An Update on Verbal Behavior Research

Alice Shillingsburg, PhD, BCBA-D
May Institute, Inc
Range of Needs

Hopes

Dreams

Goals

Demands for Effective Intervention

ABA Services
Review Recent Research on Interventions to Promote Verbal Behavior for Individuals with Autism and Related Disorders
Empirical Applications of Skinner’s Analysis of Verbal Behavior with Humans

Rachael A. Sautter & Linda A. LeBlanc
Western Michigan University

In *Verbal Behavior*, Skinner (1957) provided a conceptual framework and taxonomy for the controlling variables of language that defined independent verbal operants by their functional relations to antecedents and consequences (rather than by topography or meaning). Although professional interest in this area has recently increased within the behavior analytic community, Skinner’s conceptual framework may not yet have fully impacted the experimental literature. This quantitative review of the literature examined the studies on verbal behavior that were empirical in nature, concerned with human verbal behavior, and addressed at least one verbal operant (e.g., mand, tact, echoic, autolalic, and/or intraverbal behavior) within the experiment. The results of this review suggest that a growing body of research exists to support many of the tenets of Skinner’s conceptualization and taxonomy but many areas of verbal behavior research have yet to be addressed. Continued research in this area is crucial for the development and implementation of effective verbal behavior interventions for people with disabilities.
Sautter & LeBlanc, 2006
Sautter & LeBlanc, 2006
Abstract Sundberg and Michael (2011) reviewed the contributions of Skinner’s (1957) *Verbal Behavior* to the treatment of language delays in children with autism spectrum disorder (ASD) and discussed several aspects of interventions, including mand training, intraverbal repertoire development, and the importance of using Skinner’s taxonomy of verbal behavior in the clinical context. In this article, we provide an update of Sundberg and Michael’s review and expand on some discussion topics. We conducted a systematic review of studies that focused on Skinner’s verbal operants in interventions for children with ASD that were published from 2001 to 2017 and discussed the findings in terms of journal source, frequency, and type of verbal operant studied.
Fig. 3 Frequency of studies published between 2001 and 2017. The asterisk (*) denotes that the year 2017 only included the first 3 months of the year.
Total=172 studies
=22 journals

DeSouza, Akers, & Fisher, 2017
Fig. 2 Frequency of studies for each verbal operant, including studies that tested for the emergence of untrained responses.

DeSouza, Akers, & Fisher, 2017
“Behavior analysts have long recognized that developing interventions capable of improving client behavior solves only one part of the problem. The problem of broad social impact must be solved by having interventions implemented effectively in socially important settings and at scales of social importance.”
The Evidence-Based Practice of Applied Behavior Analysis

Timothy A. Stocum · Ronnie Detrich · Susan M. Wilczynski · Trina D. Spencer · Teri Lewis · Katie Wolfe

Published online: 29 April 2014
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Abstract Evidence-based practice (EBP) is a model of professional decision-making in which practitioners integrate the best available evidence with client values/context and clinical expertise in order to provide services for their clients. This framework provides behavior analysis (ABA). The purpose of this paper is to respond to Smith’s arguments and extend the discussion of the relevant issues. Although we support many of Smith’s (The Behavior Analyst, 36, 7–33, 2013) points, we contend that Smith’s definition of EBP is significantly...
Strategies for Making Regular Contact With the Scholarly Literature
James E. Carr, Ph.D., BCBA-D and
Adam M. Briggs, M.S., BCBA
Auburn University

ABSTRACT
Behavior analysts are obligated by the conventions of the academic discipline and guidelines of professional conduct to stay in close contact with the scholarly literature. However, a number of variables can interfere with this obligation. We discuss several barriers to searching the literature, accessing journal content, and making contact with the contemporary literature and provide solutions for eliminating them.
Keywords: evidence-based practice, information literacy

A ubiquitous notion in applied behavior analysis is that practitioners should base their professional activities on the research literature. For example, the Guidelines for Responsible Conduct of the Behavior Analyst Certification Board® (BACB, graduate programs require a course in within-subjects research methodology (ABAI, 2010). It is particularly easy to access the literature while enrolled in a graduate program. For example, graduate students are routinely assigned numerous readings pertinent to their number of barriers impact the ease with which practitioners can search the literature or affect the success of the searches.

