Teaching Topography and Selection Based Methods of Communication to Children with Autism

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INTRODUCTION TO SELECTON-BASED AND TOPOGRAPHY-BASED VERBAL BEHAVIOR

The behavioral and conceptual analysis of the differences between selection-based (SB) and topography-based (TB) verbal behavior was offered by Jack Michael (1985).

This analysis is not widely recognized outside of the behavior analytic community. It serves as the foundation for my discussion on this topic.

This difference is more commonly referred to as the difference between aided (symbol-based) and unaided (sign language and gesture) methods of augmentative communication.

When analyzed behaviorally and conceptually, **it becomes clear that the two systems are actually quite different from the perspective of the speaker and therefore need a more thorough comparison beyond variables related to concreteness of the stimuli, visual nature of the learner, strength of the learner's motor skills, and number of competent listeners.**

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In the field of autism, practitioners must often choose between a SB symbol system, a TB method such as sign language, or some combination for their non-vocal learners.

Let's look at the differences between the two forms of communication to help guide our choices in this very important area.

See Slide Below

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SELECTION-BASED AND TOPOGRAPHY-BASED VERBAL BEHAVIOR (cont.)

Topography-Based (sign)	Selection-Based (pointing, exchanging)
▪ Different motor movement for each controlling relation ▪ Example: the mand (sign) for candy requires a different topography (motor movement) than the mand (sign) for shoes	▪ The "speaker" makes virtually the same motor movement for each controlling relation (pointing, exchanging) ▪ Example: the mand (point, exchange) for candy requires the same topography (motor movement) as the mand (point, exchange) for shoes

This analysis leads to the conclusion that signing and talking are quite similar, while selection-based systems share very few characteristics with talking.

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- While there are substantial differences in TB and SB forms of verbal behavior the research literature contains support for the use of manual sign language, PECS and SGD to develop functional communication in children with autism
- In the next couple of slides there are recent research studies that have demonstrated these findings.

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Research in Developmental Disabilities

Speech-generating devices versus manual signing for children with developmental disabilities

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ABSTRACT

We compared speed of acquisition and preference for using a speech-generating device (SGD) versus manual signing (MS) as augmentative and alternative communication (AAC) options. Four children with developmental disabilities (DD), aged 5–10 years, were taught to request preferred objects using an iPod®-based SGD and MS. Intervention was introduced in a multiple-probe across participants design and SGD and MS conditions were compared in an alternating treatments design. A systematic choice-making paradigm was implemented to determine if the children showed a preference for using SGD or MS. All participants showed increased use of SGD when intervention was introduced, but only those learned under the MS condition. Three participants exhibited a preference for the SGD while the remaining participant demonstrated a preference for using MS. Results support previous studies showing that individuals with DD often show a preference for different AAC options and extend previous data by suggesting that acquisition and maintenance was better for the preferred option.

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Research in Autism Spectrum Disorders

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A further comparison of manual signing, picture exchange, and speech-generating devices as communication modes for children with autism spectrum disorders

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ABSTRACT

We compared acquisition of, and preference for, manual signing (MS), picture exchange (PE), and speech-generating devices (SGDs) in four children with autism spectrum disorders (ASD). Intervention was introduced across participants in a non-concurrent multiple-baseline design and acquisition of the three communication modes was compared in an alternating treatments design. Children's preference for using MS, PE or the SGD was also assessed. With intervention, all four participants learned to make specific requests using at least one of the three communication modes. The children also showed a preference for one mode. These results extend previous studies by demonstrating (in four new children with ASD) differential acquisition of, and idiosyncratic preferences for, three commonly used alternative communication modes. The present results further suggest faster acquisition and better maintenance with the preferred mode. We conclude that children's preferences for MS, PE, and SGDs should be considered when designing and implementing augmentative and alternative communication interventions.

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Research in Developmental Disabilities

Review article

Comparing communication systems for individuals with developmental disabilities: A review of single-case research studies

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ABSTRACT

Studies that have compared different communication systems for individuals with developmental disabilities were systematically reviewed in an effort to provide information useful for clinical decision making and directions for future research. Specifically, 28 studies that compared (a) non-electronic picture systems to speech generating devices, (b) aided AAC (e.g. picture exchange systems and SGDs) to unaided AAC systems (manual sign), or (c) AAC to speech-language interventions were included in this review. Dependent variables forming the basis for comparison included: (a) effectiveness (e.g. acquisition of systems and/or rate of use), (b) efficiency or rate of skill acquisition (c) participants' preference for systems, (d) occurrence of vocalizations and problem behavior, and (e) generalization across communication partners, settings, and time (i.e. maintenance). Results suggest that clear and consistent differences between communication systems are rare, precluding definitive statements regarding a universal best approach for all people with developmental disabilities. Instead, findings of this review support the consideration of an individual's existing skills, goals and preferences as part of the process of selecting an approach to communication.

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Research in Developmental Disabilities

Review article

Comparisons of intervention components within augmentative and alternative communication systems for individuals with developmental disabilities: A review of the literature

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ABSTRACT

Decisions regarding augmentative and alternative communication (AAC) for individuals with developmental disabilities (e.g. what AAC to use and how to teach a person to use a specific AAC modality) should involve consideration of different intervention component options. In an effort to elucidate such decisions and options, this review synthesized 14 studies, published between 2004 and 2012, comparing different AAC intervention components including different symbol sets, instructional strategies, or speech output within aided AAC systems, and different verbal operants within unaided AAC. Evidence supported the following: (a) different instructional strategies such as building motivation, using errorless learning, or adding video models to picture exchange interventions may improve the acquisition or rate of acquisition of picture exchange mands, (b) limited data supports training mimetic (imitated) or mand signs over tacts and (c) differences in symbol sets and speech output levels appeared to have little effect on AAC-based mand acquisition, but listener-based differences should be considered. These findings have implications for future research and clinical practice.

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Research Support for Teaching Manual Sign Language

- I have highlighted some additional support for the use of Manual Sign Language with children with autism because of the strong bias against this form of alternative communication in the practitioner ranks.
- First of all, here is sufficient empirical support to conclude that sign language along with PECS and SGDs can be an effective forms of alternative communication. (Gevarter, et al. 2013)
- There are several reports that conclude that the use of manual sign manding will produce a functional communication repertoire. (see Millar, Light, & Schlosser, 2006, Schlosser & Wendt, 2008a).
- Schlosser and Wendt (2008a) in their review chapter write:

  The available body of research on manual sign and gestures for children with autism reveals strong intervention effectiveness scores for symbol acquisition and production, as well as related outcomes such as speech comprehension and speech production. These results suggest that the use of manual signing gestures is a very effective communication option for children with autism. (p.370).

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Research in Developmental Disabilities 34 (2013) 4415–4432

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Comparing communication systems for individuals with developmental disabilities: A review of single-case research studies

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In the 2013 review of the literature, Gevarter, et al. found there were a total of 33 participant's responding across 10 studies. SGDs, PECS and MANUAL SIGN LANGUAGE were all effective. In support of manual sign they found that "… the use of manual sign is likely to be an effective and viable AAC system for many individuals with developmental disabilities"
(p.4428)

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CONSIDERATIONS IN CHOOSING ALTERNATIVE METHOD OF VERBAL BEHAVIOR

"The Big 5" (Esch, 2010)

- Fast
- Easy
- Cheap
- Effective
- Always accessible

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Three Additional Considerations

1. Efficiency- supports problem behavior reduction.
2. Ease of Acquisition
3. Development of Vocal Production

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EFFICIENCY OF THE RESPONSES

- An important consideration in choosing an augmentative form of communication is how efficient it is in replacing problem behavior.
- Several studies have examined the ease of acquisition and efficiency issues.
- On the issue of efficiency and response effort there is empirical support for the superiority of sign compared to visual symbol **systems in reducing problem behavior (Richman, et al. 2001). In addition, the learner almost always chose the sign over the symbol to replace problem behavior in this study.**
- A task analysis of the motor movements necessary to communicate with a symbol (i.e. scanning, selecting, placement on a Velcro strip) shows the difference in efficiency between SB and TB.

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JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2001, 34, 73–76 NUMBER 1 (SPRING 2001)

RESPONSE EFFICIENCY DURING FUNCTIONAL COMMUNICATION TRAINING: EFFECTS OF EFFORT ON RESPONSE ALLOCATION

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An analogue functional analysis revealed that the problem behavior of a young child with developmental delays was maintained by positive reinforcement. A concurrent-schedule procedure was then used to vary the amount of effort required to emit mands. Results suggested that response effort can be an important variable when developing effective functional communication training programs.

DESCRIPTORS: functional analysis, functional communication training, aggression, concurrent schedules, mands, developmental disabilities

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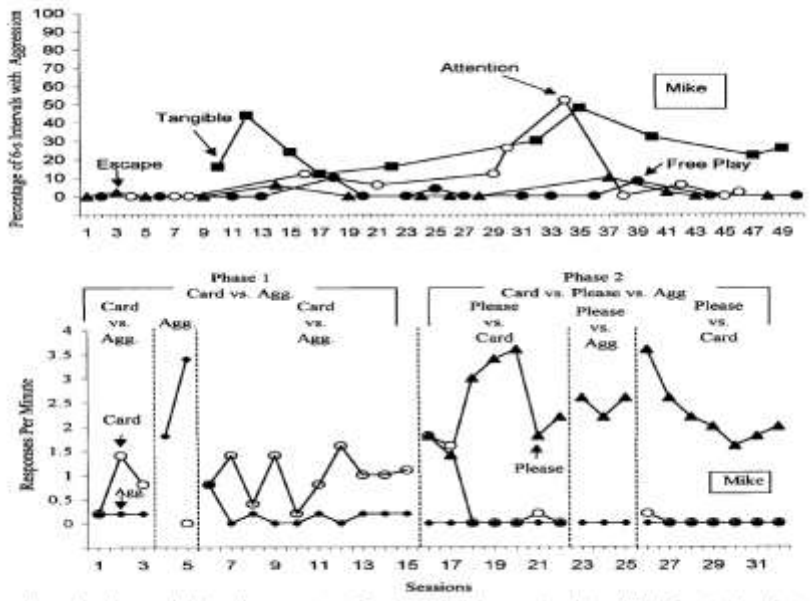

Figure 1. Top panel depicts the percentage of 6-s intervals with aggression during Mike's functional analysis. Bottom panel depicts responses per minute of aggression and manding (card or "please") during the mand analysis.

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NUMBER OF RESPONSES FOR TB & SB RESPONSES

Sign Mand for Water

MO ⟶ sign water **(1)** ⟶ receives water

Selection Based Mand for Water

MO ⟶ scans for book **(1)** ⟶ moves to book **(2)** ⟶ opens book **(3)** and scans to picture **(4)** ⟶ picks up picture **(5)** scans for strip **(6)** ⟶ places picture **(7)** ⟶ scans for "I want" ⟶ (8) selects "I want" **(9)** ⟶ places "I want" **(10)** ⟶ (9) gives strip to listener **(11)** ⟶ receives water

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Recent Research

- Two more recent studies found similar results demonstrating that the most efficient response based upon level of proficiency was emitted most often and was strongest in reducing problem behavior. (Ringdahl, et al. 2009; Winborn-Kemmerer, et al, 2010)
- When the sign was the most proficient it was emitted and when the picture was most proficient it was emitted

- **It can be difficult to ensure that the "speaker" always has the relevant symbols available.** And, when an item suddenly becomes effective as a reinforcer and the symbol is not available due to space limitations or other reasons an episode of problem behavior could occur.
- **In addition, the speed of the SB communication is generally slower compared to signing or talking. This may effect the stimulus control of the speaker (i.e. I forgot what I had to say while searching the symbol) or the stimulus control of the listener (i.e. no longer interested in what you have to say).**
- This may partially account for why persons with both SB and TB verbal repertoires will generally prefer to engage in TB responding given a capable audience.
- The SB response in general may be shorter due to time and effort limitations.

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EASE OF ACQUISITION

- The data in this area are mixed within studies that have compared SB and TB related to ease of acquisition. For an early review of research on this topic see Potter and Brown (1997).
- The studies reviewed by Potter & Brown all showed that persons with developmental disabilities acquired TB skills more quickly, with less errors, and developed receptive responses to the same stimuli while heir SB repertoires developed more slowly with more errors and less development of receptive responses.
- Conflicting data on efficiency has been presented by Adkins and Axelrod (2000) but there were some methodological flaws.
- Michael's conceptual behavioral analysis of the differences between SB and TB would suggest quicker acquisition rates with TB vs SB.
- This difference is partially related to the extra level of conditionality in the discrimination between SB and TB.

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DIAGRAMS OF THE METHODS OF COMMUNICATION

Topography-Based VB Diagram

1.MO/S^D ⟶ 2. R ⟶ 3. Sr^+

Selection-Based VB Diagram

1. MO/S^D ⟶ 2. scan response ⟶ 3. Sr^+ (finding the picture)

4. MO/S^D (seeing the picture) ⟶ 5. response (selection) ⟶ 6. Sr^+

An additional level of discrimination is required in SB verbal behavior.

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- In the case of SB there must always be two stimuli present, two responses, and a mediating scanning response between them. In the case of TB (sign) there need only be one stimulus present to produce a response while eliminating the need for a scanning response.
- Not only must two stimuli be present but a conditional relationship must be strengthened between the specific stimuli and some type of selection response. You only point to a picture of a cup when the presence of the picture makes it an S^D for selecting it while all other stimuli are S^Δ for the selection response. This is a very difficult discrimination to learn and is not required when teaching signing.
- A study by Grow, et al. (2011) documented this finding.

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JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2011, **44**, 475–498 NUMBER 3 (FALL 2011)

A COMPARISON OF METHODS FOR TEACHING RECEPTIVE LABELING TO CHILDREN WITH AUTISM SPECTRUM DISORDERS

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Many early intervention curricular manuals recommend teaching auditory-visual conditional discriminations (i.e., receptive labeling) using the simple-conditional method in which component simple discriminations are taught in isolation and in the presence of a distracter stimulus before the learner is required to respond conditionally. Some have argued that this procedure might be susceptible to faulty stimulus control such as stimulus overselectivity (Green, 2001). Consequently, there has been a call for the use of alternative teaching procedures such as the conditional-only method, which involves conditional discrimination training from the onset of intervention. The purpose of the present study was to compare the simple-conditional and conditional-only methods for teaching receptive labeling to 3 young children diagnosed with autism spectrum disorders. The data indicated that the conditional-only method was a more reliable and efficient teaching procedure. In addition, several error patterns emerged during training using the simple-conditional method. The implications of the results with respect to current teaching practices in early intervention programs are discussed.

Key words: autism, conditional discrimination training, early intervention, receptive labeling, stimulus control

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The Analysis of Verbal Behavior 2013, **29**, 59–69

Comparing Acquisition of Exchange-Based and Signed Mands With Children With Autism

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Therapists and educators frequently teach alternative-communication systems, such as picture exchanges or manual signs, to individuals with developmental disabilities who present with expressive language deficits. Michael (1985) recommended a taxonomy for alternative communication systems that differentiated between selection-based systems in which each response is topographically identical (e.g., card selection and exchange systems) and topography-based systems in which each response is topographically distinct (e.g., signed language). We compared the efficiency of training picture exchanges and signs with 3 participants who presented with severe language deficits; all participants acquired the picture-exchange responses more readily.

Key words: autism, mands, picture exchanges, selection-based communication, signs, topography-based communication, verbal behavior

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- A more recent review of the research literature suggests that the earlier work seemed to demonstrate that tacts and intraverbals were more easily acquired with TB methods and that the more recent research suggests mands are more easily acquired using SB methods such as PECS (Barlow, Tiger, Slocum, & Miller, 2013).

- The later studies (Chambers & Rehfeldt, 2003; Gregory, DeLeon, & Richman, 2009; Tincani,2004; Ziomek & Rehfeldt, 2008) that concluded exchanged based methods was acquired more easily were all plagued with the same methodological flaw related to presenting one single picture stimulus therefore precluding responding within a conditional discrimination arrangement. This will favor quicker acquisition of exchanged based methods over sign.

- An attempt at a more rigorous study by Barlow, et al. (2013), also reported that exchanged based methods may be more easily acquired by some children with autism. All three participants showed acquisition patterns similar to those presented on the following slide.

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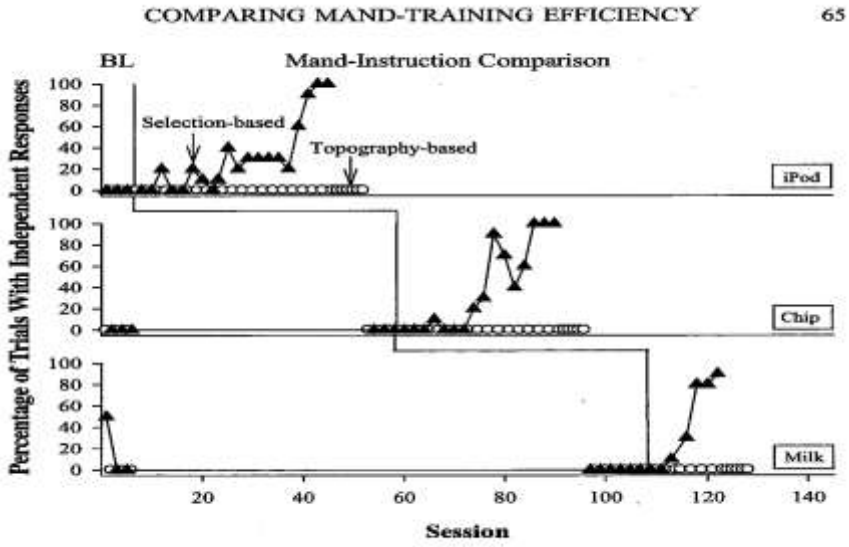

Figure 1. The percentage of trials Joey engaged in independent selection-based (SB) and topography-based (TB) mands across the iPod, Chip, and Milk.

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• Barlow et al. (2013) attempted to control for the failure to program a conditional discrimination from the start of the study. In other words, the presentation of only one stimulus during the SB sessions would strongly favor quicker acquisition initially of SB responding.

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- While Barlow, et al. (2013) attempted to control for the level of conditionality however they actually failed to do so.

[redacted] It is worth noting too that during their exchange-based training, the authors initially presented only a single card but gradually increased the comparison array to four cards.

(Barlow, et al., 2013, p.61

[redacted] (c) we presented the target picture cards in a three-card array to account for the challenges associated with acquiring a SB repertoire from the onset of SB instruction.

During SB-baseline sessions, we presented the target card and two other comparison cards in a horizontal array on a table in front of the participant. We alternated the position order of these cards randomly across trials. The comparison cards consisted of images of items that would not be targeted for mand-instruction during the course of the study.[redacted]

(Barlow, et al., 2013, p.63)

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- In presenting an array of 3 stimuli to select in the PECS treatment sessions they always presented distractors that were never taught as mands.
- The children then learned to always choose the one they have chosen previously even when the MO may have been for a different item. You can not conclude there was correspondence between the MO and item selected.

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This is not a true discrimination since the targeted items were only available when the participant wanted them and never available when the participant wanted something else (didn't want them) therefore precluding a conditional discrimination

Consequently, the findings in favor of exchanged based methods may have been skewed by the ease of acquisition associated with a simpler discrimination established by the researchers and not a true difference between sign and PECs.

See Next Slide

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TABLE 1
Examples of Balanced Three-Choice Match-to-Sample Trials

Samples	Comparisons: Left	Center	Right
	Conditional Identity MTS (pictures)		
Pictures		*Pictures*	
spoon	spoon	knife	fork
fork	knife	fork	spoon
knife	fork	spoon	knife
	Arbitrary MTS (visual–visual)		
Objects		*Pictures*	
spoon	knife	fork	spoon
fork	fork	spoon	knife
knife	spoon	knife	fork
	Arbitrary MTS (auditory-visual)		
Spoken words		*Objects*	
"spoon"	fork	spoon	knife
"fork"	spoon	knife	fork
"knife"	knife	fork	spoon

Note. MTS = match-to-sample.

FOCUS ON AUTISM AND OTHER DEVELOPMENTAL DISABILITIES
VOLUME 16, NUMBER 2, SUMMER 2001

Behavior Analytic Instruction for Learners with Autism:
Advances in Stimulus Control Technology

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- One final point, none of the participants in the Barlow study had imitative responding in their repertoires and **more importantly, sign responses necessary for a correct score may have been too difficult**. For example the required sign for chip for a 2 year old with autism, Joey, was the " …presentation of one hand, palm facing up and thein a "c" formation with at least 2.5 cm between the thumb and the other four fingers, the hand in the "c" formation had to move across the palm of the bottom hand at least one time". (p.62) The authors cite this as a possible limitation of the study.

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JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2009, 42, 399–404 NUMBER 2 (SUMMER 2009)

THE INFLUENCE OF MATCHING AND MOTOR-IMITATION ABILITIES ON RAPID ACQUISITION OF MANUAL SIGNS AND EXCHANGE-BASED COMMUNICATIVE RESPONSES

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Establishing a relation between existing skills and acquisition of communicative responses may be useful in guiding selection of alternative communication systems. Matching and motor-imitation skills were assessed for 6 children with developmental disabilities, followed by training to request the same set of preferred items using exchange-based communication and manual signs. Three participants displayed both skills and rapidly acquired both communicative response forms. Three others displayed neither skill; 1 mastered exchange-based responses but not manual signs, and neither of the other 2 easily acquired either response form.

