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**EVIDENCE-BASED SPEECH PRODUCTION
TRAINING FOR CHILDREN WITH AUTISM**

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THE CENTER
FOR AUTISM TREATMENT

www.centerautismtreatment.org

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The presenter wishes to thank
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and his associates
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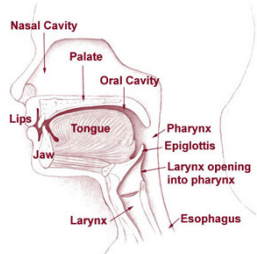
SPEECH PRODUCTION:

Speech Production

- Speech production is the process by which spoken words are produced by modification of a breath stream as it passes through the vocal apparatus. Speech production can be spontaneous such as when a person asks for an item or creates the words of a conversation; reaction such as when they name a picture or read aloud a written word, or a vocal imitation such as in speech repetition.
- Speech production is vocal verbal behavior which functions as a mand, intraverbal, tact, textual or echoic.
- Speech production (Vocal verbal behavior) is not the same as language production since language (verbal behavior) can also be produced manually by signs.

http://en.wikipedia.org/wiki/Speech_production

Human Vocal Apparatus used to Produce Speech



http://teaching.voc-center.gov/te_mechanisms_human_vocal_system_anatomy.html

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SPEECH SOUND DISORDERS

- Speech sound disorders are speech disorders in which some speech sounds (phonemes) in a child's native language are either not produced, not produced correctly, or are not used correctly.
 - Articulation delay or disorder (phonetic)
 - Phonological delay or disorder (phonemic)
 - Inconsistent speech disorder
 - Speech Impairment
 - Childhood apraxia of speech
 - Motor speech disorders, including childhood apraxia of speech and developmental dysarthria

Williams, A., McLeod, S., and McCauley, R. (2010). *Interventions for Speech Sound Disorders in Children.* Baltimore: Paul H. Brooks Publishing.

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VOCAL VERBAL DEVELOPMENT

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

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

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LORD, RISI, ET AL. (2007)

Journal of Consulting and Clinical Psychology
2007, Vol. 75, No. 4, 594–604

Table 1
Expressive Language Level at Age 9 by Age 2 Diagnostic: Percentage of 172 Participants

Language level	Autistic (n = 84)	PDD-NOS (n = 46)	Nonspectrum (n = 42)
Complex sentences (ADOS Module 3)	23.8	58.7	54.8
Sentences but not fluent (ADOS Module 2)	23.8	26.1	31.0
Words but not sentences (ADOS Module 1; ADI-R = 1)	23.8	10.9	7.1
No or few consistent words (ADI-R = 2)	28.6	4.3	7.1

Note. Four children were not administered ADOS; level of language was inferred from ADL Vineland, and best verbal IQ scores. PDD-NOS = pervasive development disorders-not otherwise specified; ADOS = Autism Diagnostic Observation Schedule; ADI-R = Autism Diagnostic Instrument-Revised.

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TREATMENT OF SPEECH SOUND DISORDERS



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HOW DO WE CHOOSE
AN APPROACH?

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EVIDENCE-BASED PRACTICE (EBP)

Schlosser and Raghavendra define EBP as "the integration of best and current research evidence with clinical/educational expertise and relevant stakeholder perspectives, in order to facilitate decisions about assessment and intervention that are deemed effective and efficient for a given direct stakeholder" (p. 3).

This definition emphasizes three cornerstones- research evidence, clinical/educational expertise, and relevant stakeholder perspectives-that need to be integrated through the EBP process.

Schlosser, R. W., & Raghavendra, P. (2004). Evidence-based practice in augmentative and alternative communication. *Augmentative and Alternative Communication*, 20, 1-21.

Schlosser, R. W., & Prabhu, A. (2004b). *Interrogating evidence-based practice through a humanistic lens*. Paper to be presented at The Second International Conference on New Directions in the Humanities, June, Monash University, Prato Campus, ITALY.

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ASHA ON EBP

○ The goal of EBP is the integration of:

- (a) clinical expertise/expert opinion
- (b) external scientific evidence
- (c) client/patient/caregiver perspectives to provide high-quality services reflecting the interests, values, needs, and choices of the individuals we serve.

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American Speech Language Hearing Association. (2011). *Evidence Based Practice (EPB)*. Retrieved July 15, 2011 from <http://www.asha.org/members/ebp/>.

ASHA ON EBP



American Speech Language Hearing Association. (2011). *Evidence Based Practice (EPB)*. Retrieved July 15, 2011 from <http://www.asha.org/members/ebp/>.

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BEHAVIOR ANALYSIS & SPEECH-LANGUAGE PATHO



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DIFFERENT CONCEPTUAL FRAMEWORKS

Mark Sundberg (2011) notes that “Speech and language pathologists and behavior analysts share the same clinical focus of teaching communication skills to individuals with language delays and disorders”

“Collectively, the content from these two professional fields can have a bigger clinical impact on language intervention programs than each can have separately”

However these two professions are based on vastly different theoretical foundations (Hegde, 2010)

Hegde, M. N. (2010). *Introduction to Communicative Disorders* (4th Ed.). Austin, TX: Pro-Ed.

Sundberg, M. (May, 2011). *Form and function: Uniting speech and language pathologists and applied behavior analysts*. Presented at The Applied Behavior Analysis International Annual Convention, Denver, CO.

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DIFFERENT CONCEPTUAL FRAMEWORKS

- SLP : Assessment and diagnosis of disorder or delay. Associated etiology or theory in conjunction with EBP guides intervention
- ABA: Analysis of repertoires and contingencies leads to selection of evidence based intervention
- Differences in terminology and conceptual frameworks may contribute to miscommunication and conflict.
- Differences in conceptual frameworks, terminology, and degree technological precision creates challenges in sharing data and replication of studies between fields.

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UNITING SLPS AND BCBAs

- Intervention to address communication deficits should be an integral part of both Speech/Language and Behavior Analytic programs. Challenging behavior and its relationship to the ability to communicate and remediation of speech sound disorders highlight the importance of collaborative interaction between SLPs and behavior analysts.

LaRue, Robert; Weiss, Mary Jane; Cable, Mary Kelly. (2009, June 22). Functional communication training: the role of speech pathologists and behavior analysts in serving students with autism *The Free Library*. (2009). Retrieved July 24, 2011 from <http://www.thefreelibrary.com/Functional+communication+training:+the+role+of+speech+pathologists.../a0216961576>

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CHARACTERISTICS OF ABA AND SPEECH-LANGUAGE PATHOLOGY

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

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VIEWING SPEECH-LANGUAGE DEVELOPMENT AS A SPEECH -LANGUAGE PATHOLOGIST AND BEHAVIOR ANALYST

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WHAT APPLIED BEHAVIOR ANALYSIS HAS TO OFFER SPEECH-LANGUAGE PATHOLOGISTS

Sundberg (2011) cites the following as

“What the Behavior Analyst Brings to the Table”:

- Behavioral teaching procedures (ABA methodology)
- Functional analysis of language
- Functional analysis of behavior problems
- Criterion-referenced verbal behavior assessment
- Intervention (teaching the verbal operants)
- Analysis of language barriers
- Contact with the behavioral literature
- Clinical skills
- Materials and teaching tools

Sundberg, M. (May, 2011). *Form and function: Uniting speech and language pathologists and applied behavior analysts*. Presented at The Applied Behavior Analysis International Annual Convention, Denver, CO.

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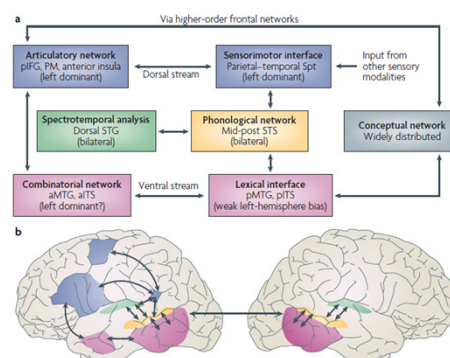
WHAT SPEECH-LANGUAGE PATHOLOGISTS OFFER BEHAVIOR ANALYSTS

“What the SLP brings to the Table”

- Thorough topographic description of an individual's speech-language repertoire
- Procedures to shape vocalizations
- Developmental sequence of speech production
- Developmental sequence of language and grammar
- Knowledge of anatomy and physiology of the respiratory and oral mechanisms
- Component analysis of speech production in terms of place, manner, and voice
- Appropriate speech target selection
- Contact with the speech-language literature
- Materials and teaching tools

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HICKOK, G. & POEPPPEL, D. (2007). THE CORTICAL ORGANIZATION OF SPEECH PROCESSING. *NATURE REVIEWS NEUROSCIENCE*, 8, 393-402.

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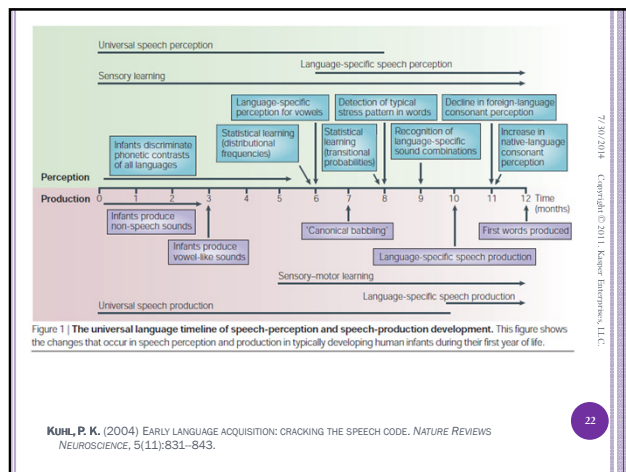
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DEVELOPMENT OF VOCAL VERBAL SKILLS

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

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NEUROTYPICAL DEVELOPMENT OF VOCAL VERBAL SKILLS

- Requesting via Non-Speech Means
- Babbling/ Oral Exploration
- Babbling with Sounds of Native Language
- First Word Approximations
- Successive Approximations

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VOCAL VERBAL DEVELOPMENT

- Socially-Mediated Positive Reinforcement →
Attention, Items

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UNDERSTANDING VOCAL VERBAL DEVELOPMENT

Antecedent→Behavior→Consequence



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VOCAL VERBAL DEVELOPMENT

- Schlinger (2010) points out that although Kuhl doesn't acknowledge the role of operant learning in speech production, "she cited studies showing that social contact and interactions affect the duration, rate, and frequency of vocal learning in human infants". He notes that "she cited a study by Goldstein, King, and West (2003) with human infants in which in a contingent condition "mothers were instructed to respond immediately to their infants' vocalizations by smiling, moving closer to and touching their infants" (Kuhl, 2004, p. 837). Not surprisingly, at least to a behavior analyst, the results showed that when compared to infants in the non-contingent condition, infants in the contingent condition produced more vocalizations and more mature and adult-like vocalizations. This is obviously operant conditioning and it is consistent with previous research demonstrating that reinforcement, even in the absence of awareness, can strengthen (i.e., select) vocalizations and numerous forms of speech (e.g., Greenspoon, 1955; Rosenfeld, & Baer, 1970; Rheingold, Gewirtz, & Ross, 1959; Todd & Palmer, 1968).

SCHLINGER, H. (2010). BEHAVIORAL VS. COGNITIVE VIEWS OF SPEECH PERCEPTION AND PRODUCTION. *THE JOURNAL OF SPEECH-LANGUAGE PATHOLOGY AND APPLIED BEHAVIOR ANALYSIS*, VOL. 5(2), PP. 150-165.

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VOCAL VERBAL DEVELOPMENT

- Socially-Mediated Positive Reinforcement→
Attention, Items
- Automatic Reinforcement→ Sounds/Words heard in the child's environment and heard just prior to receiving reinforcement are more likely to be produced by the child

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VOCAL VERBAL DEVELOPMENT

- Schlinger (2010) further explains “When the infants... hear themselves making sounds that match what they have heard from others, those sounds are automatically strengthened (i.e., reinforced) in the sense that they occur with a greater frequency relative to sounds that do not match what they have heard from others. In other words, the parity achieved when produced sounds are closest to heard sounds automatically strengthens the produced sounds (Palmer, 1996). According to some researchers, this vocal learning occurs relatively rapidly in infants and songbirds and without much in the way of external reinforcement (Doupe & Kuhl, 1999, but see Goldstein et al., 2003, 2009, emphasis added). But it does not occur in the absence of any reinforcement. Such shaping takes place as a function of automatic reinforcement, that is, reinforcement not mediated by another individual (see Vaughan & Michael, 1982).”

Schlinger, H. (2010). Behavioral vs. cognitive views of speech perception and production. *The Journal of Speech-Language Pathology and Applied Behavior Analysis*, vol. 5(2), pp. 150-165.

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VOCAL VERBAL DEVELOPMENT

- Socially-Mediated Positive Reinforcement → Attention, Items
- Automatic Reinforcement → Sounds/Words heard while receiving reinforcement are more likely to be produced
- Parity → Automatic shaping of vocalizations to match those of significant others

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TYPICAL DEVELOPMENT OF VOCAL VERBAL SKILLS

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

“trial and error” until it “sounds right”

Palmer, D. (1996). The Role of automatic reinforcement in the establishment of parity. *Journal of the Experimental Analysis of Behavior*, 65(1): 289-290.

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TYPICAL DEVELOPMENT OF VOCAL VERBAL SKILLS

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

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WHAT APPLIED BEHAVIOR ANALYSIS HAS TO OFFER SPEECH-LANGUAGE PATHOLOGISTS

- Schlinger (2010) notes: "What behavior analysis can offer language researchers and speech-language pathologists (SLPs) is a coherent and parsimonious interpretation of speech consistent with experimentally established scientific principles of learning that has immediate practical applications."
- He concludes that a functional, behavior-analytic approach serves the SLPs better than a cognitive approach, by offering both an experimentally based analysis of speech and language and measurable and manipulable methods of treatment.

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SCHLINGER, H. (2010). BEHAVIORAL VS. COGNITIVE VIEWS OF SPEECH PERCEPTION AND PRODUCTION. *THE JOURNAL OF SPEECH-LANGUAGE PATHOLOGY AND APPLIED BEHAVIOR ANALYSIS*, VOL. 5(2), PP. 150-165.

SLPS NEED SKINNER'S ANALYSIS

- Barb Esch notes, "Without assessing the controlling variables (motivation, discriminative stimuli, consequent stimuli) that evoke and strengthen or weaken speech-language responses, we may fail to identify appropriate functional (cause-effect) relations by which defective forms (e.g., grammatical errors) of a disorder should be remediated. Evaluations that result in effective intervention plans include an examination of the reasons (controlling variables) that an individual's verbal environment would occasion or maintain particular speech-language topographies (right or wrong) in the first place. We must account for these occurrences by determining the conditions that evoke and maintain them, to adequately prescribe a treatment program that will eliminate, modify, or otherwise resolve these errors."

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Esch, B. E., LaLonde, K. B., & Esch, J. W. (2010). Speech and language assessment: A verbal behavior analysis. *The Journal of Speech-Language Pathology and Applied Behavior Analysis*, 5, 166-191.