Barriers
Some journals (e.g., Journal of Applied Behavior Analysis, JABA) include
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<th># of Issues per Year</th>
<th>Individual Subscription Cost</th>
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<th>Searchable Website</th>
<th>In Press Articles Online</th>
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Fig. 3 Frequency of studies published between 2001 and 2017. The asterisk (*) denotes that the year 2017 only included the first 3 months of the year.
Objectives

• Review recently published research
  • Mands
  • Tacts
  • Intraverbals
  • Echoics
Mands

• 91 of the 172 studies (52.9%) focused on mands (DeSouza, et al., 2017)

• Recently, studies have focused on complex mands such as Mands for Information and Mands using speech generating devices (SGD)
Mands for Information
Motivating Operations (Michael, 1993)

1. Change the reinforcing effectiveness of other stimuli (reinforcer establishing/abolishing effect)

2. Change frequency of the occurrence of behaviors associated with those reinforcers (evocative/abative effect)

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<tr>
<th>EO</th>
<th>Change in value</th>
<th>Change in Behavior</th>
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<tbody>
<tr>
<td>5 hours since Breakfast</td>
<td>Food becomes valuable</td>
<td>-Go to fridge</td>
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<tr>
<td>AO</td>
<td>Change in value</td>
<td>-Look up menu</td>
</tr>
<tr>
<td>Just finished buffet lunch</td>
<td>Food loses value</td>
<td>-Ask for a snack</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Take a nap</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Watch a football game</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Do not ask for a snack</td>
</tr>
</tbody>
</table>
Mand Training

EO
Snack
Deprivation

Change in value
Increase value of snack item

Mand
"no"

Prompt the Mand

Reinforcer
Access to chips
Manding for Information

- A child asks for something he can’t find
- He’s told it’s in a cabinet but isn’t told which specific cabinet

Diagram:

- EO Information Withheld
- Change in value Increase value of information
- Prompt “Which one?”
- Mand
- Reinforcer Information Use Info Access Item
Manding for Information

- A child asks for something he can’t find
- He’s told the specific cabinet where the item is

<table>
<thead>
<tr>
<th>AO</th>
<th>Change in value</th>
<th>Mand</th>
<th>Reinfactor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information Provided</td>
<td>NO Increase value of information</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Use Info
Access Item
Functional Manding

• Functional manding requires discriminating EO and AO conditions
  • Manding under AO conditions

• Mands for information
  • Teach individuals to mand when information is needed

• Avoid rote responding
MANDS FOR INFORMATION USING “WHO?” AND “WHICH?” IN THE PRESENCE OF ESTABLISHING AND ABOLISHING OPERATIONS

M. Alice Shillingsburg

MARCUS AUTISM CENTER AND EMMORY UNIVERSITY SCHOOL OF MEDICINE

AND

Crystal N. Bowen, Amber L. Valentino, and Laura E. Pierce

MARCUS AUTISM CENTER

Treatments designed to teach mands for information have included prompting and differential reinforcement, as well as procedures to manipulate the relevant establishing operation (EO). However, previous studies have not included relevant abolishing operation (AO) conditions to ensure that the mand is under relevant antecedent control. Data on listener responses (i.e., use of the information) are also absent in the literature. The current study shows differential responding under EO and AO conditions and reports listener responses that demonstrate use of the provided information. Three participants, diagnosed with an autism spectrum disorder, learned to mand for information using “who?” and “which?” questions exclusively under EO conditions. In addition,
Mands for Information—Who and Which

• Contrive relevant Establishing Operations (motivation) and Abolishing Operations (AO)

• EO Present (EO) – Information regarding location of preferred item NOT given (contriving a motivation for the information)

• EO Absent (AO) – Information regarding location of preferred item given (no motivation for information)

• Dependent Variables
  • Asking “Who has it?” or “Which” when EO is Present
  • Refraining from asking when Motivation is Absent
Mands for Information—Who and Which

• EO Present (EO) –
  Hide a preferred item in a container amongst a set of similar containers and do not specify which container it is in. (contrive motivation for information)

• EO Absent (AO) –
  Hide a preferred item in a container amongst a set of similar containers and DO specify which container it is in. (no motivation for information)
Mands for Information—Who and Which

• EO Present (EO) –

Child asks for a cookie. You say, “sure, its in one of those boxes.” Contrive motivation for which box and sets the stage to prompt the mand.

