedent.
## Table 16.4 Verbal Behavior Classification Chart

<table>
<thead>
<tr>
<th>Controlling Variables</th>
<th>Verbal Relation</th>
</tr>
</thead>
<tbody>
<tr>
<td>UMO/CMO</td>
<td>Yes -&gt; Mand</td>
</tr>
<tr>
<td></td>
<td>NO</td>
</tr>
<tr>
<td>Nonverbal Stimulus</td>
<td>Yes -&gt; Tact</td>
</tr>
<tr>
<td></td>
<td>NO</td>
</tr>
<tr>
<td>Verbal Stimulus</td>
<td>Yes -&gt; pt-pt corr. -&gt; No -&gt; Intraverbal</td>
</tr>
<tr>
<td></td>
<td>YES</td>
</tr>
<tr>
<td></td>
<td>Formal Similarity -&gt; Yes -&gt; Echoic</td>
</tr>
<tr>
<td></td>
<td>Imitation</td>
</tr>
<tr>
<td></td>
<td>Copy a text</td>
</tr>
<tr>
<td></td>
<td>NO</td>
</tr>
<tr>
<td></td>
<td>Textual</td>
</tr>
<tr>
<td></td>
<td>Transcriptive</td>
</tr>
</tbody>
</table>
Skinner’s Analysis of Verbal Behavior: Complex Behavior

- The functional units of echoic, mand, tact, intraverbal, textual, and transcription, along with the audience relations form the foundation of a verbal behavior analysis.

- “But this is only the beginning. Once a repertoire of verbal behavior has been set up, a host of new problems arise from the interaction of its parts. Verbal behavior is usually the effect of multiple causes. Separate variables combine to extend their functional control, and new forms of behavior emerge from the recombination of old fragments.” (p. 10)

- “A speaker is normally also a listener. He reacts to his own behavior in several important ways. Part of what he says is under the control of other parts of his verbal behavior.” (p. 10)
Verbal Extensions

- Generalization
  - “If a response is reinforced upon a given occasion or class of occasions, any feature of that occasion or common to that class appears to gain some measure of control” (p. 91)
  - “A novel stimulus possessing one such feature may evoke a response” (p. 91)
  - “There are several ways in which a novel stimulus may resemble a stimulus previously present when a response was reinforced, and hence there are several types of what we may call ‘extended tacts’” (p. 91).
Verbal Extensions

- Skinner distinguished between four types of extended tacts: generic, metaphorical, metonymic, and solecistic.
- The distinction is based on the degree to which a novel stimulus shares the relevant or irrelevant features of the original stimulus.
- In **generic extension**, the novel stimulus shares all of the relevant or defining features of the original stimulus.
- In **metaphorical extension**, the novel stimulus shares some, but not all of the relevant features of the original stimulus.
- In **metonymical extensions**, involve responses to novel stimuli that have none of the relevant features of the original stimulus configuration, but some irrelevant but related feature has acquired stimulus control.
Verbal Extensions

- Finally, a *solecistic extension* occurs when
- “The property which gains control of the response is only distantly related to the defining properties upon which standard reinforcements are contingent or is similar to that property for irrelevant reasons....Most verbal communities not only fail to respond effectively to such extensions but provide some sort of punishment for them” (p. 102)
The Distinction Between the Mand and the Tact

- Based on the distinction between the establishing operation (MO) and stimulus control (SD) as separate sources of control
- Skinnerian psychology ("radical behaviorism," see Skinner, 1974) has always maintained that motivational control is different from stimulus control (Skinner, 1938, 1953, 1957)
- In *Behavior of Organisms* (Skinner, 1938) Skinner devoted two chapters to the treatment of motivation; Chapter 9 titled "Drive" and Chapter 10 titled "Drive and Conditioning: The Interaction of Two Variables"
- Skinner also made it clear in the section titled "Drive Not a Stimulus" (pp. 374-376) that motivation is not the same as discriminative, unconditioned, or conditioned stimuli
The Distinction Between the Mand and the Tact

- Keller and Schoenfeld (1950) state, “A drive is not a stimulus…a drive has neither the status, nor the functions, nor the place in a reflex that a stimulus has…it is not, in itself either eliciting, reinforcing, or discriminative” (p. 276)

- Keller and Schoenfeld suggest the term “establishing operation”