SLPS NEED SKINNER'S ANALYSIS

- Further, Esch states "In sum, a complete speech-language account (Skinner, 1957) would describe not only the form of a speaker's response but it would also explain the function of interactions between a speaker and a listener, resulting in a detailed description of response errors in terms of their topographies (specific words) and the environmental contexts (antecedent/consequent stimuli) in which those topographical errors occur. This would provide both the description (topography) and the explanation (function) for any given response. Such an account is essential for planning and carrying out effective interventions, whether they involve simple or complex treatments. Without such information, we risk embarking on an incomplete or poorly articulated treatment program that produces or maintains errors (i.e., poor stimulus control over correct responses), resulting in gaps (e.g., splinter skills) in the overall verbal repertoire (see Baker, LeBlanc, & Raetz, 2008; Greer & Ross, 2008)."

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Esch, B. E., LaLonde, K. B., & Esch, J. W. (2010). Speech and language assessment: A verbal behavior analysis. *The Journal of Speech-Language Pathology and Applied Behavior Analysis*, 5, 166-191.

B. F. SKINNER

"Verbal Behavior"

$$MO/Sd \rightarrow R \rightarrow Sr$$

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UNDERSTANDING BEHAVIOR

Antecedent \rightarrow Behavior \rightarrow Consequence

R

R \rightarrow SrSd \rightarrow R \rightarrow Sr
$$MO/Sd \rightarrow R \rightarrow Sr$$

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UNDERSTANDING BEHAVIOR

Antecedent \rightarrow Behavior \rightarrow Consequence

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UNDERSTANDING BEHAVIOR

Antecedent \rightarrow Behavior \rightarrow Consequence

Cookie!

uuu

uuu

uuu

kUgU

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Skinner's Behavioral Classification of Language

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

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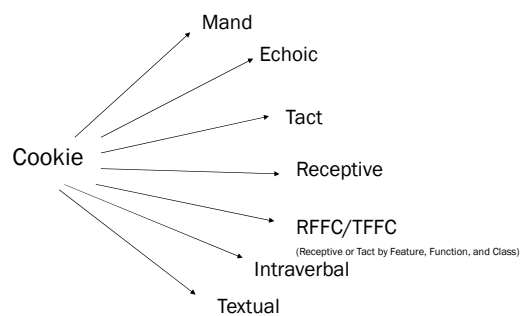
VERBAL BEHAVIOR

B. F. Skinner

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Teach All the "Meanings"



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MAND

- "Demand"
- Form controlled by motivation
 - Antecedent: Motivative operation
 - Response: Specific to the MO
 - Reinforcer: Specific to the MO
- First type of verbal behavior to develop
- Requesting items, events, information, or removal of an aversive
- Saying "cookie" when you want a cookie

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MIMETIC (MOTOR IMITATION)

- Form controlled by another's motor movements
- Motor Imitation
 - Antecedent: Motor movement
 - Response: Exact imitation (point to point correspondence)
 - Reinforcer: Social
- The tendency to sign "cookie" when someone else signs it

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ECHOIC

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

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TACT

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

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RECEPTIVE

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

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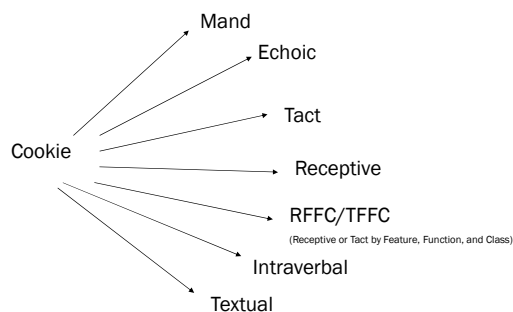
INTRAVERBAL

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

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Teach All the “Meanings”



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WHY VERBAL OPERANTS INSTEAD OF COMMUNICATIVE FUNCTIONS?

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

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WHY VERBAL OPERANTS INSTEAD OF COMMUNICATIVE FUNCTIONS?

- “Research on verbal behavior analysis has shown that the use of procedures from the science produces more speaker behavior for learners with missing verbal repertoires than linguistic based curricula that do not employ the procedures from verbal behavior analysis.”

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Williams, G., & Greer, R. D. (1993). A comparison of verbal-behavior and linguistic communication curricula for training developmentally delayed adolescents to acquire and maintain vocal speech. *Behaviorology* 1, 31-46.

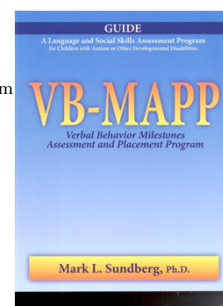
ASSESSING LANGUAGE LEVEL ACROSS THE OPERANTS

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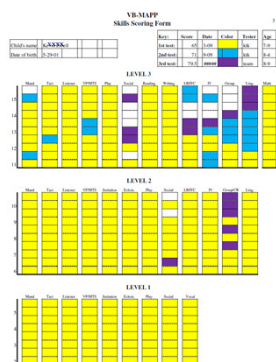
VERBAL BEHAVIOR MILESTONES ASSESSMENT AND PLACEMENT PROGRAM (VB-MAPP)

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



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IDENTIFICATION OF INTERVENTIONS FOR SPEECH SOUND DISORDERS WITH SUPPORTIVE RESEARCH

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INTERVENTIONS FOR SPEECH SOUND DISORDERS WITH SUPPORTIVE RESEARCH

Research from the field of speech-language pathology is limited.

In a clinical forum on evidenced-based practice, Kamhi (2006) stated that it is “often troubling to clinicians and researchers who want there to be a ‘gold standard’ treatment approach that works for all children with [speech sound disorders]”. He continued that the problem is that “there seem to be too many ways to improve children’s speech, and these approaches are often theoretically incompatible with one another” (p. 272).

Kamhi, A. (2006). **Treatment Decisions for Children With Speech-Sound Disorders.** *Lang Speech Hear Serv Sch* 37: 271-279.

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INTERVENTIONS FOR SPEECH SOUND DISORDERS WITH SUPPORTIVE RESEARCH

Tyler (2006) commented that,

“Although the abundance of evidence suggests that a variety of treatment approaches are effective for children with speech-sound disorders, less is known about which are most efficient as compared to one another or for which specific children. Practitioners, however, are embracing EBP when they select a treatment by matching the research evidence with a client’s profile, collect systematic data, and use those data to demonstrate that change is attributable to treatment.”

Tyler, A. (2006). Commentary on “treatment decisions for children with speech-sound disorders”: revisiting the past in EBP. *Language, Speech and Hearing Services in the Schools.* Oct;37(4):280-3.

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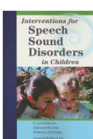
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INTERVENTIONS FOR SPEECH SOUND DISORDERS WITH SUPPORTIVE RESEARCH

Research from the field of speech-language pathology is limited.

“Some Evidence”

1. Exploratory studies of a potential intervention
2. Efficacy studies: Studies showing usefulness under conditions allowing for greater experimental control
3. Studies of effectiveness: illustrating usefulness under the conditions of everyday practice



Williams, A., McLeod, S., and McCauley, R. (2010). *Interventions for Speech Sound Disorders in Children.* Baltimore: Paul H. Brooks Publishing.

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH

- Imitation
- Motor Imitation Sequences
- Joint Attention
- Augmentative Communication
- Manding (Requesting)
- Motivation
- Natural Language Paradigm/Incidental Teaching
- Shaping
- Parent Training
- Stimulus-Stimulus Pairing (with and without direct reinforcement)
- Phonetic Hand Cues

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TREATMENT PROCEDURES FOR SPEECH DISORDERS WITH SUPPORTIVE RESEARCH

- Kaufman Speech to Language Protocol
- Minimal Pair Intervention
- Multiple Oppositions Intervention
- Complexity Approaches to Intervention
- Core Vocabulary Intervention
- The Cycles Phonological Remediation Approach
- The Nuffield Centre Dyspraxia Programme
- Strand DTTC Approach for Apraxia of Speech
- Stimulability Intervention
- Psycholinguistic Intervention
- Metaphonological Intervention: Phonological Awareness

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TREATMENT PROCEDURES FOR SPEECH DISORDERS WITH SUPPORTIVE RESEARCH

- Computer-Based Intervention
- Speech Perception Intervention
- Nonlinear Phonological Intervention
- Dynamic Systems and Whole Language Intervention
- Morphosyntax Intervention
- Naturalistic Intervention for Speech Intelligibility and Speech Accuracy
- Parents and Children Together (PACT) Intervention
- PROMPT: A Tactually Grounded Model

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TREATMENT PROCEDURES FOR SPEECH DISORDERS WITH SUPPORTIVE RESEARCH

- Visual Feedback Therapy with Electropalatography
- Vowel Intervention
- Nonspeech Oral Motor Intervention

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Williams, A., McLeod, S., and McCauley, R. (2010). *Interventions for Speech Sound Disorders in Children*. Baltimore: Paul H. Brooks Publishing.

ASD IN NOT HOMOGENEOUS

- In an attempt to narrow the focus of this presentation, the population to be considered was limited to create a target treatment group with some similar characteristics:
- Children with ASD who would be classified as falling within 2 different developmental categories.
- Levels 1 and 2 of the VB-MAPP. That is, the target population would have language and social skills that fall within the 0-30 month range of development.
- Level 3 of the VB-MAPP. Children with ASD who were functioning about the language and social skills level of 30-48 months were included for several additional treatments.
- Children above 48 months were excluded as they would be more likely to demonstrate improvement from procedures which require more elaborate receptive/expressive (mand, learner responding, tact, intraverbal) language skills.

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EVIDENCE-BASED PRACTICE (EPB)

According to The World Health Organization, 10 factors are important within an EBP framework to select an appropriate intervention that aligns with client factors as well as family and clinician factors. 10 factors are – client age, primary client populations, key intervention agents, key components, broad goals, basis of target selection, level of focus, session type, technology and/or materials required and key codes from the International Classification of Funding, Disability and Health: Children and Youth Version (p.28)

World Health Organization. (2007). International classification of functioning, disability and health for Children and youth version (ICF-CY). Geneva: Author.

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SPECIFIC CLIENT, FAMILY, AND CLINICIAN FACTORS

Client age: Language and social skills 0-30 months as indicated by the VB-MAPP and 30-48 months as indicated by the VB-MAPP
primary client populations: ASD and Speech sound disorders
key intervention agents: SLPs, BCBA, teachers, tutors, parents
Broad goals: Improve functional communication via development of vocal verbal skills

World Health Organization. (2007). International classification of functioning, disability and health for Children and youth version (ICF-CY). Geneva: Author.

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SPECIFIC CLIENT, FAMILY, AND CLINICIAN FACTORS

For Each Intervention Strategy, further identify:

Specific goals (dependent variables):

Key components (independent variables):

Basis of target selection:

Level of focus:

Verbal operant: mand, tact, intraverbal, textual, multiply-controlled

Setting: Natural Environment Teaching (NET) Discrete Trial Instruction (DTI)

Technology and/or materials required:

World Health Organization. (2007). International classification of functioning, disability and health for Children and youth version (ICF-CY). Geneva: Author.

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Natural Environment Teaching (NET)	Discrete Trial Instruction (DTI)
<ul style="list-style-type: none"> Loosely structured sessions paced by the student (e.g., typical play setting) Free operant responding No pre-specified order for instruction; target stimuli selected based on the student's motivation Target stimuli are varied every few trials Reinforcers are functionally related to responses Loose shaping contingencies; any vocalization is reinforced Decreased need for specific procedures to target generalization because target stimuli, reinforcers, and prompts are present in natural environments 	<ul style="list-style-type: none"> Highly structured sessions paced by the teacher (e.g., student seated at table across from teacher) Discrete learning trials Specific scope and sequence for instruction; target stimuli selected irrespective of the student's motivation Target stimuli repeated until criteria are met Responses and reinforcers are not functionally related Correct or successive responses are often reinforced Requires special procedures for generalization because target stimuli, reinforcers, and prompts are not present in natural environments

(adapted from Delprato, 2001; Koegel, O'Dell, & Koegel, 1987, and Sundberg & Partington, 1998)

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OTHER CONSIDERATIONS FOR LEARNERS WITH AUTISM

1. Motivation/Cooperation
2. Instructional Control
3. Language demands (Receptive/Tact)
4. Sufficient training opportunities
5. Functional Use/Generalization
6. Potential for Parent/Teacher involvement

National Research Council (2001). *Educating Children with Autism*. Committee on Educational Interventions for Children with Autism, Catherine Lord and James P. McGee, (Eds.), Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

- Imitation
- Motor Imitation Sequences
- Discrete Trial Instruction: Motor Imitation to Verbal Imitation
- Joint Attention
- Augmentative Communication
- Manding (Requesting)
- Motivation
- Natural Language Paradigm/Incidental Teaching
- Shaping
- Parent Training
- Stimulus-Stimulus Pairing (with and without direct reinforcement)
- Phonetic Hand Cues

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH POSSIBLY APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30-48 MONTH LEVEL

- Kaufman Speech to Language Protocol (K-SLP)
- Minimal Pair Intervention
- Multiple Oppositions Intervention
- Complexity Approaches to Intervention
- Core Vocabulary Intervention
- The Cycles Phonological Remediation Approach
- The Nuffield Centre Dyspraxia Programme
- Strand DTTC Approach for Apraxia of speech
- Stimulability Intervention
- Psycholinguistic Intervention
- Metaphonological Intervention: Phonological Awareness
- Traditional Articulation Therapy

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH POSSIBLY APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30-48 MONTH LEVEL

- Kaufman Speech to Language Protocol (K-SLP)
- Minimal Pair Intervention
- Multiple Oppositions Intervention
- Core Vocabulary Intervention
- The Cycles Phonological Remediation Approach
- Strand DTTC Approach for Apraxia of Speech
- Naturalistic Intervention for Speech Intelligibility and Speech Accuracy
- PROMPT: A Tactually Grounded Model

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS
WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH
ASD FUNCTIONING 30-48 MONTH LEVEL OR BELOW

- Computer-Based Intervention
- Speech Perception Intervention
- Nonlinear Phonological Intervention
- Dynamic Systems and Whole Language Intervention
- Morphosyntax Intervention
- Naturalistic Intervention for Speech Intelligibility and Speech Accuracy
- PROMPT: A Tactually Grounded Model
- Parents and Children Together (PACT) Intervention
- Visual Feedback Therapy with Electropalatography
- Vowel Intervention
- Nonspeech Oral Motor Intervention

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TREATMENT PROCEDURES FOR SPEECH DISORDERS
WITH SUPPORTIVE RESEARCH

- **Visual Feedback Therapy with Electropalatography**
- **Vowel Intervention**
- **Nonspeech Oral Motor Intervention**

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Williams, A., McLeod, S., and McCauley, R. (2010). *Interventions for Speech Sound Disorders in Children*. Baltimore: Paul H. Brooks Publishing.

