EMERGENT RESPONDING:
GETTING MORE BANG FOR YOUR BUCK WHEN TEACHING VERBAL BEHAVIOR

SARAH A. LECHAGO, PH.D., BCBA-D

OBJECTIVES

• Facts about ASD
• Define emergent verbal behavior (VB)
• Brief literature review emergent VB
• Recommendations for practice
SOME FACTS ABOUT AUTISM SPECTRUM DISORDER (ASD)

- 1 in 68 children
- 4.5X more common in boys (1 in 42)

$17,000

$21,000
APPLIED BEHAVIOR ANALYSIS (ABA) TREATMENT

• Primary treatment - ASD

• Intensive behavioral interventions $40,000-$60,000/yr

• Cost effective treatment

CDC, 2014

SO LET’S TALK ABOUT VERBAL BEHAVIOR (VB)

• VB programs – critical to EIBI

• VB approach
  • Functional independence: environmental variables

• Typically developing individuals - respond across verbal operants without explicit training (Skinner 1957; Taylor and Harris 1995)
MORE ON VB

• Emergent responding between verbal operants and between listener and speaker repertoires - deficient in many individuals with language delays (Guess and Baer 1973; Kelley et al. 2007; Nuzzolo-Gomez and Greer 2004)

EMERGENT VERBAL BEHAVIOR

• The emission of language (verbal behavior) that was not directly taught
  • Most of our verbal behavior
  • Example
    • Teach an infant to point to a ball when asked “Where is the ball?”.  
    • When presented with ball and asked “What is it?”, the infant can say “ball” without direct teaching.
AN IMPORTANT NOTE ABOUT EMERGENCE

Type

Why

Applied

Treatment for people with ASD

Current: 2000-2016
PROMOTING EMERGENT VERBAL BEHAVIOR

• A few commonly-employed approaches
  • 1. Multiple exemplar instructions (MEI) - MET
  • 2. Sequencing of instructional programs
  • 3. Matching-to-sample (stimulus equivalence)

MULTIPLE EXEMPLARY INSTRUCTION
(MULTIPLE EXEMPLARY TRAINING)
MULTIPLE EXEMPLAR INSTRUCTION

• Definition:
  • Multiple examples using a subset of targets to produce emergent responding when presented with new targets
  • E.g., Teaching motor imitation

• Effective in producing emergent responding
  • (Fiorile, & Greer, 2007; Greer, Yuan, & Gautreaux, 2005; Nuzzolo-Gomez & Greer, 2004)
MEI LITERATURE REVIEW
Evaluating the Effectiveness of the Stimulus Pairing Observation Procedure and Multiple Exemplar Instruction on Tact and Listener Responses in Children with Autism

Brittany L. Byrne - Ruth Anne Rehfeldt - Angelica A. Aguirre

Published online: 15 August 2014
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Table 1  Stimulus sets for each participant:

<table>
<thead>
<tr>
<th>Participants</th>
<th>Original set</th>
<th>MEI set 1</th>
<th>MEI set 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jackson</td>
<td>Ladle</td>
<td>Tambourine</td>
<td>Clarinet</td>
</tr>
<tr>
<td></td>
<td>Vase</td>
<td>Kiwi</td>
<td>Valve</td>
</tr>
<tr>
<td></td>
<td>Rush</td>
<td>Parachute</td>
<td>Pastry</td>
</tr>
<tr>
<td>Jenna</td>
<td>Rice</td>
<td>Taxi</td>
<td>Pepper</td>
</tr>
<tr>
<td></td>
<td>Paint</td>
<td>Kiwi</td>
<td>Fountain</td>
</tr>
<tr>
<td></td>
<td>Gum</td>
<td>Ax</td>
<td>Globe</td>
</tr>
<tr>
<td>Sophia</td>
<td>Cucumber</td>
<td>Washer</td>
<td>Pliers</td>
</tr>
<tr>
<td></td>
<td>Colt</td>
<td>Freckles</td>
<td>Wreath</td>
</tr>
<tr>
<td></td>
<td>Canoe</td>
<td>Ground</td>
<td>Plantain</td>
</tr>
</tbody>
</table>
Evaluating the Emergence of Reverse Intraverbals in Children with Autism

Aldea C. Allan · Jason C. Vladoscu · April N. Kinamore · Sharon A. Reeves · Tina M. Sidner

Published online: 21 November 2014
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Abstract Verbal behavior plays a fundamental role in the development of complex social and communication skills. Many children diagnosed with autism spectrum disorder exhibit profound deficiencies in intraverbal repertoires and the development of social relationships. Recent studies that investigated the effects of intraverbal training on the emergence of reverse intraverbals produced mixed results (e.g., Perez-Gonzalez et al., Journal of Applied Behavior Analysis 40:697–701, 2007)). In the current study, a multiple-probe design across four participants with autism was used to evaluate the effects of intraverbal training on the emergence of reverse intraverbals. Intraverbal training consisted of multiple exemplars taught concurrently, bidirectional stimulus–response teaching formats, general case analysis, reinforcement, and a constant prompt delay (CPD) procedure. Participants were trained on intraverbal targets and probe restrictions conducted to assess emergence of untaught reverse intraverbals. Three participants demonstrated the emergence of reverse intraverbals as a result of the intraverbal training procedures. Social validity and maintenance of target responses and emergent reverse intraverbals were assessed.

