Case 1: Treating Severe Speech Delay with a Phonetic-Based Approach

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Problem

How do you treat speech sound production in a child who has age-appropriate cognition, language comprehension, and expressive vocabulary, but who has:

- limited capability for consonant production
- made minimal speech progress after almost 2 years of treatment that included
  - experimentation with a variety of speech-language approaches
  - intermittent emphasis on non-speech oral motor exercises when a speech-language approach was ineffective

Possible Solution

Non-Speech Oral Motor Exercises?

WHY "YES":

Theoretical support

- Viewed within a Piagetian model, non-speech oral motor exercises might lay the foundation for speech development by facilitating development of neural pathways that relate movement and the resulting percept (1).
- Viewed within a dynamic systems model, rhythmic behaviors such as chewing and sucking are modified into diverse behaviors for speech production (2).

Clinical support

- Clinical reports suggest that non-speech oral motor exercises facilitate speech production by improving muscle tone through strengthening (3).
- Non-speech oral motor exercises are often used when other speech-language treatment approaches have not been effective.

Pragmatic support

- Speech and non-speech behaviors rely on the same neurophysiologic infrastructure.

WHY "NO":

Research support

- Although speech and non-speech behaviors rely on the same neurophysiologic infrastructure, there are significant differences in muscle activity and movements for speech versus chewing and sucking (4,5,6,7).
- Data on muscle strength needed for speech production are limited. Ranges for adults are from 11% to about 20% of maximal force that can be generated with the particular articulator; data are not available for children. Data regarding an interaction between lip strength and articulatory competence for adults and children are equivocal (8).
- Research on the transfer of training for motor learning does not support the use of simple behaviors (e.g., blowing) to master complex ones (i.e., speech) (8).

ANY ALTERNATIVES?

Consider the Phonetic-Based Approach (refer to Case Study II poster for a description).

Efficacy of a Phonetic-Based Approach

Case Study 1

Subject

- 4;10 year old male
- Seen twice weekly for treatment at a university clinic; study covered one university semester
- Delayed onset of speech and language; first word at 2 ½ years
- Chronic middle ear infections; PE tubes placed bilaterally at 1 year and 4;1
- Hearing within normal limits

Pre-Study Profile

Strengths

- Age-appropriate cognition, language comprehension, and expressive vocabulary
- Verbal language used for communication
- Complete vowel/diphthong inventory
- Speech usually intelligible with contextual cues because of vowel accuracy, normal prosody, and complementary gestures and facial expressions

Challenges

- Limited skill for consonant production
  - Diagnosis of childhood apraxia of speech
  - Consonant inventory: /m/ (I, F); /w/ (I, M); /k/ (I, F); /g/ (I); /h/ (I). Only /m/, /w/, and /k/ were used consistently in the indicated word positions
  - Errors on consonants: primarily deletions; substitutions included w/l; r (I, M); h/f; and s (I)
  - Stimulability: not stimulable with multiple cues and supports for consonants he was not producing; lacked ability to manipulate the tongue; groping behaviors evident during all production attempts
  - Syntactic analysis not possible because of limited consonant inventory
- Subtle gross and fine motor delays

Case Study 1 (continued)

Treatment Program

Objective

Production of /n/, /p/, /b/, /d/, /f/, /v/, /s/, and /ʃ/ at sound, syllable and word level

Structure of the Practice

- Use of the Phonetic-Based Approach
- In addition, because all targeted sounds were challenging, /m/ (M) and /h/ (I) were practiced at the word and carrier phrase levels for short periods during each session to provide opportunities for "easy success."

Parental Input that Informed Treatment Decisions

Parents demonstrated a voiced non-speech sound the child had produced with his tongue sticking out during vocal play with his 1-year-old sister: because of the tongue control that the behavior demonstrated, the tongue-out strategy was used to begin shaping production of /n/ and /d/, and later /s/ with positive outcomes.

Learning Challenges and Effective Strategies

- Nasal air direction during production of /p/, /b/, and /d/, and resistance to occlusion of the nares because of facial defensiveness

Strategy. Within four sessions, the child was receptive to the SLP's use of two felt finger-puppets (called "our hug-nose friends") to occlude the nares to train oral direction of the air stream.

- Inability to achieve tongue placement for /n/ and /d/

Strategy. Work began with a gross approximation of the sounds while sticking out the tongue; the tongue was then retracted in small increments over several sessions to alveolar placement and correct sound production.

- Inability to achieve appropriate control of the air stream and tongue placement for /s/

Strategy. Work began with an approximation of the sound while sticking the tongue out (target approximated a voiceless /θ/), with focus on the air stream and later on retracting the tongue in small increments over several sessions to alveolar placement and correct sound production.

- Easily frustrated during challenging speech tasks

Strategy. In addition to rotating between more and less challenging speech targets, the child earned an X for each best production. Later two X's were awarded for correct production, elicited self-correction, and self-initiated rehearsal. Each designated number of X's received a small reward that his parents delivered.

- Inattentive during challenging speech tasks

Strategy. At the beginning of each drill and keyword practice, three poker chips were placed in front of the child. A chip was removed when the SLP needed to remind him explicitly to attend. If at least one chip remained at the end of the practice, he received a checkmark; checkmarks for each practice received a small prize which the SLP delivered at the end of the session.

Case Study 1 (continued)

Treatment Outcomes

- Targeted sounds that were successfully evoked (i.e., /n/, /p/, /b/, /d/, /s/), either generalized to spontaneous conversational speech or were readily stimulable with only an auditory model as shown in Table 1 below.
- Targeted sounds that were not successfully evoked (i.e., /f/, /v/, /ʃ/) were not produced; however, deletions were sometimes replaced with stop substitutions.
- Non-targeted sounds (i.e., /z/, /ð/, /θ/, /tʃ/, /ʤ/) were not produced; however, deletions were sometimes replaced with stop substitutions.

Table 1. Sequence of change and outcomes for successfully evoked target sounds.

	Target				
Week	/n/	/p/	/b/	/d/	/s/
1			Began work		
2		Began work		Began work on tongue-protruded d-like sound	
3	Began work on tongue-protruded n-like sound				
4			Production with nares occluded		
5	Consistent production of dentalized /n/	Production with nares occluded			
6				Production of dentalized /d/ with nares occluded	
9			Production with unoccluded nares on third try following two tries with nares occluded		
10	Dentalized /n/–75% Correct /n/–25%	Production without nares occluded			
11				Dentalized /d/–75% Correct /d/–25%	Began work on tongue-protruded s-like sound
12	Beginning to generalize dentalized /n/ to conversational speech			Beginning to generalize dentalized /d/ to conversational speech	
13		Beginning to generalize to conversational speech	Beginning to generalize to conversational speech		Occasional production of dentalized /s/
[Five-week semester break]					
18	Correct /n/ generalized 100% to conversational speech	/p/ generalized 100% to conversational speech	/b/ generalized 100% to conversational speech	Correct /d/ generalized 100% to conversational speech; generalized to voiceless cognate /t/	Stimulable for /s/ in words with auditory model only

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Copies of this poster and related research are available at the Phonology Project and Clinic Web site: <http://www.waisman.wisc.edu/phonology/>