INTERVENTIONS TO INCREASE VOCAL PRODUCTION AND
VOCAL IMITATION IN CHILDREN WITH LIMITED SKILLS

- Prelock, Paul, and Allen suggest that for young children with autism who do not speak, it is important to provide treatment that attempts to elicit:
 - vocal production
 - vocal imitation
 - speech (as this is the most universal means of communication and enables the greatest degree of integration)

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Prelock, P. Paul, R. Allen, E. (2011). Evidence-Based Treatments in Communication for children with Autism Spectrum Disorders. In Reichow, B. et al. (eds.) *Evidence Based Practices and Treatments for Children with Autism*. New York: Springer Science + Business Media.

TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS
WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH
ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

- Imitation
- Motor Imitation Sequences
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- Phonetic Hand Cues

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MOTOR IMITATION

- The relationship between imitation and language development in children with ASD has been the focus of several studies, which found that the earlier imitation abilities of children with ASD are predictive of later language skills (Charman et al., 2003; Stone & Yoder, 2001; Toth, Munson, Meltzoff, & Dawson, 2006).

Charman, T., Baron-Cohen, S., Swettenham, J., Baird, G., Drew, A., & Cox, A. (2003). Predicting language outcome in infants with autism and pervasive developmental disorders. *The International Journal of Language and Communication Disorders*, 38, 265-285.

Toth, K., Munson, J., Meltzoff, A. N., & Dawson, G. (2006). Early predictors of communication development in young children with autism spectrum disorder: Joint attention, imitation, and toy play. *Journal of Autism and Developmental Disorders*, 36, 993-1005.

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MOTOR IMITATION PREDICTS FUTURE SPEECH

Stone and Yoder (2001) analyzed child variables (play level, motor imitation ability and joint attention) and environmental variables (socioeconomic status, and hours of speech/language therapy between ages 2 and 3) to predict an aggregate measure of language outcome at age 4. After controlling for age 2 language skills, the only significant predictors were motor imitation and hours of speech/language therapy.

Stone, Ousley, and Littleford demonstrated that imitation of body movement was concurrently and predictively associated with expressive language skills.

Stone, W. L. and Yoder, P. J., 2001. Predicting spoken language in children with autistic spectrum disorders. *Autism*, 5, 341-361.

Stone, W.L., Ousley, O.Y., & Littleford, C.D. (1997). Motor imitation in young children with autism: What's the object? *Journal of Abnormal Child Psychology*, 25(6), 475-485

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MOTOR IMITATION INSTRUCTION INCREASES LANGUAGE USE (IN CHILDREN WHO HAD SOME WORDS)

Purpose: Reciprocal imitation training (RIT) is a naturalistic behavioral intervention that teaches imitation to children with autism spectrum disorder (ASD) within a social-communicative context. RIT has been shown to be effective at teaching spontaneous, generalized object and gesture imitation. In addition, improvements in imitation are associated with increases in verbal imitation and spontaneous language.

Method: This study used a modified multiple-baseline design across 4 children to examine whether adding gesture imitation training improves the overall rate of appropriate language use in children with ASD who have already been participating in object imitation training.

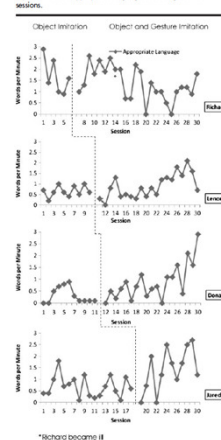
Ingersol, B. and Schreibman, L. (2006). Teaching reciprocal imitation skills to young children with autism using a naturalistic behavioral approach: effects on language, pretend play, and joint attention. *J Autism Dev Disord*. May;36(4):487-505.

Ingersoll, B. & Lalonde, K. (2010). The Impact of Object and Gesture Imitation Training on Language Use in Children With Autism Spectrum Disorder. *Journal of Speech Language and Hearing Research*, 53(4): 1040-1051.

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Figure 1. Rate of appropriate language use during treatment sessions.



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Table 3. Participants' language performance at pre, post, and follow-up.

Participant	Rate per minute of appropriate language (UIA)			Expressive vocabulary size (MCDI)		
	Pre	Post	Follow-up	Pre	Post	Follow-up
Richard	1.71	2.13	1.81	303 ^b	427	482
Lenore	0.98	1.38	2.51	102 ^a	157	181
Donald	0.25	1.16	0.79	80 ^a	99	142
Jared	0.43	1.34	0.45	347 ^b	464	497
Average (SD)	0.84 (0.66)	1.50 (0.43)	1.39 (0.94)	208 (137)	287 (185)	326 (190)

Note. UIA = Unstructured Imitation Assessment; MCDI = MacArthur-Bates Communicative Development Inventory.

^aWords and Gestures form. ^bWords and Sentences form.

Ingersoll, B. & Lalonde, K. (2010). The Impact of Object and Gesture Imitation Training on Language Use in Children With Autism Spectrum Disorder. *Journal of Speech Language and Hearing Research*. 53(4): 1040-1051.

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MOTOR IMITATION INSTRUCTION INCREASES LANGUAGE USE (IN CHILDREN WHO HAD SOME WORDS)

Results: Three of the 4 children showed greater improvements in their use of appropriate language after gesture imitation was begun. Further, the children were more likely to use verbal imitation during gesture imitation training than during object imitation training.

Conclusion: These findings suggest that adding gesture imitation training to object imitation training can lead to greater gains in rate of language use than object imitation alone.

Ingersoll, B. and Schriebman, L. (2006). Teaching reciprocal imitation skills to young children with autism using a naturalistic behavioral approach: effects on language, pretend play, and joint attention. *J Autism Dev Disord*. May ;36(4):487-505.

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

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- Natural Language Paradigm/Incidental Teaching
- Shaping
- Parent Training
- Stimulus-Stimulus Pairing (with and without direct reinforcement)
- Phonetic Hand Cues

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MOTOR IMITATION SEQUENCES

Ross and Greer (2003) Tested the effects of presenting a rapid generalized motor imitation sequence before an opportunity to imitate on the vocal speech of non-vocal children with autism. Participants were 5 elementary school students with ASD who emitted no vocal imitations during a mand training baseline.

Results: All participants began to vocalize with the generalized motor imitation sequence and that mands were maintained in 3 month follow-up probes.

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

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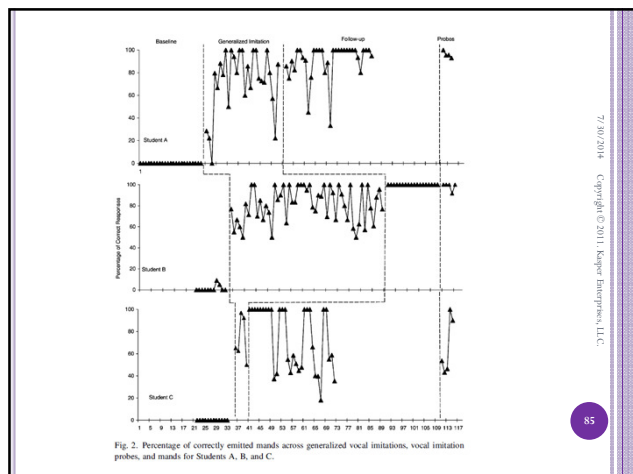


Fig. 2. Percentage of correctly emitted mands across generalized vocal imitations, vocal imitation probes, and mands for Students A, B, and C.

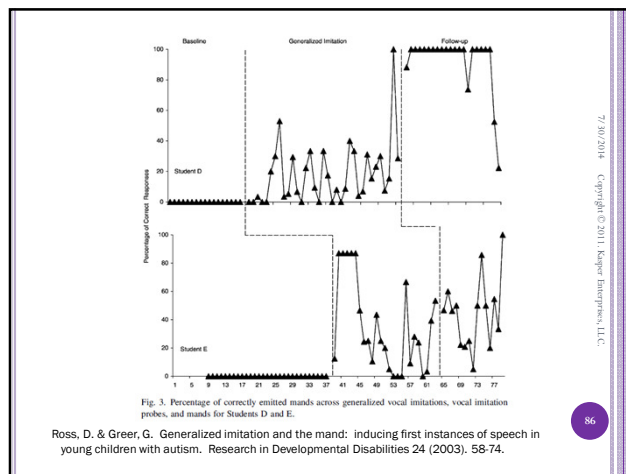


Fig. 3. Percentage of correctly emitted mands across generalized vocal imitations, vocal imitation probes, and mands for Students D and E.

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

KEY COMPONENTS OF MOTOR IMITATION INSTRUCTION TO INCREASE VOCAL VERBAL IMITATION

Specific goals (dependent variables): Specific imitation targets of gestural movements to movements with vocalizations. Also measured "spontaneous speech" and manding.

Key components (independent variables): Discrete trial teaching of motor imitation; discrete trial instruction in motor and echoic imitation using a variety of aba techniques including, prompting, prompt fading using differential reinforcement.

Target selection: Teacher selected imitation goals and imitation of movements with speech. Mands individualized to the subject's EO.

Level of focus: speech output involving vocalizations, and words.

Verbal operant: echoic, mand, unspecified.

Session type: Individual

Setting: Natural Environment Teaching and Discrete Trial Instruction

Technology and/or materials required: Objects, reinforcers specific to learner EO.

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

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DISCRETE TRIAL INSTRUCTION FROM MOTOR IMITATION TO VOCAL VERBAL IMITATION

In 1970, Hartung provided a review of procedures being utilized by behavior analysis to increase verbal imitation skills and functional speech in autistic children. He described a sequence of teaching from gross motor imitation to speech and then provides suggestions for specific speech targets. Risley (1968) demonstrates this use of imitative skills to develop complex performances. Risley developed the children's ability to imitate by starting with gross motor imitations, progressing to fine motor imitations, then to facial responses, and at the end added verbalizations.

Hartung, J. (1970) A review of procedures to increase verbal imitation skills and functional speech in autistic children. *Journal of Speech and Hearing Disorders* 35: 203-217.

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DISCRETE TRIAL INSTRUCTION FROM MOTOR IMITATION TO VOCAL VERBAL IMITATION

Hartung further noted that Lovaas et al. (1966) list three criteria for selecting vocal sounds that the nonspeaking child may readily learn:

1. Vocal sounds that can be prompted by manually moving the child through the sound. For instance, the clinician might emit the sound/b/, holding the child's lips closed with his fingers and quickly removing them when the child exhales.
2. Words or sounds centers on their concomitant visual components.
3. Those words or sounds that the child already can use (those most frequently used) may be selected for training.

Hartung, J. (1970) A review of procedures to increase verbal imitation skills and functional speech in autistic children. *Journal of Speech and Hearing Disorders* 35: 203-217.

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DISCRETE TRIAL INSTRUCTION FROM MOTOR IMITATION TO VOCAL VERBAL IMITATION

Dyer (2009) notes that these researchers(cf. Koegel & Koegel, 1995; Lovaas, 1977; Lovaas, 2003) have developed powerful and effective strategies for teaching children to produce initial sounds, words, sentences, and conversational speech. Thus, many children have benefited from these procedures with the development of functional vocal repertoires. While some of these children have adequate intelligibility, there is a portion of this population with compromised intelligibility that require additional or alternative intervention.

Dyer, K. (2009). Clinical Application of Speech Intelligibility Research: The River Street Autism Program at Coltsville. *The Journal of Speech-Language Pathology and Applied Behavior Analysis* 3, 140-153.

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KEY COMPONENTS OF DISCRETE TRIAL INSTRUCTION FROM MOTOR IMITATION TO VOCAL VERBAL IMITATION

Specific goals (dependent variables): Specific imitation targets from gross motor to sounds, words, and sentences.

Key components (independent variables): Discrete trial teaching of motor imitation to vocal imitations using a variety of aba techniques including, prompting, prompt fading, differential reinforcement, punishment, and physical guidance of the oral mechanism.

Target selection: Teacher selected imitation goals and articulatory targets based on ability to physically prompt, visibility, and frequency of use.

Level of focus: speech output involving vocalizations, word approximations, and sentences

Verbal operant: echoic

Session type: Individual

Setting: Discrete trial instruction

Technology and/or materials required: Reinforcers

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS
WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH
ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

- Imitation
- Motor Imitation Sequences
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- Phonetic Hand Cues

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JOINT ATTENTION TRAINING IMPROVES VOCALIZATIONS

Prelock et al (2011) note that several treatment studies examining the effectiveness of joint attention training have been carried out since 2002. The research has utilized strong experimental designs, including both randomized control trials and multiple baseline Single Subject Experimental Designs (SSED). The effects of joint attention training have been powerful or increasing verbalizations. Significantly more children in the treatment group went from nonverbal to having single-word or phrases speech.

Drew, A., Baird, G., Baron-Cohen, S., Cox, A., Sionims, V., et al. (2002). A pilot randomized control trial of a parent training intervention for pre-school children with autism: Preliminary findings and methodological challenges. *European Child & Adolescent Psychiatry*, 11, 266-272.

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JOINT ATTENTION TRAINING IMPROVES VOCALIZATIONS

- The parents of the children in the intervention group were taught several techniques to maximize the effect of the intervention.
- Behavior management techniques, including principles of (differential) reinforcement, interrupting unwanted behavior, and teaching alternative behaviors.
- Techniques to stimulate mutual enjoyment and eye contact including using an (overly) enthusiastic voice, holding objects close to own eyes, and then wait for eye contact before complying with the child's requests.
- Holistic learning of language, for example use of exaggerated prosody and repetitive paraphrasing to maximize the likelihood that the child would understand the meaning of key referent words.
- Use of visual support for spoken language (objects, photos, pictures) and use of simple gestures.
- Consequent attention to adequate pace, timing, and adjustment to the child's developmental level and interests (sensitivity).

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KEY COMPONENTS OF JOINT ATTENTION TRAINING TO
INCREASE VERBAL VOCAL RESPONDING

Specific goals (dependent variables): Number of single words and phrases used by the subjects.

Key components (independent variables): Parent training in a variety of techniques including receptive joint attention.

Target selection: Vague and included a complex parent report.

Level of focus: speech output involving vocalizations, word approximations, and/or words.

Verbal operant: Unspecified

Session type: Individual with parent

Setting: Natural Environment Training

Technology and/or materials required: Preferred items

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

- Imitation
- Motor Imitation Sequences
- Discrete Trial Instruction: Motor Imitation to Verbal Imitation
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- Augmentative Communication
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- Motivation
- Natural Language Paradigm/Incidental Teaching
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META-ANALYSIS OF AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (AAC)

Schlosser (2008) conducted a systematic review aimed to determine the effects of augmentative and alternative communication (AAC) intervention on speech production in children with autism spectrum disorders. A systematic review methodology was utilized to limit bias in searching, selecting, coding, and synthesizing relevant treatment studies. To be included, studies had to meet stringent criteria.

- Results: Nine single-subject experimental design (27 participants) and 2 group studies (98 participants) were included. Results indicated that AAC interventions do not impede speech production. In fact, most studies reported an increase in speech production. However, in-depth analyses revealed that the gains were rather modest.

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.