Keywords Autism · Emergence · Intraverbal training · Verbal behavior
Table 1  Bidirectional teaching and probe assignments for intraverbal and reverse intraverbal targets

<table>
<thead>
<tr>
<th>Intraverbals teach and probe assignments for Ray</th>
<th>Intraverbals teach and probe assignments for Eric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A—teach (cities)</td>
<td>Group A—teach (states)</td>
</tr>
<tr>
<td>Baltimore (Ravens)</td>
<td>Florida (Miami)</td>
</tr>
<tr>
<td>Carolina Panthers</td>
<td>Idaho (Boise)</td>
</tr>
<tr>
<td>Denver (Broncos)</td>
<td>Virginia (Williamsburg)</td>
</tr>
<tr>
<td>Oakland (Raiders)</td>
<td>Tennessee (Chattanooga)</td>
</tr>
<tr>
<td>Group A—probe (teams)</td>
<td>Group A—probe (cities)</td>
</tr>
<tr>
<td>Ravens (Baltimore)</td>
<td>Miami (Florida)</td>
</tr>
<tr>
<td>Panthers (Carolina)</td>
<td>Boise (Idaho)</td>
</tr>
<tr>
<td>Broncos (Denver)</td>
<td>Williamsburg (Virginia)</td>
</tr>
<tr>
<td>Raiders (Oakland)</td>
<td>Chattanooga (Tennessee)</td>
</tr>
</tbody>
</table>

Fig. 1  Percentage of correct unprompted intraverbals and reverse intraverbals for all four participants. Each filled data point is computed from three presentations of ten intraverbals; each open data point is computed from one presentation of ten reverse intraverbals. The small arrows in the bottom panel indicate training of reverse intraverbals for Tony.
USING AUDIO SCRIPT FADEING AND MULTIPLE-EXEMPLAR TRAINING TO INCREASE VOCAL INTERACTIONS IN CHILDREN WITH AUTISM

ELена GARCIA-ALBA, SHARON A. REEVE, AND KENNETH E. REEVE
CALDwell COLLEGE
AND
KEVIN J. BROTHERS
SOMERSET HILLS LEARNINg INSTITUTE

Script-fading procedures have been shown to be effective for teaching children with autism to initiate and participate in social interactions without vocal prompts from adults. In previous script and script-fading research, however, there has been no demonstration of a generalized repertoire of vocal interactions under the control of naturally occurring relevant stimuli. In this study, 4 boys with autism were taught to initiate a conversation in the presence of toys through the use of a script and script-fading procedure. Training with multiple categories and exemplar of toys was used to increase the likelihood of generalization of vocal interactions across novel toys. A multiple-probe design across participants was used to assess the effects of these procedures. The intervention successfully brought interactions by children with autism under the control of relevant stimuli in the environment. Future research pertaining to the specific implementation of these procedures (e.g., fading, script placement, participant characteristics) is discussed.

Key words: autism, multiple-exemplar training, scripts, script fading, spontaneous language

Table 1

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample toy</th>
<th>Script 1</th>
<th>Script 2</th>
<th>Script 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicles</td>
<td>Car</td>
<td>Check out this car!</td>
<td>Look, it's red!</td>
<td>Can go beep!</td>
</tr>
<tr>
<td>Instruments</td>
<td>Piano</td>
<td>I can play piano.</td>
<td>It's black.</td>
<td>Watch me hit the keys!</td>
</tr>
<tr>
<td>Balls</td>
<td>Soccer ball</td>
<td>I have the soccer ball!</td>
<td>It's black and white.</td>
<td>Let's kick it!</td>
</tr>
<tr>
<td>Action figures</td>
<td>Spiderman</td>
<td>Spiderman is so cool!</td>
<td>He has a web.</td>
<td>Watch how he climbs!</td>
</tr>
<tr>
<td>Building materials</td>
<td>Lego tractor</td>
<td>These legos are awesome!</td>
<td>It's a tractor!</td>
<td>You can attach them.</td>
</tr>
<tr>
<td>Animals</td>
<td>Cow</td>
<td>Cool, it's a cow!</td>
<td>It goes to a farm.</td>
<td>Grow any more.</td>
</tr>
</tbody>
</table>

Note. Each category consisted of four toy exemplars with three scripts assigned to each. The table depicts one exemplar toy from each category along with its scripts for illustration purposes.