DESCRIPTORS: alternative and augmentative communication, autism, matching to sample, motor imitation

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Gregory, et al (2009)

- Finally, on the issue of ease of acquisition, it appears that pre-requisite skills may play a role on the ease of acquisition.
- Gregory, et al, 2009, found that children who exhibited strong motor imitation and matching skills acquire both PECS and sign very effectively
- Children without these skills had difficulty in acquiring either communication method.

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- **Other issues comparing manual sign language and PECS are listed below.**
- It is not possible to teach truly spontaneous manding solely under the control of just the motivation using SB methods. Because the picture or symbol must always be present to produce the mand response, it is always multiply controlled and therefore spontaneous manding is never achieved.
- Within SB verbal behavior systems it becomes difficult to develop symbols that effectively control the behavior of the "speaker" and listener as the concepts become more complex. This may reduce speed of acquisition and limit number of responses that can be acquired (i.e. symbol for beautiful, help).
- TB verbal behavior may allow for a greater number of opportunities to communicate since additional environmental supports are not necessary. This may mean that you can acquire communication responses in more environments and more often (e.g. swimming pool, bed, bathroom, picnic, on a swing, on play equipment).

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- Contriving incidental teaching opportunities and capturing communication opportunities during active play is an important program component for children with autism. The effort and equipment needed to communicate with symbol systems (SB) during these activities limit the number and quality of communication responses that can be taught when motivation for verbal behavior may be the strongest.
- Since there is no actual verbal community of SB responders and teachers generally do not use pictures and the spoken word while teaching, there are no models for the learner to benefit from through simultaneous observation of picture communication paired with reinforcement.
- Some verbal responses are learned by hearing the words or seeing the signs of others when paired with reinforcement during enjoyable activities. If a teacher signs while singing a reinforcing song, the signs may begin to acquire some control over the signs of the child when fill-in opportunities are provided.

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Functional Communication and Preference for Method

1. Manual sign language, PECS and use of the iPad as a SGD all produce functional communication with children with autism. (Van De Meer, Didden, et al. 2012;Van der Meer, Kagohara, 2012; Van der Meer Sutherland, et al, 2012.)

2. In addition it appears that preference assessments demonstrated that most children prefer to use SGDs over PECS.

3. Preference assessments have also demonstrated a strong preference for SGD over MANUAL SIGN LANGUAGE.

4. The learner preferences may be an artifact of the preference assessment procedure and not the actual preference of the individual.

5. Recent reviews of the literature suggested that 10 participants preferred SGDs and PECs compared to only 1 participant choosing sign.

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Research in Developmental Disabilities

Review article

Assessing preferences for AAC options in communication interventions for individuals with developmental disabilities: A review of the literature

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Self-determination

ABSTRACT

We synthesized studies that assessed preference for using different augmentative and alternative communication (AAC) options. Studies were identified via systematic searches of electronic databases, journals, and reference lists. Studies were evaluated in terms of: (a) participants, (b) setting, (c) communication options assessed, (d) design, (e) communication skill(s) taught to the participant, (f) intervention procedures, (g) outcomes of the intervention and outcome of the preference assessment, (h) follow-up and generalization, and (i) reliability of data collection and treatment integrity. Seven studies, involving 12 participants, met the inclusion criteria. In these studies, individuals were taught to use either speech-generating devices (SGD), (b) picture exchange (PE) systems, and/or (c) manual signs. Assessments to identify preferences for using each AAC option were conducted in each study. Sixty-seven percent (n = 8) of participants demonstrated some degree (≥55%) of preference for using SGD compared to 33% (n = 4) of participants who demonstrated some degree (≥55%) of preference for PE. The results indicate that individuals with developmental disabilities often show a preference for different AAC options. Incorporating an assessment of such preferences might therefore enable individuals to exert some degree of self-determination with respect to AAC intervention.

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2.9.4. *AAC preference assessments*

These assessments were undertaken to determine if participants would show a preference for using one of the two AAC options. These assessments occurred after every eighth session (i.e., after four MS and four SGD sessions) on average. This number varied slightly because these assessments had to occur before the first session for the day to prevent sequence effects (selecting the AAC option that was taught last; Sigafoos et al., 2005), as well as to ensure that at least two such preference assessments were undertaken during intervention for each participant.

During a preference assessment, the trainer presented the MS option on one side of the table and the SGD option on the other side of the table (alternated across sessions to control for choice being made dependent on location of the AAC option). The trainer asked the participant: *Which communication option would you like to use? Sign language on this side* (while pointing), *or the SGD on this side* (while pointing)? The trainer initiated one requesting opportunity with the chosen AAC option before reverting back to initiating requesting opportunities with the AAC device that was being used for that session. Choice for an AAC option was defined as physically pointing to, touching, or picking up the selected communication option. If the child did not choose an option within 10 s, the device preference assessment was terminated and training continued with the AAC option that was scheduled for use in that session.

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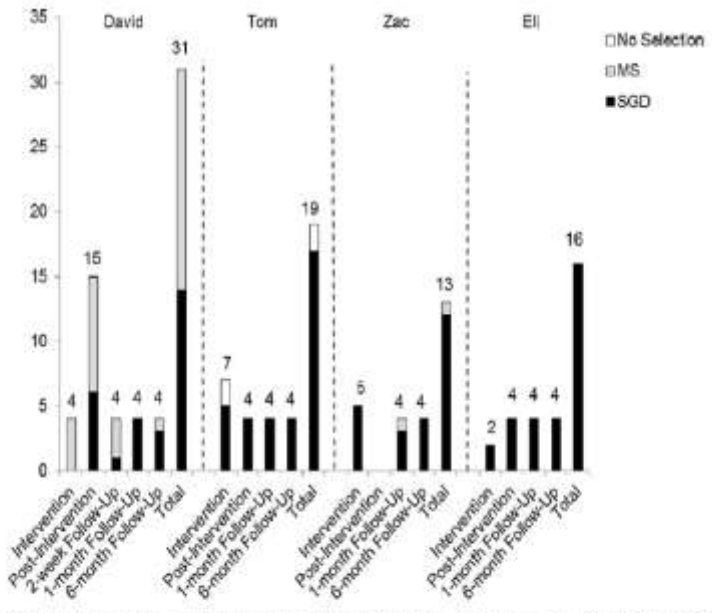

Fig. 2. Results from the device preference assessment probes depicting the number of times each communication option (SGD and MS) was chosen and number of times a device was not chosen (no selection) across each phase of the study for each participant.

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J Dev Phys Disabil (2012) 24:451–468
DOI 10.1007/s10882-012-9283-3

ORIGINAL ARTICLE

Comparing Three Augmentative and Alternative Communication Modes for Children with Developmental Disabilities

Larah van der Meer · Robert Didden · Dean Sutherland · Mark F. O'Reilly · Giulio E. Lancioni · Jeff Sigafoos

Published online: 8 May 2012

Abstract We compared acquisition, maintenance, and preference for three AAC modes in four children with developmental disabilities (DD). Children were taught to make general requests for preferred items (snacks or play) using a speech-generating device (SGD), picture-exchange (PE), and manual signs (MS). The effects of intervention were evaluated in a multiple-probe across participants and alternating-treatments design. Preference probes were also conducted to determine if children would choose one AAC mode more frequently than the others. During intervention, all four children learned to request using PE and the SGD, but only two also reached criteria with MS. For the AAC preference assessments, three participants chose the SGD most frequently, while the other participant chose PE most frequently. The results suggest that children's preference for different AAC modes can be assessed

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AAC Preference Assessments These assessments were undertaken to determine if participants would show a preference for using one of the three AAC options. They were undertaken after every sixth intervention session (i.e., after two sessions for each AAC option). During each preference assessment, the SGD, PE, and MS options were presented (randomly) at different positions on the table. While pointing to each option, the trainer asked the participant: *Which communication option would you like to use? The SGD, PE, or MS?* The child had 10 s in which to make a choice by touching one of the options. Once a choice was made, the trainer initiated one requesting opportunity with the chosen AAC option before reverting back to initiating requesting opportunities with the AAC device that was scheduled to be used for the session. If the child did not choose an option within 10 s, the device preference assessment was terminated and training continued with the AAC option that was scheduled for use in that session.

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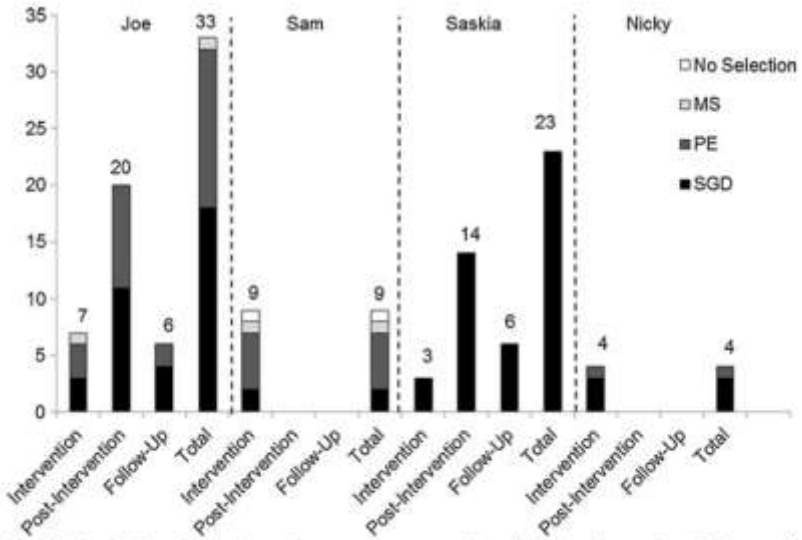

Fig. 2 Results from the device preference assessment probes depicting the number of times each communication option (SGD, PE, and MS) was chosen and the number of time a device was not chosen (No Selection) across each phase of the study for each participant

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How To Teach The Sign Mand

- Get the best quality response with the least amount of prompting.
- Practice teaching mands so that your are skilled in how and when to reinforce, what approximations to accept, what level of prompt to provide, and how to fade the prompts as quickly as possible.
- Consistency in methods across trainers is essential, and numerous trials are necessary to promote generalization.
- An orderly and progressive curriculum must be in place.
- The practical steps to teaching mands, once the MO has been established, include stimulus control transfer procedures. The quick transfer procedure for teaching the mand, as recommended by Sundberg and Partington (1998), includes the following steps:

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Stimulus Control Transfer Procedures

Sign Manding

- MO
- Physical Prompt
- Gestural Prompt
- Echoic Prompt
- Item

Fade All

- FADE ALL TO MO + Audience

Teaching a Functional Verbal Repertoire with Sign Manding

Sign Videos---Kyle Case Study Olumide Case Study

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Recent Research on SGDs

- Still et al. (2014) conducted a systematic review of the use of "high tech" devices to teach communication skills to children with autism.
- Their review included studies between 1998 – 2013
- The types of devices included were: iPad, BIGmack switch, Cheap Talk 4 in line direct VOCA, Touch Talk Direct VOCA, Cheap Talk VOCA, Blackhawk, Introtalker SGD, Pick a Word, Tech/Talk,6X8, Vantage, Logan Pox Talker, Talk-Trac Wearable.
- The general finding was that each of these devices can be used by children with autism to increase their mand repertoires.

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Research in Autism Spectrum Disorders 8 (2014) 1184–1195

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Review

Facilitating requesting skills using high-tech augmentative and alternative communication devices with individuals with autism spectrum disorders: A systematic review

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ABSTRACT

We conducted a systematic review to identify research studies that utilised high-tech devices (e.g., smartphone technology) to teach functional requesting skills to individuals under the age of 16 with a diagnosis of autism spectrum disorder (ASD). We identified 16 studies that included a total of 46 participants. Speech generating devices were the most frequently employed mode of communication, the most frequently requested items were preferred food or toys, and the maximum number of target-requesting skills taught was eight. Research has tended to utilise the multiple baseline design or a variant thereof (e.g., a multiple-probe design). Overall, the intervention results were largely positive, suggesting that high-tech devices can be successfully implemented as augmentative and alternative communication (AAC) devices for individuals with autism. Further research is needed to evaluate the claims made about high-tech AAC devices in facilitating requesting skills in children with ASD.

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- They selected for discussion only high tech devices because of their concerns with PECs as a selection-based modality.

- They identified several problems with PECs that should direct a teacher to using a high tech device instead.

- Their criticisms of PECs were:

i. PECs is time and labor intensive
ii. "represents a significant practical challenge for parents and practitioners" p.1185
iii. Device must be available and not forgotten
iv. Preparation includesSelection ofobjects and taking photos
v. Print, laminate, cut and apply velcro
vi. Considerable amount of time to do the above
vii. Young children can't help with all this do to dangerous materials
viii. "…independence achieved by learning to communicate via the PECs is tempered somewhat by the set up and operation requirements of the system (p.1185)
ix. Current SGD can be much smaller than a PECS book.

- The authors therefore conclude that the recent development of many high tech devices should be considered as a selection based alternative to PECS.

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- These authors also presented several disadvantages of the use of Manual Sign Language and concluded that the advent of smaller and more complex high tech alternatives may be the most effective alternative form of communication
- The smaller size of the these devices in recent years and the larger storage available have made them a potentially worthwhile communication method for children with autism.
- There were 16 studies in the review and 4 included use of the Ipad.
- There was a total of about 50 subjects between the ages of 4 and 27.
- Three of the studies compared the use of manual sign language to a SGD.
- The general findings were that sign language was acquired along with the SGD.
- The largest number of responses taught in any one study was eight (8) and some only taught one (1) mand.
- The trainers in the studies included parents, teachers, researchers and even typical children who instructed children with autism.

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- The instructional methods to teach the skills were not thoroughly described.
- They mostly described the prompt and prompt fade procedures, e.g. least to most or most to least.
- Generally, reinforcers were identified through preference assessments at the start of the treatment session.
- There was no control for the moment to moment changes in MOs throughout the sessions except in a couple of studies in which a grab response for an item alerted the trainer to the MO for a specific item.
- In most cases however, it was impossible to know if an MO for the "requested" item was in place at the time that the response occurred.

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Teaching Manding with SGDs

paper

- Teaching the mand relations with a SGD can be a very difficult and a complicated process.
- Issues that require attention are:

i. Insuring the relevant MO is established .

ii. prompting and prompt fading,

iii. Insuring a conditional discrimination which entails number of pictures displayed simultaneously and insuring that the pictures displayed are also those being taught so that each picture acts as both and S^D and S-Delta across trials. (See next slide)

iv. position of the picture to avoid placement bias

v. backward chaining of multiple screens with categories

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- Here is an example of procedures that are frequently used during the teaching of mands with SGDs.

TEACHING WITHOUT CONDITIONAL DISCRIMINATION

To begin a session, the experimenter placed each of the four objects assigned to a condition (i.e., SPEECH, NO-SPEECH) individually and successively on a table in front of the participant, and said "Let me know if you want (name of object)"

TEACHING WITHOUT MO CHECK

After offering one object item and saying "Let me know if you want ——— [name of object]," the experimenter immediately (0-s delay) prompted a response, consistent with the simultaneous prompting technique (Schuster, Griffen, &

Failure to consider these issues will lead to difficulties in acquiring a mand repertoire although it will appear as though it has been acquired.

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TABLE 1
Examples of Balanced Three-Choice Match-to-Sample Trials

Samples	Comparisons: Left	Center	Right
	Conditional Identity MTS (pictures)		
Pictures		*Pictures*	
spoon	spoon	knife	fork
fork	knife	fork	spoon
knife	fork	spoon	knife
	Arbitrary MTS (visual–visual)		
Objects		*Pictures*	
spoon	knife	fork	spoon
fork	fork	spoon	knife
knife	spoon	knife	fork
	Arbitrary MTS (auditory-visual)		
Spoken words		*Objects*	
"spoon"	fork	spoon	knife
"fork"	spoon	knife	fork
"knife"	knife	fork	spoon

Note. MTS = match-to-sample.

FOCUS ON AUTISM AND OTHER DEVELOPMENTAL DISABILITIES
VOLUME 16, NUMBER 2, SUMMER 2001

- What follows is a description of the how a mand repertoire was taught using an iPad and Proloquo 2 as a SGD.
- My impression is that this is a very common method for teaching manding using SGDs.
- The participants were three children with autism, ages 3, 4 and 5 years old. Two of the three had echoic repertoires with one to three word utterances and the third produced only sounds.
- Many studies use a modified PECS training protocol developed by Bondy and Frost

Below is the display of the pictures of the iPad during each phase of the experiment to teaching manding with a SGD.

Table 3
Visual representation of the iPad screen for all phases.

Baseline probes	I want (_____) I want Gummy	 Book Spin toy
Phase 1	Blank icon Blank icon	Cookie Blank icon
Phase 2	Playdoh Blank icon	Blank icon Blank icon
Phase 3a	Blank icon Blank icon	Cat (preferred item) Tissue (nonpreferred item)
Phase 3b	Snail Sing book	Noise stick Slinky
Phase 4	I want (_____) I want Elmo phone	 Camera Snail

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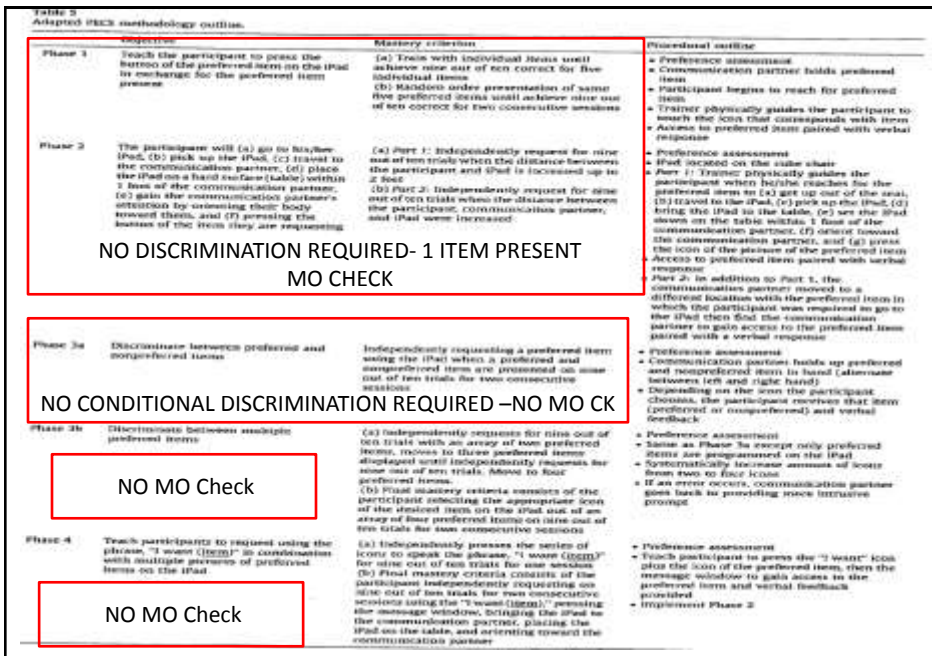

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- Here is what they did and the problems associated with these procedures:

1. They conducted preference assessments to determine items that might act as reinforcers during the study.
2. They did a check for MO in phases 1 and 2 but not in phases 3, 3a and 4. The authors rotated the position of the items every 5 trials.
3. In all phases they displayed the items in their hands or on a table in front of the individual.
4. In phase 1 they presented preferred items in isolation with blank "buttons" for 3 other items.
5. In phase 2 they added "traveling" to get the iPad with the same array containing only 1 preferred item.
6. This arrangement denied the opportunity to develop a conditional discrimination in phases 1 and 2 and therefore it is unclear if the response was under the control of the MO and the sight of that particular picture or merely the presence of a picture that had been correlated with reinforcement for selecting.

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7. In phase 3a they presented a preferred item in one hand and an unpreferred item in the other hand and rotated the hands. The iPad display included the preferred item and the unpreferred item (tissue) and 3 blank buttons and NO MO check was required.
8. Since the children only had a history of choosing the preferred item it is unclear if the responses to the picture of the preferred item was under the control of the MO and the particular picture or just a default response to previously selected pictures. Moreover, there was no check for an MO.
9. In phase 3b the children were required to choose among 4 preferred items. Only 2 of the 3 children met mastery criteria.
10. It is unclear if there was an MO for the item represented by the picture and therefore it is unclear if the response was a mand for the item.
11. None of the children mastered level 4 which included the use of the "I want" phrase.

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- Finally, the reported increase in vocalizations was attributed to the SGD without regard for the more likely controlling variables of the MO and SSP of receipt of preferred item and hearing the name of the item when a reinforcer was delivered. Moreover, the children engaged in echoic responses which probably facilitated the vocal productions.

