Update on Research on Verbal Behavior and Autism

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Purpose: To summarize and synthesize recently published findings on teaching verbal behavior to individuals with ASD.

The goal is for you to become aware of recent studies that may be relevant to what you do in your practice.

You won’t get all the information here, but you will know where to find articles that may be useful to you.
B. F. Skinner’s (1957) analysis of the elementary verbal operants will be used as a framework for classification and discussion.

Mands, tacts, intraverbals, echoics

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VB Research: Recent Developments

Sautter & LeBlanc (2006):

[Figure 1 from Sautter & LeBlanc, 2006]

Over 30 research articles per year in 2013 and 2014!
A great resource you should know about!

Analysis Verbal Behav. (2015) 31:3-9
DOI 10.1007/s40166-015-0029-z

An Annotated Bibliography of Verbal Behavior
Scholarship Published Outside of The Analysis of Verbal Behavior: 2014

James E. Carr • Melissa R. Nosik • Sarah A. Lechago • Lauren Phillips

Studies Included in Review

PsycINFO search + manual search of several journals

Initial search included:
- Original empirical research only (no review/discussion papers)
- Studies published in 2014 and 2015 (before July)
- Studies in which one or more participants were diagnosed with ASD
- Behavior-analytic studies that addressed similar topics as recent VB studies, but without using VB terminology

The search excluded:
- Studies in which no participants had ASD diagnoses
- Studies in which the primary focus was reduction of problem behavior (e.g., functional communication training)
- Studies that focused on listener behavior exclusively
- Studies that focused on textual behavior exclusively
PRESENTATION OVERVIEW

- Teaching Manding (8)
- Teaching Tacts and Simple Intraverbals (8)
- Emergent Speaker and Listener Behavior (7)
- Increasing Vocalizations of Minimally Verbal Children (3)
- Teaching Complex Verbal Behavior (3)

+ brief update on other topics if time permits
Mand: “[v]erbal operant in which the response is reinforced by a characteristic consequence and is therefore under the functional control of relevant conditions of deprivation or aversive stimulation” (Skinner, 1957, pp. 35-36)

ESTABLISHING OPERATIONS (EO)
(Michael, 1993)

A subclass of MOTIVATING OPERATIONS
(Laraway, Snyerski, Michael, & Poling, 2003)

Motivating Operations

A variable that (a) increases or decreases the reinforcing value of stimulus or event X, and (b) evokes or suppresses responses that have produced X in the past (e.g., Laraway et al., 2003; Michael, 1982, 1993)
If “R” is reinforced through the mediation of another person, it is a verbal response - a *mand*.
Question

If this child says “spoon” right now, is it likely to be a mand?

If a response is equally likely to occur in the presence and the absence of the EO, then it is probably not a mand!

Studies on teaching mands for information:


What is a mand for information (MFI)?

A mand under the functional control of a condition (EO) that renders information valuable (because in the presence of the information, effective action is possible)

EO1: The drawer is locked (renders key valuable)
EO2: Location of key is unknown (renders information valuable)

[Plus a third EO that renders contents of drawer valuable!]

R1: “Where is they key?” [mand]
S1: “It is hanging on a nail on the wall by the back door”
R2: Go to back door and retrieve key [listener response]
S2: Access to contents of drawer

What if you have no need for the content of the drawer? What if the drawer is unlocked? What if you already know where the key is? These abolishing operations should decrease the probability of manding for information.

To verify that you have truly taught an MFI, you need to demonstrate that it occurs more under EO than AO conditions (missing from some earlier studies)
Target MFIs: “Which . . .?” and “Who . . .?”

Three children diagnosed with ASD; 6, 8, and 12 years old

Approximately 100 tacts, a number of intraverbal fill-in responses, could respond to “What . . .?” and “Where . . .?” questions

Two types of trials for each MFI: EO and AO
- AO trials served to provide evidence that the response that was taught functioned as a mand for information

EO trial for “Which”:

Participant: “I want a Skittle”
**Shillingsburg, Bowen, Valentino, & Pierce (2014)**

EO trial for “Which”:

![Cups and Skittles](image)

Experimenter: “It is under one of these cups”

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EO trial for “Which”:

![Cups and Skittles](image)

Participant: “Which cup?” [target response]
EO trial for “Which”:

Experimenter: “The yellow cup”

Participant: Looks under yellow cup [secondary measure]
AO trial for “Which”:

Participant: “I want a Skittle”

AO trial for “Which”:

Experimenter: “It is under the yellow cup”
In both EO and AO trials, the participant could look under one cup before the trial was terminated.