Table 2

<table>
<thead>
<tr>
<th>Fading Levels Used During Script Fading</th>
<th>Script content</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Full script</td>
</tr>
<tr>
<td>1</td>
<td>Very mild auditory</td>
</tr>
<tr>
<td>2</td>
<td>Mild auditory</td>
</tr>
<tr>
<td>3</td>
<td>Moderate auditory</td>
</tr>
<tr>
<td>4</td>
<td>High auditory</td>
</tr>
<tr>
<td>5</td>
<td>All instructions</td>
</tr>
<tr>
<td>6</td>
<td>All instructions</td>
</tr>
<tr>
<td>7</td>
<td>No scripts or instructions</td>
</tr>
</tbody>
</table>

Note: Level 7 was used only for Adam.
<table>
<thead>
<tr>
<th>Category of interaction</th>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiations (vocal responses directed to the conversation partner before the partner engages in the conversation)</td>
<td>Scripted</td>
<td>Vocal response was exact match to any of the three possible scripts for that toy or category or differed only in conjunctions, articles, prepositions, or pronouns, regardless of whether scripts were full, partial, or failed.</td>
</tr>
<tr>
<td></td>
<td>Unscripted</td>
<td>Vocal response was not match script presented in earlier session from each category (i.e., partial or full scripts) and differed from the script by more than conjunctions, articles, prepositions, or pronouns.</td>
</tr>
<tr>
<td></td>
<td>Novel</td>
<td>Vocal response did not contain any words from the original scripts besides conjunctions, articles, prepositions, pronouns, or partner's name.</td>
</tr>
<tr>
<td></td>
<td>In vivo scripted</td>
<td>Vocal response that matched any statements modeled by conversation partner in prior trials, with addition that conjunctions, articles, prepositions, or pronouns were not used.</td>
</tr>
<tr>
<td></td>
<td>In vivo unscripted</td>
<td>Vocal response similar to any statements modeled by conversation partner in prior trials and differed from model by more than conjunctions, articles, prepositions, pronouns, such tense, or the partner's name.</td>
</tr>
</tbody>
</table>

Elaborations (vocal responses directed to the conversation partner after the partner engaged in the conversation)

<table>
<thead>
<tr>
<th>Type</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scripted, unscripted, novel, in vivo scripted, in vivo unscripted</td>
<td>Definitions are the same as those above except the vocal response occurred after the conversation partner engaged in the conversation.</td>
</tr>
</tbody>
</table>

Acknowledgments

Positive verbal productions (e.g., "yeah," "okay," "yes," "no," or "uhm") emitted after conversation partner made a statement.

Generalized interactions

<table>
<thead>
<tr>
<th>Within category</th>
<th>Across category</th>
</tr>
</thead>
</table>
| Any interaction type that occurred in presence of novel toy drawn from teaching category of toys | Any interaction type that occurred in presence of novel toy drawn from novel category of toys.

Figure 1: Number of scripted and unscripted vocal responses per session, showing data for each participant. Numbered arrows along the top of each panel indicate script fading levels. The arrows labeled P indicate the timing of reinforcement (i.e., 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100).
Sarcasm can be linguistically defined as a form of non-literal language in which someone subjectively states the opposite of what is objectively known to be true in reality.
Table 1
Sample context and corresponding sarcastic and sincere comments.

<table>
<thead>
<tr>
<th>Context</th>
<th>Sarcasm comment</th>
<th>Sincere comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>warm sunny day</td>
<td>&quot;It's definitely going to snow today.&quot;</td>
<td>&quot;It's so warm outside today.&quot;</td>
</tr>
<tr>
<td>non-preferred food item</td>
<td>&quot;You would love to eat broccoli every day.&quot;</td>
<td>&quot;I know you don't like broccoli.&quot;</td>
</tr>
<tr>
<td>messy room</td>
<td>&quot;You didn't make a mess at all.&quot;</td>
<td>&quot;This room is so messy.&quot;</td>
</tr>
<tr>
<td>preferred activity</td>
<td>&quot;Playing video games is never fun.&quot;</td>
<td>&quot;It's so much fun to play video games.&quot;</td>
</tr>
</tbody>
</table>
TEACHING CHILDREN WITH AUTISM A BASIC COMPONENT SKILL OF PERSPECTIVE-TAKING

Evelyn Gould, Jonathan Tarbox*, Denis Q’Hora, Steve Noone and Ryan Bergstrom

1Bangor University, Wales, Gwynedd, UK
2Center for Autism and Related Disorders, Torrance, CA, USA
3National University of Ireland, Galway, Ireland

Perspective-taking is an area of human functioning that is rarely studied by behavior analysts but likely entails a complex repertoire of verbal and relational behavior. Perspective-taking is generally acknowledged to be an important skill for successful social functioning and a significant amount of research has documented deficits in these skills in individuals with autism. However, little previous research has examined behavioral intervention procedures for remediating these deficits. The current study evaluated the effectiveness of a multiple exemplar training procedure for teaching three children with autism to identify what other people can see, a simple component skill of perspective-taking. All participants demonstrated generalization to novel table-top tasks but generalization to natural environment probes was less consistent. Results are discussed in terms of the behavioral history required to develop perspective-taking repertoires, as well as for the development of effective interventions. Descriptors: Perspective-taking, autism, Theory of Mind, conditional discrimination, and multiple exemplar training.