• EO Absent (AO) –

Child asks for a cookie. You say, “sure, its in the yellow box.” Abolishes motivation for which box and sets the stage for direct use of the information.
Mands for Information—AAC

• Shillingsburg, Marya, Bartlett & Thompson (2019 online, JABA)
Teaching mands for information using speech generating devices: A replication and extension

M. Alice Shillingsburg
MAY INSTITUTE, RANDOLPH, MA

Videsha Marya, Brittany L. Bartlett and Taylor M. Thompson
MARCUS AUTISM CENTER, ATLANTA, GA

Approximately 30% of individuals diagnosed with autism spectrum disorder (ASD) fail to develop vocal communication and, therefore, use some form of augmentative or alternative communication system. The current study replicates and extends previous research on teaching "Who?" and "Which?" mands for information to 3 young children diagnosed with ASD using a speech generating device. Procedures were evaluated using a multiple baseline across participants design. All participants learned to mand for information and, subsequently, used the information to access preferred items.

Key words: augmentative and alternative communication, autism spectrum disorder, mands for information, speech generating device, "wh" questions
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<th>Mand Scores</th>
<th>Diagnosis</th>
<th>Expressive Language</th>
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<tr>
<td>Emma</td>
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<td>113</td>
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<tr>
<td>Justin</td>
<td>Male</td>
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<td>142.5</td>
<td>14</td>
<td>ASD</td>
</tr>
</tbody>
</table>


“Sure, one of your teacher’s has it.”
One Participant-Typing
Shillingsburg, Marya, Bartlett & Thompson (2019)

*JABA*
A Preliminary Procedure for Teaching Children with Autism to Mand for Social Information

M. Alice Shillingsburg1,2 · Sarah E. Frampton1 · Sarah C. Wymer1 · Brittany Bartlett1

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Abstract We used procedures established within the mands for information literature to teach two children with autism to mand for social information. Establishing operation trials were alternated with abolishing operation trials to verify the function of the responses as mands. Use of the acquired information instructions (e.g., Swerdan & Rosales, 2015). Although successful, these approaches have focused on establishing discriminative stimuli for conversation rather than bringing question-asking under motivational control.

Skinner (1957, p. 39) classified questions as one
Requesting Social Information

• EO Present (EOP) – Information about another person is unknown and inaccessible (contriving a motivation for the information)

• EO Absent (EOA) – Information about another person is known or accessible (no motivation for information)

• Dependent Variables
  – Asking for personal/social information when EO is Present
  – Refraining from asking when EO is Absent
Two 6-year-olds with autism

Fig. 1  Cumulative number of social questions with SP1 and correct intraverbals across conditions

Shillingsburg et al., 2018
Fig. 2  Cumulative number of social questions with SP2 and a peer and correct intraverbals across conditions.
Replicated with 3 teenagers with autism (13, 17, and 18 yr)

Gordon & Shillingsburg, (accepted ANDI)
Conclusions

• Recent research is extending procedures to:
  – Those who use Speech Generating Devices
  – Social questions
  – Adolescents and young adults
Tacts

• 56 of the 172 studies (32.6%) focused on Tacts (DeSouza, et al., 2017)

• Recently, studies have focused on complex tacts such as using phrases and sentences and emergence of untrained tacts
  • Word combinations
  • Generative responding
Word Combinations/Generative Responding

- Do not combine words into multi-word utterances when typically developing children do (Paul, Chawarska, Klin, & Volkmar, 2007)
- Despite having similar number of single words in repertoire
- Engage in rote, inflexible responding
- Much language is directly taught

- Interventions to promote word combinations in flexible, novel ways are needed
THE USE OF MATRIX TRAINING TO PROMOTE GENERATIVE LANGUAGE WITH CHILDREN WITH AUTISM

SARAH E. FRAMPTON, SARAH C. WYMER, AND BETHANY HANSEN
MARCUS AUTISM CENTER

AND

M. ALICE SHILLINGSBURG
MARCUS AUTISM CENTER AND EMBRY UNIVERSITY SCHOOL OF MEDICINE

Matrix training consists of planning instruction by arranging components of desired skills across 2 axes. After training with diagonal targets that each combine 2 unique skill components, responses to nondiagonal targets, consisting of novel combinations of the components, may emerge. A multiple-probe design across participants was used to evaluate matrix training with known nouns (e.g., cat) and verbs (e.g., jumping) with 5 children with autism spectrum disorders (ASD). Following baseline of Matrix 1 and a generalization matrix, diagonal targets within Matrix 1 were trained as noun–verb combinations (e.g., cat jumping). Posttest showed recombinative generalization within Matrix 1 and the generalization matrix for 4 participants. For 1 participant, diagonal training across multiple matrices was provided until correct responding was observed in the generalization matrix. Results support the use of matrix training to promote untrained responses for learners with ASD and offer a systematic way to evaluate the extent of generalization within and across matrices.