Guesses that occurred prior to mands for information were not blocked in EO trials.

During instruction, MFIs were prompted vocally using a constant prompt delay (0-s for the first 8 trials, then 2-s) in EO trials. Both prompted and independent responses produced the information.

In AO trials, no consequences were provided if an MFI was emitted.

[Figure 1 from Shillingsburg, Bowen, Valentino, & Pierce, 2014]
“Who” mands were taught in a similar manner and results were similar.

Participants continued to perform well when “Which” and “Who” trials were alternated:

Extensive generalization probes conducted for “Which” MFIs.

Immediate generalization to novel containers obtained for two participants.

The third participant required training with multiple exemplars before generalization was observed.
“How” MFIs

Two boys diagnosed with ASD

- Josh: 7 years old, 100 tacts, 90 intraverbals, mand repertoire
- Doug: 3 years old, 50 tacts, 50 intraverbals (answers to wh- questions), high rates of multiple-word phrase manding

EO (EO-present) and AO (EO-absent) trials

Activities were selected based on a pretraining assessment indicating that all activities were preferred, and that the participant either could (EO-present) or could not (EO-absent) complete them independently.
EO-present teaching activities that Doug learned to complete independently during teaching were re-classified as EO-absent activities from that point on.

Trials were interspersed within regular language programming; 10 trials per day on the average

A trial began with the therapist asking the participant if he or she wanted to engage in the target activity, and conducted only if the participant indicated yes.

EO present trial: The therapist delivered an instruction to complete an unknown activity (“Spell Bugati” or “Plug in the mouse”)

EO absent trial: The therapist delivered an instruction to complete a known activity (“Spell Ferrari” or “Press play”)
Teaching procedures similar to previous study.

In EO-present trials, prompted and unprompted “How?” responses produced information on how to complete the task. Upon task completion, the therapist provided verbal praised and joined the participant in the activity.

In EO-absent trials, participant was permitted to complete the task independently, but the trial was terminated if the participant asked “How?”
“Where . . .?” MFIs

Participants:
• Two boys diagnosed with ASD, 8 and 9 years old
• Could mand for at least 20 items using the phrase “I want [item]” but did not mand for information about location

Importance of differentiating “I want . . .” from “Where is . . .”!

Three types of trials:
• Item present (AO) trials
• “I want” trials: Item visible but inaccessible
• “Where” trials: Item not visible
At the beginning of a trial, the participant had access to a choice board with 15 photographs of preferred toys:

![Choice Board](image1)

After selecting a picture, the participant took it to a toy shelf that held 15 clear containers with the same photographs, matched the two photographs, and looked inside the container.

![Toy Shelf](image2)
Item present trials: Item inside container; participant plays with item for 2-3 min

“I want” trials: Items not in container but visible in teacher’s hands; “I want” mand required to play with item.

“Where” trials: Item not in container and not visible. “Where is . . .?” MFI resulted in being told the location of the item and having an opportunity to retrieve and play with it.

Generalization probes included novel instructor, novel setting, novel items, and two natural situations involving activities in participant’s daily routine.

[Figure 1 from Somers et al., 2014]
Studies on selecting mand modality:


All three studies addressed alternative communication systems for establishing mands/requests in children diagnosed with ASD who had severe communication impairments.

Two studies (Couper et al., 2014; McLay et al., 2015) compared acquisition and preference for picture exchange, manual signing, and an iPad® speech-generation app (Proloquo2Go™; Sennott & Bowker, 2009) with a total of 13 participants.

Participants were taught to request “more” when preferred toys were removed, using a 10-s delay to physical prompt involving the least amount of assistance needed to produce the response.
A comparison of trials to criterion in the three conditions yielded variable results across participants.

McLay et al. tested generalization across settings and people; results varied across participants.

Preference probes conducted throughout all conditions revealed a preference for using the iPad for 12 of 13 participants.

In conclusion, children with ASD tend to show a preference for using iPad®-based speech output over other options, but this is not necessarily reflected in faster acquisition.

