Sound Judgment:

Choosing effective speech therapy techniques and using motor learning principles for speech sound disorders, with or without related structural anomalies

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• None
SOUND JUDGMENT: INTRODUCTION
Objectives

As a result of this course, participants will be able to:

• Use auditory, visual and tactile-kinesthetic cues to enhance the child’s awareness of the misarticulated sound versus the correct sound production.

• Apply effective speech therapy techniques for typical speech sound errors.

• Use motor learning and motor memory principles to achieve carryover soon after acquisition of the appropriate placement.
Course Outline

• Anatomical requirements for normal speech
• Effects of abnormal structure on speech sound production
• Enhancing speech sound awareness
• Speech therapy “cookbook”
• Achieving carry-over using motor learning principles
• Summary
ANATOMICAL REQUIREMENTS FOR NORMAL SPEECH SOUND PRODUCTION
Normal Speech Production

Most speech sounds are produced in the front of the mouth:

• Bilabial sounds- p, b, m, w
• Labiodental sounds- f, v
• Lingual-alveolar sounds- t, d, n, l, s, z
• Palatal sounds- ñ, ʒ, ŋ, ʧ, ʤ
Normal Speech Production

• The only speech sounds produced in the back of the mouth are velar sounds (k, g, η)
Normal Speech Production

• The lips should:
  • Approximate at rest without effort
• Bilabial competence is important for production of bilabial and labiodental sounds
Normal Speech Production

• The tongue tip should:
  • Rest under the alveolar ridge
  • Be able to move up and down, back and forth without interference
• Tongue tip movement is important for production of lingual-alveolar and palatal sounds.
Normal Speech Production

• In an evaluation of speech sound production, the following should always be assessed:
  • Bilabial competence
  • Tongue tip to alveolar ridge relationship
Normal Speech Production

- What about the teeth?
- What if you don’t have any?
Normal Speech Production

• Sibilants or the “teeth sounds” (s, z, ʃ, ʒ, ʧ, ʤ) are not actually produced by the teeth.

• Teeth are NOT necessary for normal speech production.

• Teeth are not necessary for speech, but can actually interfere with normal speech production.
Science Experiment

• Produce an /s/ sound
• Note the airstream flowing between the tongue tip and alveolar ridge
• Open the jaws and produce an /s/ sound
• Why do we close our teeth to produce /s/?
• Answer: To raise the mandible so the tongue is positioned just under the alveolar ridge
Normal Speech Production

• Sibilants are actually produced by forcing airstream between the tip of the tongue and the alveolar ridge

• Labiodental and interdental sounds can be produced with the lip/tongue and gum ridge
Video 1: Edentulous Speech
EFFECTS OF ABNORMAL STRUCTURE ON SPEECH SOUND PRODUCTION
Structural Abnormalities

Can causing either:

- Obligatory distortions
  OR
- Compensatory errors
Obligatory Distortions

• Articulation placement is NORMAL, but the structural abnormality affects sound production
• Corrected by changing structure only
• Cannot be corrected with therapy
Compensatory Errors

- Articulation placement is altered due to structural abnormality
- Corrected by changing structure first... and then by changing function (articulation placement) through speech therapy
Structural Abnormalities that Affect (or Do Not Affect) Speech

• Dental malocclusion
• Ankyloglossia - actually not a cause
• Velopharyngeal insufficiency/incompetence (VPI)
Dental Malocclusion
Dental Malocclusion

• The tongue rests in the mandible
• Wherever the mandible goes, so goes the tongue
• Biggest concern about malocclusion: It affects the position of the tongue tip relative to that alveolar ridge!
Class II Malocclusion

• If the mandible is in a posterior position relative to the maxilla (Class II malocclusion)—the tongue will be posterior to the alveolar ridge
Class II Malocclusion

- Bilabial competence is compromised
- Tongue tip is under the palate instead of the alveolar ridge
Video 2: Class II Malocclusion
Class III Malocclusion

- If the mandible is in an anterior position relative to the maxilla (Class III malocclusion)—the tongue will be anterior to the alveolar ridge
Class III Malocclusion

- Bottom lip cannot articulate against the top lip or maxillary teeth
- Tongue tip is anterior to the alveolar ridge and maxillary teeth
Video 3: Class III Malocclusion
Anterior Crossbite

• An anterior crossbite is when the maxillary incisors are inside the mandibular incisors
• Can occur with or without a Class III skeletal malocclusion
Video 5: Anterior Crossbite
Video 6: Anterior Crossbite
Ankyloglossia and Speech
Ankyloglossia ("Tongue Tie")