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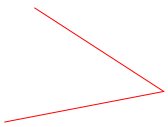
Teaching SGDs

- MO
- Physical Prompt
- Gestural Prompt
- Echoic Prompt



Fade All

FADE ALL to MO + Audience

SGD Videos

Protocol # 1

Protocol # 2

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DEVELOPMENT OF VOCALIZATIONS

- Vocal verbal behavior is the most desirable form of communication and therefore should be at least one of the goals to be achieved by augmentative communication.
- **The research literature suggests that some children with autism may develop vocal verbal behavior with both SB and TB methods. However, manual sign language has shown some superiority over selection based methods.** (Tincanci, 2004; Anderson, 2002; Curtis, 2012)
- Gevarter et al. (2013) wrote "In support of Tincani's suggestive finding, that two participants vocalized more often or consistently with sign than with PECS, Curtis (2012) found that while 3 participants had little to no vocalizations, there was preponderant evidence that one participant who mastered both sign and PECS used vocalization more often with sign than PECS".
- There appear to be both learner characteristics and instructional variables that account for the development of vocal responding in some children with autism.
- The learner characteristics necessary for the development of vocal responding **appear to be related to the development of at least a minimal echoic repertoire. Children who do not develop this repertoire are less likely to become vocal regardless of the method of instruction.**

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- **The limited TB-based literature (sign language) shows greater support for the development of vocalizations although SB verbal behavior methods (PECS and SAL) have successfully engendered vocal verbal behavior.**
- It appears that regardless of the method, learners with some echoic skill may develop vocalizations if the instruction focuses initially upon intensive mand training, which takes advantage of the effects of strong reinforcement, along with stimulus-stimulus pairing of spoken words with delivery of the reinforcer. When vocal responses are also shaped as they develop, vocalizing is enhanced. These may be the contributing independent variables separate from the SB or TB method.
- TB sign language may have some advantage over SB in developing vocalizations with some children with autism.
- **It appears that the different motor movements associated with each sign and the point to point correspondence between the motor movements and the response product (what is seen) for each sign may facilitate both the development of the sign repertoire and the development of vocalizations. The unique motor movement associated with each sign may act as a built in prompt for the vocalization.**
- Through sign training, a more sophisticated motor imitative repertoire may be developed and in turn this newly acquired repertoire may facilitate the development of improved vocal imitation.

Sign Vocalization Videos VIDEO

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Comparing the Picture Exchange Communication System and Sign Language Training for Children with Autism

Matt Tincani

This study compared the effects of Picture Exchange Communication System (PECS) and sign language training on the acquisition of mands (requests for preferred items) of students with autism. The study also examined the differential effects of each modality on students' acquisition of vocal behavior. Participants were two elementary school students with autism enrolled in a suburban public school. Training sessions involved presentations of preferred items, prompting and prompt fading procedures. Probes were conducted to evaluate the generalization of learned mands to classroom teachers. For one participant, sign language training produced a higher percentage of independent mands. PECS training produced a higher percentage of independent mands for the other participant. For both participants, sign language training produced a higher percentage of vocalizations during training. Mands learned with the augmentative generalized to classroom teachers. The results of the study suggest that acquisition of picture exchange and sign language may vary as a function of individual student characteristics, specifically, motor imitation skills prior to intervention. However, further research is needed to determine the optimal procedures for teaching both modalities to students with communication difficulties.

Speech deficits are common in children with autism (American Psychiatric Association, 2000). Approximately 50% of children diagnosed with autism will remain functionally mute in adulthood (Parsons & Gillberg, 1989). Even with early intensive intervention including speech instruction, some children may fail to acquire useful speech (e.g., Lovaas, 1987). Training in augmentative and alternative communication (AAC) is an option for children with autism who do not readily learn speech. Two AAC modalities, sign language and picture exchange, show promise for teaching communication to nonvocal learners.

In sign language training, children may be taught to mand or request preferred items, engage in conversation, and emit verbal behavior under the control of various stimulus conditions (cf. Sundberg & Partington, 1998). Although there has been little recent research on sign language intervention for children with autism, there is evidence that simultaneous communication training in teaching signs and speech produces favorable communication outcomes for children with autism and other developmental disabilities (e.g., Brady & Smouse, 1978; Konstantareas, 1984; Layton & Baker, 1981). The Picture Exchange Communication System (PECS; Bondy & Frost, 2002), a popular picture exchange system used primarily for children with autism (National Research Council, 2001), teaches children to exchange picture symbols to mand and tact items, among other functions. Initial studies suggest that most children taught PECS acquire independent use of the system, and many even acquire functional speech (Bondy & Frost, 1994; Charlop-Christy et al., 2002; Schwartz, Garfinkle, & Bauer, 1998).

Given the positive reported outcomes for each modality, choosing between sign language and PECS may be difficult. Although some have argued for the benefits of teaching one AAC system over others (e.g., Sundberg & Partington, 1998), it is unlikely that any single system best meets the diverse needs of all children with autism and multiple disabilities. A number of factors, including cognitive and motor abilities, may influence a child's acquisition of an AAC system (Bondfilan & Blackburn, 1991). Four comparison studies of sign language and picture-based systems, described below, have yielded mixed and unclear evidence about the advantages and disadvantages of each system.

Hodgdon and Schwartzkin (1984) taught 52 nonvocal children with mental retardation sign language and two types of picture-based systems. In the sign lan-

FOCUS ON AUTISM AND OTHER DEVELOPMENTAL DISABILITIES
VOLUME 19, NUMBER 3, FALL 2004
PAGES 159–163

Tinacani, 2004

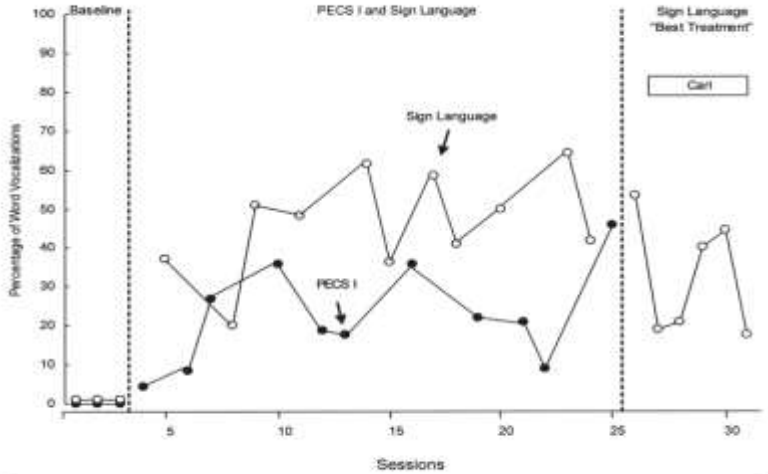

FIGURE 5. Percentage of word vocalizations in baseline and training conditions for Carl.

Tincani, 2004

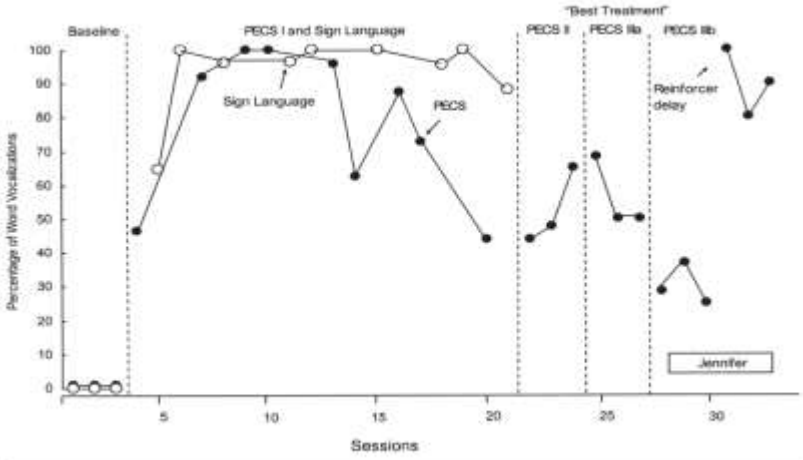

FIGURE 6. Percentage of word vocalizations in baseline and training conditions for Jennifer.

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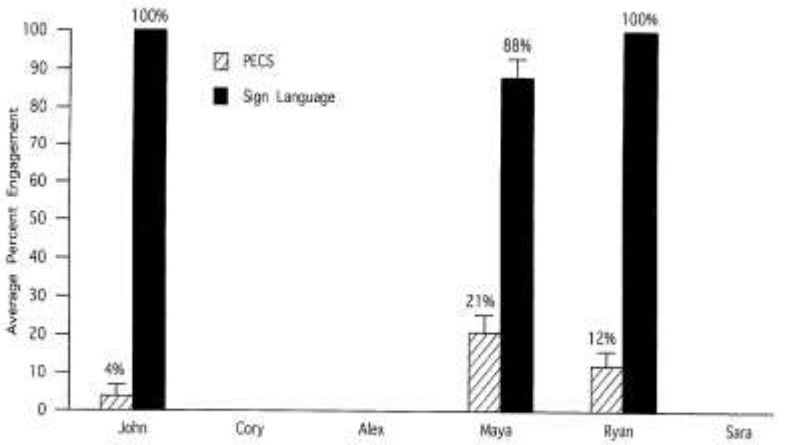

Figure 50: Average percent engagement in vocalization during correct responding at post-treatment across participants in the PECS and sign language conditions.

Anderson, A. (2001) Augmentative Communication and Autism: A Comparison of Sign Language and Picture Exchange Communication System, Dissertation Abstracts.

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- On the next few slides is a study our clinic published related to speech production and application of manual sign.
- In this study the learner was vocal in that she had a strong echoic repertoire but failed to acquire and maintain vocalizations in mainly the tact repertoire.
- When sign was added to the her repertoire a substantial improvement in the frequency of vocal productions occurred as displayed on the data sets on the next few slides.

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SLP- ABA Volume 1, No. 3, 2006

A Comparison of Two Approaches for Teaching VB Functions: Total Communication vs. Vocal-Alone

Vincent J. Carbone, Lisa Lewis, Emily J. Sweeney-Kerwin, Julie Dixon, Rose Louden and Susan Quinn

Abstract

Total communication (TC) involves the use of manual signs with their corresponding spoken words simultaneously; and research indicates that TC facilitates vocal responding by children with autism. However, most of this previous research was conducted 20 years ago and did not consider vocal responding in relation to verbal behavior functions (Skinner, 1957). The present study used an alternating treatment design to compare the effects of TC vs. vocal-alone (VA) training on the vocal tact responses of a child with autism. Results indicated that the child produced nearly four times as many vocal tact responses during TC training than during VA training in less than half the number of teaching trials. The use of manual sign training is considered in relation to its advantages for supporting the production of vocal responses.

Keywords: verbal behavior, sign language, tact, autism, total communication.

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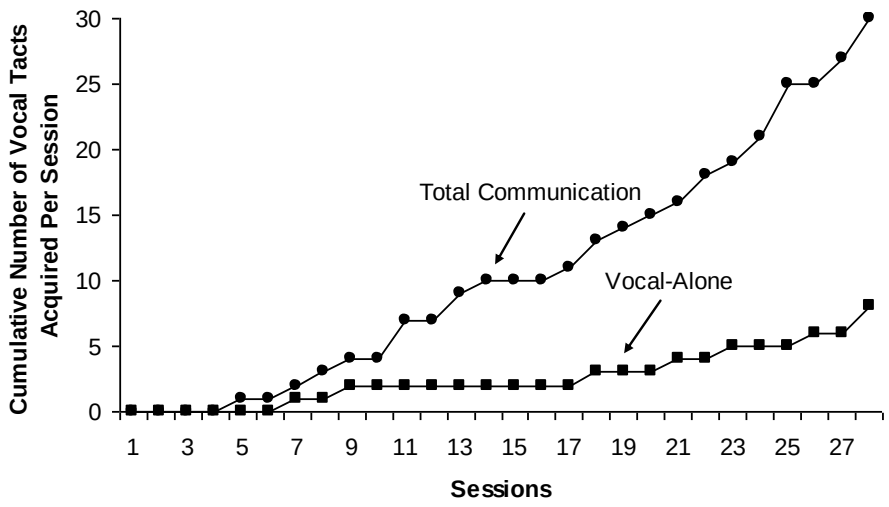

Figure 1. Cumulative number of vocal tacts acquired in the total communication condition and vocal-alone condition per session.

Carbone, V. J. (2006)

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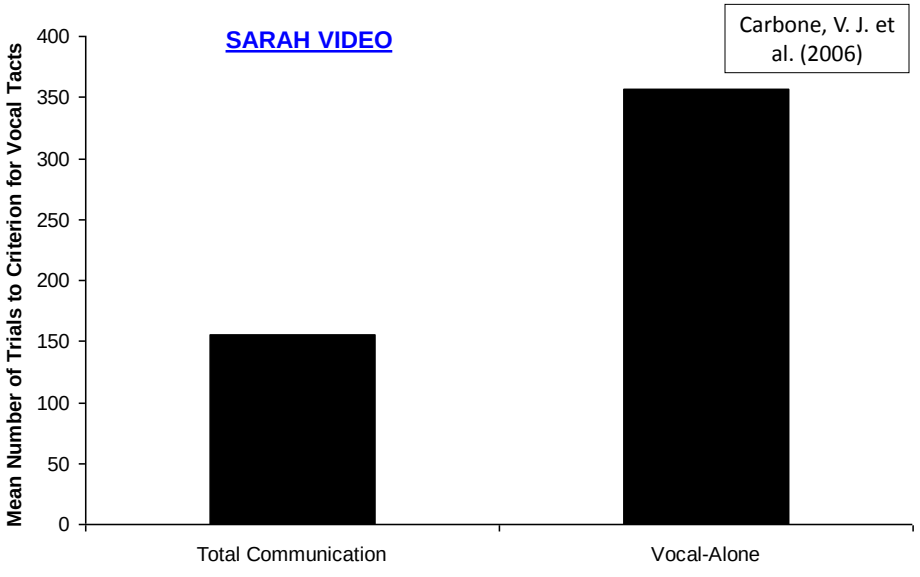

Figure 2. The mean number of trials to criterion for vocal tacts in the total communication condition and vocal-alone condition.

Sign Vocalization Videos

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EUROPEAN JOURNAL OF BEHAVIOR ANALYSIS 2009, **10**, 275 - 282 NUMBER 2 (WINTER 2009)

Brief report: an evaluation of total communication vs vocal alone for teaching tacts

Beverley Ann Jones[1], J. Carl Hughes[1], and Bethan Mair Williams[1, 2]
Wales Centre for Behaviour Analysis, School of Psychology, Bangor University, Wales[1]
and Betsi Cadwaladr University Health Board[2]

Total Communication (TC) and Vocal Alone (VA) are two teaching approaches used to facilitate vocal responding with children with language delays and autism. TC involves the simultaneous use of the manual sign and the spoken word. VA involves the use of the spoken word only. This single subject study aimed to compare the two approaches using an alternating treatment design to find which condition produced the most effective acquisition rate of vocal tacts for an echolalic child with autism. We also examined the effect of condition on speech articulation on targeted items and the child's listener behaviour (selection) following tact only (speaker) training. An in depth phonological assessment was carried out pre test and the subject's vocal utterances phonetically transcribed over the course of the study by a speech and language therapist (SALT). Results indicated that the TC condition produced six times more vocal tacts than the VA condition; results from the listener behaviour tests showed the subject was able to respond appropriately when given both the vocal and sign, but not with the vocal stimulus alone. The phonetic transcription yielded inconclusive results but indicated ways that such information could be used more effectively in future research.

Keywords: Total Communication, Vocal Alone, tact, autism, articulation, listener behaviour.

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Discussion

In the present study, Jim acquired six times more vocal tacts in the TC condition compared to the VA condition. These results support the findings of Carbone et al. (2006) in that TC is a more effective training condition to teach vocal tacts. Although the overall number of acquired targets was relatively low in both conditions, this emphasises the difficulty that some children lacking these repertoires have in acquiring verbal behaviour.

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Journal homepage: http://ees.elsevier.com/RASD/default.asp

Review

Spontaneous communication in autism spectrum disorder: A review of topographies and interventions

Cormac Duffy, Olive Healy *

National University of Ireland, Galway, Ireland

. In spite of some of the criticisms of signing and "total communication", studies comparing the effects of teaching expressive language using speech, signing, or "total communication" report that signing or "total communication" training often results in quicker and more complete learning than speech training alone for many participants (Carbone et al., 2006; Yoder & Layton, 1988). Carbone et al. (2006) compared the effects of "total communication" and speech alone training on labelling responses of a child with autism. Significant differences in terms of the effectiveness of the two training conditions were reported, whereby the child produced over three times as many comments during "total communication" training relative to speech alone training.

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References

Carbone, V. J., Lewis, L., Sweeney-Kerwin, E. J., Dixon, J., Louden, R., & Quinn, S. (2006). A comparison of two approaches for teaching VB functions: Total communication vs. vocal-alone. *Journal of Speech-Language Pathology and Applied Behavior Analysis, 1,* 181-192.

Millar, D. C., Light, J. C., & Schlosser, R. W. (2006). The impact of augmentative and alternative communication intervention on the speech production of individuals with developmental disabilities: A research review. *Journal of Speech, Language, and Hearing Research, 49*, 248 – 264.

Schlosser, R. W., & Wendt, O. (2008a). Augmentative and alternative communication intervention for children with autism: A systematic review. In J. K. Luiselli, D. C. Russo, W. P. Christian, & S. M. Wilczynski (Eds.) E*ffective practices for chidren with autism. (*pp.325-389). New York: Oxford University Press.

Schlosser, R.W., & Wendt, O. (2008b) Effects of augmentative and alternative communication intervention on speech production in children with autism: A systematic review. *American Journal of Speech Language Pathology, 17*. 212-230.

74

References

Bijou, S. W., & Baer, D. M. (1965). *Child development II: Universal stage of infancy*. New York: Appleton-Century-Crofts.

Charlop-Christy, M. H., Carpenter, M., Le, L., LeBlanc, L. A., & Kellet, K. (2002). Using the picture exchange communication system (PECS) with children with autism: Assessment of PECS acquisition, speech, social-communicative behavior, and problem behavior. *Journal of Applied Behavior Analysis, 35*, 213 – 231.

Drash, P. W., High, R. L., & Tudor, R. M. (1999). Using mand training to establish an echoic repertoire in young children with autism. *The Analysis of Verbal Behavior, 16*, 29 – 44.

Durand, V. M., & Carr, E. G. (1991). Functional communication training to reduce challenging behavior: Maintenance and application in new settings. *Journal of Applied Behavior Analysis, 24*, 251 – 264.

Koegel, R. L., Camarata, S., Koegel, L. K., Ben-Tall, A., & Smith, A. E. (1998). Increasing speech intelligibility in children with autism. *Journal of Autism and Developmental Disorders, 28*, 241 – 251.

Laraway, S., Snycerski, S, Michael, J., & Poling, A. (2003). Motivating operations and terms to describe them: Some further refinements. *Journal of Applied Behavior Analysis*, 36, 407-414.

75

Mirenda, P. (2003). Toward functional alternative and augmentative communication for students with autism. *Language, Speech, and Hearing Services in Schools, 34*, 203 – 216.

National Research Council. (2001). *Educating children with autism*. Washington, D. C.: National Academy Press.

Shafer, E. (1994). A review of interventions to teach a mand repertoire. *Analysis of Verbal Behavior, 12*, 53 – 66.

Skinner, B. F. (1957). *Verbal behavior*. Acton, MA: Copley.

Sundberg, M. L. (2004). A behavioral analysis of motivation and its relation to mand training. In W. L. Williams (Ed.), *Developmental disabilities: Etiology, assessment, intervention, and integration* (pp. 199 – 220). Reno, NV: Context Press.

Sundberg, M. L., & Partington, J. W. (1998) *Teaching language to children with autism or other developmental disabilities*. Pleasant Hill, CA: Behavior Analysts, Inc.

76

Mirenda, P. (2003). Toward functional alternative and augmentative communication for students with autism. *Language, Speech, and Hearing Services in Schools, 34*, 203 – 216.

Müller, N., & Damico, J. S. (2002). A transcription toolkit: Theoretical and clinical considerations. *Clinical Linguistics & Phonetics, 16*, 299 – 316.

National Research Council. (2001). *Educating children with autism*. Washington, D. C.: National Academy Press.

Ross, D. E., & Greer, D. (2003). Generalized imitation and the mand: Inducing first instances of speech in young children with autism. *Research in Developmental Disabilities, 24*, 58 – 74.

Schlosser, R. W., & Wendt, O. (2008). Augmentative and alternative communication intervention for children with autism: A systematic review. In J. K. Luiselli, D. C. Russo, W. P. Christian, & S. M. Wilczynski (Eds.) E*ffective practices for children with autism. (*pp.325-389). New York: Oxford University Press.

Shafer, E. (1994). A review of interventions to teach a mand repertoire. *Analysis of Verbal Behavior, 12*, 53 – 66.

Skinner, B. F. (1938). *The behavior of organisms*. New York: Appleton-Century.

Skinner, B.F. (1953). *Science and human behavior*: New York: Macmillan.

77

Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.

Sweeney-Kerwin, E. J., Carbone, V. J., O'Brien, L., Zecchin, G., & Janecky, M. N. (2007). Transferring control of the mand to the motivating operation in children with autism. *The Analysis of Verbal Behavior, 23,* 89-102.

Sundberg, M. L. (2004). A behavioral analysis of motivation and its relation to mand training. In W. L. Williams (Ed.), *Developmental disabilities: Etiology, assessment, intervention, and integration* (pp. 199 – 220). Reno, NV: Context Press.

