Motivating Children with Autism to Speak: Incorporating ABA Principles to Increase Functional Communication

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Challenges in Working with Children with Autism

- Cooperation/Motivation
- Learning/Training Trials
- Problem Behavior
- Dependency on Prompts
- Generalization

Vocal Verbal Challenges

- Functional Communication
- Limited Vocalizations
- Training Trials
- Training Vocalizations without Disrupting Communication System
Goals

- Establishing Cooperation
- Teaching Functional Communication
- Building Vocalizations through Requesting
- Verbal Imitation Training
- Individually selected phonetic placement cues

Evidence-based Practices

- Children with specific learning issues require more precise teaching
- Effective treatment for children with autism exists
- ABA-based approaches for educating children with autism and related disorders have been extensively researched and empirically supported
- Application of behavior analytic strategies for treatment of children with autism has consistently been demonstrated to be an effective treatment

Evidence-based Practices

  - Review articles and meta-analyses of hundreds of research articles supported efficacy of ABA-based procedures in the assessment and treatment of problem behavior associated with autism, mental retardation, and related disorders.

Evidence-based Practices

Evidence-based Practices

The Surgeon General of the United States of America (2006) noted that thirty years of research demonstrated the efficacy of applied behavioral methods in reducing inappropriate behavior and in increasing communication, learning, and appropriate social behavior in children with autism.


Evidence-based Practices

The New York State Department of Health Clinical Practice Guideline (1999, p.138) recommends that “principles of applied behavior analysis (ABA) and behavior intervention strategies be included in intervention programs for children with autism.”


Evidence-based Practices

The following agencies state that ABA-based procedures represent best practices for individuals with autism and mental retardation:

- National Institute of Mental Health
- National Institute of Child Health and Human Development
- National Academy of Sciences (Committee on Educational Interventions for Children with Autism)

Evidence-based Practices

- American Psychological Association (Division 33: “Guidelines on Effective Behavioral Treatment for Persons with Mental Retardation and Developmental Disabilities”
- Association for Science in the Treatment of Autism
- California Department of Developmental Services
- Florida State Department of Children and Families
- Maine Administrators of Services for Children with Disabilities (Hagopian and Boelter, 2006)
Eclectic Approaches Are Less Effective

- Current research demonstrates that an eclectic approach is less effective. Two recent studies compared the use of ABA-based procedures to "eclectic" treatment.


- Compared one group of children receiving an applied behavior analysis program that emphasized the use of proven techniques, such as shaping, prompting and positive reinforcement in structured, informal one-on-one and group settings to a second group.


"the behavioral treatment group showed larger increases in IQ and adaptive functioning than did the eclectic group. The behavioral treatment group also displayed fewer aberrant behaviors and social problems at follow-up. Results suggest that behavioral treatment was effective for children with autism in the study."

Eclectic Approaches Are Less Effective

- A second group of children received a variety of teaching procedures, including applied behavior analysis, sensory integration, music sessions, and circle time. Children received treatment for approximately 30 hours per week.

- At follow-up, the children receiving the non-eclectic applied behavior analysis program scored higher and had made more progress than the children in the other groups in areas of language, communication, social skills, independence, and problem behaviors.
Characteristics of ABA

- All skill domains addressed
- Skills broken into small components, defined in observable, measurable terms
- Effective for building skills and reducing problem behaviors in people with and without disabilities
- Scientific demonstrations of effectiveness is essential
- Highly individualized

Characteristics of ABA

- Continuously evolving
- Individual needs are assessed by direct observation and measurement
- Each component skill taught through many learning opportunities
- Multiple learning opportunities contrived
- Simple skills built systematically into more complex repertoires

Viewing Speech-Language Development through the Eyes of a Behavior Analyst

B. F. Skinner
“Verbal Behavior”

MO/Sd→R→Sr
Understanding Behavior
Antecedent → Behavior → Consequence

R
R → Sr
Sd → R → Sr
MO/Sd → R → Sr

Sr = Reinforcement
- Defined by its effect on behavior
- Follows a response
- Maintains or increases the likelihood that a response will occur again under similar circumstances

R = Response
- Response = one instance of a behavior
- Behavior = observable interaction between child and environment

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Reinforcement

“Reinforcement may occur naturally, as a result of our day-to-day interactions with our social and physical environment, or may be planned as part of a behavior modification program used to change a person’s behavior”


Sd= Discriminative Stimulus

- Stimulus present when a behavior is reinforced
- Stimulus Control: a behavior is more likely to occur when a specific antecedent is present due to a history of reinforcement when that antecedent is present

“He doesn’t act that way for me!”

MO=Motivative Operations

- Variables that change the value of the reinforcer
  1. Establish the effectiveness of a reinforcer for a particular time/situation
  2. Increase the likelihood that a behavior will occur

Communicative Functions Through the Eyes of a Behavior Analyst
Skinner's Behavioral Classification of Language


Teach All the “Meanings”

- **Mand**
  - Echoic
  - Tact
  - Receptive
  - RFFC/TFFC (Receptive or Tact by Feature, Function, and Class)
  - Intraverbal
  - Textual

- **Cookie**

- **Mand**
  - “Demand”
  - Form controlled by motivation
    - Antecedent: Motivative operation
    - Response: Specific to the MO
    - Reinforcer: Specific to the MO
  - First type of verbal behavior to develop
  - Requesting items, events, information, or removal of an aversive
  - Saying “cookie” when you want a cookie
Mimetic (Motor Imitation)
- Form controlled by another’s motor movements
- Motor Imitation
  - Antecedent: Motor movement
  - Response: Exact imitation (point to point correspondence)
  - Reinforcer: Social
- The tendency to sign “cookie” when someone else signs it