Limitation: Only one response taught
**Mand Modality Studies**

The third study (Roche et al., 2014) compared acquisition and preference for 3-D symbol vs. 2-D picture exchange; a third condition was direct access to the reinforcer without a listener’s mediation.

Six cartoons used for each participant.

No consistent acquisition differences, but both participants preferred 3-D symbol exchange to the other options.

**Other studies on teaching mands:**


In the context of Functional Communication Training, children are often taught to mand for the removal of aversive stimuli that otherwise may evoke problem behavior.

But shouldn’t children also learn to mand for aversive stimuli, even if they have not developed problem behavior?

- May prevent problem behavior
- May improve quality of life

Groskreutz et al. (2014) developed an assessment to identify aversive stimuli or activities in daily environment; then taught the participants to sign “stop” or “finished” to escape the stimulus or activity.

[Figure 3 from Groskreutz et al., 2014]

Two boys diagnosed with ASD; 7 and 9 years old. Jared had no vocal communication; Brian spoke in 3-4 word utterances but rarely initiated communication.
Peer manding: A peer, rather than an adult, serves as the listener who reinforces a mand.

Previous studies in which both participants and peers were children with ASD did not provide data on the peer’s listener behavior.

Lorah et al. (2014) taught some participants to direct mands toward a peer, and other participants to accurately reinforce the mands of peers.

Participants: Six 4- and 5-year-old children with ASD diagnoses; mands weak or absent according to VB-MAPP.

Participants were taught to (a) mand for missing puzzle pieces, or (b) deliver missing puzzle pieces upon request, using a variety of age-appropriate puzzles.

Through prompting and reinforcement, each participant acquired his or her target response, and generalization was observed to novel peers.
Teaching Tacts and Simple Intraverbals (8)

- Temporal arrangement of instructional trials (2)
- Prompting and error correction procedures (2)
- Other (4)

Focus on discrete-trial instruction; tacts or intraverbals served as instructional targets

**Tact:** A verbal response controlled by a nonverbal discriminative stimulus due to a history of generalized conditioned reinforcement (e.g., praise)

**Intraverbal:** A verbal response controlled by a verbal discriminative stimulus, with no point-to-point correspondence between stimulus and response, due to a history of generalized conditioned reinforcement (e.g., praise)
Studies on discrete-trial instruction with tacts or intraverbals as instructional targets

Temporal arrangement of instructional trials:


Prompting and error-correction procedures:


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**Haq et al. (2015)**

<table>
<thead>
<tr>
<th>Massed Practice:</th>
<th>Distributed Practice:</th>
<th>Control:</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 training trials in a single training session 1 day/week</td>
<td>20-trial training sessions 4 days/week</td>
<td>No instruction</td>
</tr>
</tbody>
</table>

Three children with ASD diagnoses; 4, 5, and 10 years old; verbal and spoke in full sentences.

Distributed practice was more efficient than massed practice. No participant reached mastery in the massed practice condition, even after many more trials, weeks, and minutes than it took to reach mastery in the distributed practice condition.
**Majdalany et al. (2014)**

<table>
<thead>
<tr>
<th>Massed Trials*</th>
<th>Distributed Trials*</th>
<th>Task Interspersal:</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 trials alternated across five new tact targets; 1-2 s ITI</td>
<td>20 trials alternated across five new tact targets; 10 s ITI</td>
<td>Identical to distributed trials except three mastered targets presented during ITI</td>
</tr>
</tbody>
</table>

*Refers here to the length of the inter-trial interval (ITI)*

Six children with ASD diagnoses; Level 2 learners on VB-MAPP

Five participants acquired the target responses fastest in the massed-trial condition; results of follow-up probes varied across participants.

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**Carroll et al. (2015)**

<table>
<thead>
<tr>
<th>Single-response repetition:</th>
<th>Remove and represent:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contingent on incorrect responses and failures to respond, the participant was required to echo a vocal model.</td>
<td>Contingent on incorrect responses, the instructor turned away for 2 s, then re-presented the trial. Consequences for failures to respond were the same as in single-response repetition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multiple-response repetition:</th>
<th>Represent until independent:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contingent on both incorrect responses and failures to respond, participant was required to echo vocal model repeatedly until 5 correct echoic responses.</td>
<td>Contingent on both incorrect responses and failures to respond, the participant was required to echo a vocal model; the trial was then re-presented until a correct, independent response was obtained or 20 error correction trials had been conducted.</td>
</tr>
</tbody>
</table>
Carroll et al. (2015)

Five 5- to 8-year-old children; 3 diagnosed with ASD and 2 with ADHD. Participants with ASD communicated vocally in one- to five-word utterances.