Sundberg, M. L., & Michael, J. (2001). The benefits of Skinner's analysis of verbal behavior for children with autism. *Behavior Modification, 25*, 698 – 724.

Sundberg, M. L., & Partington, J. W. (1998) *Teaching language to children with autism or other developmental disabilities*. Pleasant Hill, CA: Behavior Analysts, Inc.

Tincani, M. (2004). Comparing the Picture Exchange Communication System and sign language training for children with autism. *Focus on Autism and Other Developmental Disabilities, 3,* 152-163.

Tincani, M., Crozier, S., & Alazetta, L. (2006). The Picture Exchange Communication System: Effects on manding and speech development for school-aged children with autism. *Education and Training in Developmental Disabilities, 41,* 3-15.

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GENERALIZED SELECTION-BASED BEHAVIOR

- It appears that topography based verbal behavior has primacy over selection-based verbal behavior.
- In another section we discussed the role of joint control in the development of generalized selection based responding.
- It is clear however, that TB plays a role in mediating many selection based responses.
- In the Potter et al. (1997) article, the researchers found selection based responses were mediated by TB verbal behavior.
- In fact, persons with limited TB verbal behavior performed less adequately on tests for selection based responding.

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- A few studies have demonstrated that after acquiring TB tacts and intraverbals compared to SB responses that persons with developmental disabilities were more likely to correctly select the items when there name was given. (Sundberg, et al. 1996)

John Luca Video

Joint Control Activity

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- In addition, Potter et al (1997) demonstrated that college students reported using their TB repertoire to more accurately perform a delayed matching response.
- When they were shown arbitrary configurations of dots matched to flag-like figures and then asked later to choose the correct dot array when re-shown the flag-like figures the subjects indicated that they would tact both figures and intraverbally link them.

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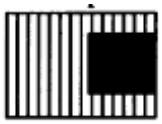
Potter et al., 1997



Goes With

82

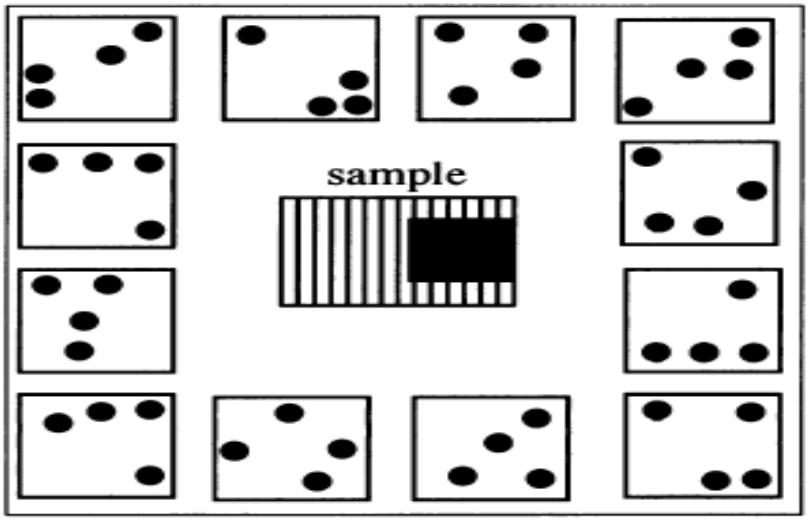


Fig. 1. Illustration of the patterns and screen arrangement used.

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- They then reported when shown the flag- like figure they would tact it as they had before and then tact each of the dot arrays until the intraverbal connection between the two responses evoked the correct selection of the appropriate dot array.
- You can imagine someone saying " That's the backward flag that goes with "Y", no wait, it goes with the backward L, that's it ".
- Other responses are possible such as self-echoing the invented name of the item that goes with the invented name of the flag-like figure until the echo and the tact can occur while looking at the same array which would be the moment of "recognition" and then choosing it.

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The role of joint control in teaching listener responding to children with autism and other developmental disabilities☆

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ABSTRACT

This study evaluated the effectiveness of a teaching procedure derived from the analysis of joint control in increasing listener responses for three children with autism using a multiple probe design across participants. One nonvocal and two vocal children with autism were taught to select multiple pictures of items from a large array in the order in which they were requested (e.g., "Give me the ball, cup, and spoon") using the joint control teaching procedure. The effect of these procedures on the emission of accurate selection responses to both trained and novel stimulus sets was measured. The results indicated that listener responses to trained stimuli increased following the implementation of the independent variable and untrained responses across novel stimulus sets also emerged. Implications for designing language training programs for children with autism based on an analysis of joint control are discussed.

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Full Linguistic System

- Sundberg and Michael have suggested that it may not be possible to acquire the tact and intraverbal repertoire with a selection-based response form.
- In fact, it appears that what appears to be a tact is in fact a match-to-sample response.
- And, what appears to be an intraverbal is a listener response by feature, function or class.
- What appears on the next couple of slides are diagrams of the operants that illustrate these points.
- Keep in mind that an operant is defined by the controlling variables and therefore operants with different controlling variables are different operants.

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TACT

Tact Video

Controlling Relations for Topography-Based Tact

A	B	C
NV Stimulus →	Verbal Reponse (Vocal or Sign) →	Social Reinforcer

Controlling Relations for a "Selection-Based Tact"

A	B	C
NV Stimulus →	Scan →	Sight of the Picture
Sight of the Picture →	Selection →	Social Reinforcer

Controlling Relation for a MTS Response

A	B	C
NV Stimulus →	Scan →	Sight of the Picture
Sight of the Picture →	Selection →	Social Reinforcer

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INTRAVERBAL

Intraverbal Video

Controlling Relations for Topography-Based Intraverbal

A	B	C
V Stimulus →	Verbal Reponse (Vocal or Sign) →	Social Reinforcer

Controlling Relations for a "Selection-Based Intraverbal"

A	B	C
V Stimulus →	Scan →	Sight of the Picture
Sight of the Picture →	Selection →	Social Reinforcer

Controlling Relation for a Listener Response

A	B	C
V Stimulus →	Scan →	Sight of the Picture
Sight of the Picture →	Selection →	Social Reinforcer

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WHY SIGN LANGUAGE TRAINING MAY FAIL

- First signs taught are not mands
- First signs taught are too complex/generic (e.g., please, yes/no, help, toilet, more, thank you)
- First signs may resemble each other too closely (e.g., eat and drink)
- First signs may involve a complex response form
- Not enough training trials are provided
- Training is conducted under multiple sources of control (e.g., motivation, picture/object prompts, vocal prompts, imitative prompts), and prompts are not faded so "spontaneous'' responses can occur
- Individual verbal operants are never established (i.e., mands, tacts, intraverbals); responses remain multiply controlled
- Stuck at one level too long, not a progressive curriculum in place
- Single verbal operant focused on almost extensively (e.g., tacts, but limited intraverbal or mand training)
- Failure to establish a signing verbal community
- Failure to require signs outside of the training sessions
- Failure to generalize to novel stimuli, staff, settings, times, etc.

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Conclusions

<u>Selecting a Response Form</u>

- Even when echoic responding is weak vocal behavior should be the response form of choice initially.
- If skilled attempts to develop the echoic repertoire and mands and tacts are unsuccessful then an alternative response should be considered.
- If a person has physical or neurological disabilities which makes the differential muscle control necessary for signing impossible a pointing or selection based system should be immediately considered.

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- If a student is young without physical conditions which preclude sign then begin an intensive signing program that includes speaking while signing. The teacher, however, should be skilled in prompting and differentially reinforcing vocalizations that may occur.
- With older students who may be involved in frequent community activities and who do not have a strong echoic repertoire or frequent verbalizations, a combination of signing and selection based systems may be best.

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- This older person may have a need to immediately verbally interact with persons in the community who do not have specialized sign training and therefore would benefit from the use of a picture selection repertoire. Picture selection will be easier to acquire once sign language has been taught.

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FOCUS ON AUTISM AND OTHER DEVELOPMENTAL DISABILITIES
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The Application of PECS in a Deaf Child With Autism:
A Case Study

Georgia A. Malandraki and Areti Okalidou

A 10-year-old nonverbal Greek boy, C.Z., who had been diagnosed with both bilateral sensorineural profound hearing loss and autism, was taught to use the Picture Exchange Communication System (PECS), with some modifications and extensions, over a 4-month intensive intervention period. C.Z.'s original communication and behavioral status as well as the PECS application process are presented, along with the communicative, language, and psychosocial outcomes following the intervention program. Follow-up data were collected 6 months post.

ing impairments. In another Swedish study, Rosenhall, Nordin, Sandstrom, Ahlsen, and Gillberg (1999) reported on audiological examinations of 199 children with autism; 7.9% of them were found to exhibit mild to moderate hearing loss, and 3.5% had severe or profound hearing losses.

Despite the high comorbidity of autism and hearing loss, few studies have used complete audiometrical battery tests (i.e., combined measures of pure tone audiometry and tympanometry) to assess the hearing status of children with autism (Smith, Miller, Stewart, Walter, & McConnell, 1988). The small number of studies may be explained by the observation

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Quick Assessment Overview: Spoken Words

- Outlines 6 profiles of learners with moderate-to-severe developmental disabilities based on the extent of their spoken-word repertoires
- Assists educators in determining whether to select "saying words" as the learner's primary method of speaking or to select an alternate

Spoken Words: the extent to which a learner exhibits spontaneous, understandable spoken words and the conditions under which spoken-word repetitions occur

4	Exhibits many spontaneous, spoken-words, nearly typical spoken-word interactions, and spoken-word repetitions when asked to do so, all of which are understandable **6. MS-Profile 1**
3	Exhibits a few spontaneous spoken words and spoken-word repetitions, both of which are understandable **6. MS-Profiles 2/3**
2	Exhibits occasional words or spoken-word repetitions, but neither are understandable **6. MS-Profiles 4/5**
1	Exhibits only noises and a few sounds **6. MS-Profile 6**

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Quick Assessment Overview: Alternative Method of Speaking

- An assessment within the EFL
- Focuses on selecting an alternate method of speaking (communicating)
- Selecting of Alternate Method of speaking is based on one or more of the following:
  - the physical skills of the learner (gross and fine motor skills)
  - The size of audience for specific methods (sign vs device)
  - The ease with which specific methods can be implemented by instructors, care providers and parents OR
  - The potential for the teaching of advanced language

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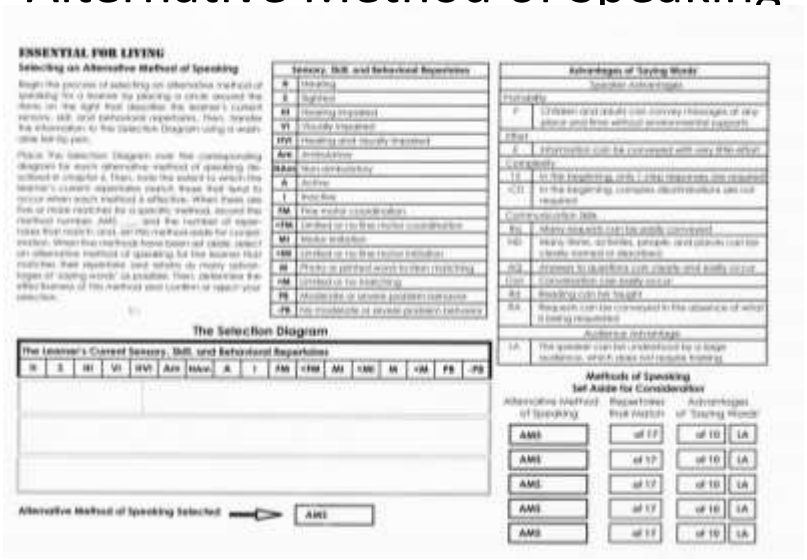
Alternative Method of Speaking



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Additional Methods to Teach Vocal Verbal Behavior: Increasing Speech Sound Production of Children with Autism

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Introduction

- A large number of children with autism fail to develop echoic responses (vocal imitation) to adult sounds and words (Esch, Carr & Michael, 2008).
- The low frequency and variety of sound production by these children provides few responses to be selected and shaped by a verbal community.
- As a result many children with autism do not acquire vocal verbal behavior as their primary form of communication.
- To overcome this deficit the implementation of some behavior analytic procedures have shown promise in supporting the development of vocal verbal behavior.

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- The term vocal behavior is used specifically to refer to the production of auditory stimuli resulting from the movements of the muscles of the vocal apparatus, e.g., the sounds one makes.

- In treatment programs for children with autism we are interested in developing not just vocal responses because not all vocal responses constitute verbal behavior. Coughing and yawning produce vocalizations but in most cases they are not considered verbal.

- Vocal verbal behavior is the production of auditory stimuli that effectively control the behavior of a community of listeners resulting in reinforcement for the speaker (Skinner, 1957). Vocal verbal behavior is the production of the sounds and words of a verbal community.

- Non-vocal persons are individuals who fail to emit high rates of vocal verbal behavior

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- In the case of children with autism this issue is represented by individuals who produce very few speech sounds or words that correspond to those produced by other members of their verbal community.

- In more common terms, these are children with articulation problems or speech sound disorders.

- More precisely, for some children with autism the naturally occurring contingencies of reinforcement have failed to effectively control the movements of their vocal musculature.

- This does not mean that non-vocal persons do not emit verbal behavior (VB); they may exhibit other forms of VB (e.g., sign language, exchanging pictures, speech output devices, hitting, screaming, self-injury, etc.

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- The purpose of this talk is to outline the evidence-based methods to increase the speech production of children with autism who emit few vocal verbal responses and who have generally failed to develop functional vocal verbal behavior.

- Be reminded, that many of the children we will be discussing have weak alternative verbal behavior repertoires (language) as well. In other words, their alternative forms of verbal behavior are not extensive across verbal operant categories.

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- Teaching vocal verbal behavior to nonvocal learners can be very difficult task. It requires a diverse teacher repertoire and a substantial understanding of the applications of Skinner's analysis of VB. Procedures that have been shown to have at least some support include:

1. Reinforcing all Vocalizations
2. Stimulus-Stimulus Pairing (Automatic Reinforcement)
3. Echoic Training
4. Alternative Communication Methods- Manual Sign Language and PECS
5. PECS and Manual Sign Mand Training with Time Delay and Differential Reinforcement Procedures.
6. Shaping Vocal Productions. (Phonetic Transcription)

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Non-Behavior Analytic Approaches to Speech Production

- The field of speech language pathology contains several methods that clinicians use to increase speech production of children with autism.

- Two of the most frequently reported are:

1. Non-Speech Oral Motor Exercises (NSOME)
2. PROMPT Therapy

- I will only briefly mention these methods because they are frequently recommended as alternatives to behavior analytic approaches.

- Notwithstanding the popularity of these methods there are no adequately controlled studies that suggest their benefit for children with autism.

NSOME

- NSOME are based upon the assumption that the limited speech production of some children with autism is the result of weak articulatory muscles and therefore oral motor exercises will overcome the problem.

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- Carole Bowen describes these exercises this way:

"Exercises for the mouth, or what some Speech Language Pathologists (Speech and Language Therapists) call "oral motor exercises", "oral motor therapy", "oral placement therapy" or "oro-motor work", are, in some clinical settings, a prominent component of intervention for children with speech sound disorders. The activities may include sucking thickened drinks through straws; blowing cotton balls, horns, whistles and windmills; chewing and mouthing plastic and rubber objects; licking peanut butter and other foods from around the mouth; and playing with "oral motor tools and toys!" (Carole Bowen, 2005) http://speech-language-therapy.com/oralmotortherapy.htm

- In a special issue of the journal *Speech and Language Seminars* Gregory Lof (2008) reported:

"Many SLPs believe that children with speech sound disorders need to strengthen their articulatory muscles, which research has refuted. In fact, Sudbury et al. found that children with speech sound disorders actually had stronger tongues than did children without speech problems. In Clark's article, she elaborates on the role of strengthening exercises, also pointing out how targeting increased strength in therapy probably is not beneficial for improving speech accuracy."(p. 254)

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Lof went on to say:

"Research studies have been conducted on the efficacy of nonspeech tasks, and these studies do not support the use of NSOMEs to change speech sound productions. Forrest and Iuzinni report on findings from their study, one that compares a traditional production treatment approach to NSOMEs for nine children with speech disorders. Their findings are consistent with prior research that shows the benefits of production training and the lack of benefits of NSOMEs." (p.254)

Watson and Lof Chart

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Parent-Friendly Information about Nonspeech Oral Motor Exercises

Poster presented at the 2011 ASHA Convention, San Diego, CA

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INTRODUCTION

Nonspeech oral motor exercises (NSOME) are techniques that do not involve speech production but are used to influence speaking abilities. These often include blowing bubbles and horns, tongue pushes/wags/curling, pucker/smile movements and other mouth gymnastics[1-3]. Although often used by many SLPs, the legitimate professional literature refutes the appropriateness of NSOME for intervention to change speech sound productions[4-6].

Parents may request NSOME be used because:[7-9] •Their child's previous SLP used NSOME, •NSOME objectives may already be on the child's IEP, •They have read testimonial information on the internet encouraging NSOME, •There is a proliferation of attractively packaged NSOME products available for purchase, •Other professionals (e.g., OT, PT) recommend their use, •These exercises provide something concrete for parents to do with their children under the guise of "therapy."

PARENTS COMMENTS/QUESTIONS	POSSIBLE RESPONSE
The SLP has my child practicing sticking her tongue in and out and side-to-side before working on speech. Is this a good idea?	These nonspeech movements will not help with speech because the parts of the brain that control movements for speech are different from the parts that control nonspeech movements. It's a brain thing![1-3, 10, 25, 27]
My child has a repaired cleft lip/palate. To me it makes sense that blowing must be a good way to get his speech to not come out his nose.	For over 30 years it has been proven that blowing exercises will not prevent speech from coming out the nose. It is surprising that this technique is still being used![1-3, 27]
The SLP working with my child says that exercises "warm up" their mouths. What's wrong with that?	Because limited strength is needed to speak, warm-up is not necessary. While a few simple mouth movements may provide some focus on the mouth area, they should only be a very minor part of therapy.[1-3, 24]
I have been told that many kids are diagnosed with Childhood Apraxia of Speech. Aren't these kinds of exercises necessary to help their speech improve?	Children with CAS need therapy devoted to making speech, not movements that barely mimic speech (because of how the brain organizes information). Children with CAS have "Apraxia of Speech" so speech is what needs to be worked on, not nonspeech tasks.[1-3, 12]
On the internet, I've read information provided by experts who say these exercises work and are necessary to help children learn to speak. It is all over the web, so it must be legitimate.	You must use caution about believing information found on websites. Research shows that a technique works, not opinions, testimonials, and "expert" advice. While these statements may be interesting, they do not prove that the exercises work. Special care should be taken if you are encouraged to buy a product.[1-3, 17]
The last SLP my child had said oral motor exercises will help develop necessary speech awareness. Don't children need to become aware of their mouth movements in order to improve speech?	Research has shown that young children have little awareness of mouth movements. Children need to learn how different mouth movements affect speech, not mouth movements that are not speech.[13, 14]
My child can move his tongue up and down quickly, so why can't he make "tongue tip" sounds such as "t" or "s"?	The tongue can make many different kinds of movements; however, tongue movements for speech are controlled by a different part of the brain than movements that don't involve speech.[1-3, 26]
Won't working on chewing and swallowing help my child speak better? Doesn't she need to become good at these nonspeech movements before we can work on actually making her talk?	Chewing and swallowing are unrelated to speaking. Even though the tongue, lips and other parts of the mouth are used for speech and nonspeech movements, nonspeech movements do not influence how she talks.[1-3, 22, 23]
PTs and OTs often use exercises to improve motor skills. Isn't speech also a motor skill?	Yes, but speech is much more than just a motor skill because it involves communication. Speech is different from other motor tasks. Speech is special because it involves language. Speech motor tasks are organized in the brain in a unique way.[11-13]

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It was recommended that my child receive muscle-based therapy because he has "low muscle tone". So that must mean his muscles are weak.	Muscle tone and muscle strength are different. Tone refers to the elasticity of muscles at rest. Just because your child has low muscle tone does not necessarily mean that she has weak muscles. Working on strengthening will not have an effect on tone.[3]
My child has something called a "phonological" problem. Why not mouth exercises for this?	Phonological issues are a problem with the language aspects of talking and do not involve simple mouth movements. Your child needs to learn the "rules" of speech/language, and these rules are not learned by mouth movements. Therapy must be done in meaningful communication contexts.[18, 19, 24]
We have fun doing these exercises at home. What can it hurt to do them?	Although these exercises probably won't harm your child, focused talking time is too valuable to be wasted. Work at home should be based on practicing valuable skills that will improve speaking.[18, 19, 24]
According to the occupational therapist, my child has speech problems because her mouth is not strong enough. So isn't strengthening the mouth important?	Very little strength is needed to produce speech; agility and coordination are needed, but little strength. Also, it is surprisingly difficult to accurately determine strength. Therefore, any statements about weakness are questionable.[4, 23]
My child is blowing horns in therapy and has progressed from one horn to the next. That is progress, right?	It is progress in horn blowing but not in speech. Blowing and speaking are completely different from each other and doing one well will not have an impact on the other.[25, 26]

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PROMPT Therapy

- PROMPT therapy has become a popular method designed to increase the vocal production of children with autism.