Echoic
- Verbal behavior whose form is controlled by someone else’s verbal behavior
- Verbal Imitation
  - Antecedent: Verbal behavior
  - Response: Verbal behavior (with point to point correspondence)
  - Reinforcer: Social
- The tendency to say “cookie” when someone else says, “cookie”

Tact
- “Contact”—contacted by the senses
  - Under control of nonverbal stimulus
- Labeling
  - Antecedent: Non-verbal stimulus
  - Response: Specific to the non-verbal stimulus
  - Reinforcer: Social
- The tendency to say “cookie” when you see, smell or taste a cookie
- Tact by feature, function, or class

Receptive
- Following the instructions or requests of others
  - Antecedent: Verbal behavior
  - Response: Specific to that verbal behavior
  - Reinforcer: Social
- Tendency to pass a cookie to someone when they say “Give me a cookie”
- Receptive by Feature, Function or Class
Intraverbal

- Responding to verbal behavior with verbal behavior without non-verbal stimuli present
  - Antecedent: Verbal Behavior
  - Response: Verbal Behavior (no point to point correspondence)
  - Reinforcer: Social
- The tendency to say “cookie” when asked, “What is a snack you eat at school?” (no cookies present)

Teach All the “Meanings”

Why verbal operants instead of communicative functions?

1. We cannot assume that skills will transfer from one operant to another.
2. It explains why many children with ASD can tact, but not mand, or mand but not tact.
   “when motivated…”
3. It provides a hierarchy and method of transfer from one verbal operant to another.

Why verbal operants instead of communicative functions?

- Research on verbal behavior analysis has shown that the use of procedures from the science produces more speaker behavior for learners with missing verbal repertoires than linguistic based curricula that do not employ the procedures from verbal behavior analysis.
The Assessment of Basic Language and Learning Skills- Revised

- Sundberg and Partington
- Partington ABLLS-Revised
- Assessment Curriculum Guide
  Skills Tracking System
- “Learning to Learn”
- Available through www.difflearn.com or www.behavioranalyst.com

<table>
<thead>
<tr>
<th>Task</th>
<th>Score</th>
<th>Task Name</th>
<th>Task Objective</th>
<th>Question</th>
<th>Example</th>
<th>Criteria</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>01234</td>
<td>Labels</td>
<td>The student will label reinforcing items.</td>
<td>If you ask, “What is that?” with one of his reinforcing items present, will the student identify the item.</td>
<td>4=10 or more labels, 3=6 labels, 2=4 labels, 1=2 labels.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example ABLLS Item

VB-Mapp

- Verbal Behavior Milestones Assessment and Placement Program
- A Language and Social Skills Assessment Program for Children with Autism and Other Developmental Disabilities
- Mark L. Sundberg, Ph.D.
- AVB press www.avbpress.com
Viewing Development of Communication as a Behavior Analyst

Neurotypical Development of Vocal Verbal Skills
- Requesting via Non-Speech Means
- Babbling/Oral Exploration/Feeding
- First Word Approximations
- Successive Approximations
Typical Development of Vocal Verbal Skills

- Socially-Mediated Positive Reinforcement
  - Attention, Items
- Automatic Reinforcement
  - Sounds/Words heard while receiving reinforcement are more likely to be produced
- Parity
  - Automatic shaping of vocalizations to match those of significant others
  - “outcome monitoring”
- Physiologic Variables
  - Children with intact neurology and anatomy are set up to develop sounds in a predictable progression

Understanding Behavior

Antecedent → Behavior → Consequence

Cookie!

Yum yum cookies
Research that supports Automatic Reinforcement Theory


Typical Development of Vocal Verbal Skills

- Socially-Mediated Positive Reinforcement → Attention, Items
- Automatic Reinforcement → Sounds/Words heard while receiving reinforcement are more likely to be produced
- Parity → Automatic shaping of vocalizations to match those of significant others—“outcome monitoring”
- Physiologic Variables → Children with intact neurology and anatomy are set up to develop sounds in a predictable progression

Typical Development of Vocal Verbal Skills

- Parity: “Automatic” shaping of verbal responses toward parity (to match) the vocalizations of others in your environment (the verbal community) which is mediated by the speaker’s repertoire as listener.
### Typical Development of Vocal Verbal Skills

- Socially-Mediated Positive Reinforcement → Attention, Items
- Automatic Reinforcement → Sounds/Words heard while receiving reinforcement are more likely to be produced
- Parity → Automatic shaping of vocalizations to match those of significant others “outcome monitoring”
- Physiologic Variables → Children with intact neurology and anatomy are set up to develop sounds in a predictable progression

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### Development of Vocal Verbal Skills

- **Brain Development**
  - Right to left
  - Sensory to motor
  - PFC
- **Language Learning Timetable**
  - Perceptual development
  - Speech development

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Vocal Verbal Development

- “There is much variability in the capacity to use vocal communication in this population, which likely contributes to the wide range of speech skills. Some children with ASD have been found to use a limited consonant inventory and less complex syllabic structure; others show adequate complexity of vocalizations…” (Stone & Caro-Martinez, 1990; Wetherby et al., 1998; Wetherby & Prutting, 1984)


Lord, Risi, et al. (2007)