Key words: autism, matrix training, recombinative generalization, tact
Tact Noun-Verb Word Combinations

• Three Goals
  – Directly teach noun-verb combinations when tacting
    • “What’s happening?” “What do you see?”
  – Assess Recombinative Generalization
  – Assess novel noun-verb combinations (generalization)

• Recombinative Generalization
  – Process in which individuals come to produce and respond to novel combinations of known components (Goldstein & Mousetis, 1989)
  – Involves teaching with overlapping stimuli

• Matrix Training
  – Systematic method to organize overlapping stimuli within a matrix
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<tr>
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<th>Verb 1</th>
<th>Verb 2</th>
<th>Verb 3</th>
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<td>Probe</td>
<td>Probe</td>
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<td>Train</td>
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<tr>
<td></td>
<td>Jumping</td>
<td>Sleeping</td>
<td>Drinking</td>
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<td>Train</td>
<td>Probe</td>
<td>Probe</td>
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<td>Train</td>
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Diagonal Targets are Directly Taught

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Diagonal Targets are Directly Taught

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<td>Dog</td>
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<td>Dog sleeping</td>
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</tbody>
</table>

Non-Diagonal Targets are Probed for Recombinative Generalization

Probe Novel Matrix with known components
Frampton et al. (2016)
Probe Novel Matrix with known components

Baseline

Diagonal Training Matrix 1

Post-Test 1

Percent Correct (Test)

Sessions

Jake
Probe Novel Matrix with known components

- Baseline
- Post-Test I
- Post-Test II

Percent Correct (Total)

Sessions

Jake
Probe Novel Matrix with known components

Baseline → Post-Test I → Post-Test II → Post-Test III

Percent Correct (Tar)

Sessions

Jake
Results

- Recombination of targeted skills
- Emergence in untrained set for 4 participants
- When emergence did not occur?
  - Multiple exemplar training aided in emergence in untrained set for Jake
The Use of Matrix Training to Teach Color-Shape Tacts to Children with Autism

Sarah E. Frampton¹ · Taylor M. Thompson² · Brittany L. Bartlett² · Bethany Hansen²,³ · M. Alice Shillingsburg¹

Published online: 24 September 2018
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Abstract
Matrix training consists of preplanning instruction by arranging components of desired skills across a minimum of two axes. In the current study, three matrices were developed for each participant (e.g., Matrix 1, Generalization Matrix 1, and Generalization Matrix 2) with known color and shape components. Following baseline, nonoverlapping (i.e., diagonal) training was conducted with Matrix 1. Results of posttests were used to determine the extent of emergence of untrained color-shape combinations across all matrices. Results from all six participants indicated that mastery criteria were eventually met for Matrix 1. For five participants, mastery criteria were also eventually met for generalization matrices. Results replicate findings from prior studies and offer a simple approach for both testing emergence of untrained skills and remediating responding.
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<tr>
<td>red</td>
<td>triangle</td>
</tr>
<tr>
<td>orange</td>
<td>arrow</td>
</tr>
<tr>
<td>blue</td>
<td>pentagon</td>
</tr>
<tr>
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### Target Groupings

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### Matrix 1

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<tr>
<td>Blue</td>
<td>Pentagon</td>
</tr>
<tr>
<td>Green</td>
<td>Circle</td>
</tr>
<tr>
<td>Yellow</td>
<td>Square</td>
</tr>
<tr>
<td>Pink</td>
<td>Star</td>
</tr>
<tr>
<td>White</td>
<td>Rectangle</td>
</tr>
<tr>
<td>Black</td>
<td>Heart</td>
</tr>
</tbody>
</table>

## Generalization Matrix 1

<table>
<thead>
<tr>
<th></th>
<th>Pentagon</th>
<th>Circle</th>
<th>Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Blue Pentagon</td>
<td>Blue Circle</td>
<td>Blue Square</td>
</tr>
<tr>
<td>Green</td>
<td>Green Pentagon</td>
<td>Green Circle</td>
<td>Green Square</td>
</tr>
<tr>
<td>Yellow</td>
<td>Yellow Pentagon</td>
<td>Yellow Circle</td>
<td>Yellow Square</td>
</tr>
</tbody>
</table>
### Target Groupings

<table>
<thead>
<tr>
<th>Colors</th>
<th>Shapes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purple</td>
<td>Crescent</td>
</tr>
<tr>
<td>Red</td>
<td>Triangle</td>
</tr>
<tr>
<td>Orange</td>
<td>Arrow</td>
</tr>
<tr>
<td>Blue</td>
<td>Pentagon</td>
</tr>
<tr>
<td>Green</td>
<td>Circle</td>
</tr>
<tr>
<td>Yellow</td>
<td>Square</td>
</tr>
</tbody>
</table>