- One proponent of this method describes it this way:

  "PROMPT stands for "Prompts for Restructuring Oral and Muscular Phonetic Targets." It is used to restructure the speech production capabilities of children with a variety of speech disorders, including apraxia.

  PROMPT utilizes specific techniques based on touch pressure, proprioceptive (the body's sense of itself) and kinesthetic (tactile) cues to help reshape the way the brain and mouth work together to articulate words. This is a very hands-on approach which will require the involvement of a speech language pathologist to administer treatments.

  For example, one PROMPT technique involves manipulating the external muscles of the face to help the child understand the movement required to produce a specific sound. Because each individual's needs are different, the types of techniques will vary. The PROMPT technique often is not used by itself to treat apraxia, but is used in conjunction with other tools." (Karen George http://www.chicagospeechtherapy.com/how-can-the-prompt-speech-therapy-technique-help-children-with-apraxia/

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Below are illustrations of therapists conducting PROMPT therapy sessions.

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- Despite the popularity of this method there are no controlled studies to support the effectiveness of this method with children with autism.
- To learn more about this method visit the prompt institute website of and read comments by the developer of the method Deborah Hayden. http://www.promptinstitute.com/

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REINFORCING ALL VOCALIZATIONS IN FREE AND RESTRICTED OPERANT CONDITIONS

- Reinforcement was delivered for any and all vocalizations that were produced during 3 hour sessions.
- Activities are scheduled that lead to increased vocalizations (e.g. jumping, singing, tickling).
- On the next slides is a data recording sheet for recording any and all sounds and graphs documenting the increase in vocalizations that correlated with the implementation of this procedure.

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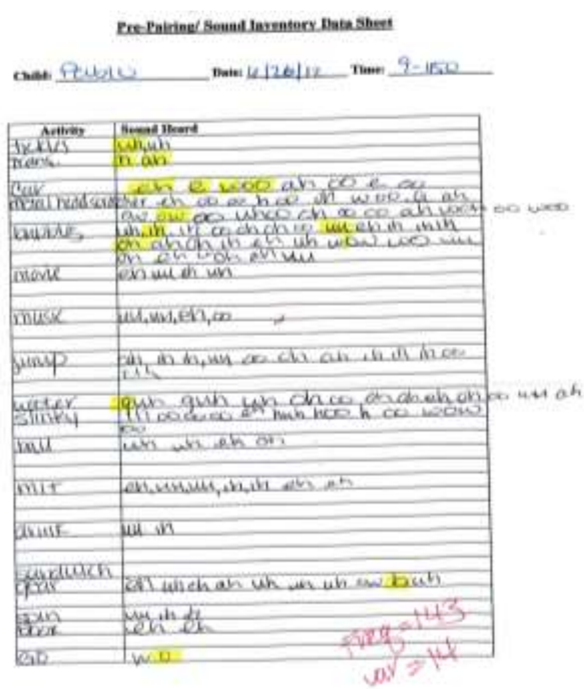

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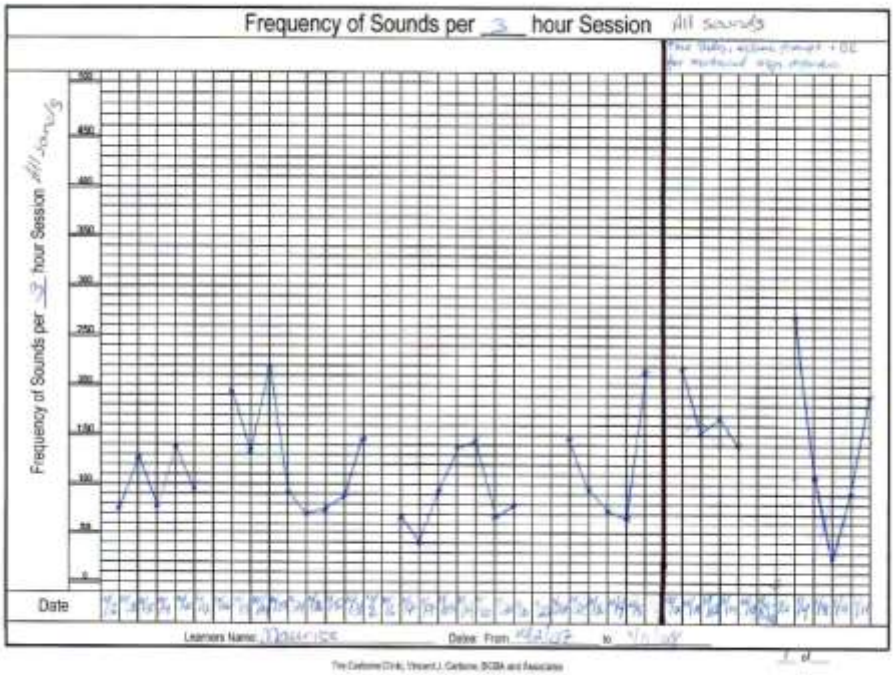
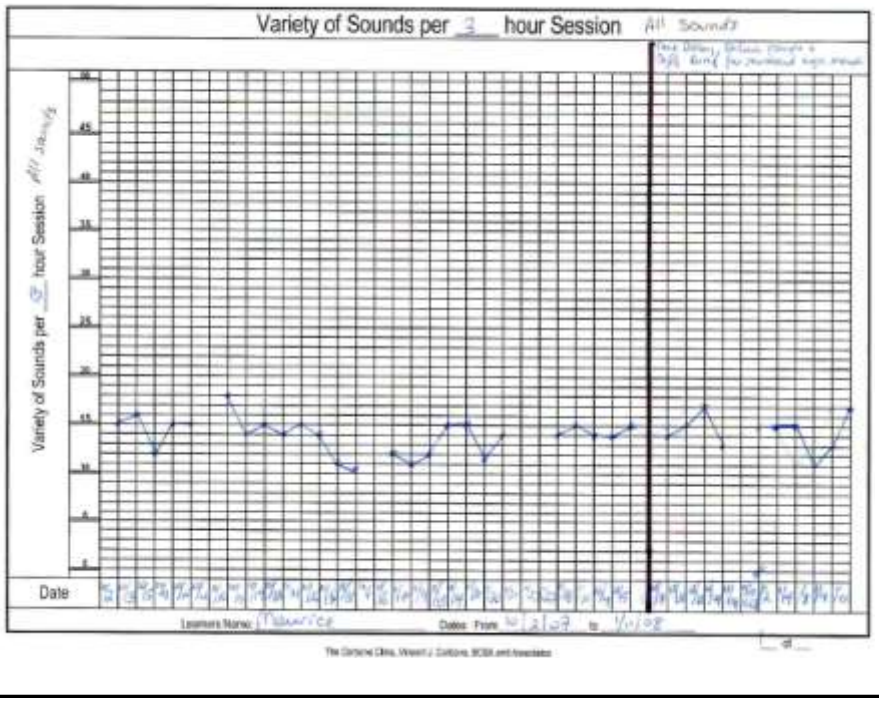
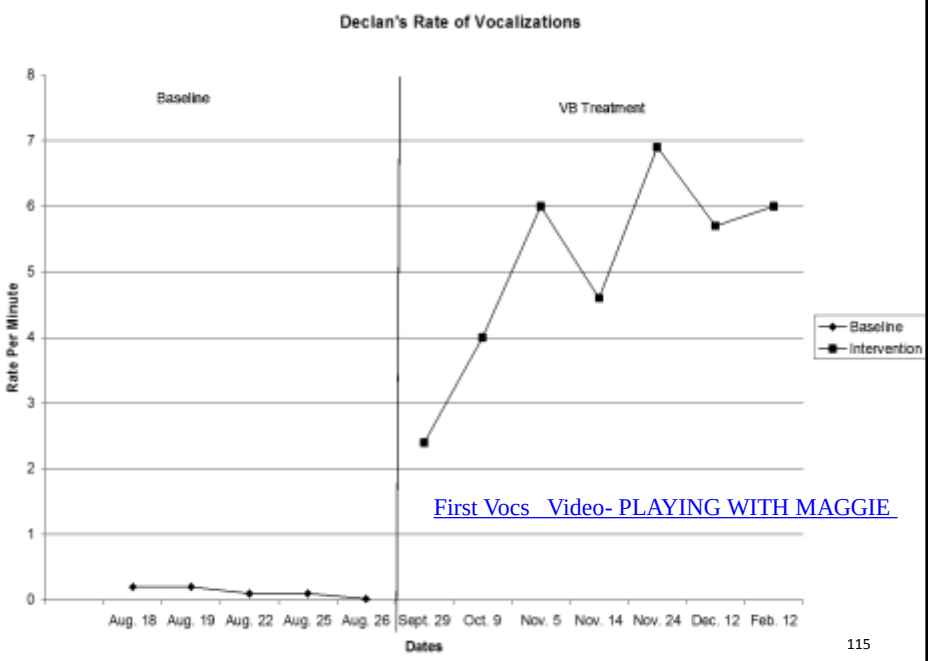

Frequency of Sounds per 3 hour Session All Sounds
Frequency of Sounds per 3 hour Session All Sounds
Date
Learners Name: Maurice
Dates: From 4/2/07 to 7/1/08

113


Variety of Sounds per 3 hour Session All Sounds
Variety of Sounds per 3 hour Session All Sounds
Date
Learners Name: Maurice
Dates: From 4/2/07 to 7/1/08

114



First Vocs Video- PLAYING WITH MAGGIE

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The Role of Automatic Reinforcement in Speech Sound Production

- Automatic reinforcement describes circumstances in which reinforcement of behavior occurs when it is not directly socially mediated but is, instead, the product of a response. (Michael & Vaughan, 1980)
- Skinner referred to this type of overlooked source of reinforcement many times in his writings.
- He claimed that a substantial portion of behavior that appears to produce limited social reinforcement might well be controlled by automatic reinforcement.
- In fact, he claims that much of the behavior of infants might well be under the control of automatic reinforcement.
- For example, he suggests that an infant's movements that effectively change the environment, such as swatting a mobile hung above the crib or the first steps might be automatically reinforced by the control over the non-verbal environment.
- Indeed, problem solving behavior might well be strengthened by those, "I did it," moments.

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- As Palmer (1996) points out, children become effective listeners before they become effective speakers.
- Parents frequently talk in positive terms to their children as they are providing early survival tasks, e.g. feeding, bathing, removing unpleasant stimuli, etc.
- As such, the parent's sounds and words that have been paired with the reinforcing activities noted above might well become conditioned reinforcers.
- The same sounds when produced by the child during babbling might well strengthen the muscle movements necessary to produce them.
- Consequently infants may babble more frequently the sounds that have been paired with socially mediated reinforcement.
- The data on children's development of sounds shows the pattern of producing the sounds that have been heard during parent care-giving activities. (Schlinger, 1995)
- This process of automatic reinforcement seems to strengthen the vocal repertoire and increase the variety of sounds produced overall and prepare the young child to speak in words and sentences.

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- All of this is to say that the foundation for speaking intelligibly in young children might well be the outcome of automatic reinforcement upon the vocal attempts.
- Several researchers have extended this analysis to the application of a procedure called stimulus-stimulus pairing (SSP) and the concept of automatic reinforcement to the development of vocalizations in children who fail to develop them typically.
- Petursdottir, Carp, Mathhies, & Esch (2011) describe this procedure " This procedure involves an adult's repeated presentations of a specific phoneme or syllable, each immediately followed by the presentation of a preferred item or activity, without any response requirement by the child" (p.45)
- Since phonemes and syllable units are the building blocks of vocal verbal behavior, any attempts to increase their frequency and variety in young children who do not develop them typically might lead to a greater likelihood of developing vocal behavior.
- Sundberg et al. (1996) were the first to make use of the concept of automatic reinforcement to develop vocal responding in language delayed children.

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- All children developed novel vocalizations without direct reinforcement after stimulus-stimulus pairing procedures were implemented.
- A series of studies have been conducted since 1996 with children with developmental disabilities and with low rate speech sound production and virtually absent vocal verbal behavior.
- Overall the results of these studies indicate that for some children this method is effective in increasing vocal productions but not for all children.
- The most recent study published related to the topic of SSP by Pettursdottir, et al. (2011), investigated the variables that might account for the successes and failures of the procedure in clinical applications.
- As an alternative to SSP Esch, Esch & Love (2009) demonstrated some preliminary benefit to a direct reinforcement procedure using lag schedules of reinforcement that support speech variability.
- Despite the mixed results to date, a recent replication and extension of the methods currently "in press" with the *Journal of Applied Behavior Analysis* by Miliotis, Sidener, Reeve, Carbone, Radar, Sidener & Delmolino, demonstrated a treatment effect with children with autism.
- For a current review of the literature on the SSP method see the Pettursdottir, et al. (2011) in The Analysis of Verbal Behavior.
- On the next slide is a description of the stimulus-stimulus pairing account of increased vocal production..

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Stimulus-Stimulus Pairing

The two-step process is as follows:

- STEP 1. The speech sounds and words heard by young children are frequently conditioned as reinforcers by correlation with parents' positive reinforcers (e.g., food, caresses, smiles).

- STEP 2. Subsequent production of these sounds by the child is strengthened by the product of his or her verbal behavior in the form of auditory stimuli. The closer the sound production is to matching the sounds that have been conditioned as reinforcers the greater the reinforcement (Schlinger, 1995; Sundberg, Michael, Partington, & Sundberg, 1996).

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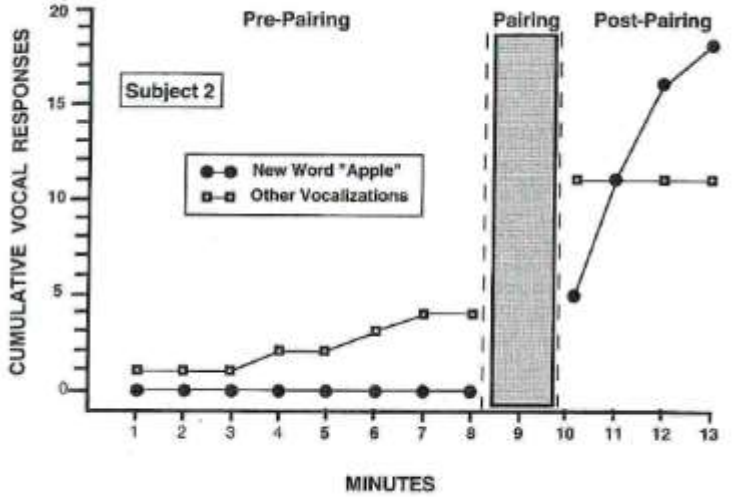

Fig. 2. Cumulative number of all vocal responses for Subject 2 on pre- and post-pairing measures. The shaded area represents the time during which one new target word was paired with tickles.

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Analysis Verbal Behav
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BRIEF REPORT

Stimulus-Stimulus Pairing of Vocalizations: A Systematic Replication

Lisa Rader · Tina M. Sidener · Kenneth E Reeve · David W. Sidener · Lara Delmolino · Adriane Miliotis · Vincent Carbone

Abstract The current study replicated an enhanced stimulus-stimulus pairing (SSP) procedure used by Esch et al. (Journal of Applied Behavior Analysis 42: 43–225, 2009) for increasing vocalizations in children with autism. The enhanced SSP procedure consisted of pairing target vocalizations with high-preference items, interspersed target and nontarget trials, an observing response, and the presentation of the vocalizations in "motherese" speech. Results showed substantial increases in target vocalizations above baseline levels and above nontarget vocalizations for two of three participants.

Keywords Stimulus-stimulus pairing · Autism · Speech · Vocalizations

Introduction

For children with developmental disabilities who emit a variety of vocalizations, an array of instructional methodologies exists to promote the development of language (e.g., Lovaas 2002). However, few interventions have been evaluated for children who do not exhibit vocal play and vocal imitation. Recently, a stimulus-

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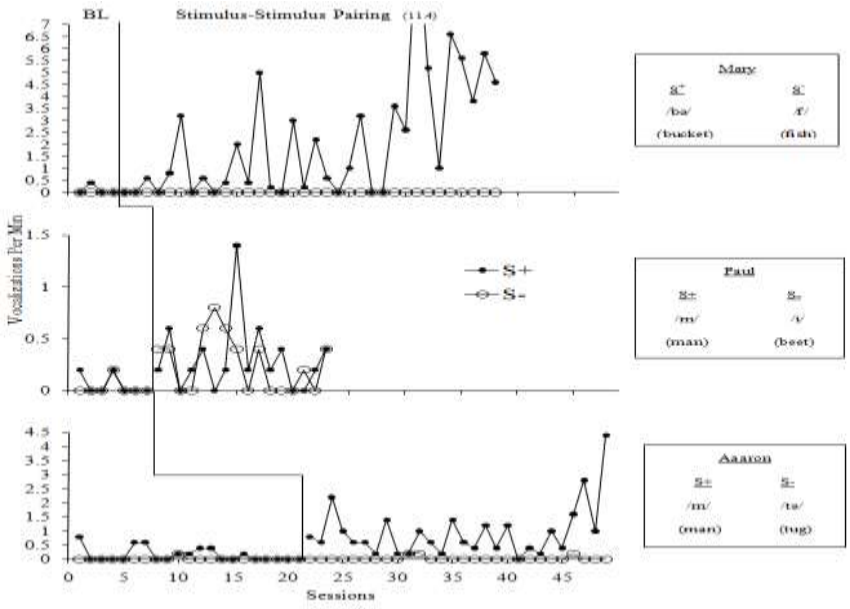

Figure 1.Within-session data on rate of target and non-target vocalizations for Mary (top panel), Paul (middle panel), and Aaron (bottom panel).

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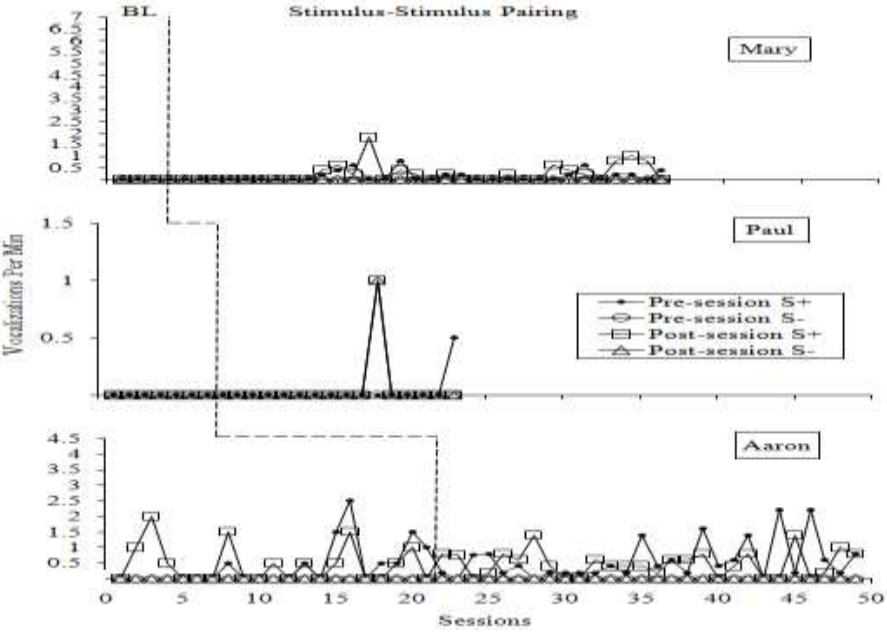

Figure 2. Target and non-target vocalizations during pre- and post-sessions for Mary (top panel), Paul (middle panel), and Aaron (bottom panel).

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JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2012, 45, 809–813 NUMBER 4 (WINTER 2012)

AN EVALUATION OF THE NUMBER OF PRESENTATIONS OF TARGET SOUNDS DURING STIMULUS–STIMULUS PAIRING TRIALS

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We evaluated the differential effects of 2 variations of a stimulus–stimulus pairing procedure on the vocalizations of 2 children with autism. For both participants, presenting 1 sound per pairing trial resulted in a higher rate of vocalizations than 3 sounds per pairing trial.