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META-ANALYSIS OF AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (AAC)

- Conclusions: Although AAC interventions do not appear to impede speech production and may result in increased speech production, the modest gains observed require realistic expectations among clinicians and other stakeholders. Future research should be more hypothesis driven and aim to identify predictive child characteristics, such as prior speech imitation and object exploration skills.

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.

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META-ANALYSIS OF AAC-SIGN LANGUAGE

- According to Schlosser, R. & Wend, O. (2008a), "The available body of research on manual signs and gestures for children with autism reveals strong intervention effectiveness scores for symbol acquisition and production, as well as for related outcomes such as speech comprehension and speech production. These results suggest that use of manual signing and gestures is a very effective communication option for children with autism." p. 370.

Schlosser, R. & Wend, O. (2008a). Augmentative and alternative communication intervention for children with autism: A systematic review. In J. K. Luiselli, C.C. Russo, W. P. Christian, & S.M. Wilczynski (Eds). *Effective practice for children 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.

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META-ANALYSIS OF AAC SIGN LANGUAGE V. PICTURE EXCHANGE COMMUNICATION SYSTEM (PECS)

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META-ANALYSIS OF AAC: SIGN LANGUAGE V. PECS

Two studies comparing the PECS and manual sign intervention monitored speech productions as a result of AAC intervention. Results revealed that the participants achieved gains in speech production that were highly effective with manual signing and with PECS. Schlosser and Wendt in their meta-analysis agreed with Tincanni's (2004) analysis that manual signing led to better speech production than PECS in his study. "When the treatment goal is speech production, however, the appraised evidence to date has not yet reached a sufficient threshold to inform practice in favor of either manual signing or PECS." (Schlosser, P. 345)

Anderson, A. E. (2001). *Augmentative communication and autism: A comparison of sign language and the Picture Exchange Communication System*. Unpublished doctoral dissertation, University of California, San Diego.

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

Tincanni, M. (2004). Comparing the Picture Exchange Communication System (PECS) and sign-language training for children with autism. *Focus on Autism and Other Developmental Disabilities*, 19, 152-163.

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AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (AAC)-PECS WITH MODIFICATION

Recent studies explored the effectiveness of various innovation to the PECS protocol or Sign language instruction in an attempt to encourage vocalizations. Tincani et al modified the PECS instruction during phase IV to include reinforcement of vocalizations. This modification resulted in improvement of word approximations, but not adult form words.

Tincani, M., Crozier, S., and 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, 177-184.

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AUGMENTATIVE AND ALTERNATIVE COMMUNICATION (AAC)-SIGN LANGUAGE WITH TIME DELAY

Another study conducted by Carbone, et al (2011), measured 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. Two of the three subjects of the study demonstrate an increase in word approximations as well as vocalizations.

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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

VINCENT J. CARBONE AND EMILY J. SWEENEY-KERWIN

CARBONE CLINIC

VIVIAN ATTANASIO

VERBAL BEHAVIOR INSTITUTE

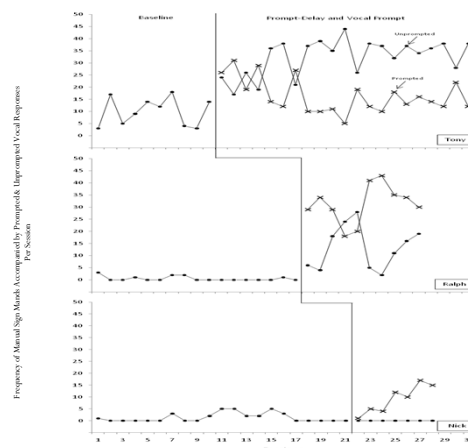
AND

TAMARA KASPER

CENTER FOR AUTISM TREATMENT

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RESEARCH STUDIES THAT SUPPORT THE TIME DELAY AND DIFFERENTIAL
REINFORCEMENT TO INCREASE VOCAL RESPONDING

Carbone, V. J., Kerwin-Sweeney-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.

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.

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.

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.

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

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AUGMENTATIVE AND ALTERNATIVE COMMUNICATION
(AAC)-SPEECH GENERATING DEVICES (SGDs)

Schlosser and Wend (2008) reviewed two studies examined the effects of speech output from SGDs on speech production. In the first study (Parsons and La Sorte 1993) yielded suggestive evidence, six learners with autism produced more spontaneous vocalizations when working with software that provided speech compared with no speech. A second study (Schlosser et al, 2007) taught children to request with and without speech output. Four of the five study subjects did not increase speech output. Schlosser and Wend(2008) conclude that "...the evidence suggests that it is plausible to explore the use of SGDs with these children." (p. 355).

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

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KEY COMPONENTS OF AAC TRAINING TO INCREASE VERBAL VOCAL RESPONDING

Specific goals (dependent variables): Number of signs or exchanges accompanied by vocalizations

Key components (independent variables): Mand, Tact, or Textual Training, some with Time delay and Echoic trials.

Target selection: Targets mands, tacts, text, pictures.

Level of focus: speech output involving vocalizations, word approximations, and/or words.

Verbal operant: Mand, Tact, Echoic, Textual, Multiply controlled

Session type: Individual

Setting: Natural Environment Training

Technology and/or materials required: Preferred items and Augmentative System

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

- Imitation
- Motor Imitation Sequences
- Discrete Trial Instruction: Motor Imitation to Verbal Imitation
- Joint Attention
- Augmentative Communication
- Manding (Requesting)
- Motivation
- Natural Language Paradigm/Incidental Teaching
- Shaping
- Parent Training
- Stimulus-Stimulus Pairing (with and without direct reinforcement)
- Phonetic Hand Cues

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MANDING

Drash, High, and Tudor described a method that establishes a mand repertoire as the firm component producing echoic and tact repertoires in 3 young nonverbal children with autism. The results indicated that establishing a mand repertoire as the starting point for echoic training produced the acquisition of an initial echoic repertoire in all 3 children within the first 10 sessions. A mand repertoire was acquired by all 3 children by the sixth session.

The procedures involved shaping the mand repertoire by using EOs and specific reinforcers.

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.

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MANDING-MAND TO ECHOIC

- Children received preferred reinforcer only for appropriate vocalizations. Shaping was used to create the mand repertoire. Varying verbal prompts such as "do you want this?" were delivered while presenting an item. Any vocalization was reinforced. Problem behavior was not reinforced, rather the child was told "no fussing, do good talking". If the child did not produce a vocal response to a prompt with 5 seconds, the reinforcing item was moved closer until just beyond grasp. If the child was able to reach the item and a vocal response was not emitted, a variety of reinforcers, both foods and toys were presented in rapid succession until one evoked a vocal response. Then, the item was given to the child. Children quickly began to emit different sounds for different reinforcers. Instructors began reinforcing vocalizations by delivering reinforcers specific to the vocalizations. These sounds were then transferred to echoic or verbal imitation skills. (p.36)

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.

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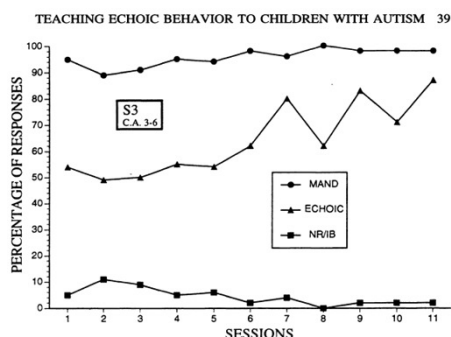


Fig. 3. Acquisition of a mand and echoic repertoire by Subject 3.

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.

MANDING

- “the mand-model procedure (e.g., Rogers-Warren & Warren, 1980; Warren, McQuarter, & Rogers-Warren, 1984) is an extension of the incidental teaching model. It was developed as part of the least-to-most prompting package strategy. The mand-model procedure requires the teacher or caregiver to model and/or mand (request) a response from the child. When modeling, the teacher or caregiver observes the focus of the child's interest (e.g., a toy train) and produces the word to represent the request. If the child produces the response, the teacher or caregiver then provides the requested item together with social reinforcement. Rogers-Warren and Rogers (1980) trained teachers to use the mand-model procedure and contingent praise to improve the speech production of particular student. The results indicated that the student increased his general rates of verbalization, his use of novel words, and his use of novel word-combinations. In addition, Warren, McQuarter, and Rogers-Warren (1984) demonstrated the effectiveness of this procedure in promoting generalization and maintenance.

Cautilli, J. (2006). Validation of the verbal behavior package: old wine new bottle—a reply to Carr & Firth (2005). *The Journal of Speech-Language Pathology and Applied Behavior Analysis*, 1. Retrieved July 23, 2011 from [http://www.thefreelibrary.com/Validation of the verbal behavior package: old wine new bottle-a...a0170157300](http://www.thefreelibrary.com/Validation+of+the+verbal+behavior+package:+old+wine+new+bottle-a...a0170157300)

KEY COMPONENTS OF MAND TRAINING TO INCREASE VERBAL VOCAL RESPONDING

Specific goals (dependent variables): Number of vocalizations emitted as mands

Key components (independent variables): Contriving MOs and prompting mands via echoic trials, vocal prompts, time delay and position.

Target selection: Based on motivation (high interest items). Targets for differential reinforcement based on vocalizations emitted by child

Level of focus: speech output involving vocalizations, word approximations, and/or words.

Verbal operant: Mand, Multiply controlled

Session type: Individual

Setting: Natural Environment Training

Technology and/or materials required: Preferred items

TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

- Imitation
- Motor Imitation Sequences
- Discrete Trial Instruction: Motor Imitation to Verbal Imitation
- Joint Attention
- Augmentative Communication
- Manding (Requesting)
- Motivation
- Natural Language Paradigm/Incidental Teaching
- Shaping
- Parent Training
- Stimulus-Stimulus Pairing (with and without direct reinforcement)
- Phonetic Hand Cues

MOTIVATION (REINFORCING VERBAL ATTEMPTS)

- Koegel, Dell, and Dunlap (1988) suggest that selecting aspects of motivation as a central target behavior rather than concentrating on motor speech production per se, may improve the effectiveness of teaching speech to severely handicapped non-verbal autistic children. They compared two different reinforcement conditions; one in which successive motor approximations of speech sounds were reinforced; and a "motivation" condition in which attempts to produce speech sounds were reinforced, without any motor shaping of speech.

Koegel, R., O'Dell, M. & Dunlap, G. (1988) Producing speech use in nonverbal autistic children by reinforcing attempts. *Journal of Autism and Developmental Disorders*, Vol. 18 (4).

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MOTIVATION (REINFORCING VERBAL ATTEMPTS)

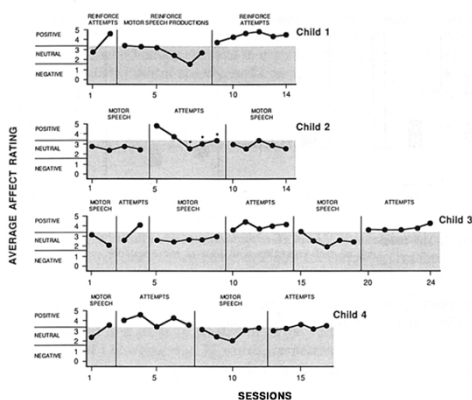
- The results, replicated within a repeated reversal design, showed that reinforcing speech attempts was more effective than reinforcing motor speech sounds with respect to a) the children's interest, enthusiasm, happiness and behavior and b) improvements in the children's speech production.

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Reinforcing Verbal Attempts

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MOTIVATION (REINFORCING VERBAL ATTEMPTS)

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Koegel, O'Dell, and Dunlap

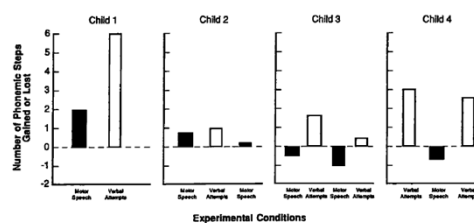


Fig. 2. The change in the level of correct speech production from the beginning to the end of each condition with four or more sessions.

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KEY COMPONENTS OF MOTIVATION TRAINING TO INCREASE VERBAL VOCAL RESPONDING

Specific goals (dependent variables): Any topography of vocalization compared to a specific motor speech topography

Key components (independent variables): Contriving MOs and prompting mands via echoic trials, vocal prompts, time delay and position.

Target selection: Based on motivation (high interest items). Targets for differential reinforcement in levels based on the target word.

Level of focus: speech output involving vocalizations, word approximations, and/or words according to levels of complexity established.

Verbal operant: Mand, Multiply controlled

Session type: Individual

Setting: Natural Environment Training

Technology and/or materials required: Preferred items

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

- Imitation
- Motor Imitation Sequences
- Discrete Trial Instruction: Motor Imitation to Verbal Imitation
- Joint Attention
- Augmentative Communication
- Manding (Requesting)
- Motivation
- Natural Language Paradigm/Incidental Teaching
- Shaping
- Parent Training
- Stimulus-Stimulus Pairing (with and without direct reinforcement)
- Phonetic Hand Cues

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NATURAL LANGUAGE PARADIGM/PARENT TRAINING

(a) Direct reinforcement of verbal attempts. To meet criterion, parents were required to reinforce 85% or more of their child's communicative attempts.

(b) Turn-taking with the stimulus material. To meet criterion, control of the stimuli was required to pass between parent and child in at least 50% of the intervals.

(c) Task variation and multiple exemplars. Parents were required to change stimulus materials and/or the words modeled in at least 50% of the intervals.

(d) Shared control. Shared control needed to occur at least five times during the session.

Laski, K., Charlop, M., & Schriebman, L. (1988). Training parents to use the natural language paradigm to increase their Autistic children's speech. *The Journal of Applied Behavior Analysis*, 21(4), 391-400

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NATURAL LANGUAGE PARADIGM

- Parents of four nonverbal and four echolalic autistic children were trained to increase their children's speech by using the Natural Language Paradigm (NLP), a loosely structured procedure conducted in a play environment with a variety of toys.
- Parents were trained in a clinic with subsequent parent-child speech sessions occurring at home.
- The results indicated that following training, parents increased the frequency with which they required their children to speak (i.e., modeled words and phrases, prompted answers to questions).

Laski, K., Charlop, M., & Schriebman, L. (1988). Training parents to use the natural language paradigm to increase their Autistic children's speech. *The Journal of Applied Behavior Analysis*, 21(4), 391-400

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NATURAL LANGUAGE PARADIGM

- All children increased the frequency of their verbalizations in three nontraining settings.
- Thus, the NLP appears to be an efficacious program for parents to learn and use in the home to increase their children's speech.

Laski, K., Charlop, M., & Schriebman, L. (1988). Training parents to use the natural language paradigm to increase their Autistic children's speech. *The Journal of Applied Behavior Analysis*, 21(4), 391-400

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

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AUTOMATIC REINFORCEMENT

Carbone (2011) summarized the literature on automatic reinforcement as follows:

- The principle of automatic reinforcement may result in the vocal verbal attempts of the young child.
- Researchers have applied this analysis to procedures using stimulus-stimulus pairing (and direct reinforcement) to increase the number and type of vocalizations of children with limited speech sound production.
- Stimulus-stimulus pairing procedures have been used to increase free operant vocalizations and in some cases transfer these vocalizations to other operants (echoic, mand). (Ward, Osnes, & Partington, 2007; Yoon, Feliciano, 2007)"

Carbone, V. (April 2011). **What Does Applied Behavior Analysis (ABA) Offer Children with Autism?** Presented at Spectrum 2011 A Multidisciplinary Approach to Autism Spectrum Disorders, Dothan, Alabama.

