Integration of Phonological Awareness Training for Children with Severe Phonemic Impairment

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Historical Perspectives

- Initial treatment directed at the motor act of speech production
- Evolved over the years to include the linguistic bases as knowledge on normal and disordered increased
- Recent emphasis on global implications for children with more severe speech sound errors including literacy

Terminology

- Dyslalia: 1920’s
- Articulation Impediment: 1930-1950’s
- Articulation Disorder: 1950-1980’s
- Articulation/Phonological Disorders: 1980’s
- Speech Sound Disorders: Present*
  - Phonetic
  - Phonemic
  - Phonological

And Then There’s Apraxia

- Developmental Apraxia of Speech
- Verbal Apraxia
- Dyspraxia
- Childhood Apraxia of Speech

Speech Disorder Etiologies

- Select Populations
  - Clefting
  - Hearing Loss
  - Syndrome
  - Developmental Delay
  - Structural Deviation
  - Motor Impairment
- Majority have unknown etiology

Disclosure Statement
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Prevalence of Speech Sound Disorders

- Preschoolers: 8-9%
- By first grade: 5%
- 80% of children with phonological disorders require clinical intervention
- 24% of school-age children (grades 1-12) receive services for speech/language*

Course of SS Disorders

- Approximately 75% of children with SS delay normalize their speech by 6 yrs.
- For remaining 25%, most normalize by age 9.
- Small percentage continue to have residual errors

*Source: ASHA report and National Institute on Deafness and Other Communication Disorders (NIDCD) 2008

Shift Our Thinking

- Tendency to treat the speech, language, and reading disorders as separate entities
- Need to see them as parts of a whole
- Treat all aspects preferably through one approach
- Prevention

Typical Childhood Speech Disorders

- Phonetic or Articulation Disorders
- Phonemic or Phonological Disorders
- *Mixed Phonetic/Phonemic
- Apraxia
- Residual Errors

Phonetic (Articulation) Errors

- Result from difficulty physically producing the intended phonemes.
- Vary in severity
- Often treated by teaching the child how to physically produce the sounds
- Generally fewer errors than with a phonemic disorder
- Articulation disorders should not be confused with motor speech disorders
Phonetic/Phonological Disorders
- Significant deficit in speech production or the organization of phonology
- Difficulty learning the sound system of the language
- Can be described by phonological analysis
- Vary in extent and severity of disorder
- Can significantly impact intelligibility

Phonemic approaches
- Distinctive features
- Phonological Cycling
- Meaningful Minimal Pairs
- Maximal opposition
- Multiple Opposition
- Metaphon
- Nonlinear

Childhood Apraxia of Speech (CAS)
- ...is a multilevel speech disorder characterized by disturbed programming and planning of speech movements that can not be attributed to neuromuscular weakness (Ozanne, 1995)
Problems Diagnosing CAS

- Don’t all exhibit all characteristic traits; therefore little agreement as to necessary diagnostic criteria
- Hallmarks of disorder change with age (Stackhouse, 1992; Velleman and Strand, 1994)
- Preschool: difficult to distinguish CAS from severe SS impairments; become more noticeable at school age: syllable sequences, prosody, error patterns

Common CAS Characteristics*

- Speech Characteristics
  - Limited phonemic inventory
  - Inconsistent speech errors
  - Vowel distortions
  - Difficulty with sequential movements
  - Suprasegmental differences

*Davis et al, 1998; Lewis et al, 2004

Common CAS Characteristics*

- Linguistic Features
  - Language impairment: receptive/expressive
  - Disorders in reading, spelling
  - Phonological processing difficulties

Video Apraxia

Common Treatment Strategies for CAS

- Motor learning; drill-based
- Emphasize repetition with gradual fading cues
- Target individual sound production and sound sequences emphasizing automatic speech motor plans for target words (Shriberg et al, 1997)

Tx Approaches for CAS

- Multimodality cueing (PROMPT)
- Drill-based
- Melodic Intonation Therapy
- Simple to more complex sound progression (Kaufman Speech To Language Protocol)
- Interactive Metronome
- Augmentative systems such as signs
Limitations of Current Approaches for CAS and Phonological Disorders

• Overemphasis on motor based imitation techniques; little evidence regarding efficacy of motor learning and drill (Pannbacker, 1998)
• Neglect of linguistic and literacy deficits in symptom cluster
• Failure to produce rapid changes in intelligibility
• Limited to remediation of speech production deficits

Rethinking Our TX Strategies

• Need to address larger deficits in this population with more targeted treatments
  – Specifically phonological processing and its role in production and perception of sound system
  – Target specific deficits in decoding and encoding
  – Possible prevention of further literacy and academic failure or lessening impact
  – Integration of PA with speech targets