<table>
<thead>
<tr>
<th>Language level</th>
<th>Autistic</th>
<th>PDD-NOS</th>
<th>Non-autistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>No or few vocal sounds (UDS = 2)</td>
<td>20.6</td>
<td>3.5</td>
<td>7.1</td>
</tr>
<tr>
<td>Words but no sentences (UDS = 1)</td>
<td>25.8</td>
<td>16.8</td>
<td>7.2</td>
</tr>
<tr>
<td>Sentences but not fluent (UDS = 0)</td>
<td>25.4</td>
<td>16.4</td>
<td>7.1</td>
</tr>
<tr>
<td>Complex sentences (UDS = 0)</td>
<td>25.4</td>
<td>16.4</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Note: Four children were not administered the UDS; level of language was inferred from ADOS (Toddler and child version), ADOS = Autism Diagnostic Observation Schedule; PDD-NOS = pervasive development disorder not otherwise specified.

Children with Autism

Requesting/Communicating via Non-Speech Means

- “Good Baby”
- Proximity Cues
- Contact Gestures
- “Instrumental Function”
- Highly Skilled Problem Solvers

Children with Autism

Qualitative and Quantitative Differences

- Babbling
- Oral Exploration/Experiences
- Feeding
Children with Autism

First Words

Neurotypical
-mama
-bye-bye
-dada
-hot

Children w/Autism
- Cheeto
- Sponge Bob
- No
- ABCs
- “What’s next?”
- “Are you ok?”

Quantitative and Qualitative Reduction in Shaping of Successive Approximations via:
- Socially-Mediated Positive Reinforcement (Attention, Praise, Items)
- Automatic Reinforcement (Words which have been paired with reinforcement are more likely to be selected from the child’s babbling repertoire.)

Recreate/Teach These Components

- Pair Signs/AAC with Words During MAND Training
- Pair Sounds and Words with Reinforcement
- Differentially Reinforce Words or Word Approximations
- ECHOIC Training (Vocal Imitation)
- Oral Placement Cues for some children

How Problem Behaviors Develop During Teaching
TEACHING EXAMPLE
REFLEXIVE MOTIVATIVE OPERATION

AVERSIVE CONDITION
STARTS WITH REMOVAL OF SR+
LESS VALUED SR+
LOWER RATE OF SR+
MORE DIFFICULT R
MORE EFFORTFUL R
MANY DEMANDS
FREQUENT LEARNER ERRORS
LESS IMMEDIATE SR+
LOWER MAGNITUDE SR+

EVOKE BEHAVIOR THAT REMOVES
TEACHER DEMANDS AND
INSTRUCTIONAL MATERIALS

TEACHER DEMANDS & MATERIALS

EVOKES BEHAVIOR THAT REMOVES
TEACHER DEMANDS AND
INSTRUCTIONAL MATERIALS

(REFLEXIVE MO)
Warning Stimulus

AVERSIVE CONDITION
STARTS WITH REMOVAL OF SR+
LESS VALUED SR+
LOWER RATE OF SR+
MORE DIFFICULT R
MORE EFFORTFUL R
MANY DEMANDS
FREQUENT LEARNER ERRORS
LESS IMMEDIATE SR+
LOWER MAGNITUDE SR+

EVOKE BEHAVIOR THAT REMOVES
TEACHER DEMANDS AND
INSTRUCTIONAL MATERIALS

TEACHER DEMANDS & MATERIALS

EVOKES BEHAVIOR THAT REMOVES
TEACHER DEMANDS AND
INSTRUCTIONAL MATERIALS

(REFLEXIVE MO)
Warning Stimulus

AFTER REPEATED CORRELATIONS

ABOLISHING THE REFLEXIVE MO

USE TEACHING PROCEDURES THAT INSURE:
TEACHER IS PAIRED W/ SR+
HIGHER VALUE SR+
HIGHER RATE OF SR+
GREATER MAGNITUDE SR+
MORE IMMEDIATE SR+
LESS EFFORTFUL

EVOKE COOPERATIVE
BEHAVIOR THAT
PRODUCES TEACHER
MEDIATED POSITIVE
REINFORCER
(RESPONSES TO TEACHER
PRESENTED INSTRUCTIONAL
DEMANDS)

TEACHER DEMANDS & MATERIALS

EVOKES BEHAVIOR THAT REMOVES
TEACHER DEMANDS AND
INSTRUCTIONAL MATERIALS

(REFLEXIVE MO)
Warning Stimulus

ABOLISHING THE REFLEXIVE MO

USE TEACHING PROCEDURES THAT INSURE:
TEACHER IS PAIRED W/ SR+
HIGHER VALUE SR+
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(RESPONSES TO TEACHER
PRESENTED INSTRUCTIONAL
DEMANDS)

TEACHER DEMANDS & MATERIALS

FUNCTIONAL RESPONSE CLASSES

1. Socially Mediated Negative Reinforcement (Sr-)
   Problem Behaviors

2. Socially Mediated Positive Reinforcement (Sr+)
   Target Behaviors

3. Automatic Positive Reinforcement (SpA)
   Problem Behaviors
Teaching Procedures that Promote Cooperation

1. Pair the teacher and the teaching environment with reinforcement

Pairing with Reinforcement

- Discover likes/dislikes
- Make desirable items available
- Pair yourself with delivery of the items/activities
- Create a history of being associated with wonderful items and fun experiences
- Teacher signals improving conditions

Comparing Approaches

“Pairing with Reinforcement”
“Help them do what they want to do”
“Pez Dispenser of Good Things”
“Therapeutic Rapport”
“Building Social Reciprocity”
Research to Support Pairing