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AUTOMATIC REINFORCEMENT

- Sundberg et al (1996) demonstrated use of automatic reinforcement to develop vocal responding in language delayed children.
- A series of studies since that time (Partington, So-Young & Bennet, Carbone, Miguel, Esch, etc.) demonstrated mixed results with some participants showing greater effects than others.
- Esch, Esch & Love (2009) demonstrated some preliminary benefit to a direct reinforcement procedure using lag schedules of reinforcement that support speech variability.

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AUTOMATIC REINFORCEMENT

- One study (Esch, Carr, & Michael, 2005) suggested that direct reinforcement may be necessary to establish durable vocal behavior and further recommended identification of variables that influence the effectiveness of the stimulus-stimulus pairing procedure.
- Carroll and Klatt (2008) also studied the effects of automatic and direct reinforcement.
- Results demonstrated that the pairing procedure can be used to increase an existing, but low occurring vocalization for a child as young as 2 years. And, the results were obtained for the participant who initially began with the most limited verbal skills.
- The pairing procedure could be used in addition to alternative forms of communication to increase a vocalization that could then be brought under echoic control.

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(1), 135-146.

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AUTOMATIC REINFORCEMENT

- Petursdottir, Carp, Matthies, and Esch (2011) attempted to isolate procedural variables related to failure of SSP to condition speech sounds as reinforcers.
- These authors concluded that SSP is easy to implement and requires little therapist training compared other procedures for increasing specific vocalizations, such as shaping. However, given its unreliable effects in the literature to date and the lack of information on participant or procedural variables that contribute to its effects, it may be premature to recommend the procedure clinically.

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RESEARCH THAT SUPPORTS AUTOMATIC REINFORCEMENT THEORY

- 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.
- Miguel, C.F., Carr, J.E. & Michael, J. (2001/2002). 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.
- 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.
- So-Young, Y., & Bennett, G. M. (2000). Effects of stimulus-stimulus pairing procedure on conditioning vocal sounds as reinforcers *The Analysis of Verbal Behavior*, 17, 75-88.

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KEY COMPONENTS OF TREATMENT BASED ON AUTOMATIC REINFORCEMENT TO INCREASE VERBAL VOCAL RESPONDING

- Specific goals (dependent variables):** Number of target vocalizations emitted (phonemes, CV), variety of vocalizations
- Key components (independent variables):** Contriving MOs and pairing sounds/syllables with reinforcement, direct reinforcement, reinforcement of variety via lag schedule
- Target selection:** Varied. Some targets based on pre-existing free operant vocal inventory, typical development, or variety
- Level of focus:** speech output involving phonemes, syllables, or change in vocalizations.
- Verbal operant:** Mand, Multiply controlled, echoic
- Session type:** Individual
- Setting:** Natural Environment Training
- Technology and/or materials required:** Preferred items

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METHOD

Participant

- Darrell is an 18 year old male with a diagnosis of autism.
- His educational placement is a self-contained classroom in a High School.
- Prior to intervention provided by The Early Autism Project of South Carolina (EAP) in September of 2005, it was assumed that Darrell's potential for learning was limited.

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- Darrell's skill levels across the verbal operants were assessed via *The Assessment of Basic Language and Learning Skills* (Sundberg & Partington, 1988)
- Results revealed very limited skills as shown in the ABLLS grid.

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Student: _____ Assessor: _____ Date: _____ Color Code: _____

ABLLS

Assessment of Basic Language and Learning Skills
Skills Tracking System

A Cooperation & Responding Checklist

B Visual Performance

C Receptive Language

D Imitation

E Vocal Imitation

F Requests

G Labeling

H Interactions

I Spontaneous Vocalizations

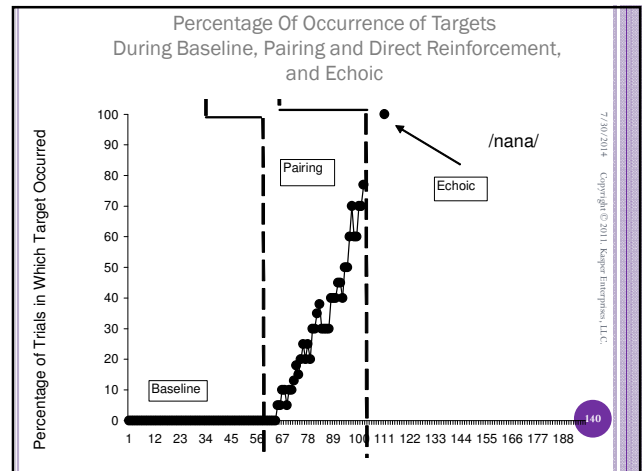
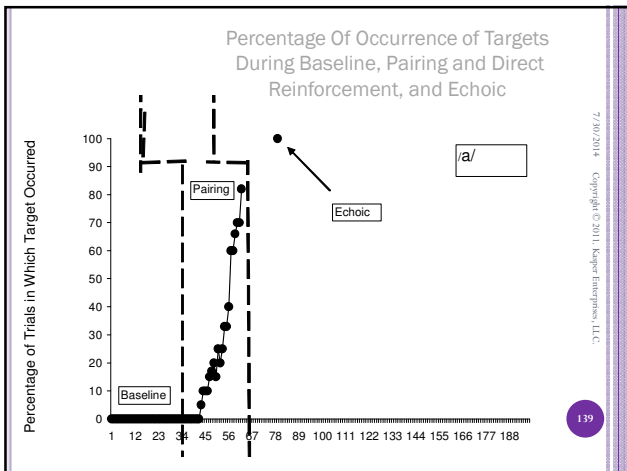
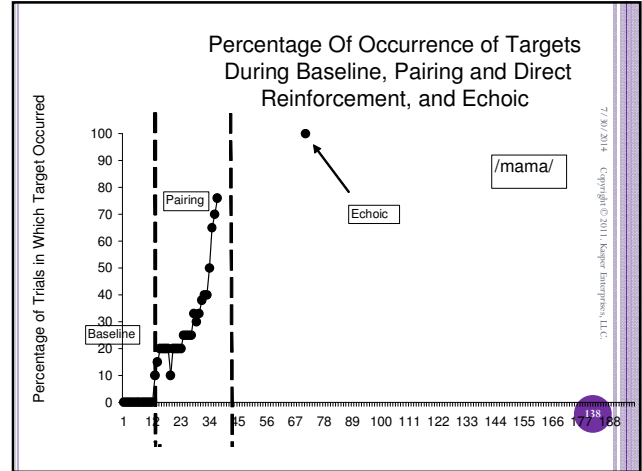
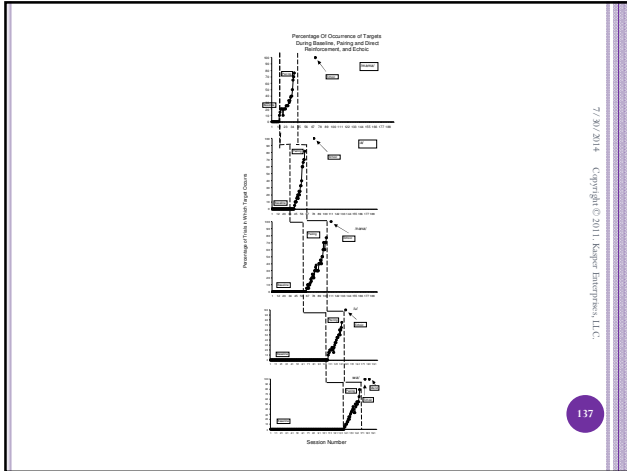
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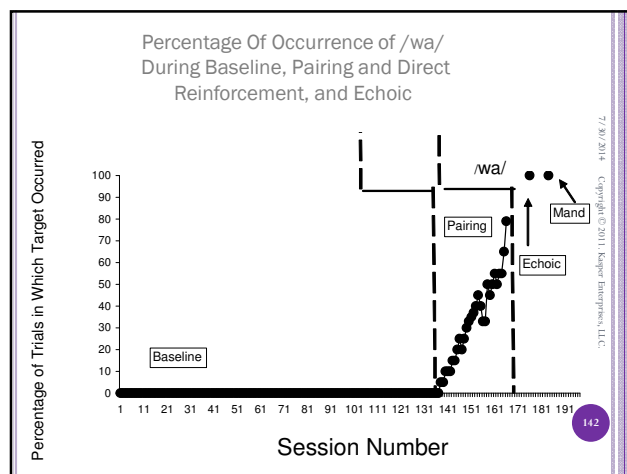
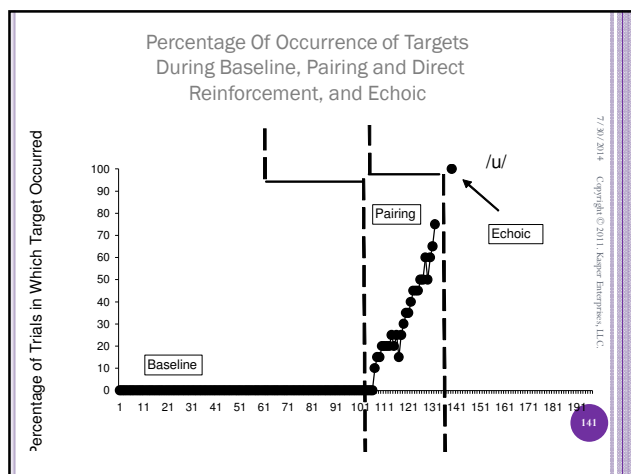
TARGETS

- /mama/
- /a/
- /nana/
- /u/
- /wa/

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30 MONTH LEVEL OR BELOW

- Imitation
- Motor Imitation Sequences
- Discrete Trial Instruction: Motor Imitation to Verbal Imitation
- Joint Attention
- Augmentative Communication
- Manding (Requesting)
- Motivation
- Natural Language Paradigm/Incidental Teaching
- Shaping
- Parent Training
- Stimulus-Stimulus Pairing (with and without direct reinforcement)
- Phonetic Hand Cues

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PHONETIC HAND CUES

- The Adapted Cuing Technique (ACT) was created to accompany oral stimulus presentation in treatment of dyspraxia. ACT emphasizes patterns of articulatory movement, manner of production, and multimodality facilitation.
- ACT refers to manually presented visual cues created to accompany orally presented speech in the treatment of dyspraxia.

Klick, S. L. (1985). Adapted cuing technique for use in treatment of dyspraxia. American Speech-Language-Hearing Association. Language, Speech, and Hearing Services in Schools.

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PHONETIC HAND CUES

- The primacy of the visual modality over the auditory for stimulus input has been noted in dyspraxia speakers (Rosenbeck, 1978). To take advantage of this, signs and the manual alphabet have been used to cue production (Jaffe, 1984) and ACT is similar to these approaches.
- Emphasis on sequential articulatory movement and representation of manner of speech sound production are additional features of ACT. Research suggests that these additional features will aid production. Focus on patterns of movement in sound sequences rather than on isolated sounds is effective (Macaluso-Haynes, 1978) and errors in manner of production occur nearly as frequently as those of place (Darley, Aronson, & Brown, 1975).

Klick, S. L. (1985). Adapted cuing technique for use in treatment of dyspraxia. American Speech-Language-Hearing Association. Language, Speech, and Hearing Services in Schools.

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PHONETIC HAND CUES

- ACT reflects the shapes of the oral cavity and movements required during speech production. Patterns of articulatory movement and manner of production of sounds are made visible by motions of the hand. In general, the clinician's hand is held near his/her face and is in motion while the clinician says the word or phrase to be repeated by the client.
- In cuing place of production, the trajectory of the tongue, rather than its static placement is represented. The hand is held near the side of the face, moving as the tongue does. Nasal consonants are cued by raising the hand to the nose for /n/ and /m/ is cued on the lips.

Klick, S. L. (1985). Adapted cuing technique for use in treatment of dyspraxia. American Speech-Language-Hearing Association. Language, Speech, and Hearing Services in Schools.

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PHONETIC HAND CUES

- Hand motions also cue manner by depicting airflow release
- Finger movements signal specific speech sounds. The fingers are held in configurations loosely based on those of the manual alphabet but correspond to phonemes in the word.
- A study of a 5;6 year old girl found that after 3 months of treatment, her oral communication skills improved. She progressed from 2 to 4 true words to several carrier phrases and 12 single words were produced functionally. Within 6 months she began producing novel utterances. As treatment progressed, she became less reliant on ACT and its use was reduced.

Klick, S. L. (1985). Adapted cuing technique for use in treatment of dyspraxia. American Speech-Language-Hearing Association. Language, Speech, and Hearing Services in Schools.

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PHONETIC HAND CUES

- Signed Target Phoneme (STP) Therapy uses the hand shapes of the American Manual Alphabet (Rieckhof, 1980) to cue phonemes. These hand shapes are coupled with a verbal presentation of the target sound.
- To use STP the child must be familiar with the phoneme hand shape correspondence. Therapy using STP presents consonants (C) and vowels (V) in CVC combinations that include visual phonemes, phonemes that can be produced by the child and STP cued phonemes.
- If the target sound is /d/ in the final position of a CVC combination, the clinician presents the verbal stimulus "mad" simultaneously pairing the signed hand shape for "d" with /d/ as it is spoken. The child repeats the utterance as the clinician provides the signed target phoneme.
- STP can be used in the sequencing of two or three phonemes in one utterance. STP can also be used to visually control the rate of CVC phoneme sequences.

Shelton, I.S. & Garves M. M. (1985). Use of visual techniques in therapy for developmental apraxia of speech. Language, Speech, and Hearing Services in Schools.

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PHONETIC HAND CUES

- In a single subject study, a 5-year-old-boy with developmental apraxia of speech received therapy from two different clinicians. The clinicians working with John charted and compared therapy sessions in which STP was used to facilitate correct production, versus session in which it was not used. Clinician A incorporated signed target phonemes into traditional therapy while Clinician B used a traditional auditory/visual approach instructing the child to “watch me, do what I do.” The target phoneme was initial /s/ in CVC combinations.
- In the initial steps, John reached criterion more quickly in few sessions using signed phonemes. At the end of the school year, John exhibited 80% accuracy of production of initial /s/ in spontaneous speech.
- STP therapy appeared to facilitate volitional sequences of speech sounds in the case presented. Clinicians may find that this is one visually orientated therapy technique that can be used with children demonstrating characteristics of developmental apraxia of speech.

Shelton, I.S. & Garves, M. M. (1985). Use of visual techniques in therapy for developmental apraxia of speech. *Language, Speech, and Hearing Services in Schools*.