What We Have Learned

• High correlation between hx speech disorder and literacy disorder if speech is not resolved by 5:6 (Bishop and Adams 1990)
• Persistent mild speech production difficulties beyond 6:9 are associated with literacy disorders (Nathan et al, 1994)
• Especially true if semantic and syntactic difficulties are present
• Need to be aware even if kids have completed tx for SS and have normalized

What is Not Known*

• Etiology and exact nature of functional disorders
• Neural mechanisms involved in aspects of phonology/language processing/decoding/encoding
  – Working memory
  – Phonological memory and operations

Associated Areas of Impairment: Spelling

• Children with severe speech sound impairment can experience difficulty with spelling
  – Three components of spelling (Apel, 2011)
    • Phonology
    • Morphology
    • Memory

Three Components of Spelling

• Phonology:
  • Sound-letter correspondence, appreciation of digraphs, diphthongs, and multiple representations of different sounds
• Morphology:
  • root word vs more complex word-phonology can change even though the morphological meaning is the same
  sign/signal and muscle/muscular
Three Components of Spelling

• Memory:
  – Mental Graphemic Representations (MGRs): mental images of word/parts that allow for correct spelling without requiring sound-letter correspondence analysis (Apel, 2011)

Summary of Findings

• Performance of children with severe speech-sound disorders on measures of spelling:
  – Performance on a memory task (spaced retrieval) targeting spelling
  – Resolution of spelling errors based on semantic vs memory training tasks

Skills Involved in Reading

• Learn an orthographic system that corresponds to oral phonology
  – All aspects of phonology are requisites for reading
  – Children can acquire phonology without being able to express this knowledge consciously, reading requires conscious knowledge

Skills to Decode Words not Known by Sight

• Metaphonological abilities (phonological awareness)
  – Subset of metalinguistic abilities –
  – Metaphonological abilities such as rhyme, identification of beginning and ending sounds of words, syllabification, sound-letter correspondence

Correlation Between PA and Reading

• Well documented (BlachmanWafner and Torgesen, 1988; Liberman, 1983; Vellutino, 1987; Liberman and Shankweiller, 1985)

• Best Predictors:
  – Phonemic awareness in kindergarten and early grades
  – Phonological awareness skills
  – Phonological working short term memory

Literacy Outcomes for Children with CA/SS Disorders

• Poor phonological processing abilities
  – Difficulty understanding phoneme-grapheme relationships, rhyme, isolation
  – Poor use of phonological strategies in decoding and encoding written print
  – Poor phonological representation receptively (Sutherland and Gillon, 2005)
  – Persist even after speech sound deficits have been remediated
Follow-Up of CAS Kids

- School-age follow-up of 10 children with CAS (Lewis et al, 2004)
- 8 kids CAS improved artic but all 10 cont. to have diff in syll. seq., nonsense word repetition, lang., reading, spelling
- SL improved more in language
- Spelling CAS similar to SL
- Suggest phenotype for CAS changes with age
- At risk for reading/spelling

Take Home Message

- Spelling and reading are linked- very similar processes
  - Increasing knowledge of spelling can improve both literacy and vocabulary (Arndt and Foorman (2010))
  - Orthography is linked to BOTH literacy and phonology (Rosenthal and Ehri, 2008)

Postulated

- Speech, language, literacy characteristics of CAS result from an impoverished phonological representation system (Marion et al, 1993, Marquardt et al, 2002)
- Inadequate neural substrates for phonological attributes of language
- Difficulty with the selection and retrieval of phonological plans to direct motor production

What’s Needed

- Need to improve child’s phonological representation
  - Awareness of phonological components of language
  - Explicit knowledge of the phonological components of words and syllables
- May improve speech, phonological awareness, and prevent or minimize literacy impairments

Phonological Awareness Intervention Studies

- Evidence that children with severe speech sound disorders respond positively to PA intervention
- Performance of children participating in 20 hours of PA 20 vs. 20 hours of traditional and those receiving minimal intervention

Phonological Awareness Intervention Studies

- Speech production, PA, and reading were superior to the two control groups, maintained at 11 months (Gillon, 2000, 2002)
- CAS group did best with prompts using phonological information rather than imitation (Bradford-Heir and Dodd, 1998)
Phonological Awareness

Intervention Studies

- PA with 3 children diagnosed with CAS, 6:3-7:3 (Moriarty and Gillon, 2006)
- Integrated PA and target PP 3 x week/7 weeks
- 2/3 participants significantly improved target speech and phonological awareness skills
- Generalized PA skills from trained to untrained items and were able to transfer to nonword reading