Teaching Procedures

2. Use Most to Least Prompts

3. Use Errorless Teaching
   **Reduce learner errors
   **Value of escape remains low
   **Responding high
Research to Support Most to Least Prompts and Errorless Teaching


Errorless Teaching Procedures

SD → 0 second delay prompt → correct R

Transfer Trial

SD → 2 second delay → correct response

Several Responses Later

SD → 2 second delay → correct response

Teaching Procedures

4. Use Transfer trials
Whenever a prompt is necessary, follow that prompt with a less prompted trial or an independent trial—partial or complete transfer of stimulus control

Teaching Procedures

5. Teach until fluent

Teaching Procedures

6. Mix and Vary
Promoting Functional Communication (Manding)

BUT...

He doesn't have any reinforcers!

Possibilities...
- Fragile Interests
- Atypical Interests
Or......
- Reinforcers have been killed

Have Reinforcers Been Killed?
- Response effort—the effort necessary to obtain the reinforcement outweighs the value of the reinforcer.
- The child doesn’t “want” the toy if it “looks like he might have to work for it.”
Be a Detective

- Identify reinforcers that maintain current behaviors
- Observe the child/note activities or interests pursued
- Ask the child, parent, or past teachers

Be a Detective

- Use reinforcer questionnaires
- Present potential reinforcers and measure approach behaviors
- Present potential reinforcers contingent on a response and measure response rate and duration

Build More Reinforcers

- Pair yourself with the objects/activities he enjoys (In some cases, uses ATYPICAL reinforcer)
- Identify reinforcing feature of “toy” and find one that is better
- Create a situation in which “his” activities are more fun because you are there

Build More Reinforcers

- Scheme about ways to contrive situations using the things that are reinforcing to him to teach communication.
- Use repeated exposure
- It may take many presentations—“The black bag”
- Use Stimulus-Stimulus Pairing
Stimulus-Stimulus Pairing

- Make a list of activities
- Place the item(s) on the floor
- Use a promise and guide the child to item
- Prompt the child as needed to play with the toy as designed
- Deliver an established reinforcer throughout the activity
- Rate the activity

Coding Levels

- Red = Established reinforcer used as a promise and paired with activity, used as direct reinforcer at times, multiple prompts needed
- Yellow = Intermittent use of reinforcer, some independent responses
- Green = Child willingly engages in task with minimal prompting, beginning to reach for items, less use of established reinforcer

We Have Established a "Willing Learner"

How Do We Teach Functional Communication?

Building Curriculum
Start with the Mand (Request)

"Manding (Requesting) should be the first type of language to teach because it directly benefits the student. Manding should be targeted regardless of the student’s current skill level.”


Rules for Manding

1. Teaching must occur in the natural and everyday environment where the motivation is typically strong. *NET--Basement*
2. Make sure the child has an MO for an item before prompting a mand. Never attempt to prompt a child to mand for items that they do not want.

3. Capture and contrive as many opportunities per day to teach mands. Set a goal of hundreds of mands per day across many reinforcers, teachers and settings for early learners.
4. Count the number of mands, prompted and unprompted, per day and graph or chart your results.
5. Prompt the mands initially to teach the child that it is easy to get things with verbal behavior and so as to not turn the child off to communicating by requiring a difficult response at first.
6. Get the best quality response with the least amount of prompting.
7. Practice teaching mands so that you are skilled in how and when to reinforce, what approximations to accept.
9. Be a “giver” and not a “taker”
10. Avoid “Killing” MO’s-to prevent this with early learners, give some items for “free” or require less response effort at times.
11. For vocal children, you can begin teaching mands for all MOs.
Vocal Manding

VOCAL MANDING

- Establish motivation
- Initially, simply say the name of the item while giving it to the child (Pairing the word with reinforcement)
- Begin to use 3-5 verbal models (echoic trials) with a 1-2 second delay between each trial as you deliver the item.

ECHOIC TO MAND TRANSFER

Echoic-Mand Prompts

- Vocal (echoic)----------Name of Sr+
- Item/Activity present------Item/signal
- Motivation is strong-----Child wants Sr+

Fade prompts to:
Motivation is strong—spontaneous request

If the child imitates/approximates the word at any time during the echoic trials—differentially reinforce. Provide the item
- more quickly
- in greater quantity
- in greater duration

Teach the child “I talk, I get”

Work for huge numbers of manding trials per day. Use a tally counter to track.
VOCAL MANDING

- If the child produces the word quickly after your model with acceptable articulation, begin to run transfer trials.

- After he repeats the word, pause (75% of trials) or use some natural verbalization to evoke a second, less prompted or independent response.

Basic Procedures

- Echoic Trials

- Echoic to Mand Transfer
  - Part Word
  - Phonemic
  - Oral Posture Cue

- Eventually, Fade the Item

SCROLLING

- Scrolling refers to the error process in which a child cycles through all responses which have led to reinforcement under similar circumstances.

- It can be eliminated through careful error correction.

Vocal Scrolling

- Say “Wait” while simultaneously turning away and presenting a hand signal

- Wait 2-3 seconds

- Represent the item

- Prompt immediately

- Fade prompts on subsequent trials if possible.
Count and Mand

- Child wants something and you are willing to give it, but not for problem behavior
- Say “no______” while giving hand signal
- Begin counting to a predetermined number

Count and Mand

- If the child demonstrates the behavior (or a new behavior), say “no______” while giving hand signal and restarting the count
- When the count interval is successfully completed, prompt the learner to request the item

Why Sign Language?