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KEY COMPONENTS OF HAND CUE TREATMENT INCREASE VERBAL VOCAL RESPONDING

Specific goals (dependent variables): Number of correctly produced words

Key components (independent variables): Vague, but included “familiarizing: the child with the hand cues which were selected to depict manner, place, voice of the target phoneme. Prompting and prompt fading.

Target selection: Based on error patterns and initial phoneme inventory

Level of focus: speech output involving words.

Verbal operant: Echoic, tact, mand, intraverbal, multiply controlled

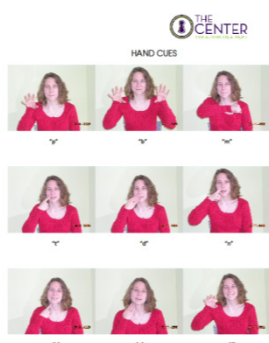
Session type: Individual

Setting: Natural Environment Training and Discrete Trial Instruction

Technology and/or materials required: Hand cues

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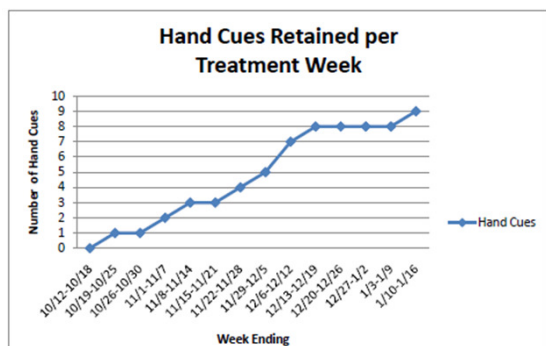
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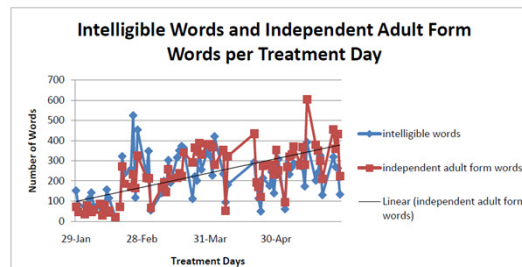


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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH POSSIBLY APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30-48 MONTH LEVEL

- Kaufman Speech to Language Protocol (K-SLP)
- Minimal Pair Intervention
- Multiple Oppositions Intervention
- Core Vocabulary Intervention
- The Cycles Phonological Remediation Approach
- Strand DTTC Approach for Apraxia of Speech
- Naturalistic Intervention for Speech Intelligibility and Speech Accuracy
- PROMPT: A Tactually Grounded Model
- Parents and Children Together (PACT) Intervention

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KAUFMAN SPEECH TO LANGUAGE PROTOCOL (K-SLP)

- Dyer (2009), notes that the Kaufman method (1997), which was designed for treating children with developmental apraxia of speech offers some promising data. This approach uses prompts, prompt fading and reinforcement of successive approximations and moves from sounds/syllables to whole words, phrases, and sentences, and reinforces attempts with functional, direct reinforcers.
- In addition, the unique feature of Kaufman's approach is that it integrates what is known about children's natural phonological processes into the therapy protocol. Specifically, phonological processes are systematic simplifications of sound sequences, syllables, and words that characterize the speech produced by normal toddlers and preschoolers (e.g. Ingram, 1976).

Dyer, K. (2009). Clinical Application of Speech Intelligibility Research: The River Street Autism Program at Coltsville. *The Journal of Speech-Language Pathology and Applied Behavior Analysis* 3, 140-153.

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KAUFMAN SPEECH TO LANGUAGE PROTOCOL (K-SLP)

- For example, when typical children first learn to speak, they commonly use a phonological simplification process known as 'syllable reduplication' (saying *baba* for *bottle*.) Other common processes include 'cluster reduction' (e.g., saying *dink* for *drink*) and 'final consonant deletion' (e.g., saying *ca* for *cat*). In Kaufman's model, these simplification processes are used as a guide for breaking down words in the initial shaping process.

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candle
kan-dō
tan-dō
ta-do
da-do

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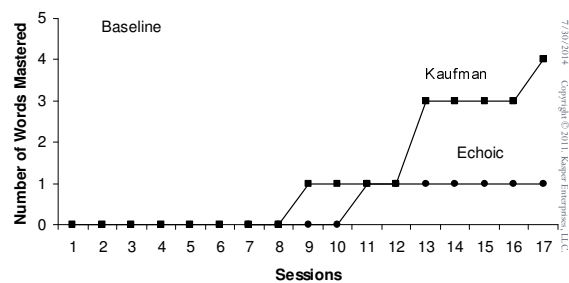
KAUFMAN SPEECH TO LANGUAGE PROTOCOL (K-SLP)

A pilot study conducted by Sweeney-Kerwin et al. (2006) analyzed the effectiveness of the Kaufman approach for teaching speech to two young children with autism. This method was compared to an echoic procedure that included reinforcement for correctly echoing (imitating) the target response and extinction (e.g., providing no reinforcement) for echoing incorrect responses. These researchers found that, following the implementation of both treatment conditions, both children's articulation improved across the words targeted for treatment. However, the children met criteria on targeted words in fewer trials in the Kaufman group than in the echoic group. In addition, there were better results in transferring the words from the echoic control to tact (e.g. naming) control when words were taught using the Kaufman protocol rather than the echoic protocol. The authors therefore concluded that the Kaufman protocol was superior to the echoic protocol in the treatment of articulation for these two children, and **suggested that this protocol be used by people within the field of applied behavior analysis to treat children who present poor articulation patterns.**

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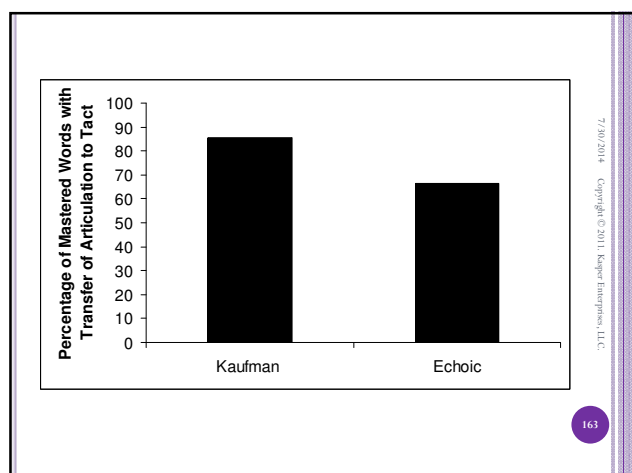
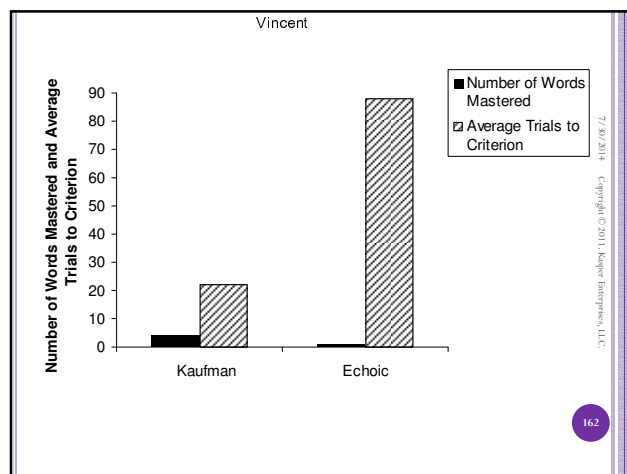
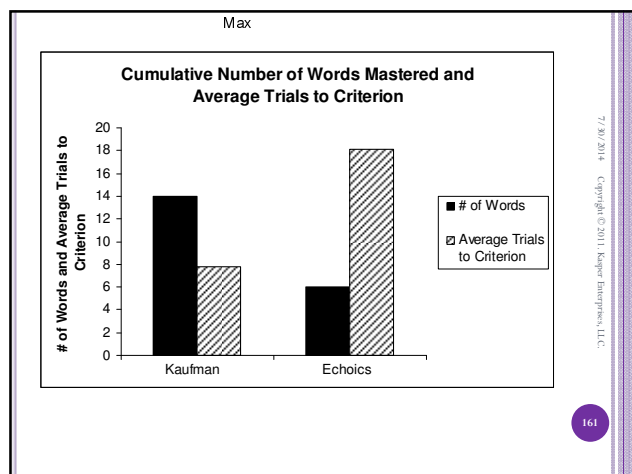
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Sweeney-Kerwin, E. J., Zecchin, G., Carbone, V., Janeckely, M., & McCarthy, K. *Improving the speech production of children with autism*. Paper presented at the New York State Association for Behavior Analysis, Verona, NY.



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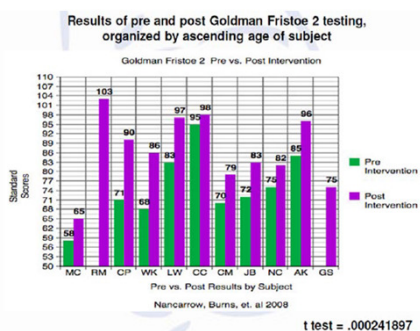
K-SLP FINDINGS

- The intensive speech-language intervention program consisted of 28.5 hours of individual and group treatment extending over a 3-week period.
- Descriptive analysis of pre and post-test data revealed that all children showed gains in articulation accuracy, word and non-word repetition of initial and final consonants and vowels. These data represent a promising approach for determining efficacy of intensive speech-language intervention with pre-school and early elementary school-aged children; but a randomized controlled clinical trial will ultimately be necessary to definitively determine the value of this methodology over nontreatment and other approaches.

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BURNS, M. (2011). APRAXIA OF SPEECH IN CHILDREN AND ADOLESCENTS: APPLICATIONS OF NEUROSCIENCE TO DIFFERENTIAL DIAGNOSIS AND INTERVENTION, ASHA PERSPECTIVES.



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KAUFMAN SPEECH TO LANGUAGE PROTOCOL (K-SLP)

- Additional unpublished research by Eldridge, Kasper, and Goodwin (2006) and Kasper and Godwin (2003) demonstrated that the strategy of guiding learner to produce adult form words via tutor-modeled successive approximations was effective in improving echoic skills and more effective than modeling adult form words when training tacts.

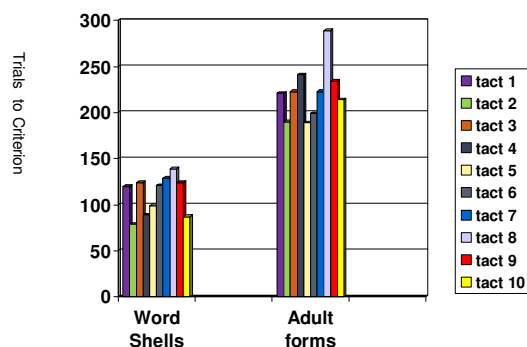
Eldridge, A., Kasper, T. and Goodwin, J. (2006) *Effect of Tutor Modeled Successive Approximations versus Tutor Modeled Adult Forms to Improve Topography of Tacts*, Presented at the International Convention of the Association for Behavior Analysis; Atlanta 2006.

Kasper, T. and Goodwin, J. (2003). *Improving Vocal Verbal Behavior Via Tutor-Modeled Successive Approximations*. Presented at the International Convention of the Association for Behavior Analysis; San Francisco, 2003.

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TRIALS TO CRITERION FOR INDIVIDUAL ITEMS VIA WORD SHELLS V ADULT FORM TRAINING



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KASPER AND KAUFMAN SIGN TO TALK

- The Kaufman procedures have been further modified by Kasper and Kaufman to be utilized with children with autism and are described in the K&K Sign to Talk Materials (2008).
- Wood-Rich (2009) demonstrated use of tutor modeled successive approximations to improve intelligibility of mands for a learner with autism. The subject's articulation was successfully shaped across sessions and intelligible mands were mastered.

Wood-Rich, K. (2009). *A Comparison of Methods to Improve the Mand, Tact and Echoic Repertoires in a Child with Autism*. Presented at the International Convention of the Applied Behavior Analysis, Phoenix, AZ.

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chocolate
 chawk-līt
 chawk-wīt
 chaw-kīt
 chaw-īt
 taw-kīt
 taw-īt
 taw

chocolate

chocolate: Right C-hand moves in a circular motion on the top of left open hand, palm down.

Use "t" or "d" for "ch" if child can't produce "ch".
 Use "t" or "d" for "k" if child can't produce "k".

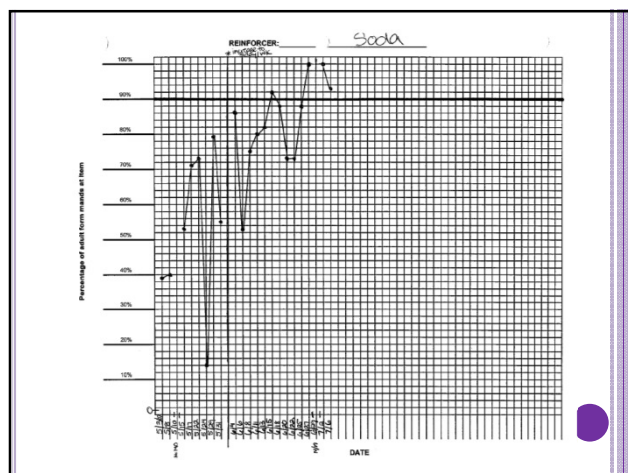
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blow
 bū-lō
 bū-wō
 bō
 ō

blow

blow: Palm-out, flattened O-hand moves forward from mouth (a) and opens to S-hand (b) to simulate blowing.

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KEY COMPONENTS OF K-SLP TO INCREASE VERBAL VOCAL RESPONDING

Specific goals (dependent variables): Number of correctly and independently produced words, improvement on standardized articulation assessments.

Key components (independent variables): Use of modeling and prompting of successive approximations to the target with differential reinforcement. Use of a variety of additional prompts with prompt fading and differential reinforcement. Systematic instruction in natural environment to build phrases.

Target selection: Based on error patterns and initial phoneme/syllable inventory of the subject.

Level of focus: speech output involving phonemes, syllables, words, and phrases

Verbal operant: Echoic, tact, mand, intraverbal, multiply controlled

Session type: Individual

Setting: Natural Environment Training and Discrete Trial Instruction

Technology and/or materials required: None, however; Kaufman Speech Praxis Treatment kits, K&K Sign to Talk and other training materials available

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH POSSIBLY APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30-48 MONTH LEVEL

- Kaufman Speech to Language Protocol (K-SLP)
- Minimal Pair Intervention
- Multiple Oppositions Intervention
- Core Vocabulary Intervention
- The Cycles Phonological Remediation Approach
- Strand DTTC Approach for Apraxia of Speech
- Naturalistic Intervention for Speech Intelligibility and Speech Accuracy
- PROMPT: A Tactually Grounded Model
- Parents and Children Together (PACT) Intervention

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MINIMAL PAIR INTERVENTION

- Contrastive word pairs (error – target)
- Intervention phases typically include familiarization, identification and production at imitative and spontaneous levels
- Minimal pair may not be the ideal approach for children with moderate-to-severe or severe phonology impairments who need multiple changes to their phonological system (best for children with one to two sound errors).
- May be difficult for children with Autism to create a meaningful or motivating context within which to discriminate words.