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Barnes-Holmes, & McHugh, 2004). Perspective-taking involves inferring another person’s desires and beliefs, in order to interpret their behavior and predict what they will do next (Howlin, Baron-Cohen, & Hadwin, 1999; Sigman & Capps, 1997). Common human activities that are believed to involve perspective-taking include deception, empathy, self-consciousness, self-reflection, persuasion, and pretense, as well as being essential for effective communication (Howlin et al., 1999).
Figure 1. Sample stimulus cards, with an example of a card with no visual prompt used during baseline and probing (lower left), and examples of cards including the visual arrow prompt being faded out (upper left to lower right).

Figure 2. Percentage of correct responses across baseline, training, and probing conditions, for Aaron, Case, and Hannah.
Teaching children with autism to detect and respond to deceptive statements

Jennifer Ranick\textsuperscript{a,b}, Angela Persicke\textsuperscript{a,b}, Jonathan Tarbox\textsuperscript{a,b,*}, Jake A. Komack\textsuperscript{a,b}

\textsuperscript{a}Autism Research Group, United States
\textsuperscript{b}Center for Autism and Related Disorders, United States

TABLE 1
Examples of lies included in the study.

<table>
<thead>
<tr>
<th>Lies to take an item away from the participant:</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Your mom said I could have this.”</td>
</tr>
<tr>
<td>“I’m the guest so you have to give me one of your toys.”</td>
</tr>
<tr>
<td>“This is mine; I brought it from home.”</td>
</tr>
<tr>
<td>“You said I could have this the last time I came over.”</td>
</tr>
<tr>
<td>Examples of lies to exclude participant from an activity:</td>
</tr>
<tr>
<td>“You didn’t spin a four so I get to go again.”</td>
</tr>
<tr>
<td>“Only people with brown hair can play this game.”</td>
</tr>
<tr>
<td>“You have to be six or older to play.”</td>
</tr>
<tr>
<td>“You didn’t find us quick enough, so you have to count again.”</td>
</tr>
</tbody>
</table>
The Effects of Observational Training on the Acquisition of Reinforcement for Listening

Tracy Betty Lawson & Darcy Walsh

Abstract

Experiment 1 investigated the effects of observational training in a social listener reinforcement game on participants' conversational units in non-instructional settings. Experiment 2 tested the effects of multiple exemplar instruction on the development of "empathy." The participants who had reader/writer levels of verbal behavior were selected because they emitted a low number of speaker and listener exchanges with others and did not have empathy as measured in the study. In Experiment 1, data were collected on the number of sequences, conversational units, "wh" questions, vocal approvals and vocal disapprovals during 5 minute probe sessions after meeting criterion on each objective of the listener reinforcement game.

During intervention, the participants were required to engage in a speaker listener exchange through playing a yoked contingency game where they competed with the experimenter to teach several objectives including "I Spy", peer tutoring, textually responding and group instruction. Data showed that the total number of verbal interactions in non-instructional settings significantly increased for both participants. In Experiment 2 multiple exemplar instruction across questions was implemented to teach the participants empathy. The participants responded to 3 questions: "What happened?" "How does the person feel?" and "What could you do to help?" The results showed a significant increase in correct responses to empathy questions.

Keywords: autism, empathy, observational training, reinforcement for listening.
Table 8. Stimuli used during empathy instruction

<table>
<thead>
<tr>
<th>Stimuli Used During Picture Probes</th>
<th>Situations Used for Real Life Probes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A boy hit by a car</td>
<td>A woman tripping over a chair</td>
</tr>
<tr>
<td>A woman wearing a neck brace</td>
<td>A woman coughing loudly</td>
</tr>
<tr>
<td>A mother and her daughter sitting together at a table and the mother is scolding the daughter who looks upset</td>
<td>A little boy screaming because he wants something that does not belong to him</td>
</tr>
<tr>
<td>A boy with a bandaged head</td>
<td>A student pulling a teacher’s hair</td>
</tr>
<tr>
<td>A woman putting eye drops in her eye</td>
<td>A boy lying on a mat alone</td>
</tr>
<tr>
<td>A little girl with her arms folded while her parents argue in the background</td>
<td>A boy vomiting on the floor</td>
</tr>
<tr>
<td>A woman with her hand on her head</td>
<td>A student pulling on a teacher’s shirt</td>
</tr>
</tbody>
</table>

![Bar charts showing number of correct responses for different sessions and participants.](image-url)
The Effects of Multiple Exemplar Instruction on the Relation Between Listener and Intraverbal Categorization Repertoires

Sarah A. Lechago • James E. Carr • April N. Kinmore • Laura L. Grow

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Abstract We evaluated the effects of multiple exemplar instruction (MEI) on the relation between listener and intraverbal categorization repertoires of six typically developing preschool-age children using a nonconcurrent multiple-probe design across participants. After failing to emit intraverbal categorization responses following listener categorization training, participants were exposed to MEI in the form of alternating response forms (listener and intraverbal) during categorization training with novel stimulus sets. For two participants for whom there was some evidence of emergent intraverbal responding, responding was variable. For the remaining four participants, 32 to 99 MEI trial blocks produced minimal improvement in responding or no emergent responding at all. The results are discussed in terms of Skinner’s analysis of verbal behavior and naming theory.