### Generalization Matrix 2

<table>
<thead>
<tr>
<th></th>
<th>Star</th>
<th>Rectangle</th>
<th>Heart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pink</td>
<td>Pink Star</td>
<td>Pink Rectangle</td>
<td>Pink Heart</td>
</tr>
<tr>
<td>White</td>
<td>White Star</td>
<td>White Rectangle</td>
<td>White Heart</td>
</tr>
<tr>
<td>Black</td>
<td>Black Star</td>
<td>Black Rectangle</td>
<td>Black Heart</td>
</tr>
</tbody>
</table>
Teaching tacts on SGD

• Tacts of pictures (Kagohara et al., 2012; Lorah & Parnell, 2017; van der Meer et al., 2015)

• Tacts of objects (Lorah et al., 2014)

• Use of prompts and reinforcement
  – Effective in establishing trained skills

Need to find strategies specifically aimed at developing generativity
Marya, Frampton, & Shillingsburg (in prep)

• Replicate Frampton et al.
Participants

• 3 participants
  – Between 4-16 years of age
• Diagnosis of ASD
• Limited vocalizations
Participants

• Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP) assessment
  – Significantly impaired echoic and articulation domains
  – Communicated using a SGD
    • IPad with digitized speech output
  – Fluent in device navigation (iconic and typed responses)

<table>
<thead>
<tr>
<th>Name</th>
<th>VB-MAPP admission</th>
<th>Tact Milestone 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruce</td>
<td>42</td>
<td>0</td>
</tr>
<tr>
<td>Mason</td>
<td>55</td>
<td>0</td>
</tr>
<tr>
<td>Robin</td>
<td>55.5</td>
<td>0</td>
</tr>
</tbody>
</table>
Settings and Materials

• All sessions conducted in a classroom within a language clinic
• Animals/toy figurines
• Accessory items (e.g. toy trampoline, toy car)
• Targets were selected for each participant based on mastery lists and results of direct probing
What’s happening?
## Methods

### Matrix 1

<table>
<thead>
<tr>
<th></th>
<th>Jumping</th>
<th>Painting</th>
<th>Sitting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dog</td>
<td>Dog Jumping</td>
<td>Dog Painting</td>
<td>Dog Sitting</td>
</tr>
<tr>
<td>Rabbit</td>
<td>Rabbit Jumping</td>
<td>Rabbit Painting</td>
<td>Rabbit Sitting</td>
</tr>
<tr>
<td>Pig</td>
<td>Pig Jumping</td>
<td>Pig Painting</td>
<td>Pig Sitting</td>
</tr>
</tbody>
</table>

### Generalization Matrix

<table>
<thead>
<tr>
<th></th>
<th>Drinking</th>
<th>Reading</th>
<th>Eating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duck</td>
<td>Duck Drinking</td>
<td>Duck Reading</td>
<td>Duck Eating</td>
</tr>
<tr>
<td>Bear</td>
<td>Bear Drinking</td>
<td>Bear Reading</td>
<td>Bear Eating</td>
</tr>
<tr>
<td>Alligator</td>
<td>Alligator Drinking</td>
<td>Alligator Reading</td>
<td>Alligator Eating</td>
</tr>
</tbody>
</table>
Methods

What’s happening?
Methods
Methods
Methods
Methods
Marya, Frampton, & Shillingsburg (in prep)
Results

• All 3 participants learned to emit noun-verb combinations when directly taught
• All 3 emitted recombined responses
• 2 of the 3 showed immediate generalization to novel combinations
• 1 participant required multiple exemplars
Conclusions

• Recent research is extending procedures to:
  – Novel word combinations (color/shape)
  – Those who use Speech Generating Devices
  – Adolescents with autism
Intraverbals

• 40 of the 172 studies (23.3%) focused on Intraverbals (DeSouza, et al., 2017)

• Recently, studies have focused on intraverbal under multiple
control, emergence of intraverbals, and distinguishing
intraverbals from responses under intraverbal control
(Palmer, 2016)


Angelica A. Aguirre1 • Amber L. Valentino1 •
Linda A. LeBlanc1

Abstract Several papers have reviewed the literature based on Skinner’s conceptual
framework presented in his 1957 book, Verbal Behavior. These reviews have called for
more research on the topic of verbal behavior generally and often for more research on
particular verbal operants. For example, Sautter and LeBlanc (2006) urged the
behavior-analytic community to conduct more research on the intraverbal because of
the scant existing literature base at that time. In the current review, we replicate
the procedures used by Sautter and LeBlanc focusing specifically on the intraverbal
relation and on the literature published in the 10 years since their call for research.
On Intraverbal Control and the Definition of the Intraverbal