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MULTIPLE OPPOSITIONS INTERVENTION

- Multiple oppositions intervention – addresses moderate-to-severe speech disorders in children with speech intelligibility impairments.
- Williams (2006c) specifies that the children must be between 36 to 72 months of age and produce at least 6 sounds in error across three different manner classes of sound production.
- May be difficult for children with Autism to create a meaningful or motivating context within which to discriminate words.

Williams, A. (2006c). A systematic perspective for assessment and intervention: A case study. *Advances in Speech-Language Pathology*, 8(3), 245-256.

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MULTIPLE OPPOSITIONS INTERVENTION

Multiple opposites approach involves two constructs: the function of phonology to signal differences in meaning through contrastive phonemes in order to avoid homonymy

selection of intervention targets from across a rule set that represent the function of the phoneme collapse and are maximally distinct from each other in terms of place, voice, manner, as well as maximally distinct from the child's error substitute, which will serve to increase the saliency of the targets and expand the relevant frame of learning that is required.

Example: beat, beef, bees, beach for final consonant deletion

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MULTIPLE OPPOSITIONS INTERVENTION

Specific goals (dependent variables): Mean change of productive phonological knowledge (PPK)

Key components (independent variables): Multiple Oppositions approach. Procedures included selection of two error patterns with five contrastive multiple oppositions for each error pattern. Intervention continued until 90% generalization was achieved on the target sound in untrained items.

Basis of target selection: Two parameters are involved with target selection: 1) maximal classification (i.e., target sounds are chosen that differ with regard to manner of production, place of production, voicing, and linguistic unit) and 2) maximal distinction (i.e., selecting a target sound that is maximally different from the child's error substitute)

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MULTIPLE OPPOSITIONS INTERVENTION

Level of focus: primarily word level

Verbal operant: varied and unspecific, multiply controlled tact stimuli

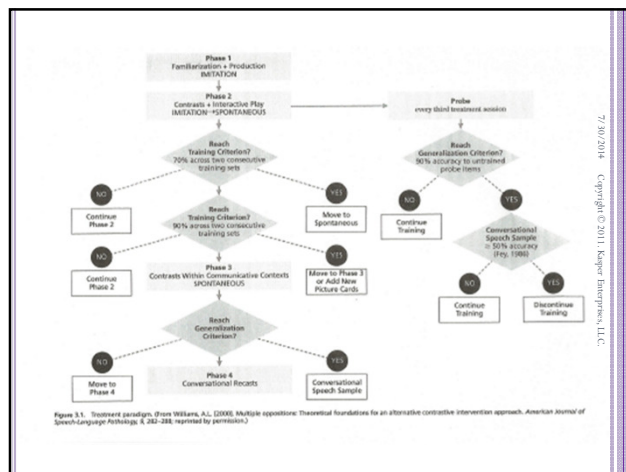
Session type: individual and/or small group

Setting: Natural Environment Teaching and Discrete Trial Instruction

Technology and/or materials required: Picture stimuli

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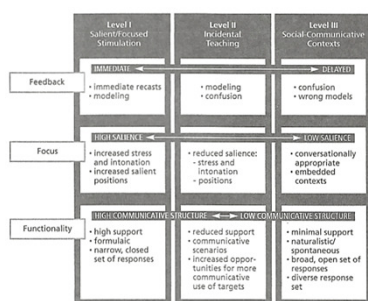


Figure 3.2. Intervention continuum of programming for generalization.

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH POSSIBLY APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30-48 MONTH LEVEL

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THE CYCLES PHONOLOGICAL REMEDIATION APPROACH

- The cycles approach was designed to facilitate the development of intelligible speech patterns in children with severe-to-profound expressive phonological impairments (intelligibility percentage typically less than 20%). A cycle (i.e., a period of time, typically 10-15 weeks) is completed after each of the phonological patterns (e.g., /s/ clusters, velars) that need to be targeted during a cycle has been facilitated. Each phoneme per pattern has been presented for approximately 60 minutes per cycle. The duration of each cycle depends on the number of deficient patterns and the number of deficient sounds in each pattern that are stimuable (i.e., consonants that are not being produced by the child but that can be imitated or produced with assistance; Hodson, 2007a).

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THE CYCLES PHONOLOGICAL REMEDIATION APPROACH

- Stimulable sounds are a central tenant to cycles approach because children have been found to demonstrate greater gains when stimuable, rather than nonstimulable, sounds are targeted (e.g., Rvachew & Nowak, 2001).
- Although a phoneme-orientated approach is adequate for children with mild speech disorders who demonstrate only a few misarticulations (e.g., lisp), children with severe speech sound disorders are ideal candidates for the cycles approach (Hodson, 2007a) in which the critical need is to expedite intelligibility gains so that children can be intelligible in time to succeed in school.
- Across 42 studies, the majority reported that intervention was effective.

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THE CYCLES PHONOLOGICAL REMEDIATION APPROACH

1. Auditory Bombardment with amplification
2. Production practice incorporating multisensory cueing and fading of cues.
3. Developing semantic awareness using minimal pair contrasts

Williams, A., McLeod, S., and McCauley, R. (2010). *Interventions for Speech Sound Disorders in Children*. Baltimore: Paul H. Brooks Publishing.

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THE CYCLES PHONOLOGICAL REMEDIATION APPROACH

Table 6.1. Underlying concepts of the cycles phonological approach and some recommendations

Underlying concept	Recommendation
1. Phonological acquisition is a gradual process (Ingram, 1978).	Allow children to practice phonological patterns (a carefully designed sequence) of primary targets that are stimuable early in treatment.
2. Children with normal hearing typically acquire the adult sound system primarily by listening (Van Riper, 1939).	Incorporate slight amplification with targets at the beginning and ending of each treatment session and also as needed when a child is experiencing a great deal of difficulty producing a particular targetword.
3. Children associate kinesthetic and auditory sensations as they acquire new patterns, enabling later self-monitoring (Fairbank, 1954).	Production practice in treatment should be structured in a way that promotes successful responses, rather than a charting of errors, which allows reinforcement of incorrect kinesthetic images.
4. Phonetic environment can facilitate (or inhibit) correct sound productions (Kent, 1982).	Choose production-practice words wisely so that children will experience greater success during treatment sessions (e.g., avoid using a word with an alveolar consonant in it when the child demonstrates extensive velar fronting).
5. Children are actively involved in their treatment.	Create an enjoyable, spontaneous atmosphere for children filled with experiential play production-practice activities (e.g., bowling).
6. Children tend to generalize new speech production skills to other targets (McReynolds & Bennett, 1972).	Target /r/ clusters before singleton stridents for two major reasons: 1) Highly unintelligible children tend to say sun initially when asked to say sun. 2) The English language is "routed" with /r/ consonant sequences. Success in producing /r/ clusters increases intelligibility substantially and also leads to productions of other stridents (e.g., /d/).
7. An optimal match facilitates a child's learning (Hunt, 1961).	Identify optimal target patterns based on phonological assessment results and choose targets for treatment that are stimuable so that a child can be challenged but also successful and not continue practicing the error production, which would reinforce the inaccurate kinesthetic image.

Source: Hodson & Padon (1991), pp. 76-85.

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Table 6.6. Pretreatment, interim, and posttreatment Hodson Assessment of Phonological Patterns-Third Edition (HAPP-3; Hodson, 2004) phonological assessment results for targeted phonological patterns

Phonological deviation	Chronological age		
	3;6	4;7	5;7
Omissions			
Consonant sequences	118%*	62%	18%
Postvocalic singletons	100%	0%	0%
Consonant category deficiencies			
Stridents	100%	10%	5%
Velars	100%	50%	5%
Liquids	100%	100%	95%
TOMPO	195	65	30
Severity level	High profound	Moderate	Mild

*The percentage for consonant sequence omissions exceeds 100% if all consonants of any cluster/sequence are omitted (rather than being reduced with at least one consonant remaining).

Key: TOMPO, total occurrences of major phonological deviations.
From Hodson, B.W. (2005). *Enhancing phonological and metaphonological skills of children with highly unintelligible speech* (p. 28). Rockville, MD: American Speech-Language-Hearing Association; reprinted by permission.

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THE CYCLES PHONOLOGICAL REMEDIATION APPROACH

Specific goals (dependent variables): mean phonological deviation (i.e., APP-R/HAPP-3 scores)

Key components (independent variables): The Cycles Phonological Remediation Approach.

Basis of target selection: Targets for which a child demonstrates readiness and stimulability should be selected based on the client's severity level as well as sounds/patterns in error. The targets are developmental: >40% occurrence of phonological patterns; primary and secondary target patterns that are consistent deviations and stimutable targets based on HAPP-3 assessment

Level of focus: speech output involving phonological patterns (e.g., word/syllable structures, syllableness, singleton consonants)

Verbal operant: Varied

Session type: Individual

Setting: Natural Environment Teaching and Discrete Trial Instruction

Technology and/or materials required: Amplification device, 5 x 8 inch index cards, high interest activities, experiential play items

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH POSSIBLY APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30-48 MONTH LEVEL

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DYNAMIC TEMPORAL AND TACTILE CUEING FOR SPEECH MOTOR LEARNING (DTTC)

- The DTTC treatment approach is based on integral stimulation, which emphasizes the shaping of movement gestures for speech production and the continued practice of those gestures, in the context of speech. Shaping occurs initially through the use of simultaneous production. The utterances are practiced slowly and simultaneously at first to facilitate movement accuracy. The clinician helps the child achieve correct jaw and lip positions for the initial articulatory configuration, has the child stay in that position for a few moments to maximize proprioceptive processing, and then simultaneously produces the utterance slowly with the child, utilizing tactile and gestural cues as needed. As the child produces the movement gesture with increased accuracy, the clinician slowly increased the rate of movement toward normal. The simultaneous production provides maximum support at first, allowing faster accuracy and success, which helps to keep the child motivated. Later, direct imitation and delayed imitation trials allow the child to develop more independent skill and eventually more automaticity in production.

Strand, E. A., Stoeckel, R. & Baas, R. (2006). Treatment of severe childhood apraxia of speech: A treatment efficacy study. *Journal of Medical Speech-Language Pathology*, 14, 297-307.

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DYNAMIC TEMPORAL AND TACTILE CUEING FOR SPEECH MOTOR LEARNING (DTTC)

Strand provides data regarding the efficacy of treatment for four young children with severe childhood apraxia of speech (CAS). A single subject, multiple baseline design across behaviors was used for experimental control and replicated over the four children. Baseline, probe and maintenance data were continuously collected.

Three of the four children exhibited rapid change following the implementation of treatment. The degree of performance change was greater than that for control probes, and improvement was maintained for all utterances, although performance was variable.

This study shows that frequent treatment, incorporating the principles of motor learning, may facilitate the treatment of severe developmental speech disorders that are accompanied by motor impairment.

Strand, E. A., Stoeckel, R. & Baas, R. (2006). Treatment of severe childhood apraxia of speech: A treatment efficacy study. *Journal of Medical Speech-Language Pathology*, 14, 297–307.

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DYNAMIC TEMPORAL AND TACTILE CUEING FOR SPEECH MOTOR LEARNING (DTTC)

○ Six steps relevant to treatment of children with CAS and autism are as follows:

1. The child watches and listens and simultaneously produces the stimulus with the clinician.
2. The clinician models, then the child repeats the stimulus while the clinician simultaneously mouths it.
3. The clinician models and provides cues and the child repeats.
4. The clinician models and the child repeats with no cues provided.
5. The clinician elicits the stimulus without modeling, such as by asking a question, with the child responding spontaneously.
6. The child produces stimuli in less-directed situations with clinician encouragement, such as in role-play or games.

Strand, E. A., Stoeckel, R. & Baas, R. (2006). Treatment of severe childhood apraxia of speech: A treatment efficacy study. *Journal of Medical Speech-Language Pathology*, 14, 297–307.

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KEY COMPONENTS OF DTTC TO INCREASE VERBAL VOCAL RESPONDING

Specific goals (dependent variables): Number of correctly and independently produced words, improvement on standardized articulation assessments.

Key components (independent variables): Use of a prompting hierarchy as noted from simultaneous production to elicited responses. Frequent sessions (two per day, 5 days per week for a half hour). Massed trials of 15-30 repetitions and distributed trials. 2-3 blocks of each utterance per session. Specific feedback and receptive instructions given. Variation of the temporal relationship between the stimulus and response, along with these multimodal cues, provides maximum cueing for movement performance, which is gradually faded with repeated practice. This technique allows high levels of success, emphasizes extensive practice (many repetitions), and maximizes proprioceptive input.

Target selection: A small stimulus set was used (five or six utterances) for each child. Stimuli were carefully chosen for syllable shape, vowel content, and phonetic complexity. Stimuli were chosen to be meaningful and useful utterances to enhance motivation and lead as rapidly as possible to functional communication.

Level of focus: Speech output involving syllables, words, and phrases

Verbal operant: Echoic, tact, intraverbal, mand, multiply controlled

Session type: Individual

Setting: Natural Environment Training and Discrete Trial Instruction

Technology and/or materials required: Various

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH POSSIBLY APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30-48 MONTH LEVEL

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NATURALISTIC INTERVENTION FOR SPEECH INTELLIGIBILITY AND SPEECH ACCURACY

- Intelligibility is defined as the degree to which the listener understand what the speaker says when the target is uncertain. Speech accuracy refers to the accuracy with which individual speech sounds (phonemes) are produced.
- Rather than remediating individual speech sounds (phonemes), children with severe SSD may require intervention that focuses at on increasing overall intelligibility rather than improving individual phoneme production.
- Although conventional wisdom would suggest that drilling individual speech sounds will ultimately generalize to words and thus incidentally improve intelligibility, there are currently no data to support this hypothesis in children with severe SSD.

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NATURALISTIC INTERVENTION FOR SPEECH INTELLIGIBILITY AND SPEECH ACCURACY

- Camarata (2002) suggested a two-tiered approach to intervention in SSD is
 - Increasing overall intelligibility so that the number of intended messages are comprehensible to listeners even if the accuracy of individual phonemes remains less than preferred
 - Focus on improving accuracy of individual phonemes/speech accuracy.

He tested the effectiveness of including speech production into naturalistic conversation training for 2 children with speech production disabilities. A multiple baseline design across behaviors (target phonemes) and across subjects (for the same phoneme) indicated that naturalistic conversation training resulted in improved spontaneous speech production.

Camarata, R. (1993). The application of naturalistic conversation training to speech production in children with speech disabilities. *Journal of Applied Behavior Analysis*, 26(2), 173-182.

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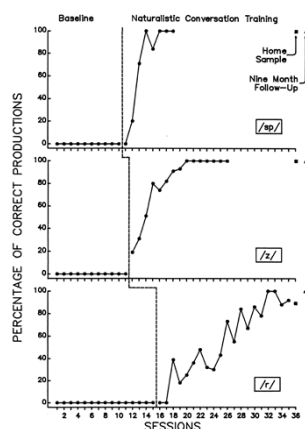


Figure 1. Percentage of correct consonant production across sessions speech production across behavior for B1.