Keywords Categorization • Intraverbal behavior • Listener behavior • Multiple exemplar instruction • Naming
PURPOSE

• Examine whether multiple exemplar instruction (MEI) results in emergence of intraverbal categorization responding after having taught listener categorization

PARTICIPANTS AND SETTING

• 6 typically developing pre-school children
• 4 boys & 2 girls
• 3 yrs 10 mo – 4 yrs 7 mo

• Preschool
• Partitioned area
• Child-sized chairs and table
"Which one is Japan?"

"Poro is _______?"

"Japan"
**DEPENDENT VARIABLE**

- Emission of untrained intraverbal categorization
  - after initial listener categorization
  - both before & after MEI

- After teaching to point to “Poro” when asked, “Which one is Japan?”
- After MEI
- Will the participant say “Japan” in response to “Poro is ____?”
DISCUSSION

- Variable 2 participants
- **Naming Hypothesis**
  - **Naming:** responding as both a speaker & listener
    - Teach to respond to stimulus as listener
      - Respond as speaker w/o training
    - Teach to respond to stimulus as speaker
      - Responding as listener w/o training
DISCUSSION

- Sophie
  - Emergence observed (without MEI) with reverse relation:
    - Trained intraverbal (Expressive) & probed for listener (Receptive)
    - Emerging naming repertoire
    - Sequencing?
• Reviewed recommendations
  
  • EIBI - recommend teaching receptive before expressive (Leaf & McEachin, 1999)
  • Typical development
  • Easier to prompt receptive

PETURSDOTTIR & CARR (2011)

• EIBI – UCLA model

• Verbal Behavior Model
  • Skinner’s analysis of VB
  • (Barbera, 2007; Greer & Ross, 2008; Sundberg & Partington, 1998)

• Large-scale study with UCLA model
  • Not all recommendations research-based
  • Teaching receptive before expressive

• Review of literature
Expressive training took fewer trials than receptive training.

Greater accuracy on receptive tests following expressive tr.

The receptive before expressive sequence took more time and trials than when expressive tr.

Expressive tr. had a greater effect on receptive responding than receptive tr. on expressive responding.

The receptive-before-expressive sequence took more time and trials than when expressive tr. came first.

Variable results within and across participants, but overall greater accuracy on receptive tests following expressive tr. than on expressive tests following receptive tr.

SEQUENCING REVIEW

• No support - receptive before expressive

• Support - expressive before receptive

• Conclusions are tentative

• Additional research
  • Children with ASD
An Investigation of Stimulus Pairing and Listener Training to Establish Emergent Intraverbals in Children with Autism

Mary Vallinger-Brown • Rocio Rosales

Published online: 6 June 2014
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Table 2  Stimulus sets for Aaron

<table>
<thead>
<tr>
<th>Intraverbal probe</th>
<th>Correct response</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>LT</em></td>
<td></td>
</tr>
<tr>
<td>(1) What coin is worth 1 cent?</td>
<td>Penny</td>
</tr>
<tr>
<td>(2) What do you find on top of the house?</td>
<td>Roof</td>
</tr>
<tr>
<td>(3) What season do you pick up the leaves?</td>
<td>Fall</td>
</tr>
<tr>
<td>(4) What do you do when you’re angry?</td>
<td>Yell</td>
</tr>
<tr>
<td>(5) What coin is worth 10 cents?</td>
<td>Dime</td>
</tr>
<tr>
<td>(6) What do you use to tell time?</td>
<td>Clock</td>
</tr>
<tr>
<td><em>SP</em></td>
<td></td>
</tr>
<tr>
<td>(1) What do you do when you’re happy?</td>
<td>Smile</td>
</tr>
<tr>
<td>(2) What shines in the sky in the day?</td>
<td>Sun</td>
</tr>
<tr>
<td>(3) What keeps food cold?</td>
<td>Refrigerator</td>
</tr>
<tr>
<td>(4) What season do the flowers bloom?</td>
<td>Spring</td>
</tr>
<tr>
<td>(5) What coin is worth 5 cents?</td>
<td>Nickel</td>
</tr>
<tr>
<td>(6) What coin is worth 25 cents?</td>
<td>Quarter</td>
</tr>
</tbody>
</table>

Fig. 1. Screenshot of stimulus presentation during LT

Fig. 2. Screenshot of stimulus presentation during SP (images shown in successive order)
Fig. 1. Unfamiliar pictures used during training.

Table 1
Order of experimental conditions.