Key words: autism, stimulus–stimulus pairing, vocalizations

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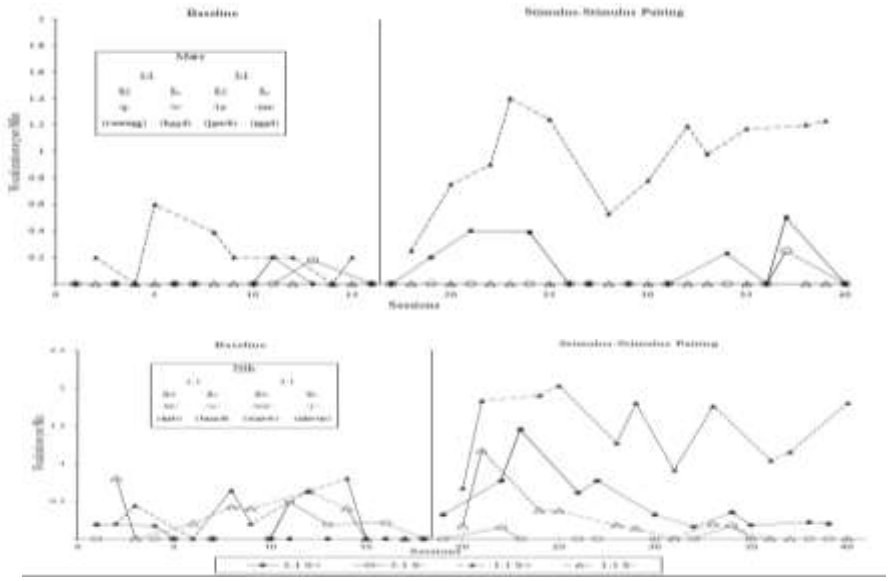

Figure 1.. Within-session data on rate of target and non-target vocalizations for Mary (top panel) and Nik (bottom panel) during the experiment

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Teaching Procedures

The following are procedures to follow when attempting to take advantage of automatic reinforcement generated by stimulus-stimulus pairing:

1. Choose sounds that have the highest frequency in the repertoire of the child or words that may be particularly easy for the learner. Initial position consonant-vowel combinations that are associated with the names of items that act as reinforcers may be useful. For example "buh" for a child who is reinforced by bubbles. Transfer to the mand may be facilitated when targets are chosen this way.

2. Present a sound three times with about a 1-second delay between presentations. If you hear any approximation or any sound after any of the presentations, deliver the reinforcer immediately. If there is no sound or approximation, then deliver the reinforcer after the third presentation anyway.

"buh" – 1 sec – "buh" – 1 sec – "buh" – 1 sec → REINFORCER

If "buh" is emitted at any point, deliver the reinforcer immediately

NOTE: According to recent research results (Miliotis et al., 2012), it would be recommended to reinforce after every single presentation.

"buh" – 1 sec → REINFORCER

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3. Graph results.
   - Percentage of ARP trials where target echoic was emitted
   - Another type of data is sound inventory
     - To track total frequency and variety of speech sounds made pre- and post-pairing
     - To track frequency of target ARP sound emitted during free operant conditions (i.e., at all times outside of the ARP sessions) pre- and post-pairing

James Video

Emily with Vince

Houston

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Automatic Reinforcement Procedure

Child: Nick B **Target:** "ik" **Date:** 6/29/11 **Time:** 2:30-4:30

Procedure:

1. Present target sound 3 times or greater with a 1 sec. delay between each presentation.
2. If the child echoes the sound during any one of the presentations reinforce and do so abundantly.
3. If after the final presentation of the trial the child doesn't echo the sound, reinforce anyway but not as much as you might if they echoed back the target sound.
4. If the child emits any other sound during your presentation of the target sound continue with presenting the target until you get to the final presentation, again reinforce anyway but not as much as you would if it were the target sound.
5. Take trial by data on what the child said if anything in the space below the trial number (see below).

1	2	3	4	5	6	7	8	9	10
+	O	—	O	O	—	O	O	O	—
11	12	13	14	15	16	17	18	19	20
O	—	O	O	O	—	O	O	O	O
21	22	23	24	25	26	27	28	29	30
—	O	O	O	—	—	O	O	—	O
31	32	33	34	35	36	37	38	39	40
—	—	O	O	O	O	O	—	O	—
41	42	43	44	45	46	47	48	49	50
O	O	+	—	O	O	—	O	—	—
51	52	53	54	55	56	57	58	59	60
—	—	—	—	—	O	O	O	O	—
61	62	63	64	65	66	67	68	69	70
O	—	—	O	O	O	O	O	O	+
71	72	73	74	75	76	77	78	79	80
+	O	O	O	O	+	O	O	+	—
81	82	83	84	85	86	87	88	89	90
—	O	O	—	—	—	—	—	O	O
91	92	93	94	95	96	97	98	99	100
—	O	O	O	O	—	O	O	—	O

Key: "+" target sound "—" no sound "O" other sound"

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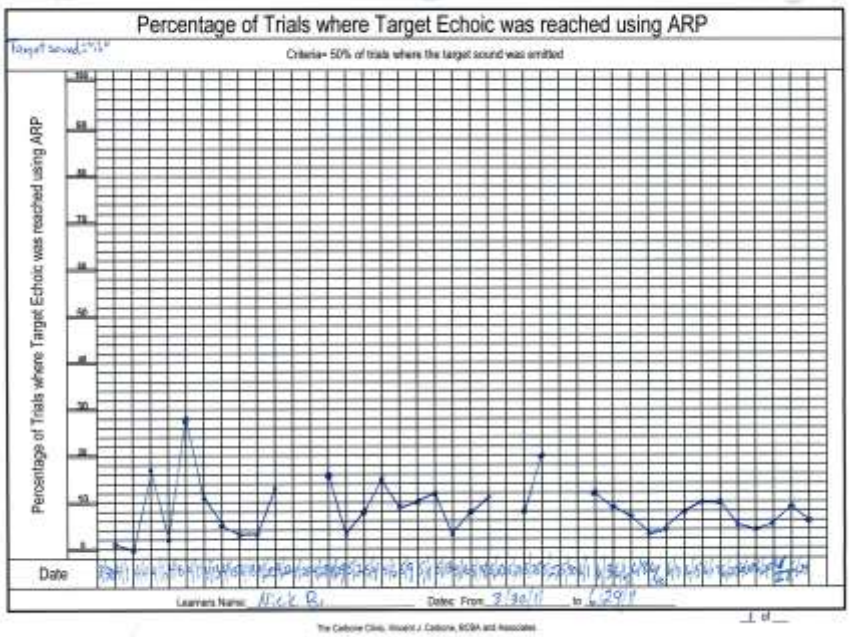

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REFERENCES

STIMULUS – STIMULUS PAIRING PROCEDURE

Carroll, R.A., & Klatt, K.P. (2008). Using stimulus-stimulus pairing and direct reinforcement to teach vocal verbal behavior to young children with autism. *The Analysis of Verbal Behavior, 24*, 135-146.

Esch, B. E., Carr, J. E., & Michael, J. (2005). Evaluating stimulus-stimulus pairing and direct reinforcement in the establishment of an echoic repertoire of children diagnosed with autism. *The Analysis of Verbal Behavior, 21,* 43-58.

Esch, B.E., Carr, J.E., & Grow, L.L. (2009) Evaluation of an enhanced stimulus-stimulus pairing procedure to increase early vocalizations of children with autism. *Journal of Applied Behavior Analysis,* 42, 225-243.

Esch, B., Esch, J. & Love (2009) Increasing vocal variability in children with autism using a lag schedule of reinforcement. *The Analysis of Verbal Behavior, 21*, 43-58.

Miguel, C.F., Carr, J.E., & Michael, J. (2002). The effects of a stimulus-stimulus pairing procedure on the vocal behavior of children diagnosed with autism. *The Analysis of Verbal Behavior, 18,* 3-13.

Miliotis, A., Sidener, T., Reeve, K., Carbone, V.J., Radar, L., Sidener, D., & Delmolino. Stimulus-stimulus pairing of vocalizations: A systematic replication and evaluation of number of target sound per trial. *Journal of Applied Behavior Analysis,* in press.

Normand, M. P., & Knoll, M. L. (2006). The effects of a stimulus-stimulus pairing procedure on the unprompted vocalizations of a young child diagnosed with autism. *The Analysis of Verbal Behavior, 22*, 81-85.

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Palmer, D. C. (1996). Achieving parity: The role of automatic reinforcement. *Journal of Experimental Analysis of Behavior, 65,* 289-290.

Peturstdottir, A.I., Carp, C.L., Matthies, D.W. & Esch, B.E., (2011) Analyzing stimulus-stimulus pairing effects on preferences for speech sounds. The Analysis of Verbal Behavior, 27, 45-60.

Miliotis,A., Sidener, T., Reeve, K., Carbone, V., Radar, L., Sidener, D., & Delmolino, L. Stimulus-stimulus pairing of vocalizations: A systematic replication and evaluation of number of presentations of target sound per trial. *Journal of Applied Behavior Analysis* (in press).

Schlinger, H. D. (1995). *A behavior analytic view of child development*. New York: Plenum Press.

Stock, R.A., Schulze, K.A., & Mirenda, P. (2008). A comparison of stimulus-stimulus pairing, standard echoic training, and control procedures on the vocal behavior of children with autism. *The Analysis of Verbal Behavior, 24,* 123-133.

Smith, R., Michael, J., & Sundberg, M. L. (1996). Automatic reinforcement and automatic punishment in infant vocal behavior. *The Analysis of Verbal Behavior, 13,* 39-48.

Sundberg, M. L., Michael, J., Partington, J. W., & Sundberg, C. A. (1996). The role of automatic reinforcement in early language acquisition. *The Analysis of Verbal Behavior, 13,* 21-37.

Vaughan, M.E. & Michael, J. (1982) Automatic reinforcement: An important by ignored concept. *Behaviorism, 10*, 217-227).

132

Yoon, S., & Bennett, G. (2000). Effects of a stimulus-stimulus pairing procedure on conditioning vocal sounds as reinforcers. *The Analysis of Verbal Behavior, 17*, 75-88.

Yoon, S., & Feliciano, G. (2007). Stimulus-stimulus pairing and subsequent mand acquisition of children with various levels of verbal repertoires. *The Analysis of Verbal Behavior, 23,* 3-16.

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Echoic Training

- Vocal imitation is an important skill in the development of vocal verbal behavior. Consequently, procedures have been developed to teach this skill. Using the parlance of Skinner's analysis this method is called echoic training.
- Echoic training methods are designed to increase the number and intelligibility of vocal responses.
- Echoic targets can be selected from the high frequency sounds the learner produces during free operant procedures.

<u>Selecting targets for echoic training:</u>

1. Developmentally easy sounds
2. High frequency sounds the learner produces during free operant procedures
3. Sounds and words associated with reinforcers and for reinforcers for which the child mands

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Echoic Teaching Procedure

1. Once echoic targets are selected, list on the probe data sheet echoic responses that will be taught first.
2. Begin the teaching procedure by having strong reinforcement available and visible to the learner to establish motivation for correct responding.
3. Present the echoic.
4. If the learner reaches parity, reinforce immediately.
5. If the learner does not reach parity, re-present the word 2-3 more times (based upon the learner).
6. At any point the learner reaches parity or a better response occurs, reinforce.
7. If the learner does not reach parity or give a better response following 2-3 echoic trials, drop to an easier echoic or motor imitation response and differentially reinforce.

Mattie Echoics
Rurai

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ECHOIC DATA SHEET

ECHOIC DATA SHEET

Learner: Declan **Date:** 10/3/03

Trial	Target Sound/Word	1st	2nd	3rd	Easier Sound/Word
1	Goo	✓			
2	Buh		✓		
3	Duh	✓			
4	Duh	✓			
5	Goo	✓			
6	Buh	✓			
7	Buh	✓			
8	Goo	✓			
9	Duh		✓		
10	Goo	✓			
11	Goo	✓			
12	Buh	✓			
13	Duh		✓		
14	Buh	✓			
15	Goo	✓			
16	Duh	✓			
17	Goo	✓			
18	Buh	✓			
19	Buh	✓			
20	Duh		✓		

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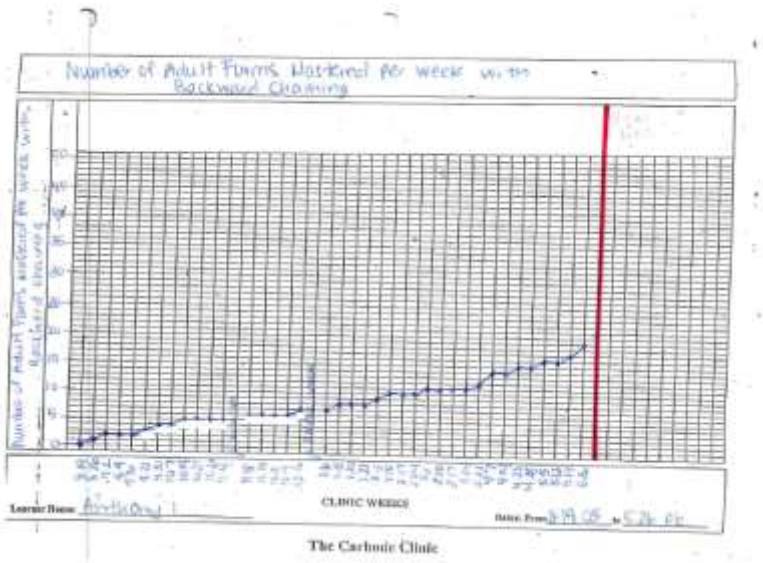

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REFERENCES

Research Studies that Support the Teaching of the Echoic Response to Increase Overall Vocal Responding

Eikeseth, S., & Nesset, R. (2003). Behavioral treatment of children with phonological disorder: The efficacy of vocal imitation and sufficient-response-exemplar training. *Journal of Applied Behavior Analysis, 36,* 325-337.

Johnston, J. M., & Johnston, G. T. (1972). Modification of consonant speech-sound articulation in young children. *Journal of Applied Behavior Analysis, 5,* 233-246.

Ross, D. E., & Greer, D. (2003). Generalized imitation and the mand: Inducing first instances of speech in young children with autism. *Research in Developmental Disabilities, 24,* 58-74.

Tarbox, J., Madrid, W., Aguilar, B., Jacobo,W., & Schiff, A. (2009) Use of chaining to increase complexity of echoic in children with autism, *Journal of Applied Behavior Analysis,* 42, 901-906.

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Additional Procedures to Increase Vocal Productions

- Some learners do not produce vocalizations during sign mand training as has been reported in the previous review of the literature.
- Additional procedures may need to be added when teaching manual sign language manding.

EARLY SIGNS- NO VOCALIZATIONS

PROCEDURES TO ADD TO SIGN LANGAUGE TRAINING
TO INCREASE VOCAL VERBAL BEHAVIOR

- The literature indicates that there are other procedures that may be used alone or along with alternative communication to increase vocal production:
  - Time Delay and Differential Reinforcement (Carbone Sweeney-Kerwin, Attanasio & Kasper, 2010; Charlop, Schreibman, & Thibodeau, 1985; Charlop & Trasowech, 1991; Halle, Baer, & Spradlin, 1981; Halle, Marshall, & Spradlin, 1979; Ingenmey & Houten, 1991; Matson, Sevin, Box, Francis, & Sevin, 1993; Matson, Sevin, Fridley, & Love, 1990); Sweeney-Kerwin, Carbone, O'Brien, Zecchin, & Janecky, 2007; Tincani, 2004; Tincani, Crozier, & Alazetta, 2006)
  - Carbone, et al.,(2010) specifically demonstrated that sign mand training along with time delay and echoic prompting procedures increased vocal production and led to some adult form mand responses.
  - The echoic prompting procedure used by Carbone, et al., was similar to the method implemented by Drash, High & Tudor (1999) to increase echoic responses within the context of vocal mand training.
  - Gevarter, et al. (2016) found very similar results with speech generating devices.

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Prompt Delay and Echoic Prompting Procedures

MO----------Sign Response---------Reinforce

ONCE RESPONSE IS STRONG
DO THE FOLLOWING

MO---------Sign Response ---(5 sec Delay)--- **Vocalization**---Reinforce

OR

MO--------Sign Response ---(5 Sec Delay)---**NR**--(Echoic Prompt)--- **Vocalization**--Reinforce

OR

MO--Sign Response ---(5 Sec Delay)--- **NR**-- (Echoic Prompt)---**NR**-----Small Reinforcer

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JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2010, 43, 705–709 NUMBER 4 (WINTER 2010)

INCREASING THE VOCAL RESPONSES OF CHILDREN WITH AUTISM AND DEVELOPMENTAL DISABILITIES USING MANUAL SIGN MAND TRAINING AND PROMPT DELAY

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VIVIAN ATTANASIO
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AND

TAMARA KASPER
CENTER FOR AUTISM TREATMENT

The purpose of this study was to determine the effect of manual sign mand training combined with prompt delay and vocal prompting on the production of vocal responses in nonvocal children with developmental disabilities. A multiple baseline design across participants verified the effectiveness of this intervention. All participants showed increases in vocal responses following the implementation of the independent variables.

Key words: autism, mand, manual sign language, prompt delay, vocal responding

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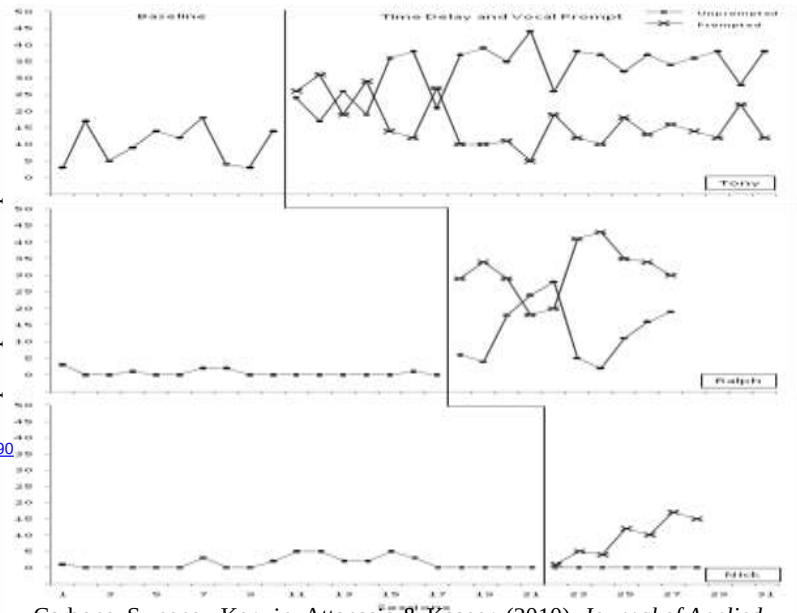
Frequency of Manual Sign Mands Accompanied by Prompted & Unprompted Vocal Responses

Trans # 90



Carbone, Sweeney-Kerwin, Attanasio & Kasper, (2010) *Journal of Applied Behavior Analysis.*

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Prompt Delay and Echoic Prompting to Improve Vocal Production

NICK

Reinforcer Nick, Mattie & Peter

1. Ball _____NR → **Prompt Delay** → ih
2. Puzzle _____NR → **Prompt Delay** → e
3. Puzzle Yuu
4. Ball _____NR→ **Prompt delay** → ___NR → **Echoic Prompt** → uh

MATTIE

5. Marble mmm → **Prompt Delay** → arpwuh

PETER

6. Cracker ___NR → **Prompt Delay** → guh → **PROMPT** → guhkuh

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Time Delay, Echoic Prompting and Differential Reinforcement of Vocalizations

Bobby and Christy

REINFORCER

Bobby w/ Christy Bobby & Brian

1. Music mooihk
2. Key ke
3. Ball buh → **TIME DELAY** → buu → **PROMPT** → baw
4. Ball bo → **TIME DELAY** → ___ → **PROMPT** → bo → **PROMPT** → baw

Case Study Data

5. Potty che → **TIME DELAY** → pohdeh
6. Cereal shoh → **TIME DELAY** → ___ → **PROMPT** → shoh → **PROMPT** → shoh → **PROMPT** → shoh
7. Key che → **TIME DELAY** → ke
8. Jump bohguhmp → **TIME DELAY** → ___ → **PROMPT** → duhmp → **PROMPT** → duhmp → **PROMPT** → juhm
9. Jump juhmp
10. Cereal che → **TIME DELAY** → kyuu → **TIME DELAY** → ke → **PROMPT** → shoh → **PROMPT** → shieyoh

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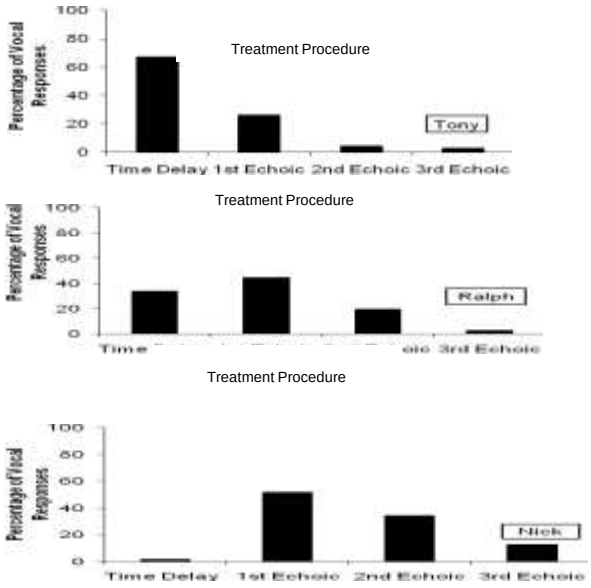
EFFECTS OF TIME DELAY AND ECHOIC