- The experimental analysis of motivation is mostly absent from the 55 years of research in JEAB

- Research has only recently begun to appear in JABA, but it too has been historically absent from that journal
The Distinction Between the Mand and the Tact

- Skinner discussed the topic of motivation in every chapter of the book *Verbal Behavior* (1957), usually with his preferred terminology of “deprivation, satiation, and aversive stimulation”
- The “30 points about motivation” paper (Sundberg, 2013) provides a comprehensive overview of Skinner’s position regarding the role of motivation in behavior analysis
The Distinction Between the Mand and the Tact

- Michael (1993) noted that the neglect of motivation “leaves a gap in our understanding of operant functional relations” (p. 191)
- And that “the basic notion plays only a small role in the approach currently identified as behavior analysis” (Michael, 1993, p. 191)
- In his most recent treatment of motivation, Michael (2007) uses the term “motivating operations” (MOs) as an omnibus term for establishing operations (EOs) and abolishing operations (AOs)
- Michael (2007) distinguishes between value-altering (EO & AO) and behavior-altering effects (evocative & abative)
Automatic Reinforcement

- Skinner did not directly define it
- He did not use it as a separate principle of behavior
- It does not appear in any of his indexes
- He uses the term over 100 times in his books
- He also uses “self-reinforcement,” and “self-stimulation” as synonymous with automatic reinforcement
- The most frequent usage occurs in Verbal Behavior

(Vaughan & Michael, 1982)
Automatic Reinforcement Defined

• “The idea (of automatic reinforcement) takes some getting use to, and Skinner for the most part leaves the reader to work it out by himself” (MacCorquodale, 1969, p. 835)

• “Automatic reinforcement is reinforcement that is not mediated by the deliberate action of another person” (Vaughan & Michael, 1982, p. 219)

• Skinner’s usage of “automatic” is simply to counteract “any tendency to restrict the concept of reinforcement to those occasions upon which it has been deliberately arranged by another person or group” (Vaughan & Michael, 1982, p. 218)
Automatic Reinforcement Defined

Automatic reinforcement has the same defining properties as “reinforcement”

• Follows behavior
• Increases behavior
• Under the stimulus conditions it occurs

Automatic reinforcement can be…

• Unconditioned
• Conditioned
• Positive or negative
• Intermittent
• Increase verbal or nonverbal behavior
Automatic Consequences

- Can also have automatic punishment (e.g., Skinner, 1957, p. 375)
- Same types as automatic reinforcement, except behavior decreases
- Can also have automatic extinction which has the same behavioral functions as non-automatic extinction (e.g., Skinner, 1957, p. 164)
- Perhaps “automatic consequences” is a better term (Skinner does use this term, e.g., p. 442)
- What about automatic “stimulus control” and “motivational control?”
Automatic Contingencies

- Behavior can be shaped by consequences that are not deliberately arranged, including coming under sources of stimulus and motivational control that are not deliberately arranged.
- Thus, all behavioral principles can affect an organism without direct arrangement from other people.
- Perhaps “automatic contingencies” is a better term.
Behavior Analysis
(Basic Principles of Operant Behavior)

Stimulus Control → Response
Motivating Operation (MO/EO) → Reinforcement

Punishment
Extinction
Conditioned reinforcement
Conditioned punishment
Intermittent reinforcement
Automatic Reinforcement

Skinner presents two types of automatic reinforcement (1957, pp. 164-166; 438-446)

- **Practical**: The reinforcement is provided by the physical environment ("the producing response operates on the surrounding world")
- **Artistic/Autistic**: The reinforcement is provided by the response product emanating from the behavior. ("The producing response operates on the behaver directly").
Automatic Reinforcement

• Summary: Behavior can be shaped, maintained, or eliminated by automatic contingencies that are not directly set up or mediated by other persons. These contingencies can be very efficient and even more precise than those formally arranged.