<table>
<thead>
<tr>
<th>Order</th>
<th>Condition</th>
<th>Stimuli per trial</th>
<th>Training criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual Categorization Pretraining</td>
<td>3</td>
<td>2 blocks at 89%</td>
</tr>
<tr>
<td>2</td>
<td>Category Tact Pretraining</td>
<td>1</td>
<td>2 blocks at 89%</td>
</tr>
<tr>
<td>3</td>
<td>Category Listener Pretraining</td>
<td>3</td>
<td>2 blocks at 89%</td>
</tr>
<tr>
<td>4</td>
<td>Visual Categorization Posttest</td>
<td>3</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>Category Tact Posttest</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>6</td>
<td>Category Listener Training</td>
<td>3</td>
<td>2 blocks at 89%</td>
</tr>
<tr>
<td>7</td>
<td>Visual Categorization Posttest</td>
<td>3</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>Category Tact Posttest</td>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>9</td>
<td>Category Tact Posttest 2</td>
<td>3</td>
<td>N/A</td>
</tr>
<tr>
<td>10</td>
<td>Category Tact Training</td>
<td>1</td>
<td>2 blocks at 89%</td>
</tr>
<tr>
<td>11</td>
<td>Visual Categorization Posttest</td>
<td>3</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* Children were exposed to this condition only if they failed the previous tact posttest.
** Children were exposed to this condition if they fail Visual Categorization Posttest, Category Tact Posttest 1, and Category Tact Posttest 2.
Fig 2. Example of trained (solid lines) and derived relations (dotted lines) for two members of the "Toy dog" class.
**Category tact**

What is it?  Work dog

**Category listener training**

Give me the toy dog
Fig. 3. The percentage of correct Category Tacts and Visual Categorizations for Charli and Marcus. Information on chronological and equivalent ages in months is included (S = speaker/expertise, L = listener/reception).

Fig. 4. The percentage of correct Category Tacts and Visual Categorizations for Quincy and Teresa. Information on chronological and equivalent ages in months is included (S = speaker/expertise, L = listener/reception).
A Comparison of Intraverbal and Listener Training for Children with Autism Spectrum Disorder

Tiffany Kodak¹ · Amber R. Paden²

Abstract The present investigation compared acquisition of intraverbals and listener behavior by function, feature, and class (FFC) for two children with autism spectrum disorder (ASD). We also measured tacts during listener training to evaluate whether higher levels of tacts predicted the emergence of intraverbal behavior following training. The results showed that intraverbal training required as many or fewer sessions to reach the mastery criterion than listener training by FFC, and intraverbal training consistently produced emergent listener behavior. In comparison, listener training by FFC did not consistently lead to the emergence of intraverbal behavior.

Keywords Autism spectrum disorders · Intraverbal behavior · Listener training

Table 1 Targets for Rosemary and Oscar for stimulus sets 1 and 2.

<table>
<thead>
<tr>
<th></th>
<th>Set 1</th>
<th>Set 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Listener training</td>
<td>Intraverbal training</td>
</tr>
<tr>
<td>Rosemary</td>
<td>The person who keeps you safe is a</td>
<td>The person who gives you medicine is a</td>
</tr>
<tr>
<td></td>
<td>The person who helps shopper is a</td>
<td>The person who talks to you is a</td>
</tr>
<tr>
<td></td>
<td>The person who checks your eyes is a</td>
<td>The person who does your nails is a</td>
</tr>
<tr>
<td></td>
<td>The person who cleans buildings is a</td>
<td>The person who builds houses is a</td>
</tr>
<tr>
<td>Oscar</td>
<td>You add with a</td>
<td>You check the date with a</td>
</tr>
<tr>
<td></td>
<td>You buy things with</td>
<td>You cook with a</td>
</tr>
<tr>
<td></td>
<td>You cover up with</td>
<td>You measure with a</td>
</tr>
<tr>
<td></td>
<td>You scoop with</td>
<td>You wash with</td>
</tr>
<tr>
<td></td>
<td>You carry groceries in</td>
<td>You carry things in a</td>
</tr>
<tr>
<td></td>
<td>You talk to people on</td>
<td>You put flowers in a</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>a</td>
</tr>
</tbody>
</table>
Emergent Intra-verbal Forms may Occur as a Result of Listener Training for Children with Autism

Dean P. Smith1,2, Svein Eikeseth3, Sarah E. Fletcher1, Lisa Montebelli1, Holly R. Smith1, Jennifer C. Taylor1
Table 2 The six intraverbals taught as listener behavior and the two untaught intraverbals for each participant

<table>
<thead>
<tr>
<th>Participant</th>
<th>Six intraverbals taught as listener behavior</th>
<th>Two untaught intraverbals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charlie</td>
<td>What's an animal that's grey? (elephant)</td>
<td>What's a vehicle that goes on water? (boat)</td>
</tr>
<tr>
<td></td>
<td>What's a drink that's white? (milk)</td>
<td>What's a vehicle with two wheels? (bike)</td>
</tr>
<tr>
<td></td>
<td>What's an animal that flies? (bird)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What's a drink that's yellow? (juice)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What's a food that's green? (apple)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What do you kick that's round? (ball)</td>
<td></td>
</tr>
<tr>
<td>Freddie</td>
<td>What's furniture that has four legs? (chair)</td>
<td>What plant has bark? (tree)</td>
</tr>
<tr>
<td></td>
<td>What vehicle has an anchor? (boat)</td>
<td>What's a type of vehicle? (train)</td>
</tr>
<tr>
<td></td>
<td>What breathes through gills? (fish)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What's a food that's yellow? (banana)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What's a drink that's white? (milk)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>What do you talk into? (telephone)</td>
<td></td>
</tr>
</tbody>
</table>
The effects of receptive and expressive training sequences on the acquisition of feature, function, and class