David C. Palmer

Abstract Behavior analysts should distinguish between the intraverbal, as a class of verbal operants, and intraverbal control, the potentiating effect, however slight, of a verbal antecedent on a verbal response. If it is to serve an explanatory function, the term intraverbal, as a class of verbal operants, should be restricted to those cases in which a verbal antecedent, as the result of a history of contiguous or correlated usage, is sufficient to evoke the putative intraverbal response. Intraverbal control is pervasive in verbal behavior, but since it is typically just one of many concurrent variables that determine the form of a verbal response, such multiply controlled responses are not usefully called “intraverbals.” Because intraverbals and their controlling variables have invariant formal properties, they are conceptually simple, but they nevertheless play a central role in the interpretation of complex phenomena such as the structural regularities in verbal behavior (i.e., grammar).
Intraverbal Control

- Mary had a little _______________
- Tell me your favorite zoo animal?___________
- Red, white, and _____________
- What color is your neighbor’s house?___________
Intraverbal Training

• Is there a place for direct training intraverbals?
  • YES
  • It occurs in typical development
  • May play an important role in development of subsequent generative intraverbal behavior

• Do we need more research on advanced, generative intraverbals (i.e., under intraverbal control)?
  • YES
Tact
Listener

Tact-Listener Interdependence

A

B
Intraverbal—You use an increment hammer to_____________________________.

Emergence of the Intraverbal
Tact by function (TFFC)
Intraverbal—You use an increment hammer to ________________________________.

Intraverbal—You measure tree growth with an ________________________________.
Interdependence

Listener

A
Dictated name
"Book"

B
Picture

C
Dictated function
"Read"

D
Spoken name
"Book"

E
Spoken function
"Read"

F
EO for Book

Functions

Tact

Mand

Intraverbal

Reversal

Listener By Function

Tact By Intraverbal Function
Promoting Emergence

• How can we program to promote emergence?
  • Procedures aimed at strengthening stimulus relations
Promoting Emergence

• Multiple Exemplar Instruction (MEI)
  • Alternating instruction between both operants **within the same session**
  • Mands/tacts (Nuzzolo-Gomez & Greer, 2004)
  • Listener/tacts (Greer et al., 2005)
  • Listener/intraverbals in typically dev. kids (Lechago et al., 2015)

  • Minimal emergent intraverbal responding
Promoting Emergence

• Multiple-tact training/Receptive discrimination training (MTT/RDT)
  (Miguel, et al., 2005, Partington & Bailey, 1993)

• Alternating **Related Operants** within same session
  
  - MTT: Tact item name and Tact item category
    - Tact (e.g., “what is it?” cup)
    - Tact Category (e.g., this is a type of .... dish)
  
  - RDT: Receptive item name and Receptive item category
    - Receptive ID (e.g., point to cup)
    - Receptive Category (e.g., point to the dish)

• Minimal effect on emergent intraverbals in typically dev. kids

A cup is a type of....dish

A cup is a type of....dish
The Effects of the Interspersal of Related Responses on the Emergence of Intraverbals for Children With Autism Spectrum Disorder

M. Alice Shillingsburg¹,² • Sarah E. Frampton¹

Published online: 19 June 2019
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Abstract
The present study evaluated the emergence of intraverbals for 2 children diagnosed with autism spectrum disorder. Prior to baseline, both children demonstrated tact, tact function, listener, and listener by function responses with 12 pictorial stimuli, yet they failed to demonstrate intraverbals related to the function of the items (e.g., “What do you do with [item]?” and “What do you use to [function]?”). Following baseline, previously unnoticed related tact, tact function, listener, and listener by function to the
Purpose

• Strategy to promote emergence of intraverbals in 2 children with autism

• Components of MTT/RDT and MEI **within a single session**
  • Include the relevant related operants (Rec, Tact, LRFFC, TFFC)
  • Alternate between related operants and intraverbal frame
Participants

• Lack of intraverbal emergence
  • Despite strong tact, listener, tact-function, listener-function repertoire

• Mark: 4 yr, 6 mth ASD
  • Level 2 VB-MAPP; 1.5 IV score
Emergence of Intraverbals