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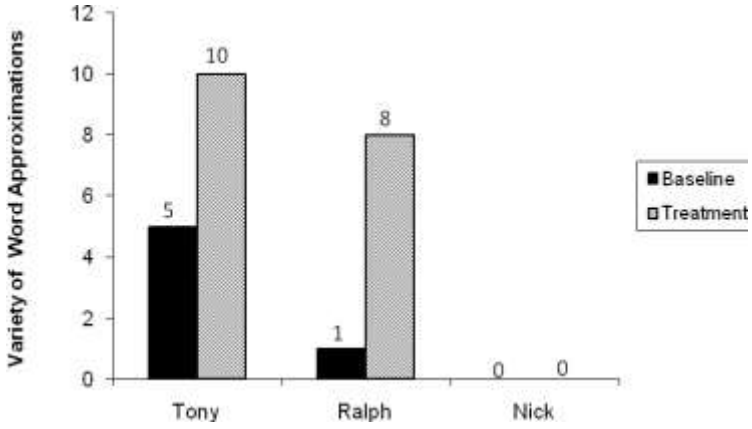
VARIETY OF WORD APPROXIMATIONS



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Tony Word Approximations

“wahwah” for water,

“buu” for book,

“reahl” and “eahl” for cereal,

“ve” and “oove” for movie,

“puh” & “buhbul” for puzzle,

“cahn” & “ahnd” for candy

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Ralph Word Approximations

puh” for puzzle

“boh” and “bloh” for block

“ta” and “ain” for train

“pa” for turn page

“eht” for pretzel”

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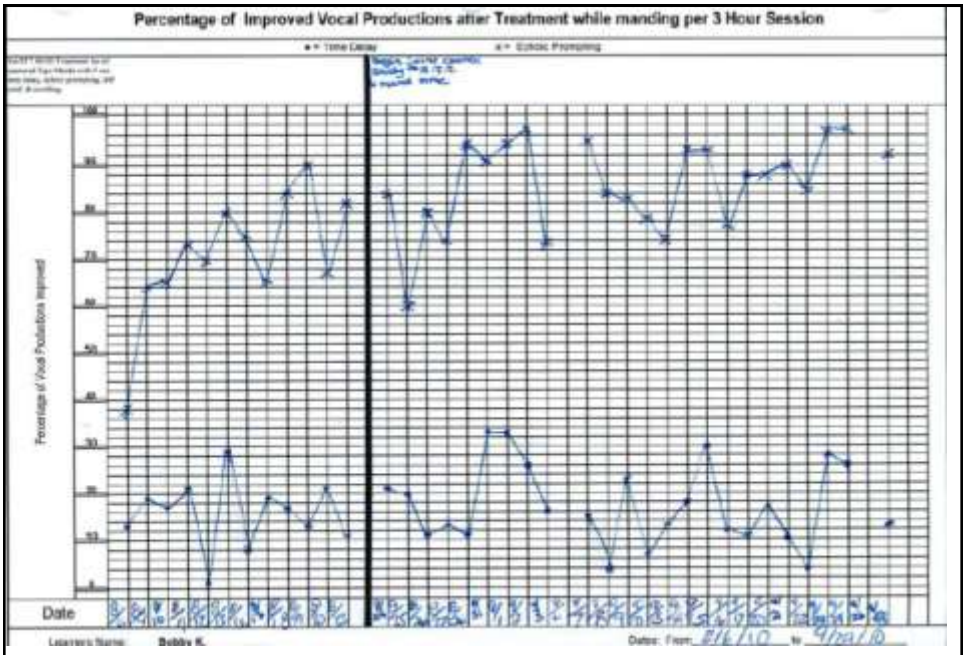

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References

Carbone, V. J., Sweeny-Kerwin, E. J. Attanasio, V., Kasper, T. (2010) . Increasing the vocal responses of children with autism and developmental disabilities using manual sign mand training and prompt delay. *Journal of Applied Behavior Analysis. 43, 705-709*

Charlop, M. H., Schreibman, L., & Thibodeau, M. G. (1985). Increasing spontaneous verbal responding in autistic children using a time delay procedure. *Journal of Applied Behavioral Analysis, 18,* 155-166.

Charlop, M. H., & Trasowech, J. E. (1991). Increasing autistic children's daily spontaneous speech. *Journal of Applied Behavioral Analysis, 24,* 747-761.

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Shaping Vocal Productions

- When manual sign language and or time delay, differential reinforcement and echoic method produce increased vocal production it may still be necessary to shape the response to more closely approximate the adult form of the word.
- Cooper, Heron, & Heward (2007) describe a teaching procedure called shaping, which can be used to teach novel behaviors. Shaping involves differentially reinforcing successive approximations to a terminal behavior. This means that the practitioner must deliver reinforcement for all responses that share predetermined dimensions of the terminal behavior (i.e., are closer approximations to the terminal behavior) while withholding reinforcement for all responses that do not contain those dimensions.
- A study by Bourett, Vollmer and Rapp, (2004) demonstrated the use of a shaping procedure to increase vocal production.
- A more recent report by Newman,Reinecke & Ramos, (2009) demonstrated that a shaping procedure can be an effective method to improve vocal productions of children with autism.

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Phonetic Transcription

- Transcription of the vocal productions during the shaping process can provide a standard on which to determine the sequence of successive approximations toward the adult form.
- Much of the theory about, rationale for, and procedures for transcription can be found in the linguistic literature related to the teaching of individuals with language disorders (e.g., apraxia) or individuals learning a second language.
- A transcript is defined as "an intentional representation of data translated from one medium to another as a necessary and convenient analytic strategy" (Müller & Damico, 2002, p. 301).
- The process of transcription involves 2 main components:
  - A listener who can accurately hear what is spoken
  - A notation system by which to record that which is heard (e.g., The International Phonetic Alphabet (IPA)

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- There are also various reasons within the behavior analytic literature to consider using transcription when teaching language.
    - Direct and repeated measures of behavior or the product of behavior serve as the data for analyzing the relationship between independent and dependent variables (Skinner, 1938, 1953). In this case, the vocal productions and their transcriptions provide a way to objectively measure the vocal product of the learner's verbal behavior.
    - Second, a precise record of speech productions can serve as a method for determining incremental response requirements toward the adult form of the word during the shaping process.

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- By identifying the adult form of the word as the terminal behavior and various combinations of speech sounds as successive approximations to that terminal behavior, the process of shaping can be applied to the development of vocal productions.
- Transcription of vocal productions allows the clinician to assess successive approximations to the adult form of the word. This permits the clinician to determine the next step, or the next successive approximation, that will be reinforced as a part of the shaping process.
- Visual display and analysis of data related to improvements of vocal productions based on transcriptive measurements provide a guide for making data-based decisions throughout the shaping process (Fuchs, Deno, & Mirkin, 1982).

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Methods for Transcription

- Based on the reasons identified in both the linguistic and behavior analytic research, we have selected transcription of vocal productions as the dependent measure for vocal shaping procedures.

- What follows are examples of the phonetic transcriptive alphabet we have designed, as well as a system for classifying vocal productions along a continuum from speech sounds to the adult form of the word.

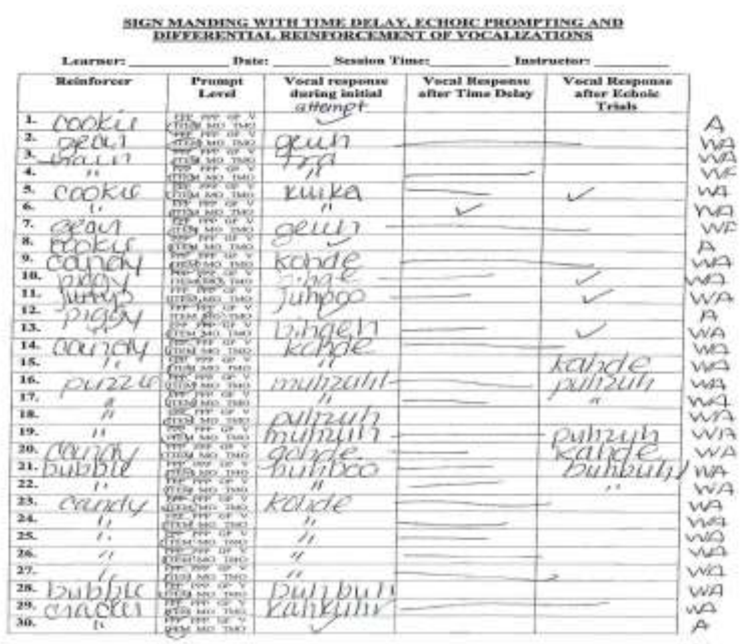
Modified Phonetic Transcription

Transcribe		Example
Vowels:		
e	key	
eh	red	
i	pie	Teach as oh-ih
ih	pin	
a	bait	Teach as a-ih
ah	had	
o	okay	Teach as oh-uu
oh	cod	
oo	moon	
uu	wood	
uh	bud	
Vowel Diphthongs:		
ow	how, about	Teach as ah-oo
aw	law	Teach as oh-oo
oy	boy	Teach as o-e
Vowels Influenced by R:		
er	butter, bird	
or	for, oar	
ar	car, large	
ear	tear	Teach as ih-uh
air	fair	Teach as a-uh

Transcribe		Example
Consonants:		
p	pork	
b	bug	
t	to	
d	dog	
k	king	
g	go	
m	mad	
n	name	
v	vote	
ng	ring	
f	for	
th-	thing	
th+	them	
s	say	
z	zoo	**Data Sheets**
sh	ship	
zh	beige	
h	hen	
ch	chew	
j	join	
w	win	Teach as oo-ihn
y	yet	Teach as e-eht
r	row	
l	let	

Developed by T. Kasper & V.Carbone

Transcribing Vocalizations During Sign Manding



SIGN MANDING WITH TIME DELAY, ECHOIC PROMPTING AND DIFFERENTIAL REINFORCEMENT OF VOCALIZATIONS

Learner: ____________ Date: ________ Session Time: ________ Instructor: ________

	Reinforcer	Prompt Level	Vocal response during initial attempt	Vocal Response after Time Delay	Vocal Response after Echoic Trials	
1.	cookie					A
2.	gear		geuh	—		WA
3.	train		tra	—		WA
4.	"		"	—		WF
5.	cookie		kuika	—	✓	WA
6.	"		"	✓		WA
7.	gear		geuh	—		WF
8.	cookie					A
9.	candy		kohde		—	WA
10.	piggy		piga	—	✓	WA
11.	jump		juhpoo	—	✓	WA
12.	piggy					A
13.			bihgeh	—	✓	WA
14.	candy		kohde			WA
15.	"		"		kahde	WA
16.	puzzle		muhzuht	—	puhzuh	WA
17.	"		"		"	WA
18.	"		puhzuh			WA
19.	"		muhzuh		puhzuh	WA
20.	candy		gohde		kahde	WA
21.	bubble		buhboo		buhbuh	WA
22.	"		"		"	WA
23.	candy		kohde			WA
24.	"		"			WA
25.	"		"			WA
26.	"		"			WA
27.	"		"			WA
28.	bubble		buhbuh			WA
29.	cracker		kahkuh	—		WA
30.	"		✓			A

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①

SIGN MANDING WITH TIME DELAY, ECHOIC PROMPTING AND DIFFERENTIAL REINFORCEMENT OF VOCALIZATIONS

Learner: mathe Date: 4.28.08 Session Time: 2:30–4:30 Instructor: HV

Reinforcer	Prompt Level	Vocal response during initial attempt	Vocal Response after Time Delay	Vocal Response after Echoic Trials	
1. cracker	FP PPP GP V ITEM MO TMO	kwahwuh	—	kahkuh	SS
2. "	FP PPP GP V ITEM MO TMO	"	kahkuhr		SS
3. movie	FP PPP GP V ITEM MO TMO	poofe	—	✓	SS
4. cracker	FP PPP GP V ITEM MO TMO	kahkuhr	—		WA
5. "	FP PPP GP V ITEM MO TMO	kwahkuh	kahkuhr		WA
6. movie	FP PPP GP V ITEM MO TMO	poofe	✓		SS
7. cracker	FP PPP GP V ITEM MO TMO	kwahguhr	—	✓	SS
8. movie	FP PPP GP V ITEM MO TMO	poofe			SS
9. "	FP PPP GP V ITEM MO TMO	poov	—	✓	WA
10. marble	FP PPP GP V ITEM MO TMO	bahbuhl	—	mahbuh	WA
11. "	FP PPP GP V ITEM MO TMO	"	—	"	WA
12. cracker	FP PPP GP V ITEM MO TMO	kahkuhr	—	—	WA
13. movie	FP PPP GP V ITEM MO TMO	poofe	—	—	SS
14. "	FP PPP GP V ITEM MO TMO	moofe	—		WA
15. "	FP PPP GP V ITEM MO TMO	poofe	—	moofe	SS
16. marble	FP PPP GP V ITEM MO TMO	bahbuhl	—	mahbuh	WA
17. "	FP PPP GP V ITEM MO TMO	"	—	"	WA
18. "	FP PPP GP V ITEM MO TMO	"	—	"	WA
19. candy	FP PPP GP V ITEM MO TMO	gohde	—	kade	WA
20. "	FP PPP GP V ITEM MO TMO	gohde	—	"	WA
21. "	FP PPP GP V ITEM MO TMO	kohde	—		WA
22. movie	FP PPP GP V ITEM MO TMO	poofe	—	moofe	SS
23. blank	FP PPP GP V ITEM MO TMO	kulip			SS
24. "	FP PPP GP V ITEM MO TMO	"			SS
25. movie	FP PPP GP V ITEM MO TMO	poofe	✓		SS
26. block	FP PPP GP V ITEM MO TMO	kuljo			SS
27. "	FP PPP GP V ITEM MO TMO	[illegible]			SS
28. movie	FP PPP GP V ITEM MO TMO	moofe	✓		WA
29. "	FP PPP GP V ITEM MO TMO	"	✓		WA
30. "	FP PPP GP V ITEM MO TMO	poofe	—	moofe	SS
SS/23	BA/ 7%		11T/	10S/.98	

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SIGN MANDING WITH TIME DELAY, ECHOIC PROMPTING AND DIFFERENTIAL REINFORCEMENT OF VOCALIZATIONS

Learner: ________ Date: ________ Session Time: ________ Instructor: ________

Reinforcer	Prompt Level	Vocal response during initial attempt	Vocal Response after Time Delay	Vocal Response after Echoic Trials	
1. cookie	FP PPP GP V ITEM MO TMO	✓			A
2. gear	FP PPP GP V ITEM MO TMO	geuh	—	—	WA
3. [illegible]	FP PPP GP V ITEM MO TMO	tza			WA
4. "	FP PPP GP V ITEM MO TMO	"	—		WA
5. cookie	FP PPP GP V ITEM MO TMO	kuika	—	✓	WA
6. "	FP PPP GP V ITEM MO TMO	"	✓		WA
7. gear	FP PPP GP V ITEM MO TMO	geuh	—	—	WA
8. cookie	FP PPP GP V ITEM MO TMO	✓			A
9. candy	FP PPP GP V ITEM MO TMO	kohde	—	—	WA
10. piggy	FP PPP GP V ITEM MO TMO	?ihae	—	✓	WA
11. jumps	FP PPP GP V ITEM MO TMO	juhpgo	—	✓	WA
12. piggy	FP PPP GP V ITEM MO TMO	✓			A
13. "	FP PPP GP V ITEM MO TMO	bihgeh	—	✓	WA
14. candy	FP PPP GP V ITEM MO TMO	kohde	—	—	WA
15. "	FP PPP GP V ITEM MO TMO	"		kahde	WA
16. puzzle	FP PPP GP V ITEM MO TMO	muhzuhl	—	puhzuh	WA
17. "	FP PPP GP V ITEM MO TMO	"	—	"	WA
18. "	FP PPP GP V ITEM MO TMO	puhzuh			WA
19. "	FP PPP GP V ITEM MO TMO	muhnuh	—	puhzuh	WA
20. candy	FP PPP GP V ITEM MO TMO	gohde	—	kahde	WA
21. bubble	FP PPP GP V ITEM MO TMO	buhboo	—	buhbuh	WA
22. "	FP PPP GP V ITEM MO TMO	"	—	"	WA
23. candy	FP PPP GP V ITEM MO TMO	kohde	—		WA
24. "	FP PPP GP V ITEM MO TMO	"	—		WA
25. "	FP PPP GP V ITEM MO TMO	"	—		WA
26. "	FP PPP GP V ITEM MO TMO	"	—		WA
27. "	FP PPP GP V ITEM MO TMO	"	—		WA
28. bubble	FP PPP GP V ITEM MO TMO	buhbuh			WA
29. cracker	FP PPP GP V ITEM MO TMO	kahkuhr	—		WA
30. "	FP PPP GP V ITEM MO TMO	✓			A
					16

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SIGN MANDING WITH TIME DELAY, ECHOIC PROMPTING AND DIFFERENTIAL REINFORCEMENT OF VOCALIZATIONS

Learner: Nathe Date: 4.28.08 Session Time: 2:30-4:30 Instructor: HV

	Reinforcer	Prompt Level	Vocal response during initial attempt	Vocal Response after Time Delay	Vocal Response after Echoic Trials	
1.	cracker		kwahwuh		kahkuhr	SS
2.	"		"	kahkuhr		SS
3.	more		poofe		✓	SS
4.	cracker		kahkuhr			WA
5.	"		kwahkwuh	kahkuhr		WA
6.	more		poofe	✓		SS
7.	cracker		kwahkuhr		✓	SS
8.	more		poofe			SS
9.	"		poov		✓	WA
10.	marble		bahbuht		mahbuh	WA
11.	"		"		"	WA
12.	cracker		kahkuhr			WA
13.	more		poofe			SS
14.	"		moofe			WA
15.	"		poofe		moofe	SS
16.	marble		bahbuht		mahbuh	WA
17.	"		"		"	WA
18.	"		"		"	WA
19.	candy		gohae		kade	WA
20.	"		gohde		"	WA
21.	"		kohde			WA
22.	more		poofe		mofe	SS
23.	walk		kuhp			SS
24.	"		"			SS
25.	more		poofe	✓		SS
26.	block		kuhp			SS
27.	"		"			SS
28.	more		moofe	✓		WA
29.	"		"	✓		WA
30.	"		poofe		moofe	SS

55/23 84% 79% 11/17 105/.98

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Vocal Production Classification System

To determine progress toward production of the adult form of the word we have developed a classification procedure based upon the transcriptive record from each mand session.

1. Transcribe vocal responding using the phonetic transcriptive alphabet during mand training.

2. Classify transcriptions of vocal responses according to the following categories:

   – **Speech Sounds** → Any vocal production that contains at least one phoneme or any combination of phonemes (not found in the adult form of the word) independent of the relevant controlling variables. (may include one sound contained in the adult form of the word)

   EXAMPLE- **saying "buh" when manding for music or saying "moo" when manding for music.**

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- Word Approximations → Any vocal production with at least 2 phonemes included in an adult form of an American English word and emitted more than once throughout the session under the control of relevant variables

  EXAMPLE- **saying "muhehk" when manding for music**

- Intelligible Word → Any word that effectively controls the behavior of an unfamiliar listener without contextual cues but does not include all phonemes of adult form under the controls of relevant variables
- EXAMPLE- **saying "muusehk" when manding for music.**

- Adult Form → Any word that contains all the phonemes of the adult form under the control of relevant variable

  EXAMPLE- **saying "muusihk" when manding for music.**

(developed by V. Carbone, T. Kasper, L. O'Brien, M. Janecky, & G. Zecchin)

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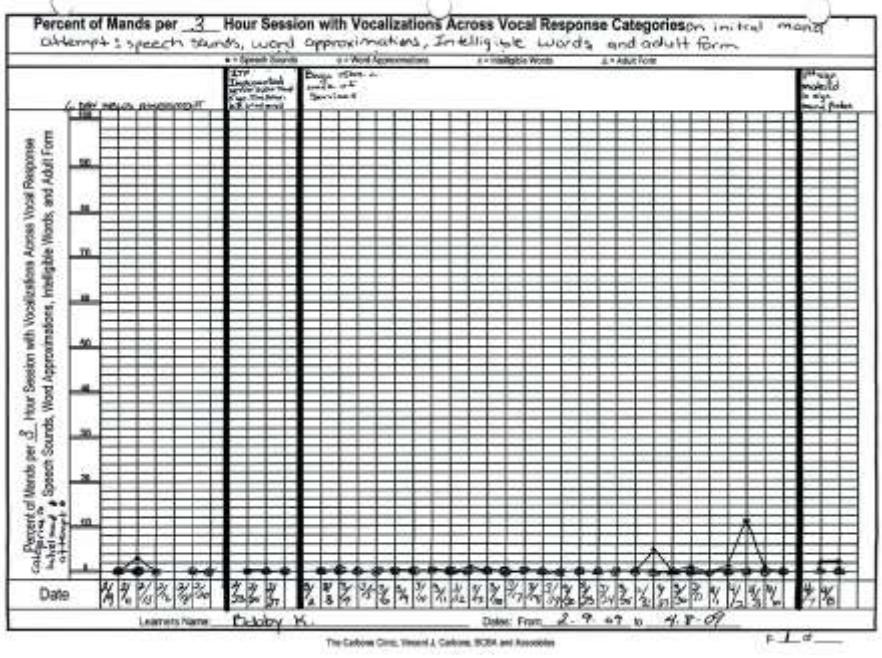