Shimin Bao, Kristin T. Sweatt, Sarah A. Lechago, and Sarah Antal

University of Houston-Clear Lake

PURPOSE

• Examine the efficacy of 3 instructional training sequences for teaching feature, function, and class of objects
  
  • Receptive-Expressive
  • Expressive-Receptive
  • Mixed
DEPENDENT VARIABLE

- Total number of trials to the mastery criterion for expressive and receptive responding

PARTICIPANTS & SETTINGS

- Marcus - 3
- Melissa - 8
- Lizzy - 7
- ASD diagnosis

- Classroom - Marcus & Melissa
- Home - Lizzy
PRE-EXPERIMENTAL TRAINING

• MSWO - preference assessment

• Tact training - label names of pictures

Show me the one that is furniture
“What group does a lion belong to?

Animal

BASELINE

• 60 pictures
• Tested expressive & receptive feature, function, or class
• 5s to respond
• Tested expressively & receptively 3 times
EXPRESSIVE-RECEPTIVE TRAINING SEQUENCE

• 1. Teach expressive responses
• 2. Probe - emergence of receptive responses
• 3. Train receptive responses to mastery

• All training conditions used sets of 3 pictures

RECEPTIVE-EXPRESSIVE TRAINING SEQUENCE

• 1. Teach receptive responses
• 2. Probe - emergence of expressive responses
• 3. Train expressive responses to mastery
MIXED TRAINING SEQUENCE

- Alternated expressive & receptive training
- 15-trial blocks

*denotes that no training was required for untrained response
RESULTS

• Expressive-receptive: fewest trials to mastery
  • Most efficient

• Mixed condition
  • Fewer trials on sets with expressive training first
  • Trial block-by-trial block vs trial-by-trial
  • Additional research required

NAMING HYPOTHESIS

• Responding as speaker and a listener to the pictures
  • Expressive training trial
    • Orient to picture (rec. response) + exp. reinforced during trials
    • Correct responding during rec.

• Receptive training trial
  • Learned to respond only rec. — pointing to picture
  • Exp. trial — no history of reinforcement for exp. responding
THE EFFECTS OF ECHOIC RESPONDING DURING RECEPTIVE TRAINING IN TEACHING FEATURE FUNCTION AND CLASS TO CHILDREN WITH AUTISM

BAO & LECHAGO (IN PROGRESS)

PURPOSE

• Examine effects of collateral response training
  • echoic response during receptive response training
  • rate of acquisition of expressive and receptive responses
  • feature, function, and class
DEPENDENT VARIABLE

• Number of trials to mastery criterion for expressive and receptive responding for a set of 3 stimuli

PARTICIPANTS & SETTING

• 5-year-old male (Allen)
• ASD
• 2 in progress

• Daily therapy room at a research clinic
PRE-EXPERIMENTAL TRAINING

• Preference assessment

• Tact training

BASELINE

• Tested expressive & receptive (Class)
• 5s to respond
• Each picture tested expressively & receptively 3 times
EXPRESSIVE-RECEPTIVE TRAINING SEQUENCE

• Teach expressive responses
• Probe for emergence of receptive responses
• Train receptive responses to mastery

• All training conditions used sets of 3 pictures

RECEPTIVE-EXPRESSIVE TRAINING SEQUENCE

• Teach receptive responses
• Probe for emergence of expressive responses
• Train expressive responses to mastery
RECEPTIVE + ECHOIC-EXPRESSIVE TRAINING SEQUENCE

- Teach receptive responses + require echoic response
  - (e.g., “Touch mammal” - child points to dog and says “mammal”)
- Probe for emergence of expressive responses
- Train expressive responses until mastery

2 PHASES - COMPARISONS

- **Phase 1**: (E-R) vs. (R-E)
  - Compare expressive-receptive to receptive-expressive

- **Phase 2**: (E-R) vs. ((R+Echoic)-E)
  - Compare expressive-receptive to receptive+echoic - expressive
Phase 1: Expressive-Receptive versus Receptive-Expressive

Phase 2: Expressive-Receptive versus Receptive + Echoic -Expressive
CONCLUSIONS

- Expressive-receptive instructional sequence proves to be most efficient
- Tentative conclusions
  - Compared to receptive + echoic
MATCHING-TO-SAMPLE

STIMULUS EQUIVALENCE

**Definition:** Responding to a group of physically dissimilar stimuli, similarly

• “Equivalence Class”

DOG

“dog!”
REFLEXIVITY

• Identity matching

\[ A = A, \ B = B, \ C = C \]