Target responses for participants with ASD were tacting features or functions of items, or reading sight words.

One or more correction procedures were generally effective for all participants, but relative efficiency varied across participants.

Fewest trials and minutes to criterion in the “represent until independent” condition for the two participants with ADHD and one participant with ASD.

Results underscore need for individualized assessment to select the most effective error correction procedure.

Leaf et al. (2014)

Flexible prompt-fading:
In each trial, the experimenter had the autonomy to decide whether to provide an immediate prompt or first allow an independent opportunity to respond, which type of prompt (how intrusive) to provide, and whether or not to implement a remedial trial following errors.

Error correction:
All trials began with an independent opportunity to respond. Error responses were followed by the experimenter providing the answer and a remedial trial with another independent opportunity to respond.
Four boys with ASD, 4-6 years old, IQ ranging from 86 to 128; three participants had a prior history of flexible prompt-fading procedures.

Dependent measures included trials, sessions, and instructional time to criterion.

Results varied across participants but generally favored the flexible prompt-fading procedure.

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**Leaf et al. (2014)**

Other studies on teaching tacts and intraverbals:


Kelly & Holloway (2015)

Used a behavioral momentum procedure to teach new tacts to a fluency (instead of an accuracy) criterion.

Three children with ASD diagnoses, 3-4 years old; Preschool Language Scale age equivalent scores of 2.1 to 3.6 years.

Participants were first taught to independently tact pictures on flashcards, controlling their own rate of presentation.

Kelly & Holloway (2015)

High-\(p\) tacts: Already mastered
Low-\(p\) tacts: Non-mastered

During intervention sessions, the participants first went through 20 flash cards of high-\(p\) stimuli followed by one minute of flashcards containing a set of four low-\(p\) tact stimuli.

The fluency goal was 30-35 correct tacts per min for low-\(p\) stimuli for 2 participants; 20-25 per min for one participant.

No reinforcement, prompts, or error correction delivered during timing, but corrective feedback was delivered after the session for stimuli tacted incorrectly during timing.
Kelly & Holloway (2015)

[Figure 1 from Kelly & Holloway, 2015]

Kelly & Holloway (2015)

[Figure 3 from Kelly & Holloway, 2015]
[Figure 5 from Kelly & Holloway, 2015]

[Figures 2, 4, and 6 from Kelly & Holloway, 2015]
Kelly & Holloway (2015)

In summary, all participants demonstrated fluent performance, and the number of sessions to fluency decreased across stimulus sets.

Positive results of retention, endurance, stability, and application checks.

Error rates?

Contribution of the high-\( p \) sequence?

Benefits of fluent tacting for individuals with ASD?

Perez-Gonzalez et al. (2014)

The goal was to increase rates of uninstructed ("spontaneous") tacts in natural settings by having the teacher model spontaneous tacting.

**Condition 1:** In each session, the teacher conducted 20 tact trials for mastered tacts with the participant

**Condition 2:** In each session, the teacher conducted 20 tact trials for mastered tacts with the participant. In addition, the teacher herself emitted 20 tacts.
Three children with ASD diagnoses, 4-5 years old; 150-250 tacts; demonstrated emergence of tacts or mands following listener training

Effects of matrix training on novel tacts in the form of subject-verb-object (S-V-O) sentences, e.g., “Jessica eats banana.”

- Recombinative generalization

Two five-year-old children with ASD diagnoses; had already mastered the single-word action and object tacts used in the study, but did not emit S-V-O sentences.

Stimuli presented via video (e.g., a familiar person named Jessica eating a banana).
Vocal prompting (0-s, then 3-s delay) and reinforcement used to teach three diagonally ordered responses in a single matrix, then tested generalization to other cells and trained as needed.

[Figure 3 from Kohler & Malott, 2014]

Next, tested three diagonal cells in each remaining matrix.