- EASE OF ACQUISITION FOR THE LEARNER:
  Easy and quick for many learners
  Immediate replacement of maladaptive behavior

- DEVELOPMENT OF VOCALIZATIONS:
  Facilitates the development of vocal behavior.

- FULL LINGUISTIC SYSTEM:
  Allows for verbal behavior across all the meanings of words, e.g. mands, tacts, intraverbals

Ease of Acquisition

- Physical prompts can be used and faded
- Signs are iconic which provides a “built in” prompt
- Signs are portable
- Signs do not break the flow of interactive play
Ease of Acquisition

- Research suggests that almost all children with autism can learn to sign despite motor imitation difficulties.


Meta-Analysis of Augmentative Communication


Motor Imitation

- Research suggests that the development of imitation plays an essential role in development.


### Research Studies that Support the Use of Sign Language to Increase Vocal Responding


Why Does Sign Language Improve Speech?

- Socially-Mediated Positive Reinforcement → Attention, Items “I talk” → “I get”
- Automatic Reinforcement → Sounds/Words heard while receiving reinforcement are more likely to be produced
- Topography Based

Full Linguistic System

- Signs are abstract symbols
- Teach all verbal operants
- Sign Language assists in development of receptive language


Benefits of Picture Selection Systems

- No Special Training Required by the Speaker
- Teacher does not need to have training in shaping signs
- First few responses may involve simple match to sample and therefore makes early acquisition quite easy.

Pat Mirenda and Teresa Iacono
Reasons Past
Sign Language Instruction Failed


Reasons Sign Language Instruction Failed

1. First signs taught are too complex
   - More
   - Me
   - All done
   - Please
   - Yes/No
   - Help
   - Toilet
   - Thank you

"The third factor to consider in choosing a sign is that broad categories should not be taught initially. If the first signs taught are EAT or MORE, they preclude the necessity of the student learning to label individual foods or toys. The only broadly based classification introduced early is that of DRINK."

Autistic and Severely Handicapped in the Classroom: Assessment, Behavior Management, and Communication Training by David Drug, Judith Fiestal Rosenblum, Patricia Almond and Joel Arick, 1980 from ASIEP Education Co.
Reasons Sign Language Instruction Failed

2. First signs taught may resemble each other too closely (e.g. eat and drink)

3. First signs may involve a complex response form

4. Training is conducted under multiple sources of control

5. Lack of sufficient training trials

6. Individual verbal operants are never established (i.e. mands, tacts, intraverbals)

7. Failure to require signs outside of the training sessions

8. Failure to generalize to novel stimuli, staff, settings, times, etc.
Prompt Dependency

- Prompt dependency is a teacher problem, not a learner problem.
- No one teaches (SLPs, OTs, EC Teachers, Parents) the art of prompting and prompt-fading.

Teaching “Sign to Talk” Requesting

Suggestions for Teaching Initial Signs

1. Always say the name of the item three times with each mand. This will help to produce vocalizations through the effects of automatic reinforcement.
2. Do not teach “more”, “help”, “please”, “give me”, “potty”, or “yes” and “no” as the initial signs. The learner should have a strong signing repertoire before teaching these.
3. Prompt levels may change from moment to moment with some signs. For example, yesterday the learner only required a model prompt and today that is not evoking the sign. First make certain the learner is motivated for the item then use a physical prompt. It is important that the learner does not become frustrated. Manding should be easy and produce a high level of reinforcement.
Suggestions for Teaching Initial Signs

4. Avoid selecting initial signs that are topographically similar. (Ex. “potato (chip)” and “melon” rhyme- or have similar hand shapes). If your child only likes items that have similar signs you may want to alter one of the signs.

5. Avoid selecting several signs from the same motivational category when teaching initial sign mands. (Ex. Several foods or several toys you play on outside).

6. Avoid signing for the same item repeatedly.

7. If the learner has poor motor imitation, initially teach 5-8 signs. Never teach only one sign.

8. If the learner has a moderate motor imitation, begin teaching up to 20 signs.

9. If the learner has strong motor imitation, teach signs for all reinforcers.

10. Items or actions that are not target signs should be taught using three echoic trials. The instructor repeats the name of the reinforcing item or activity three times, pausing at one-to-two second intervals between each presentation of the word, while delivering the item. No response is required from the learner.
Sign to Talk Requesting

- Establish motivation
- Initially, simply say the name of the item while giving it to him.
- Pairs the word with reinforcement
- Establishes a history of adult delivering the items quickly
- Learner approaches teacher

Sign to Talk Requesting

Sign-Request Prompts

<table>
<thead>
<tr>
<th>Physical (full or partial)</th>
<th>Move hands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestural (model)</td>
<td>Demonstration</td>
</tr>
<tr>
<td>Vocal (echoic)</td>
<td>Name of reinforcer</td>
</tr>
<tr>
<td>Item/Activity present</td>
<td>Item/signal</td>
</tr>
<tr>
<td>Motivation is strong</td>
<td>Child wants Sr+</td>
</tr>
</tbody>
</table>

Fade prompts to:
Motivation is strong-----Spontaneous sign

Model, Prompt, Deliver
(fade physical prompt)