SYMMETRY

If \( A = B \), then \( B = A \)
If $A=B$, & $B=C$, then $A=C$

Teach 2 relations and get 4 free!
Sample stimulus

Comparison stimuli

MATCHING-TO-SAMPLE LITERATURE REVIEW
THE EFFECTS OF THREE STIMULUS-EQUIVALENCE TESTING CONDITIONS ON EMERGENT US GEOGRAPHY RELATIONS OF CHILDREN DIAGNOSED WITH AUTISM

Linda A. LeBlanc*, Caio F. Miguel, Anne R. Cummings, Tina R. Goldsmith, and James E. Carr
Western Michigan University, USA

Figure 1. Sample stimulus board for B–C relation.

A – printed state names
B – map of state shape
C - printed state capitol
Figure 2. Pre-test and post-test scores for vocal test and C-A, A-C, B-A, and C-B relations presented in the order of administration with the first condition in the top panel and the third condition in the bottom panel. Data for Nick are presented in the left-hand column and data for Marty are presented in the right-hand column.
Figure 1. Percentage of independent correct responses during pretest, training, and posttest sessions for Lyle (upper left), Mert (upper right), Josh (middle left), Kara (middle right), Ray (lower left), and Keith (lower right).
Fig. 1. Examples of the form stimuli used in symbolic matching (stimulus set 1) and the clip-art stimuli used in thematic matching (stimulus set 2).

Fig. 2. Accuracy for each training session for individual participants. The dashed horizontal line at 50% correct indicates chance matching accuracy and the dashed vertical line indicates the introduction of thematic matching. Separate matching tasks within each condition are indicated by ‘T’ for thematic matching and ‘S’ for symbolic matching. The specific stimuli are used for each thematic task (e.g., T1) were the same across participants; the stimuli are used for each symbolic task differed across participants.
Figure 1. Percentage accuracy in the pretest and posttest for arbitrary relations (bars) and identity-matching training (dots).
Consider emergence when developing programs
A STARTING POINT

- MEI - alternate responding between subset of exemplars
- Target mands first (Sundberg & Michael, 2001)
  - Benefit speaker & MO
  - 3-4 mands to mastery
  - Teach 3-4 new targets as tacts & mands simultaneously
  - Probe with new targets
    - Teach mand → tact?
    - Teach tact → mand?
- Remember the MO when teaching and probing mands!

**Mands**
Motivating Operation (MO)
MO: play outside

MO: hungry

MO: complete an activity that requires a spoon – making a volcano
Reinforce with the item
Tacts
Item itself (physical properties)

MO for item may or may not be present

Reinforce with a different item

Teach as mand

Probe to see if they can ________

TACT

Antecedents & consequences
LISTENER & TACT TRAINING

• Expressive first (Tact)
  • Probe listener

• Few tacts (5-10)
  • SPOP (stimulus pairing observation procedure) – echoic
  • If no acquisition, teach tact

• Need additional research → alternative (to vocal) communication systems

INTRAVERBAL

• Emergence of reverse intraverbal
  • Subset with both types of intraverbals (symmetrical relation)
  • E.g., Houston is in what state? → Texas
      Name a city in Texas. → Houston
  • Subset of exemplars: city → state
  • Subset of exemplars: state → city
SOCIAL SKILLS

- General Case Analysis: all possible stimulus arrangements & response options

- Scripts and script fading
  - Saying many things about a scenario or stimulus
    - (initiating conversation during play)

- Answer questions about a scenario
  - Saying many things to assess a situation
    - (teaching to offer help)

- + MEI (multiple scenarios, multiple stimuli)

- Increases chance of verbal behavior in novel situations

LISTENER AND IVB

- Start with expressive training (IVB)

- Listener training → emergence of IVB
  - Thematically unrelated – not categorization

- Categorization
  - Naming repertoire - --> Listener or IVB

- SPOB
MATCHING-TO-SAMPLE (MTS)

• Establish relationships
  • between letters (upper to lowercase)
  • sight words (pictures → printed word → vocal emission)
  • symbols for picture exchange systems
  • educationally relevant facts (states → cities → maps → state flowers → maps)

MTS: THINGS TO CONSIDER

Cards:
- same size
- identical background

Ensure your learner is paying attention to the stimuli

Match
Thank you
Dr. Laura Grow (Cal State University – Fresno)
Assisting with MTS recommendations

Teaching Receptive Language Skills:
Recommendations for Instructors

Laura Grow
University of British Columbia

Linda LeBlanc
Trumper Behavioral Health

Keywords: autism, developmental disabilities, early intervention, instructional strategies, listener behavior, receptive language

56 RECOMMENDATIONS FOR TEACHING RECEPTIVE LANGUAGE  Behavior Analysis in Practice, 6(1), 56-75

PARTING WORDS

• Always refer to the literature
• Constantly learning new things
• Examine participant profiles
• If procedures new territory
• Contact a BCBA who has experience
• Contact the corresponding author
• LOVE IT!