If less than 2/3 correct, provided training with that matrix in the same manner

If at least 2/3 correct, tested remainder of that matrix, trained as needed (if needed)

[Figure 3 from Kohler & Malott, 2014]
Both participants mastered all 162 sentences.

One participant required explicit training on only 14 sentences and required no training with 3 of 6 matrixes.

The other required explicit training with 72 sentences and no training with 2 of 6 matrixes.

Evaluated use of the Proloqu2Go™ app combined with 5-s time delay to physical prompt to teach intraverbal responses to a social questions.

Two participants diagnosed with ASD, 8 and 12 years old, minimal or no vocal communication, intraverbal repertoire weak or absent (Level 3-4 on VB-MAPP Barriers Assessment).

Experimenter asked questions (e.g., “What is your favorite toy?”) and participants responded by selecting one of five pictures on iPad screen, producing the spoken word.
Lorah et al. (2015)

[Figures 1 and 2 from Lorah et al., 2015]

Emergent Speaker and Listener Behavior (8)

- The relationship between speaker and listener behavior (3)
- Establishing speaker and listener behavior through stimulus pairing procedures (3)
- Other (2)
The relationship between speaker and listener behavior:


Should we always teach listener behavior before teaching corresponding speaker behavior (receptive-before-expressive) or is it better to go straight to teaching speaker behavior (expressive-before-receptive)?

Petursdottir and Carr (2011) reviewed the literature that has addressed this question:

- Most studies suggested that it was more efficient to teach tacts before listener behavior than listener behavior before tacts (at least for individuals who had already acquired some tacts and listener behavior).
- However, most of the literature was dated and most studies did not include individuals with ASD.
- No studies had addressed the question for intraverbal speaker behavior except with typically developing children.
Four boys diagnosed with ASD, 3-8 years old, at different levels of language functioning. All had existing tact and listener repertoires; scored at levels 1-3 on VB-MAPP.

[Table 1 from Delfs et al, 2014]

[Figure 4 from Delfs et al., 2014]
Training trials to criterion were similar for tact and listener training.

Function, feature, and class (FFC): Listener behavior (RFFC) and intraverbal responding

Sundberg & Partington (1998) recommend teaching the listener repertoire first

Purpose of study (similar to Delfs et al., 2014): To compare trials to criterion in listener vs. intraverbal FFC instruction, as well as emergence of the untrained repertoire, and unsolicited tacting during listener training.

Two children diagnosed with ASD, 2-3 years old; extensive tact repertoires and 50 intraverbals
[Table 1 from Kodak & Paden, 2015]

[Figure 1 from Kodak & Paden, 2015]
Together, Delfs et al. (2014) and Kodak and Paden (2015) found that

- Teaching tact or intraverbal consistently resulted in the emergence of listener behavior
  - Not always the case in previous research (e.g., Wynn & Smith, 2003)

- Teaching listener behavior did not consistently produce tact or intraverbals

- Teaching speaker behavior did not require more instructional trials than teaching listener behavior

Consistent with previous literature (Petursdottir & Carr, 2011) but further research needed to determine for whom tact and intraverbal instruction produces listener behavior.
Can children with ASD categorize stimuli nonverbally after receiving listener training with their category names?

Studies with typically developing children suggest that this happens only if listener training produces emergent tacts (e.g., Horne, Lowe, Harris, & Randle, 2004; Miguel, Petursdottir, Carr, & Michael, 2008)

“Naming” repertoire (Horne & Lowe, 1996)

Listener Training

“Give me the hound dog”

[Not the actual stimuli used in the study]
Kobari-Wright & Miguel (2014)

Tact Test 1

“What is it?”

Kobari-Wright & Miguel (2014)

Categorization Test
Kobari-Wright & Miguel (2014)

[Figure 1 from Kobari-Wright & Miguel, 2014]

Kobari-Wright & Miguel (2014)

[Figure 1 from Kobari-Wright & Miguel, 2014]
Children are said to have a “naming” repertoire when the listener behavior emerges as a result of speaker training and vice versa.

Results suggest that children with naming repertoires may show increased emergence of untrained skills (see also Miguel & Kobari-Wright, 2013)

Some early intervention curricula (e.g., Leaf & McEachin, 1999; Taylor & McDonough, 1996) suggest teaching category sorting or matching before teaching category labeling (listener/tact). This may not be necessary if the student has a naming repertoire.