• “The exquisite subtlety of our verbal repertoires is shaped by contingencies of automatic reinforcement... one need not wait for the lumbering machinery of social reinforcement to swing into action” (Palmer, 1996, p. 290)

• “Money grades and honors must be husbanded carefully, but the automatic reinforcement of being right and moving forward are inexhaustible” (Skinner, 1968, p. 158)
Multiple Control

- “Two facts emerge from our survey of the basic functional relations: (1) the strength of a single response may be, and usually is, a function of more than one variable and (2) a single variable usually affects more than one response” (1957, p. 227)
- The conditions where the strength of a single verbal response is a function more than one variable can be identified as “convergent multiple control”
- The conditions where a single variable affects the strength of more than just one response can be identified as “divergent multiple control”
Multiple Control

- Convergent multiple control can be observed in almost all instances of verbal behavior.
- In convergent multiple control, more than one variable strengthens a response of a single topography.
- Any type of antecedent event can participate:
  - Verbal (e.g., mand, tact, intraverbal, autoclitic)
  - Nonverbal (e.g., visual, auditory, olfactory)
  - Public (e.g., verbal, nonverbal)
  - Private (e.g., pain, self-echoic, self-mand, imagery)
  - $S^D$ (verbal, nonverbal)
  - MO (UMO, CMO, aversive, establishing, abative)
  - US/CS (bright light, screeching sound, words)
  - Audience (lay, professional, friends, non-English speaking)
  - Contextual (settings, temperature, lights, décor)
Multiple Control

- Convergent multiple control

  - $S^D$
  - $S^D$
  - $S^D$
  - $S^D$
  - MO

  R
Multiple Control

- In divergent multiple control, a single variable controls a variety of responses
  - “Just as a given stimulus word will evoke a large number of different responses from a sample of the population at large, it increases the probability of emission of many responses in a single speaker” (p. 227)
- The response can be
  - Verbal
  - Nonverbal
  - Respondent
- The behavioral effects of a single stimulus change (Michael, 2004)
Multiple Control

- Divergent multiple control

\[ S^D/\text{MO} \rightarrow R_1 \]
\[ \rightarrow R_2 \]
\[ \rightarrow R_3 \]
\[ \rightarrow R_4 \]
\[ \rightarrow R_5 \]
Applications of Multiple Control: Take-Away Points

- 1) Human behavior is rarely under a single source of control, especially in the natural environment
- 2) The practice of “discrete trial training” may focus too much on establishing single sources of control
- 3) Multiple control is a valuable teaching tool for establishing early verbal behavior
  - a) additional sources of control are often additive or even algebraic
  - b) a strong source of control can be used to transfer control to a weaker, but essential, source of control (echoic to mand)
- 4) Most VB skills are multiply controlled
- 5) Multiple control is required for most complex verbal behavior (e.g., intraverbal behavior and VCDs)
Applications of Multiple Control: Take-Away Points

• 6) Most life skills are multiply controlled
• 7) Most social behaviors are multiply controlled
• 8) The failure to appreciate multiple control can create language and learning barriers
• 9) Multiple exemplar training is a powerful teaching technology strategy based on multiple control
• 10) Divergent control and response generalization—variation in responding—techniques using multiple control
Sundberg & Michael (2001) identify several benefits of Skinner’s analysis of verbal behavior for autism treatment, some include:

- Assessment across all the verbal operants and combinations
- Intervention across all the verbal operants and combinations
- Incorporate the mand relation into assessment and intervention
- Incorporating the motivation operation (MO) into all aspects of the program
- Incorporate the intraverbal relation into assessment and intervention
- Incorporating automatic contingencies into all aspects of the program
- Use Skinner’s analysis of verbal behavior to analyze impaired verbal behavior (e.g., echolalia, rote intraverbals, verbal scripting)
“a few relevant facts about the conditions under which Professor Whitehead made his remark are available. So far as I know there was no black scorpion falling on the table. The response was emitted to make a point-- taken, as it were, out of the blue. This was, in fact, the point of the example: why did Professor Whitehead not say “autumn leaf” or “snowflake” rather than “black scorpion?” The response was meant to be a poser just because it was not obviously controlled by a present stimulus....Perhaps there was a stimulus that evoked the response black scorpion falling on this table, which in turn led to the autoclitic No....I suggest, then, that black scorpion was a metaphorical response to the topic under discussion. The black scorpion was behaviorism” (p. 458).
Skinner goes on in this section to identify another source of control for the comment. The fact that he had not convinced Whitehead that his version of behaviorism was something new that had not been available before meant that:

“on this pleasant and stimulating table no black scorpion had fallen....There was no cause for alarm” (p. 459).
Thank You!

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