- Ankyloglossia is a congenital condition where the lingual frenulum is either abnormally short or has an anterior attachment near the tongue tip.
Ankyloglossia: Functional Characteristics

- Patient cannot touch roof of mouth with tongue tip when the mouth is open
Ankyloglossia: Functional Characteristics

- Patient cannot protrude tongue past the mandibular incisors (or the lower gingiva)
Ankyloglossia and Speech

Common sense approach:

• The sound that requires the most elevation is /l/
• The sounds that require the most protrusion are /Θ/ and /ð/  
• These sounds can be produced with significant tongue tip restriction


Video 7: Ankyloglossia
Ankyloglossia and Speech

Common sense approach:

• Ankyloglossia is unlikely to affect the production of English sounds

• Ankyloglossia may affect the lingual trill sounds (i.e., the Spanish /r/)
Velopharyngeal Insufficiency (VPI) and Velopharyngeal Incompetence (VPI)

Velopharyngeal Insufficiency

Velopharyngeal Incompeitence
Effects of VPI on Resonance

• VPI causes hypernasality, which is a resonance disorder
• Hypernasality affects the quality of vowels and voiced consonants
• It does not affect articulation and therefore, hypernasality cannot be corrected with speech therapy
Effects of VPI on Speech

• VPI causes nasal emission on pressure sounds, which can affect production of plosives, fricatives, and affricates

• Due to the lack of oral airflow, the child may develop compensatory articulation substitutions
Compensatory Errors Due to VPI

- Most common compensatory articulation productions for VPI are:
  - Glottal stops substituted for plosives
  - Pharyngeal fricatives substituted for fricatives/affricates
Glottal Stop

• Produced by closing the vocal cords and then opening suddenly
• Can be co-articulated with oral placement
• Often used as place markers for “omissions”
Pharyngeal Fricative

- Air is forced through a narrow opening between the tongue base and/or velum and the pharyngeal wall
- Will result in phoneme-specific nasal emission (PSNE)
- May seem like there is VPI, but it is an articulation disorder instead
Speech Therapy and VPI

- Speech therapy IS appropriate for correction of compensatory articulation errors, preferably AFTER correction of the structure.
- Pharyngeal fricative will cause nasal emission, even after VPI surgery.
- Work on correction placement... NOT on airflow.
Speech Therapy and VPI

- Speech therapy is NEVER appropriate for obligatory distortions (which occur with normal placement), including:
  - Distortion due to interference of the teeth
  - Hypernasality and/or nasal emission due to VPI but normal placement
ENHANCING SPEECH SOUND AWARENESS
Enhancing Awareness

• Use sensory cues to contrast the difference between the error sound and the correct sound
  • Visual cues
  • Tactile-kinesthetic cues
  • Auditory cues
Enhancing Awareness:
Glottal Stops Example
Enhancing Awareness: Glottal Stops

Visual cues:

• Have the child watch your neck during correct and incorrect production

• Have the child watch his own neck in a mirror when:
  • producing syllables in which he does not use a glottal stop (i.e., ma)
  • producing syllables in which he does use a glottal stop (i.e., ba)
Enhancing Awareness: Glottal Stops

Tactile-kinesthetic cues:

• Have the child feel your neck during correct and incorrect production

• Have the child feel his own neck in a mirror when:
  • producing syllables in which he does not use a glottal stop (i.e., ma)
  • producing syllables in which he does not use a glottal stop (i.e., ba)
Enhancing Awareness: Glottal Stops

Auditory cues:

• Have the child listen to your productions of the correct and incorrect productions.

• Reverse roles: Have the child be the “teacher” and you be the “kid”
Auditory Awareness: Oral & Nasal Listener*

* Super Duper Publications- 2007
Auditory Awareness: 
Oral & Nasal Listener*
SPEECH THERAPY “COOKBOOK”
Therapy for Placement Errors

- Glottal stop
- /l/
- /k/ and /g/)
- /ɚ/ and /r/
- Affricates: /ʧ/ and /ʤ/
- Lateral lisp
- Pharyngeal fricative
- Blends


Therapy for Glottal Stop

- Produce an isolated voiceless plosive (i.e., /p/)
- Produce the voiceless plosive and then the vowel, preceded by an /h/ (i.e., /p... ha/)
- Produce the voiced plosive cognate (i.e., /b/) with a “whisper” and slowly transition to the /h/ and then the vowel (i.e., /b...ha/)
- Do the same for the other voiceless/voiced plosives
Therapy /l/

- w/l is easy
- Place hands on the face and tell the child not to move the face during production to eliminate the lip movement
Therapy /I/

• η/I is hard
• The child can co-articulate the alveolar (tongue tip) and velar placements, so it looks like placement is correct when it’s not
Therapy /l/

- Begin with a big yawn to raise the velum up and bring the back of the tongue down
- Make the child aware of the open stretch in the back of the mouth
- Co-articulate the /l/ with a big yawn
- Gradually decrease the size of the yawn
Therapy /l/

• For feedback, use a listening tube or the ONL with the tube in the nose.