- Therapist: Models sign + says name of reinforcer
- Learner: Attempts to imitate
- Therapist: Shapes hand movements and says name of item
- Therapist: Delivers the item + says name of reinforcer
Sign Manding
Mimetic to Mand Transfer
(Fade Model Prompt)
- Therapist: Models sign + says name of reinforcer
- Learner: Imitates the sign
- Therapist: Represents the item and waits several seconds
- Therapist: Delivers the item + says name of reinforcer

Prompt, Deliver
- Learner: Attempts to take the item
- Therapist: Shapes child’s hand movements and says name of item
- Therapist: Delivers the item + says name of reinforcer
  Fade physical prompt

Sign Manding
- Prompt-Transfer-Deliver
  - Establish Motivation
  - Physically prompt the sign + say item name
  - Reduce prompts or eliminate prompts on a second trial + say item name
  - Deliver item + say item name
  - Initially may reinforce prompted trial

Sign Language Scrolling
- Bring the child’s hands to a neutral position.
- Represent the item and immediately prompt the correct sign.
- Fade prompts on subsequent trials if possible
Encouraging Vocalizations During Signing

Development of Vocalizations
- Children with a babbling repertoire and the capacity for some imitation often develop vocalizations through use of simultaneous request/sign language training.
- For these children, focus is placed on shaping vocalizations through differential reinforcement.

Why Does Sign to Talk Training Improve Speech?
1. Requesting benefits the listener—Cooperation
2. Automatic Reinforcement
3. Differential Reinforcement
4. Pairing of motor movements with the sounds of words. Signs act as prompts for vocal responses.
Signers Who Are Silent or Develop a Weak Echoic

- Some signers rarely attempt to vocalize
- Some signers attempt to vocalize, but produce word approximations that are dissimilar to the adult form of the word

Figure 1. The percentage of trials with any vocalization during baseline, treatment, and maintenance conditions for all learners.
Research Studies that Support the Time Delay and Differential Reinforcement to Increase Vocal Responding


Research Studies that Support the Use of Time Delay and Differential Reinforcement to Increase Vocal Responding.


Differential Reinforcement of “Sign to Talk” for Learners with Poor Approximations

1. Select strong sign request (object evokes)
2. When the sign occurs, momentarily withhold reinforcement
3. Sign and say the name of the reinforcer up to three times with a one second pause between each presentation.
Differential Reinforcement of “Sign to Talk” for Learners with Poor Approximations

4. Reinforce following the 3rd presentation (but with smaller magnitude), if the child signs, but a vocal approximation does not occur.

5. Prompt the sign if only a vocal approximation occurs and contrive an additional trial.

Strategies for Shaping Vocal Responses

- Differentially reinforce words or word approximations during manding
- Improve verbal vocal imitation using
  - Traditional articulation therapy
  - Successive approximations (Kaufman)
  - Hand cues

SHAPING ARTICULATION DURING REQUESTING

- Contrive opportunities to request and establish motivation.
- When the learner requests with poor articulation (or sign + poor articulation), present up to 3-5 vocal models of the word (vocal model + sign) with a 1-2 second delay between each presentation until the learner produces a BETTER APPROXIMATION of the word.

SHAPING OF ARTICULATION DURING REQUESTING

- If the learner produces a better approximation of the word, immediately reinforce and reinforce abundantly.
- If the learner does not improve his articulation within the 3-5 vocal trials, provide reinforcement, but in smaller quantity or duration.
SHAPING OF ARTICULATION DURING REQUESTING

- In this way, the better approximations result in greater reinforcement and are more likely to occur in the future.


Differential Reinforcement of Target Approximations

- Some Learners will benefit from more precise target selection.
- Select 5-10 targets for improved articulation.
- Determine the "best" approximation the child has produced with some frequency. Use the DRVV form.

Shaping Vocalizations

- Differentially reinforce this approximation until it is occurring in 50-70% of opportunities
- Set new target approximations based on the DRVV or DRVS form
- Take Trial by Trial data if feasible or sample twice weekly

Uses of DRVS or DRVV

1. Select Target Approximations
2. Assess Frequency with which the child produced the Target
3. Percentages of trials in which articulation improved
4. Variability
5. Percentage of trials in each/several categories
Categorizing Vocal Verbal Responding

- Adult form word
- Intelligible word
- Word approximation
- Vocalization

Vocal Verbal Imitation Training Using Successive Approximations

Simplifying Words

- Word Shell Approach-Kaufman
- Systemic Method for Shaping Word Approximations
- Successive Approximations to the Target Word
- Utilizes Sound Simplification Changes demonstrated by typically developing children
Verbal Vocal Development

- **Speech Sound (Phoneme) Production:**
  - developmental hierarchy from simple to complex
- **Phonological Processes:**
  - Predictable “rules” of simplification
  - Syllable and sound simplifications that all children apply to words as they are learning to speak

Speech Sound Development

- **Phoneme development**
  - Motorically easy—complex
  - Voiced/voiceless pairs
    - p/b  -f/v  -sh/zh (pleasure)
    - t/d  -s/z  -th(thumb)/th(that)
    - k/g  -ch”’j” (jump)

Common Phonological Processes

- Weak syllable deletion (banana → nānuh)
- Final consonant deletion (boat → bō)
- Reduplication (water → wahwah)
- Consonant harmony (dog → gawg)
- Cluster reduction (blue → boo)
- Stopping (jump → dūmp)
- Fronting (car → tahr)
- Gliding (leaf → wēf, yēf)
- Context-sensitive voicing (Pooh → boo, pig → pīk)
Word Shells