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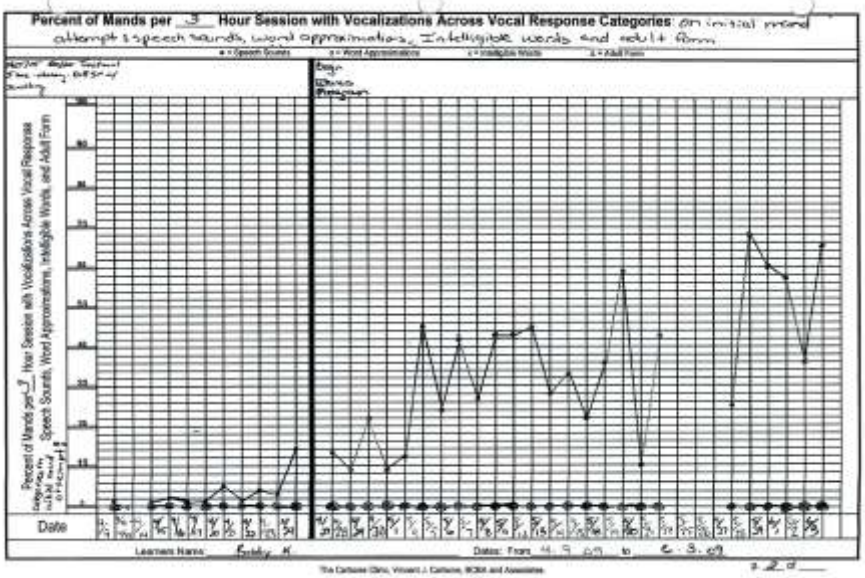
Percent of Mands per 3 Hour Session with Vocalizations Across Vocal Response Categories: on initial mand
attempt : speech sounds, word approximations, intelligible words and adult form
Percent of Mands per 3 Hour Session with Vocalizations Across Vocal Response Speech Sounds, Word Approximations, Intelligible Words, and Adult Form
Date
Learners Name: Bobby K
Dates: From 4.5.09 to 6.3.09

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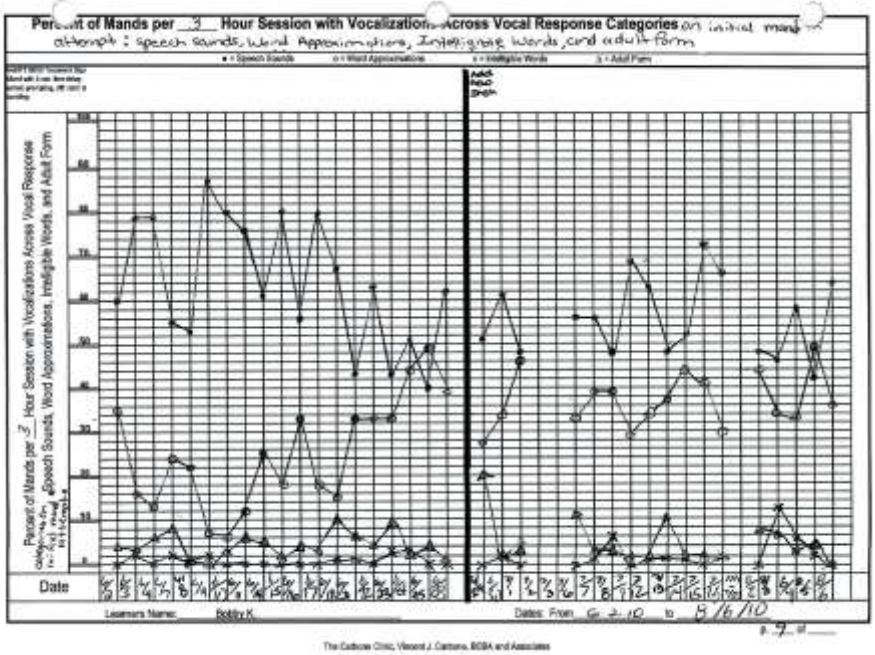
Percent of Mands per 3 Hour Session with Vocalizations Across Vocal Response Categories on initial mand
attempt : speech sounds, word approximations, intelligible words, and adult form
Percent of Mands per 3 Hour Session with Vocalizations Across Vocal Response Speech Sounds, Word Approximations, Intelligible Words, and Adult Form
Date
Learners Name: Bobby K
Dates: From 6.2.10 to 8/6/10

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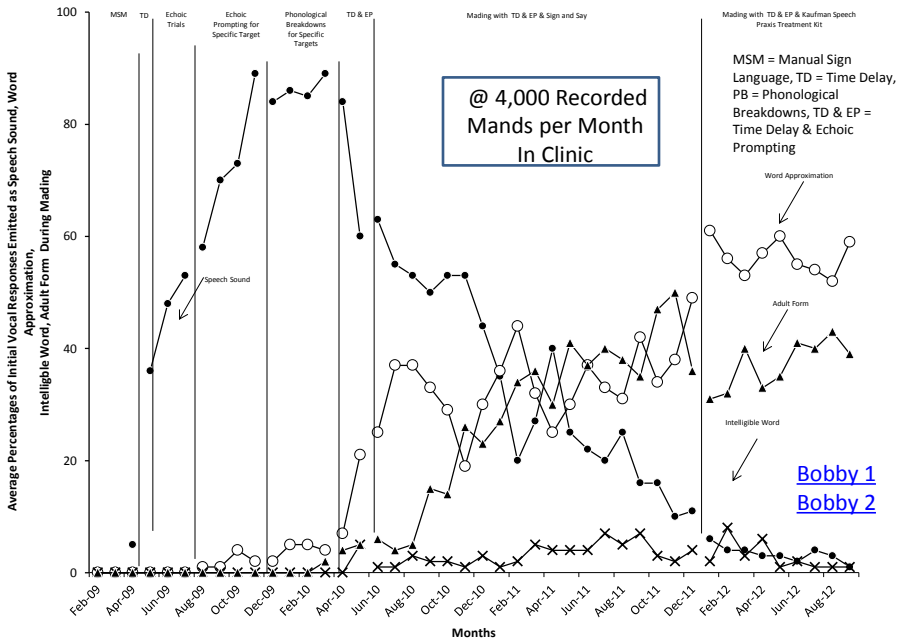

Figure 1. The average percentage of initial vocal responses emitted as a speech sound, word approximations, intelligible words, and adult word forms per month for Billy.

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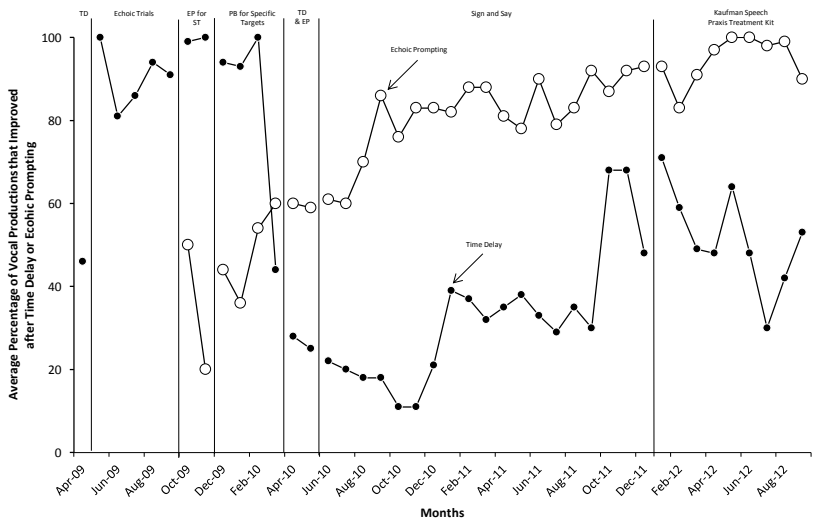

Figure 2. The average percentage of vocal productions that improved after time delay and echoic prompting for Billy. TD = Time Delay, EP for ST = Echoic Prompting for Specific Targets, PB = Phonological Breakdowns, TD & EP = Time Delay & Echoic Prompting.

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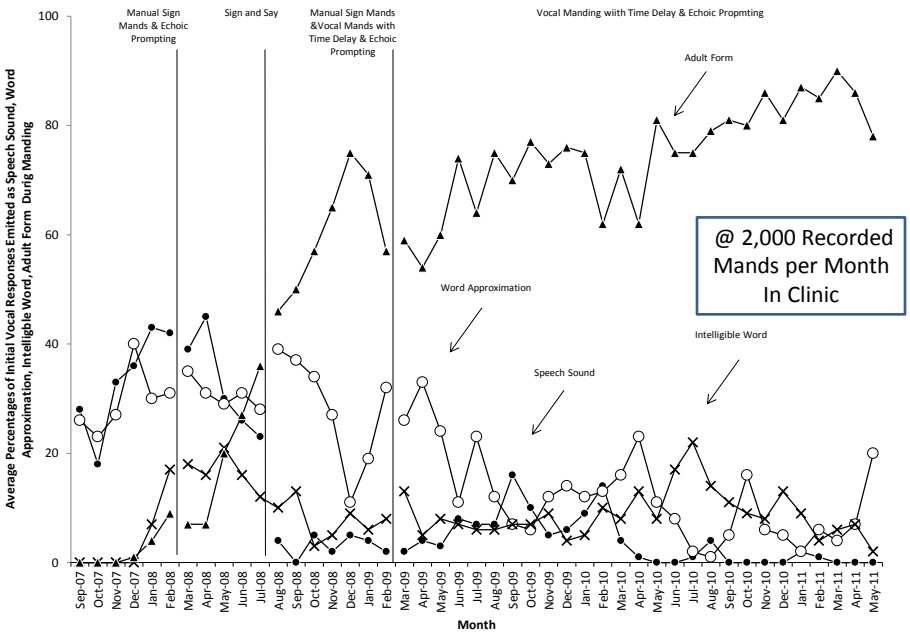

Figure 3. Average percentage of initial vocal responses emitted as a speech sound, word approximations, intelligible words, and adult word forms per month for Howard

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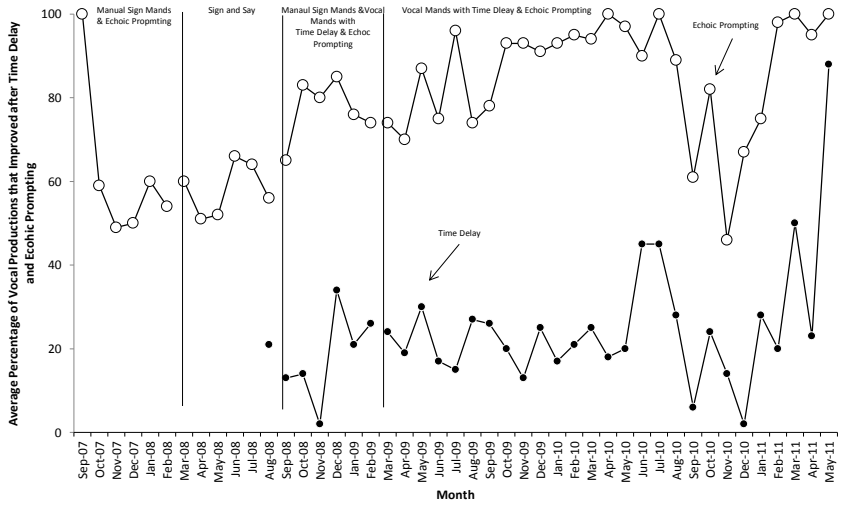

Figure 4. Average percentage of vocal productions that improved after time delay and echoic prompting per month for Howard.

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Teaching Procedures

1. The teacher has identified the baseline vocal production of all mands that may be emitted during that session.

2. A variety of reinforcers were made available but out of sight; approximately 5 reinforcers were presented at a time, clearly spread out around the instructor where Matthew could see them.

3. The instructor waited for Matthew to declare motivation for an item (e.g., looking at or reaching for an item).

4. Diagram on the following slide describes the steps of the shaping procedure.

5. On Slide # 111 is a narrative description on the procedure.

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Successive Approximations

WORD	TIME →					
	April 4	April 11	April 23	April 30	June 30	August 22
						ADULT FORM
Pretzel	Pwehshoo-	Pwehtsuh	Pwehtzuu-	Prehtzuh-	Prehzuhl-	**Prehtzuul**

				WORD APPROX.
	April 16	April 17	April 18	May 19
Wagon	twe –	twen-	ahgwih-	**wahgwih**

			INTELLIGIBLE WORD
	April 4	May 2	Nov 5
Ball	buh-	baw	**bohluh**

			ADULT FORM
	April 4	April 18	June 2
Bubble	buhboo-	bubuh	**buhbuul**

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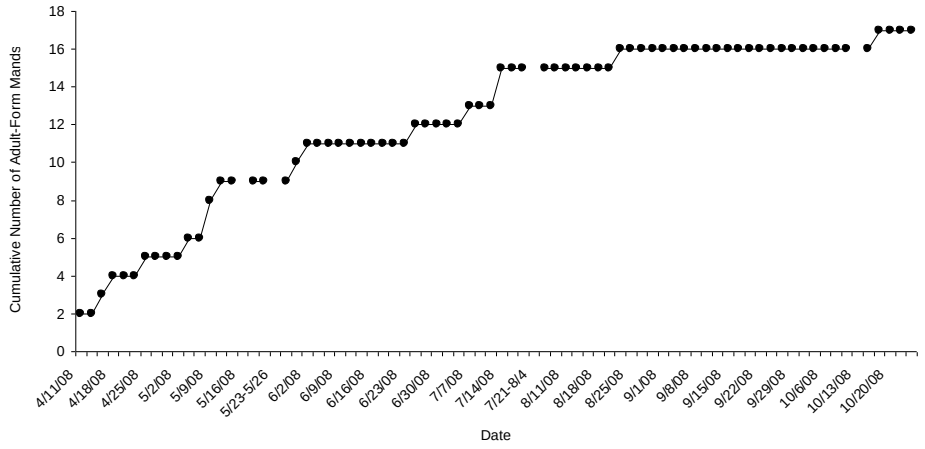

Mattie Vocalizations with Heather

Figure 3. Cumulative Number of Adult-Form Mands by Session.

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REVIEW OF TEACHING PROCEDURES TO IMPROVE SPEECH INTELLIGIBILTY

PROCEDURE	TACTICS	DATA RECORDING	GRAPHING
1. Manding Manual Sign Language (When Appropriate)	**CANDIDATE: ALL LEARNERS** 1. Run many trials per day across many reinforcers and MO's with sign language and vocals	• What the learner says • Prompt level needed to evoke each mand • Transcription of sounds	• Rate of spontaneous vs. prompted • Prompt level needed per reinforcer • Classification of sounds
2. Time Delay & Echoic Prompting and Differential Reinforcement During Manding	**CANDIDATE: POOR INTELLIGIBILITY** 1. Reinforce clear articulation of first mand attempt 2. Delay reinforcement and provide up 3-5 echoic prompts for better articulation	• Vocal approximations when manding on first attempt • Vocal approximations that improve when running echoic procedureTranscription of sounds	• % of clear vocal approximations on 1st mand attempt • % of vocal approximations that improve during time delay & echoic trials • Classification of sounds
3. Automatic Reinforcement Procedure	**CANDIDATE: FEW SPEECH SOUNDS PRODUCED** 1. Conduct sound inventory 2. Select a target sound from: • Most often sound heard during sound inventory • Developmentally appropriate sound 3. Pair the sound with reinforcement: Present target 3 times then provide reinforcement 4. Differentially reinforce if the sound is produced	• All sounds or words said during each trial	• % of trials in which the target sound occurs
4. Reinforcing all Vocalizations	**CANDIDATE: FEW SPEECH SOUNDS PRODUCED**	• Transcription of speech sounds	• Frequency of vocalizations • Variety of vocalizations • Classification of sounds

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TEACHING PROCEDURES TO IMPROVE SPEECH INTELLIGIBILTY

PROCEDURE	TACTICS	DATA RECORDING	GRAPHING
5. Echoic Procedure	**CANDIDATE: MANY SPEECH SOUNDS; POOR ARTICULATION** 1. Select targets from mands, sound inventory, and ARP produced sounds 2. Show "promise" reinforcer 3. Possible alternative procedures a. Present the word 3-5 times b. Present easy motor movements prior to target c. Present easy words within the same syllable form prior to target d. Breakdown words using a backward chain	• "Yes/No" cold probe on the adult form • Mark on the card the highest level of the shell	• Weekly cumulative number of adult forms that have met criteria
6. Kaufman Procedure	**CANDIDATE: MANY SPEECH SOUNDS; POOR ARTICULATION** 1. Conduct Kaufman assessment and select appropriate targets 2. Begin teaching session: a. Show a "promise" reinforcer b. Present the word approximation at the level where parity was last achieved c. Run up and the down the shells d. Differentially reinforce e. Other procedures: • Present easy motor movements prior to target • Present easy words within the same syllable form prior to target	• "Yes/No" cold probe on the adult form • Mark on the card the highest level of the shell	• Weekly cumulative number of adult forms that have met criteria

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General References

Atkielski, A. (2005). *Using phonetic transcription in class*. Retrieved October 26, 2008, from http://www.atkielski.com/ESLPublic/Phonetics%20-%20Using%20Phonetic%20Transcription%20in%20Class.pdf

Bijou, S. W., & Baer, D. M. (1965). *Child development II: Universal stage of infancy*. New York: Appleton-Century-Crofts.

Bourett, J., Vollmer, T. & Rapp, J. (2004) Evaluation of a vocal mand assessment and vocal mand training procedures. *Journal of Applied Behavior Analysis*, 37, 129-144.

Carbone, V., Sweeney-Kervin, E., Attanasio, V., Kasper, T., (2010). Increasing the vocal responding of children with autism and other developmental disabilities using manual sign language, mand training, prompt delay procedures, and vocal prompting. *Journal of Applied Behavior Analysis.43, 705-709.*

Charlop, M. H., Schreibman, L., & Thibodeau, M. G. (1985). Increasing spontaneous verbal responding in autistic children using a time delay procedure. *Journal of Applied Behavioral Analysis, 18,* 155-166.

Charlop, M. H., & Trasowech, J. E. (1991). Increasing autistic children's daily spontaneous speech. *Journal of Applied Behavioral Analysis, 24,* 747-761.

Charlop-Christy, M. H., Carpenter, M., Le, L., LeBlanc, L. A., & Kellet, K. (2002). Using the picture exchange communication system (PECS) with children with autism: Assessment of PECS acquisition, speech, social-communicative behavior, and problem behavior. *Journal of Applied Behavior Analysis, 35*, 213 – 231.

176

Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis*. (2nd ed.) Upper Saddle River, NJ: Pearson Education, Inc.

Drash, P. W., High, R. L., & Tudor, R. M. (1999). Using mand training to establish an echoic repertoire in young children with autism. *The Analysis of Verbal Behavior, 16*, 29 – 44.

Durand, V. M., & Carr, E. G. (1991). Functional communication training to reduce challenging behavior: Maintenance and application in new settings. *Journal of Applied Behavior Analysis, 24*, 251 – 264.

Eikeseth, S., & Nesset, R. (2003). Behavioral treatment of children with phonological disorder: The efficacy of vocal imitatino and sufficient-response-exemplar training. *Journal of Applied Behavior Analysis, 36*, 325 – 337.

Fuchs, L.S., Deno, S. L., & Mirkin, P. K. (1982). Effects of frequent curriculum-based measurement and evaluation on student achievement and knowledge of performance: An experimental study. (Research Report No. 96) November 1982.

Halle, J. W., Baer, D. M., & Spradlin, J. E. (1981). Teacher's generalized use of delay as a stimulus control procedure to increase language use in handicapped children. *Journal of Applied Behavioral Analysis, 14,* 389-409.

Halle, J. W., Marshall, A. M., & Spradlin, J. E. (1979). Time delay: A technique to increase language use and facilitate generalization in retarded children. *Journal of Applied Behavior Analysis, 12,* 431-439.

177

Haley, K. L., Ohde, R. N., & Wertz, R. T. (2000). Single word intelligibility in aphasia and apraxia of speech: A phonetic error analysis. *Aphasiology, 2*, 179 – 201.

Ingenmey, R., & Houten, R. V. (1991). Using time delay to promote spontaneous speech in an autistic child. *Journal of Applied Behavioral Analysis, 24,* 591-596.

Johnston, J. M., & Johnston, G. T. (1972). Modification of consonant speech-sound articulation in young children. *Journal of Applied Behavior Analysis, 5*, 233 – 246.

Koegel, R. L., Camarata, S., Koegel, L. K., Ben-Tall, A., & Smith, A. E. (1998). Increasing speech intelligibility in children with autism. *Journal of Autism and Developmental Disorders, 28*, 241 – 251.

Koegel, R. L., O'Dell, M., & Dunlap, G. (1988) Producing speech use in nonverbal autistic children by reinforcing attemtps. Journal of Autism and Developmental Disorders, 18, 525-538.

Lof, G. (2008) Controversies surrounding nonspeech oral motor exercises for childhood speech disorders. *Seminars in Speech and Language*, 29, 253-256.

Matson, J. L., Sevin, J. A., Box, M. L., Francis, K. L., & Sevin, B. M. (1993). An evaluation of two methods for increasing self-initiated verbalizations in autistic children. *Journal of Applied Behavioral Analysis, 26,* 389-398.

Matson, J. L., Sevin, J. A., Fridley, D., & Love, S. R. (1990). Increasing spontaneous language in three autistic children. *Journal of Applied Behavioral Analysis, 23,* 227-233.

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