- Prerequisite interrelated operants (known)
  - Receptive ID (e.g., show me cup)
  - Tact (e.g., what is it? cup)
  - RFFC (e.g., point to the one you drink from)
  - TFFC (e.g., this is something you use for ___)
- Intersperse Unknown Intraverbal frames within sessions with these 4 interrelated operants
  - Examine effects on intraverbals that were interspersed
  - Examine effects on other non-interspersed intraverbals
Methods

• Identify sets of unknown intraverbals and reverse intraverbals
• Pre-assessment to confirm mastery of related tact, listener, tact-function, listener-function

<table>
<thead>
<tr>
<th>Operant</th>
<th>$S^D$</th>
<th>Known/Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listener</td>
<td>Point to the Book</td>
<td>Known</td>
</tr>
<tr>
<td>Tact</td>
<td>What is it?</td>
<td>Known</td>
</tr>
<tr>
<td>Listener-Function</td>
<td>Which one do you read?</td>
<td>Known</td>
</tr>
<tr>
<td>Tact-Function</td>
<td>What do you do with this?</td>
<td>Known</td>
</tr>
<tr>
<td>Intraverbal</td>
<td>What do you read?</td>
<td>Unknown</td>
</tr>
<tr>
<td>Intraverbal Reversal</td>
<td>What do you do with a book?</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
Intraverbals

23 of 24 Intraverbals

Daily Probes

Number of Intraverbals Emitted

Baseline (BL) Interspersal Treatment Pair 1 Interspersal Treatment Pair 2 BL

Mark

Untreated Intraverbals Intraverbals Exposed to Interspersal Treatment Cumulative Intraverbals
Emergence Remediation?

• Will there be on-going change in intraverbal emergence?
• After learning new Tact-Function relations
  • What emerges
Conclusions

• Interspersal Intervention lead to emergence of intraverbals in 2 children with autism
  • Previously showed a lack of emergence despite strong related operants

• Improved relational responding generally for Mark

• Relatively short intervention
  • 1 Interspersal Intervention session per day
  • 1 trial daily probes
  • Mark completed within 21 days; Bulk of emergence in 10 sessions, 2 pairs
Empirical Evaluations of Skinner’s Analysis of Problem Solving

Judah B. Axe¹ • Stephanie H. Phelan²,3,4 • Caitlin L. Irwin²

Published online: 19 November 2018
© Association for Behavior Analysis International 2018

Abstract
We reviewed 12 studies in which the researcher taught problem-solving strategies, such as self-questioning and visual imagining, to children and adolescents with and without disabilities to facilitate the learning of math, spelling, play/social, and communication skills. We analyzed these studies in terms of types of problem-solving strategies, the multiple control involved in problem solving, the extent to which problem solving occurred at the overt or covert level. In addition to suggesting limitations of the literature, we recommend areas for future research and practice.
Problem Solving Strategy

- Come up with an answer from the current verbal repertoire
- Typically developing children and complex intraverbals
  - Verbal Rules (Sautter, LeBlanc, Jay, Goldsmith, & Carr, 2011)
  - Visual Imagining (Kisamore, Carr, & LeBlanc)
- Current study examined combination of verbal statements and visual sequencing
- Generate verbal explanations of how to do something
- Children with ASD and language impairments
TEACHING CHILDREN WITH AUTISM TO EXPLAIN HOW: A CASE FOR PROBLEM SOLVING?

SARAH E. FRAMPTON
MARCUS AUTISM CENTER

AND

M. ALICE SHILLINGSBURG
MARCUS AUTISM CENTER AND EMORY UNIVERSITY SCHOOL OF MEDICINE

Few studies have applied Skinner's (1953) conceptualization of problem solving to teach socially significant behaviors to individuals with developmental disabilities. The current study used a multiple probe design across behavior (sets) to evaluate the effects of problem-solving strategy training (PSST) on the target behavior of explaining how to complete familiar activities. During baseline, none of the three participants with autism spectrum disorder (ASD) could respond to the problems presented to them (i.e., explain how to do the activities). Tact training of the actions in each activity alone was ineffective; however, all participants demonstrated independent explaining-how following PSST. Further, following PSST with Set 1, tact training alone was sufficient for at least one scenario in sets 2 and 3 for all 3 participants. Results have implica-
Problem Solving Strategy

- Three pairs of activities with 4 steps to completion
  - Tell me how you play Bowling
    - First, you set up the pins
    - Next, you get the ball
    - Then, you roll the ball
    - Last, you knock over the pins
  - Intraverbal response to “tell me how to....”
    - Naturalistic probe (in the moment of the activity)
    - Intraverbal Trials (at a teaching table)
## Example