- Simple Phonemes/Syllable Sequences

- Complex Phonemes/Syllable Sequences

Simple Phonemic/Syllabic Level

- Pure Vowels /a, I/
- Vowel to Vowel (Diphthongs) /al, ol/
- Simple Consonants /p, b, m, t, d, n, h/
- Repetitive Syllables (CVCV-same C and V) (mama, papa)
- Consonant Vowel (CV) (bay, pie)
- Vowel Consonant (VC) (up, out)
- Vowel-Consonant-Vowel (VCV) (apple, open)
Simple Phonemes/Sequences
- Repetitive Syllable w/ Vowel Change (puppy, baby, bubble)
- Simple Monosyllabics w/ Assimilation (pop, bib)
- Simple Consonant Synthesis (t/top/pot)
- Simple Bisyllabic w/ Consonant and Vowel Change (bunny, tuna, muddy)

Complex Sounds/Sequences
- Complex Consonants (k,g,f,v,w,l,y,z,sh,r,er,) and blends
- Complex Consonant Synthesis (CVC/CVC-sh/fish/ship)
- Blend Synthesis (r,s,l)
- Front-Back/Back-Front
- Complex bisyllabics (CVCVC-machine)
- Polysyllabic Synthesis/Sequencing (popsicle, cucumber)

Vocal Imitation Trials Using Kaufman Materials
- **Independent Variables**
  - Decrease Response effort
  - Increased number of vocal responses will be reinforced
  - Automatic reinforcement procedures may select sounds/syllable shapes
  - Direct reinforcement for echoic responses
  - Shaping and differential reinforcement of closer approximations to adult form of the word
Research Supporting Successive Approximations
Candidates

Childhood Apraxia of Speech

“Difficulty coordinating and/or sequencing the oral motor movements to form sounds, syllables, words, and longer utterances upon volitional control”


Candidate Selection

- Poor Echoic
- Limited Phoneme Repertoire (at least 5 C)
- Difficulty producing and sequencing sounds (Apraxia, Dyspraxia, DAS)
- Use “Unnatural Phonological Processes”
- Limited response to echoic trials (as evidenced by poor shaping of initial 15-25 mands)
- Obvious Structural or Muscle weakness problems have been addressed via appropriate referrals
“Unnatural” Phonological Processes
1. Pervasive consonant omissions
2. Idiosyncratic
3. Reduction to monosyllables (first 50)
4. Reduplication
5. Backing- substitution of /k,g,ng/ or /h/
6. Deletion of initial consonant
7. Prevocalic devoicing/Postvocalic voicing
8. Vowel Neutralization
9. Cluster deletion

Prerequisites
- Instructional Control Established
- Minimum of 5 responses to reinforcement (VR:5)
- Minimum of 5 echoic trials to reinforcement without problem behavior
- At least 5 consonants and pure vowels under echoic control OR attempts to approximate words include consonant productions
- Functional communication system

Methods to Encourage Pre-requisites
- Differential Reinforcement of Vocalizations within Sign Manding
- Stimulus-Stimulus Pairing and Direct Reinforcement Procedures
- Song and Nursery Rhyme Intraverbals
- Vowel and Isolated Phoneme Training
- Phonetic Placement Cues
- PROMPT

Assessing Candidates
1. Transcribe and Review Mands and Tacts
2. Administer the Kaufman Test
3. Probe through Kits
4. Administer an Oral-Motor Inventory
4. Assess Component Skills
Simple Phonemic/Syllabic Level

- Pure Vowels (a, i)
- Vowel to Vowel [Diphthongs] (ai, oi)
- Simple Consonants (p,b,m,t,d,n,h)
- Repetitive Syllables (CVCV-same C and V) (mama, papa)
- Consonant Vowel [CV] (bay, pie)
- Vowel Consonant [VC] (up, out)
- Vowel-Consonant-Vowel [VCV] (apple, open)

Simple Phonemes/Sequences

- Repetitive Syllable w/ Vowel Change (puppy, baby, bubble)
- Simple Monosyllabics w/ Assimilation (pop, bib)
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Complex Sounds/Sequences

- Complex Consonants (k,g,f,v,w,l,y,s,z,sh,r,er,) and blends
- Complex Consonant Synthesis (CVC/CVC-sh/fish/ship)
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- Front-Back/Back-Front
- Complex bisyllabics (CVCVC-machine)
- Polysyllabic Synthesis/Sequencing (popsicle, cucumber)

Adaptations of Administration

- Two administrators
- High density reinforcement
- Mix and vary
- Intersperse with natural environment activities
ADAPTATION OF THE KAUFMAN PROCEDURES FOR CHILDREN WITH ASD

Potential Procedure Utilizing Kaufman or K&K Sign to Talk

- Identify the items to be taught.
- For Kaufman, select the highest level at which the child has some success.
- For K&K, select items that the child frequently requests. It is often better to have fewer items on acquisition (10 or fewer).

Potential Procedure Utilizing K&K Sign to Talk

- Simultaneously with request training, verbal imitation training with the contents of the Kaufman Speech Praxis Treatment Kits for Children (Kaufman, 1998; 2001) or the K&K Sign and Say kit may be initiated. To maintain high motivation and ensure that the child “looks forward” to vocal imitation training, the following procedures are recommended:

- Before initiating training, review the back of the card. Follow the suggestions regarding speech sound substitutions. That is, substitute a speech sound only if the child is unable to imitate the actual speech sound needed for the word.
- Probe the Kaufman group and separate words that can be imitated from those that cannot.
- For the target words, identify the highest level of word shell that the child can imitate and mark it with a sticker. This word shell will be the starting point for training.
Potential Procedure Utilizing Kaufman or K&K Sign to Talk

- Present a strong reinforcer. A reinforcer is an item that the child will accept that in the past has led to him learning something new. It is usually something that the child enjoys (video, food item, special toy, tickling). It should be shown to the child to ensure that he or she is motivated to respond to the imitation trials. It is best to limit the availability of this item so that the child only “earns” it when he or she is working on speech skills. This should increase motivation.