Establishing speaker and listener behavior through stimulus pairing procedures:


Early in language programming, we teach speaker and listener behavior through prompting and reinforcement.

Ultimately, we want our students to be able to pick up new speaker and listener behavior from the natural environment without formal instruction; perhaps as a result of simple exposure to word-object pairings.

The next set of studies aimed to assess the extent to which students with ASD acquired new speaker and listener behavior as a result of observing word-object pairings or observing others tact objects, without requiring a response from the student.

“SPOP”: Stimulus Pairing Observation Procedure

Byrne et al. (2014)

Three 7-year-old children with ASD diagnoses; VB-MAPP Level 1.

A single SPOP session (3 stimuli, 45 trials) initially produced limited increases in correct tacts and listener behavior.

Multiple-exemplar training was conducted with new sets of stimuli for multiple sessions until participants met criterion for emergent tacts and listener behavior (55-115 trial blocks).

One participant then demonstrated criterion performance with the original stimulus set; smaller increases were observed for the other two.
How can we get children to acquire tacts and listener behavior from exposure to word-object pairings if they do not do so already?

Byrne et al.’s (2014) data suggested that multiple-exemplar training with repeated probes will improve performance.

Longano & Greer’s (2014) approach: Strengthen participants’ preference for looking at pictures and listening to words through a conditioning procedure.

Three 5- to 7-year-old children; two diagnosed with ASD. Had mands, tacts, listener behavior, echoics, etc., but did not have strong naming repertoires.

Longano & Greer (2014)

Phase 1: Paired a set of 4 visual [auditory] stimuli with edible and social reinforcers until participants reliably engaged in observation of the stimuli

Phase 2: Paired auditory [visual] stimuli with the visual [auditory] stimuli

Pre-test: Participants showed some emergent listener behavior following
(a) identity-matching trials during which they heard the relevant spoken word (joint attention condition), and to a lesser extent
(b) after observing experimenter tacting stimuli (incidental condition).
Did not demonstrate emergent tacts or intraverbals.

Post-tests: After experiencing Phase 1 and Phase 2 with multiple (2-4) stimulus sets, all participants showed emergent tacts under both conditions.
Compared the effects of SPOP and listener training on emergent intraverbal responding

Three boys with ASD diagnoses, 4-7 years old, Level 2 on intraverbal subsection of VB-MAPP; Levels 2-3 for mands and tacts.

Listener Training: Vallinger-Brown & Rosales (2014)  
"Point to the one you use to tell time"

SPOP:  
"A dime is worth 10 cents"
One participant demonstrated all emergent intraverbals in both conditions with the minimum amount of training.

The other two participants did better in the listener training than in the SPOP condition but did not acquire all of the target intraverbals until they were trained directly.

Although SPOP does not necessarily produce tacts, intraverbals, or listener behavior to criterion, it often produces an increase in these behaviors.

A low-effort way to jump start instructional programs?

Other research on emergent verbal behavior:

Four males with ASD, 9-18 years old; three scored at Level 3 on most VB-MAPP subtests and the fourth at Levels 1-2

30 intraverbal training trials per session; 3 per target

Audio recorded vocal prompt

[Table 1 from Allan et al., 2015]

[Figure 1 from Allan et al., 2015]
Studies on teaching complex verbal behavior:


Valentino et al. (2015)

Used backward chaining with leaps ahead to teach children with ASD to re-tell simple stories.

For example, if a participant had mastered segments 9 and 10, and also produced non-targeted segment 8 in two consecutive probes, that segment was not included.
Valentino et al. (2015)

Three boys with ASD, 4 to 8 years old, with fairly extensive verbal repertoires

Three trials per session:
1. Probe trial (“Tell me the story about . . .”)
2. Prompted trial: Participant reads all segments
3. Transfer trial: Target segment and later segments are covered with blank pages

Correct Response → Praise and next blank page
Incorrect Response → Prompt by showing text and picture, then return to blank page, repeat max. 5 times

[Figure 2 from Valentino et al., 2015]
Valentino et al. (2015)

The other two participants also acquired storytelling, but various modifications to the procedure were required (e.g., book prompts).