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NATURALISTIC INTERVENTION FOR SPEECH INTELLIGIBILITY AND SPEECH ACCURACY

- Naturalistic intervention for speech intelligibility and speech accuracy is beneficial for children with Down syndrome and Autism.
- In treatment of children with autism, it is well established that reinforcing communicative attempts using natural rewards is a very effective method for teaching language (Koegel, O'Dell, & Koegel, 1987).
- The Koegels (2006) further caution that the success of a child learning to produce a word approximation that resembles the adult form of the word relies on modeling of adult forms of words. They note that "the ecological validity of the paradigm would shift when a cookie is presented while the clinician presents the phoneme /k/ rather than a word model." In keeping with functional communication, the interactions during intervention should have direct application to the naturalistic environments wherein the target behaviors are used.

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NATURALISTIC INTERVENTION FOR SPEECH INTELLIGIBILITY AND SPEECH ACCURACY

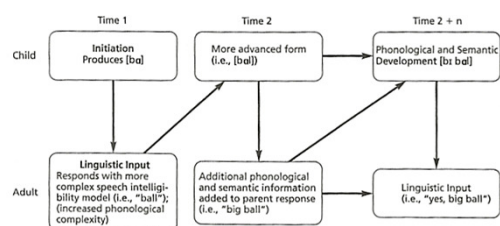


Figure 16.1. Transactional learning of speech.

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NATURALISTIC INTERVENTION FOR SPEECH INTELLIGIBILITY AND SPEECH ACCURACY

Specific goals (dependent variables): naturalistic speech intelligibility

Key components (independent variables): Imitation and Drill Approach v. Naturalistic Approach. Procedures were vague and varied.

Basis of target selection: Intelligibility and accuracy of speech sounds

Level of focus: Intelligibility and accuracy at conversational level

Verbal operant: Varied and unspecified

Session type: Individual

Setting: Natural Environment Teaching

Technology and/or materials required: High Interest Items

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CORE VOCABULARY INTERVENTION

- Core vocabulary focuses on intervention for children who have an impairment in ability to sequence phonemes that make up a word. The impairment results in inconsistent production of the same word.
- Two 30-minute sessions per week are recommended.
- Ten target words are randomly selected from a set of 70 target words chosen by the child, parents, and teachers. The best production of these 10 words is taught by the clinician.
- Comparison study Core Vocabulary v. Phonological contrast demonstrated that both procedures were effective. Core vocabulary intervention resulted in greater change for children with inconsistent errors. Phonological contrast was more effective for children with consistent errors.

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KEY COMPONENTS OF CORE VOCABULARY TO INCREASE VERBAL VOCAL RESPONDING

Specific goals (dependent variables): Mean change in percentage of consonants correct

Key components (independent variables): Core Vocabulary Therapy (targeting consistency of word production). Procedures were vague.

Basis of target selection: Names, Places (toilet), function words (please), foods, and favorite things.

Level of focus: word level and then sentences

Verbal operant: Varied and unspecific, begins with multiply controlled tact stimuli

Session type: Individual

Setting: Natural Environment Teaching and Discrete Trial Instruction

Technology and/or materials required: Picture stimuli

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TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH POSSIBLY APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30-48 MONTH LEVEL

- Kaufman Speech to Language Protocol (K-SLP)
- Minimal Pair Intervention
- Multiple Oppositions Intervention
- Core Vocabulary Intervention
- The Cycles Phonological Remediation Approach
- Strand DTTC Approach for Apraxia of Speech
- Naturalistic Intervention for Speech Intelligibility and Speech Accuracy
- PROMPT: A Tactually Grounded Model
- Parents and Children Together (PACT) Intervention

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PROMPTS FOR RESTRUCTURING ORAL MUSCULAR PHONETIC TARGETS (PROMPT)

- PROMPT, a tactually grounded, sensory-motor, cognitive-linguistic intervention model is explored as an approach, system, and technique in the treatment of children with speech production disorders. It may be used with children as young as 2 years who have sensory, motor, and phonological impairments.
- Children who benefit from PROMPT are:
 - 1) children who have typical cognitive and social skills but evidence mild-to-severe oromotor delays/disorders and motor speech difficulties. These include children with persistent articulation and/or phonological errors (Chumpek [Hayden] & Sherman, 1984; Houghton, 2003).
 - 2) Children with mild-to-severe sensory-motor impairments that affect their speech (e.g., CAS)
 - 3) Children with speech impairment who are diagnosed with disorders affecting the physical, sensory-motor, and cognitive domains (e.g., CP, DS, ADD/ADHD, and developmental dysarthria as well as PDD or ASD; Rogers et al., 2006; Sherman & Chumpek [Hayden], 1981).

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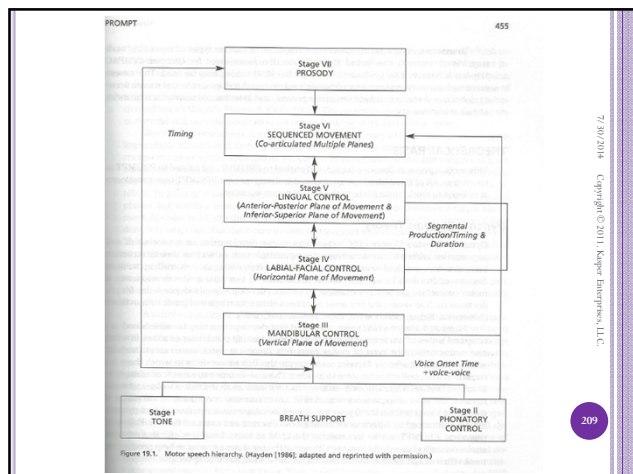
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PROMPTS FOR RESTRUCTURING ORAL MUSCULAR PHONETIC TARGETS (PROMPT)

- Appropriate for children who have an articulation, motor speech, or speech production disorder affecting execution, planning, fluency, or prosody.
- The child must be able to attend to a single task for a few moments, engage in joint attention with another, and demonstrate intent to communicate.
- A study conducted by Rogers et al. (2006) compared the effectiveness of the Denver Treatment Model (Rogers & Lewis, 1989) and PROMPT with nonverbal autistic children 2-4 years of age. All four children in the PROMPT condition acquired words over the 12 week intervention period. All but one child made receptive language gains. Analysis of individual participants' data revealed that children made changes in both intervention conditions. Interestingly, for children using PROMPT, it appeared to be most effective for those autistic nonverbal children who were in early linguistic stages (e.g., 24 months) or had motor involvement as well as autism and had made little or no change with other intervention methods.

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KEY COMPONENTS OF PROMPT INCREASE VERBAL VOCAL RESPONDING

Specific goals (dependent variables): Number of different words produced was the measure of the study cited.

Key components (independent variables): Use Global Domain Profile (Hayden, 2002) to determine strengths and weaknesses. Determine a Communication Focus. Identify the motor subsystem and plane of movement to be targeted first. Select target words. Incorporate the target words in 3-4 activities, routines or scripts. Use specific series of physical prompts with slowed rate of speech to prompt, and shape with goals of either "develop interaction, associate sensory to cognitive-linguistic information, or rebalance, develop, and organize motor speech control." Use mass and distributed practice.

Basis of target selection: Based on motor subsystem and plan of movement to be targeted first.

Level of focus: word level and then sentences

Verbal operant: Varied and unspecified

Session type: Individual

Setting: Natural Environment Teaching and Discrete Trial Instruction

Technology and/or materials required: Picture stimuli, toys/materials as needed for activities.

TREATMENT PROCEDURES FOR SPEECH PRODUCTION DISORDERS WITH SUPPORTIVE RESEARCH POSSIBLY APPROPRIATE FOR CHILDREN WITH ASD FUNCTIONING 30-48 MONTH LEVEL

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- Parents and Children Together (PACT) Intervention

PARENTS AND CHILDREN TOGETHER (PACT) INTERVENTION

- Designed for poorly intelligible 3- to 6- year-olds, PACT is a family centered, broad-based intervention approach to developmental phonological disorder. PACT incorporates phonetic, phonemic, and perceptual targets; goals, procedures, and activities; and active participation of explicitly tutored caregivers. Theoretically coherent and empirically supported, it has five components: Parent Education, Metalinguistic Training, Phonetic Production Training, Multiple Exemplar Training, and Homework. Acknowledging the gradualness of phonological change in typical development, and the often problematic logistics of accessing adequate speech-language pathology services, PACT occurs in planned, individual, in-clinic therapy blocks and in breaks from therapy attendance during which tutored caregivers continue aspects of intervention.

PARENTS AND CHILDREN TOGETHER (PACT) INTERVENTION

- PACT was born of necessity and designed to be practicable. This sorry state of affairs (e.g., children waiting 18 months to 2 years for assessment then only to receive just a few hours of intervention) in Australia and reported in the UK by Joffe and Pring (2008) contrasts manifestly with what is available to families able to access unlimited services in some public or private settings, or both. In the US, the law does not permit waiting lists for speech-language pathology intervention (Flipsen, 2009).

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PARENTS AND CHILDREN TOGETHER (PACT) INTERVENTION

Specific goals (dependent variables): percentage of consonants correct and clinician severity rating

Key components (independent variables): The PACT therapy model (i.e., child's active cognitive involvement and family communicative participation). Procedures were vague and varied with each subject.

Basis of target selection: Therapy targets are selected using linguistic criteria taking into account motivational factors and developmental error patterns.

Level of focus: Phoneme at the word level or above

Verbal operant: Varied and unspecified

Session type: Individual, provided by parent

Setting: Natural Environment Teaching

Technology and/or materials required: None

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TREATING SPEECH SOUND DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS

- Children with autism who also exhibit speech sound disorders present a unique challenge to Speech-Language Pathologists, Behavior Analysts, Instructors, and Parents.
- From a social developmental perspective, SSD is unfortunate in this population because children with autism have a reduced or even absent motivation for social communication so that the frequency of vocal verbal communicative attempts is severely restricted.
- It is essential that those interacting with a child with autism respond immediately and contingently to his/her vocal verbal attempts to communicate.
- Reduced speech accuracy makes it less likely that one will be able to respond to the child's message and therefore, can be particularly devastating.

Dyer, K. (2009). Clinical Application of Speech Intelligibility Research: The River Street Autism Program at Coltsville. The Journal of Speech-Language Pathology and Applied Behavior Analysis 3, 140-153.

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TREATING SPEECH SOUND DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS

- Dyer (2009) points out that children with autism often do not respond well to traditional assessment tools or treatment strategies from the field of speech-language pathology due to their characteristic language delays, excessive problem behavior and depressed motivation.
- Speech-Language Pathologists can benefit from partnership with Behavior Analysts and use of tools and strategies from the field of Behavior Analysis in assessment and treatment.
- The Speech-Language Pathologist can provide a careful analysis of the form of the speech sound disorder.
- The Behavior Analyst can assist in analyzing the function of language (echoic, receptive, tact, and intraverbal repertoire) that will be essential in selecting an intervention strategy.

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TREATING SPEECH SOUND DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS

- SLPs and Behavior analysts can partner to identify which treatment procedures might be appropriate to meet the unique behavioral, communication, and speech production needs of an individual with autism.
- Together, the treatment team must determine if the child has the readiness skills for a discrete trial intervention or if a naturalistic speech sound intervention is more appropriate.
- Behavior analysts have developed several exciting interventions in natural settings that can promote an increase in the quantity and quality of vocalizations.

Dyer, K. (2009). Clinical Application of Speech Intelligibility Research: The River Street Autism Program at Coltsville. The Journal of Speech-Language Pathology and Applied Behavior Analysis 3, 140-153.

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TREATING SPEECH SOUND DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS

- Individual with autism often demonstrate greater cooperation when speech production targets are selected that are stimulative and prompts are effective and well-tolerated. Speech pathologists are highly skilled in selection of appropriate targets and prompts.
- Behavior analysts can assist in training all those working with a child to use the prompts and assist in developing and refining teaching procedures and prompt fading strategies based on the individual strengths and weaknesses that the child demonstrates.

Dyer, K. (2009). Clinical Application of Speech Intelligibility Research: The River Street Autism Program at Coltsville. The Journal of Speech-Language Pathology and Applied Behavior Analysis 3, 140-153.

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TREATING SPEECH SOUND DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS

- Behavior Analysts and Speech-Language Pathologist can work together to address problem behavior by identifying the function and teaching appropriate functional equivalents as replacements thus promoting cooperation in both natural environments and structured teaching settings.
- Echoic training for children with autism may include discrete trials for word production using strategies from both fields.
- This training must be provided with careful attention to teaching procedures that maintain cooperation and promote rapid acquisition of skills.
- Behavior analysts can assist in identification of teaching strategies that can be used by all those working with the child.

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TREATING SPEECH SOUND DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS

Essential teaching procedures might include:

- Pairing the teaching situation with reinforcement:
- Stimulus demand fading:
- Mixing and varying instructional demands across language functions (verbal operants)
- Mixing and varying easy and hard demands.
- Using errorless teaching.
- Using high density and high value reinforcement by identifying the items and activities that the learner finds reinforcing and motivating.
- Using an appropriate schedule of reinforcement.
- Using fast paced instruction with short inter trial intervals.
- Teach skills speech production skills to fluency.

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TREATING SPEECH SOUND DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS

- In addition to a careful analysis of the form of the speech production disorder, it is necessary to determine if the child has the readiness skills for a naturalistic speech sound intervention and/or a discrete trial intervention.
- Individuals with autism require refined treatment strategies in order to maintain cooperation and motivation for tasks.
- Speech-Language Pathologists and Behavior analysts must consider the echoic repertoire as well as the receptive, tact, and intraverbal repertoire when designing an intervention strategy.

Dyer, K. (2009). Clinical Application of Speech Intelligibility Research: The River Street Autism Program at Coltsville. The Journal of Speech-Language Pathology and Applied Behavior Analysis 3, 140-153.

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TREATING SPEECH SOUND DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS

- If discrete trial echoic instruction is used, systematic instruction is needed to transfer the improved articulation to mand, tact, receptive and intraverbal language function.
- Systematic programming is needed to ensure that the individual is taught to generalize the improved skills to the people, places, and stimuli that he encounters in natural settings.
- Family involvement in SSD intervention can improve outcomes. Speech-Language Pathologists and BCBAS can provide adequate support and training to act in this role. (Watts Pappas & McLeod, 2009a).

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TREATING SPEECH SOUND DISORDERS IN CHILDREN WITH AUTISM SPECTRUM DISORDERS

As Mark Sundberg stated at the ABAI Convention:

“Speech and language pathologists and behavior analysts share the same clinical focus of teaching communication skills to individuals with language delays and disorders”

“Collectively, the content from these two professional fields can have a bigger clinical impact on speech and language intervention programs than each can have separately” and provide evidence-based, high-quality services that reflect the interests, values, needs, and choices of the individuals we serve.

www.centerautismtreatment.org

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