Without showing the front of the card to the child, model the word shell that he or she is able to imitate.

a. If the child imitates correctly, provide praise and move up immediately to the next word shell.

b. If the child imitates this word shell, move to the next one. Continue until he or she reaches the actual word or until he or she does not imitate the word correctly. If the child imitates the actual word correctly, show the picture and also give the child the reinforcing item.

c. If the child does not immediately match your vocalization, model the approximation 2-3 times.

If he matches your vocal after several presentations, reinforce, but do not show the card. Move the sticker.

If the learner does not match your vocalization, move to a lower level word shell until the child achieves parity. Move to the next card and reinforce.

c. If the child does not imitate the word shell correctly, try 2-3 more times. If he or she still does not imitate the word shell correctly, model the first word shell originally used or the highest level word shell that was imitated accurately, praise the child when he or she vocally matches the word shell and move on to another word.
Potential Procedure Utilizing Kaufman or K&K Sign to Talk

d. For some children, reinforcement will need to be provided when the instructor’s model of each word approximation on a card is accurately imitated. For other children, it will be possible to provide reinforcement only when the actual adult form of the word is produced and the card is shown. This will depend on the child’s motivation, his or her history, and the difficulty of the task.

Group Procedure

Prerequisites

- Several cards within a set under echoic control
- At least 8 responses to reinforcement
- Ability to provide 8 echoic responses without problem behavior

Data Recording Procedures

1. Probe only the adult form of the word.
2. Probe once per day using cold probe method.
3. Set the mastery criterion at 3 consecutive days of probes for mastery to be met.

During teaching, tutors should use the sticker on the back of the card as the point of initiation. If the child accurately imitates a higher level word shell, the therapist should move the dot to the highest level achieved. This should serve as the point of initiation for the next training trial.

Successive Approximation Approach

- Developmentally Based
  - Kaufman Assessment/Hierarchy
- Individually Based
  - Use the child’s speech sound inventory
- Motivationally Based
  - Targets needed for Manding
- Program Based
  - Targets needed for Programming
ADAPTATION OF THE KAUFMAN PROCEDURES

Important Modifications

- May start at CV/VC level
- Number of Trainers dependent on team
- Do not show the cards when training approximations.
- Do not show cards when training animal sounds.
- Remove Duplicate cards (banana, potato, pony ride)

Important Modifications

- Use actual pictures for mama, dada, papa, me, etc. and train only those which the family uses.

Personalized Kaufman
Important Modifications

- Use a reverse chain for CV, CVC and other problematic words

Reduplicate the syllable (as Nancy suggests) if helpful at the CVCV levels.
- Mommy - Bunny
- Meemee - Neenee
- Me - Nee

Important Modifications

- Don’t break off a sound, “—” equals prolong, use another strategy (hand cues, etc.)
- “Dentalize” refers to placing your tongue visibly between the teeth while touching the upper teeth. This can be very evocative for achieving t,d,n,l and usually fades to a more appropriate tongue behind the teeth position (lingua-alveolar) easily.
Important Modifications

- Pre-teach receptive instructions and hand cues to fluency if needed. Use whatever prompts are necessary to evoke the response and then fade.

Hand Cues

- **Independent Variables:**
  - Decrease Response effort
  - Direct reinforcement of component skills needed for word production
  - Fluency Training for component skills
  - Self-prompt from the motor movements of the hand cue may evoke vocal response
  - Shaping and differential reinforcement of closer approximations to adult form

Research to Support Phonetic Hand Cues


Transfer Improved Articulation Across the Operants

Combining Words

- Independent or spontaneous requests for items or actions
- Sequences in which multiple requests are made to obtain a reinforcer
- Two word combinations with functionally independent request words are taught
The Purpose of Carrier Phrases

- Skinner
  - Carrier phrases such as “I want” and “Can I have” are Descriptive Autoclitics
    “...the immediate effect upon the listener is to modify his reaction to the behavior...”
  - Often they do not significantly benefit the speaker

Carrier Phrases

- Other “purposes” of Carrier Phrases
- Sound more natural
  - Mean Length of Utterance
  - Type-Token Ratio
  - Response Effort vs Function
  - Intelligibility

Data regarding “I want”

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Requesting with Sentences (Pivot Phrases)

- Other two word phrases may benefit the speaker as they modify the response of the listener.
- Prerequisites include single word mands for objects and actions that occur in the presence of the non-verbal stimulus
- For many two word mands make sure to use a variety of stimuli (i.e. open bag, open door, open fridge)
- Error Analysis will determine if additional single words mands should be taught
Pivot Phrases

Overcome the Challenges in Working with Children with Autism
- Promote Cooperation and Enhance Motivation
- Provide Many Learning Trials
- Reduce Problem Behavior
- Eliminate Dependency on Prompts
- Promote Generalization

Overcome Verbal Challenges
- Teach Functional Communication
- Increase Vocalizations
- Provide Many Vocal Opportunities to Improve Vocalizations while Maintaining a Communication System

Make a Difference!!
References


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