O’Neill & Rehfeldt (2014)

Taught two young adults (one of whom was diagnosed with ASD) to answer job interview questions through computerized selection-based instruction in combination with a Lag 1 reinforcement schedule.

Protocol resulted in an increase in accurate vocal-verbal responses to interview questions.

A second study extended these findings by evaluate components of the instructional program separately (O’Neill, Blowers, Henson, & Rehfeldt, 2015), but participants were not diagnosed with ASD.
Three boys with ASD diagnoses, 8, 15, and 17 years old

Target response: Reporting information provided by a person the participant has just met (e.g., “She likes Taylor Swift”)

During the intervention, the participant received a token contingent on each fact about the visitor that they reported accurately.

Token reinforcement produced increases in accurate verbal reporting

Studies on increasing vocalizations of minimally verbal children:


Replication of a previous study by Esch, Carr, & Grow (2009) that used an enhanced *stimulus-stimulus pairing* procedure to increase vocalizations of children with ASD.

Adult speech sounds are paired with reinforcers; no response requirement by the child

Esch et al.’s (2009) enhanced procedure included
• Interspersed target (S+) and nontarget (S-) trials
• Observing prompt
• Motherese speech
• Measurement of vocalizations during the ITI instead of post-session

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**Rader et al. (2014)**

7 years old

4 years old

6 years old

[Figure 1 from Valentino et al., 2015]
Rader et al. (2014)

Study 1 assessed the effects of PECS instruction on the vocalizations of 4 minimally children with ASD (4-8 years old) who were minimally verbal and did not communicate vocally.

One participant failed to vocalize throughout the study; the others showed no change or decrease in vocalizations throughout the study, but an increase at follow-up.

Study 2 included two participants from Study 1, at which time they were able to imitate consonant-vowel combinations.

Time delay and prompting during PECS exchanges increased vocalizations.

Greenberg et al. (2014)

Study 1 assessed the effects of PECS instruction on the vocalizations of 4 minimally children with ASD (4-8 years old) who were minimally verbal and did not communicate vocally.

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Study 2 included two participants from Study 1, at which time they were able to imitate consonant-vowel combinations.

Time delay and prompting during PECS exchanges increased vocalizations.
Compared the effects of PECS and Pivotal Response Training on vocal language acquisition by minimally verbal children

39 children with ASD diagnoses, 2-4 years old, did not speak or spoke under 10 words; randomly assigned to conditions.

PRT targeted vocal responding directly, whereas PECS targeted picture exchange.

Both groups’ spoken language skills improved (over 23 weeks) but no difference between conditions.

Parents found PECS more difficult to implement.

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**Brief Update: Parent and Staff Training**

Barnes, Mellor, & Rehfeldt (2014): Used Behavioral Skills Training to teach school psychologists to administer the VB-MAPP.

Homlitas, Rosales, & Candel (2014): Used Behavioral Skills Training to teach teachers to implement phases 1, 2, and 3A of PECS.

Loughrey et al. (2014): Used Behavioral Skills Training to teach mand training procedures to caregivers of children with autism.
Brief Update: More on PECS

Smith, Hand, & Dowrick (2014): Used video self-modeling to teach PECS to children and an adult diagnosed with ASD.


Chien et al. (2015): Evaluated a tablet-based PECS application (iCAN), 11 children with ASD successfully learned to use it, and content-preparation time reduced compared to traditional PECS.

Brief Update: PEAK

Dixon, Belisle, Whiting, & Rowsey (2014): Compared PEAK scores of children with autism and a normative sample. PEAK scores for children with autism were lower than for typically developing children, and not correlated with age, unlike scores of typically developing children.

Dixon et al. (2015): Evaluated relationship between PEAK and VB-MAPP; scores on the two assessments were highly correlated; a ceiling effect observed for VB-MAPP but not for PEAK.
**Brief Update: PEAK**

McKeel, Rowsey, Dixon, & Daar (2015): PEAK correlated strongly with commonly used one-word vocabulary assessments (ROWPVT-4 and EOWPVT-4)

Dixon et al. (2014): Positive correlation between PEAK and PPVT scores and Illinois Early Learning Standards Test.

Dixon, Whiting, Rowsey, & Belisle (2014): Strong correlation between PEAK scores and IQ scores


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**Studies Reviewed and Other Cited References**


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