<table>
<thead>
<tr>
<th>First</th>
<th>Next</th>
<th>Then</th>
<th>Last</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bowling</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set up the pins</td>
<td>Pick up the ball</td>
<td>Roll the ball</td>
<td>Knock over the pins</td>
</tr>
<tr>
<td><strong>Making Popcorn</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Put the popcorn in the microwave</td>
<td>Push the popcorn button</td>
<td>Push the start button</td>
<td>Eat the popcorn</td>
</tr>
</tbody>
</table>

120
Tacting the Actions
Baseline Post-Tact Actions Training

Set 1: Popcorn and Bowling

Percentage Correct

Set 2: CD and Glowstick

Set 3: Juice and Grow Animal

Kiley

122
Problem Solving Strategy

- Sorting and sequencing pictures of the steps
- Verbal statements: first, next, then, last
Problem Solving Strategy: Sorting and Sequencing, Tacts

How do I play bowling?

First, set up the pins.

Next, pick up the ball.

Then, roll the ball.

Last, knock over the pins.

Great job!
Frampton and Shillingsburg, JABA
Baseline Post-Tact Training Post-Visual Sorting Strategy Training
Juice and Popcorn
0 20 40 60 80 100
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Percent Correct
Sessions
George
Sorting and Sequencing
Naturalistic IV Structured IV TFFC
Scenarios 3 and 4
0 20 40 60 80 100
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Percent Correct
Scenarios 5 and 6
0 20 40 60 80 100
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Percent Correct
Trick or Treating and Zingo
0 20 40 60 80 100
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Percent Correct
Bowling and Hand Turkey
0 20 40 60 80 100
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Percent Correct
Sessions
George
Conclusions

• Recent research is extending procedures to:
  • Focus on emergence of Intraverbals
  • Teach problem solving strategies
Echoics

• 4 of the 172 studies (2.3%) focused on Echoics (DeSouza, et al., 2017)

• Echoics are used regularly in transfer-of-stimulus control procedures to teach mands, tacts, and intraverbals

• Establishing an echoic repertoire is critical
Shaping Vocal Imitation

• Differentially reinforcing closer approximations to the goal behavior; systematically extinguishing other attempts
  • Butz & Hasazi, 1973
  • Harris, 1975
  • Hung, 1976
  • Harris & Wolchik, 1982
  • Charlop & Haymes, 1994
  • Lovaas et al. 1991; Lovaas & Smith, 2003 etc...
High-Probability Sequence

• Hi-P procedure is used to increase compliance to instructions (Lipshultz & Wilder, 2017)

• Hi-p instructional sequence consists of presenting a series of hi-p instructions followed immediately by the low-p targeted instruction (Mace, et al., 1988)

• Particularly useful when compliance cannot be physically prompted

• May be used to promote speech if noncompliance is potentially involved (Ross & Greer, 2003; Tsiouri & Greer, 2003).
Clinical Application of a High-Probability Sequence to Promote Compliance with Vocal Imitation in a Child with Autism Spectrum Disorder

Bethany Hansen1,2 • Andrea A. DeSouza1 • Ashley L. Stuart1,3 • M. Alice Shillingsburg1,4

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Abstract
The current study aimed to evaluate the effects of the high-probability (high-p) instructional procedure involving motor imitation on the levels of compliance with vocal imitation in a 3-year-old boy with autism spectrum disorder (ASD). We used a multiple-baseline design across three stimuli sets to demonstrate effects of the procedure over compliance with vocal imitation responses. Results demonstrated that the high-p procedural sequence was effective in increasing the levels of compliance with vocal imitation. We discuss these findings in terms of the operant mechanisms and clinical applications of increased compliance.

Keywords High-p • Low-p • Motor imitation • Vocal imitation • Intervention • Autism spectrum disorder

Noncompliance to instructions is commonly observed in children with autism spectrum disorder (ASD) and other developmental delays. This problem is immediately by the low-probability (low-p) instruction associated with low compliance (Mace et al., 1988).
• Selected 3 sets each with 2 low-p echoic sounds
• Identified several hi-p motor imitation targets
• Each Trial: 3 hi-p motor imitations followed by 1 low-p echoic target
• Trials presented quickly (less than 1 sec ITI)
Pre EESA Score = 0
Post EESA Score = 38
Conclusions

• Recent research on establishing echoics is pretty slim
  • Inducing instances of speech
  • Stimulus-stimulus pairing
Concluding Remarks

• The field of Verbal Behavior is growing
• Research is exploding
• Research on mands still outpaces the other verbal operants
• Establish methods to keep up with the literature
Thank you!!

ashillingsburg@mayinstitute.org