More Evidence PA Integration

- 6 kids ages 4:9 – 7:9 (Hume and Schwarz, 2012)
- Dx with CAS using Ozanne (1995) criteria
- 2x week for 20 weeks; 1x week for 10 weeks
- Results:
  - Improved no. accurate consonants, word consistency
  - PA skills improved

What is Phonological Awareness

- Metalinguistic skill: requires conscious awareness of structure of language
- Multi-level skill
- Implies skills to manipulate sound units
- Developmental*

Levels of Phonological Awareness

- Three levels of phonological awareness (hoien et al 1995)
  - Syllable awareness
  - Intra-syllabic awareness
  - Phonemic awareness

Phonological Awareness

- Developmental continuum
- Larger>smaller
- Syllable units>phonemic units
- Intra-syllabic units: rhyme, alliteration,
- *Phoneme awareness: phoneme awareness, segmentation sound blending, manipulation
Phonemic Awareness

- Subset of phonological awareness
- Focuses specifically on recognizing and manipulating phonemes
- Related to ability to read alphabet
  - Sound segmentation, sound blending, manipulation of sounds
- Sound isolation and sound segmentation have best predictive validity for later reading (Yopp, 1988)

Phonological Awareness Tasks

- Rhyme
- Phoneme identification isolation
- Sound-letter correspondence
- Identification of initial and final phonemes
- Phoneme segmentation
- Phoneme manipulation
- Syllable segmentation

Target the Deficient Skills

- Directly target the skills underlying the speech production and literacy deficits by
  - Manipulating speech subunits and speech production during phonological awareness tasks combined with ss production activities
  - Arranging targeted phonemes into larger linguistic structures such as syllables and words

Integration Training with SS Production

- Simultaneous targeting of speech, phonological awareness, and letter knowledge
- Systematic pairing of targeted sounds, phonological processes with various PA operations
- Use of letters and phonological cues to prompt speech production

Elements of Phonological Integration Treatment

Visual, auditory, tactile input/output combined with physical manipulation of representative units
These activities are paired with production targets (speech sounds or processes)
Color cueing initially progressing to letter and letter combinations

Materials

- Colored blocks
- Letter blocks with digraphs, blends
- Dry erase board
- Typical materials for phonological and/or articulation training
- Commercial phonological awareness programs
Structure of a Typical Session with Pre Schooler(s)

- Rhyme activity
- Syllable identification with drums, paint sticks, iPad. (sugar, shovel, shave, shaving, shop, shopping)
- Metaphon activity: identification of short vs. long sounds with gummy bears and gummy worms

Typical Session: Preschoolers (cont.)

- Production of short vs. long sounds using alphabetic exposure: “Let’s make our long quiet sound ‘sh.’ Let’s make our short sound ‘t.’”
- Production of target sound “sh” in words

Structure of a Typical Session for Older Child

- Production Targets:
  - Consonant blends
- PA Targets:
  - Letter sound knowledge
  - Phoneme identity (orthographic/phonetic correspondence)

Structure of a Typical Session for Older Child

- Segmentation and blending using color or letter blocks
- Manipulation (“if this is top make it say stop, pot, spot, spots, stops”
- Production practice of consonant blends at word, sentence, and/or reading levels
* Stimuli composed of target (blends)

Treatment Example: School-Age Child

- Target: /s/ clusters
- Objective 1: Segmentation and blending of /s/cluster words while physically touching each colored block and saying each sound, then blending the sounds into words
- Objective 2: Production of words with /s/ blends progressing to sentences

Treatment Session, (cont.)

- Feedback for error: “You said ‘top’ but the word is ‘stop.’” “Let’s fix it.”
- Feedback for correct: “Good. I heard all four sounds in ‘stop.’”
Home Activities

- Continued segmentation, blending if parent has been trained
- Worksheets activities targeting processes/sounds

General Strategies for Parents

- Increase opportunities for targeted oral language
- Rhyming books and activities
- Print and alphabetic exposure and knowledge
- Phonological awareness games and activities
- Encouragement of writing

Monitoring Change

Percent phonemes or consonants correct
No. words correct (Bankson Bernthal Test of Phonology)
Phonological awareness tests
Inconsistency subtest of Dodd DEAP test
Letter sound knowledge
Word decoding such as Burt Reading Test
Spelling Measures

Finally

- Be alert to the potential for further deficits when treating speech sound disorders
- Be open to trying something new or different
- Develop a Dx/Tx protocol to monitor progress
- Importance of case studies (single subject research) to add to the body of knowledge