• If sound is heard through the tube, the /ŋ/ (nasal sound) is still there.
Video 8: Yawn Technique for /l/
Therapy for /k/ and /g/

• Have the child produce and hold /ŋ/ to feel placement

• Work on the up and down movement by achieving position and then dropping the tongue
Therapy for /k/ and /g/

If the child can’t produce an /ŋ/...

• Put a tongue blade on the middle of the tongue and push down and back

  OR

• Firmly press your thumb under the base of the child’s chin to push the back of the tongue up
Therapy for /k/ and /g/ 

• Have child take a breath, place his tongue in an /ŋ/ position, and drop the tongue to produce a /g/
• If necessary, pinch his nose closed and then have him drop the tongue
  • This will turn it into a /g/ with normal oral airflow
• Have the child whisper the /g/ sound to achieve the /k/
Video 9: Therapy for /k/ and /g/
Therapy for /ɑ/ and /r/
Science Experiment

• Prolong an /ə/ and feel where how the back of your tongue articulates under your molars
• While prolonging an /ə/, move your tongue tip up and down
Science Experiment

• **Conclusion:** /ə/ is produced in the back of the mouth; the tongue tip placement doesn’t matter
• Posterior sides of the tongue articulate under maxillary molars
Therapy for /ɚ/ and /r/

• /ɚ/ is a continuant
• /r/ is a movement sound that begins with /ɚ/
• Slowly produce the syllable /ra/
• Therefore, always start with /ɚ/
Video 10:
Therapy for /ə/
Therapy for /ə/  

- With a tongue blade, stimulate both sides of the back of the tongue and then the upper gum ridge under the molars
Therapy for /ə/ 

• Show the child how the tongue forms the shape of a “boat”
• Ask the child to make a wide smile while “backing up the boat”
Therapy for /ə/ 

- To help elevate the back of the tongue, push up against the base of the chin with your finger.
- Make sure it feels loose so you can push.
Therapy for /ə/ 

- Assist placement by squeezing the cheeks with your thumb and forefinger to get lip rounding 
- Use your middle finger to push up the back of the tongue
Video 11: Therapy for /ə/
Video 12: Therapy for /ə/
Therapy for /ɚ/

• Once final /ɚ/ is achieved, work on initial /r/ by showing the forward movement of the tongue with your hand

• If the child goes to a /w/, have him hold his hands on his face and tell him not to allow the face to move while going from /ɚ/ to /r/
Therapy for Affricates: /ʧ/ and /ʤ/

• Reminder: Affricates are a combination of a plosive and a fricative:
  • ʧ = t + ʃ
  • ʤ = d + ʒ
Therapy for Affricates: /tʃ/ and /dʒ/

• Make sure the child can produce the individual components of the affricates first:
  • Plosives: t/d
  • Affricates: ʃ/ʒ

• Have the child produce the plosive component with the teeth closed and lips rounded, which will result in the affricate
Lateral Lisp

- A lateral lisp is caused by interference of the anterior airflow during sibilant production
- Interference can be caused by:
  - Abnormal position of the teeth (obligatory distortion)
  - Abnormal placement of the tongue tip or dorsum of the tongue (articulation error)
Science Experiment

• Hold your tongue on your alveolar ridge while you prolong an /s/ sound
• Produce a /t/ sound but don’t drop your tongue during the airflow release
• Both of these will cause a lateral lisp
Lateral Lisp

• To determine if the airflow is central or lateral, put a straw in front of the teeth and then to the sides during the production of the /s/
Lateral Lisp

• If normal, air through straw will be heard when it is in front of the central incisors
• If lateral, air through straw will be heard somewhere on the side of the dental arch
Pharyngeal Fricative

• Pharyngeal fricative is a common compensatory production for kids with VPI
• This placement will persist after surgical correction.
• A pharyngeal fricative substitution can also be found in children with NO history of cleft or VPI
Pharyngeal Fricative

- Because the pharyngeal fricative uses airflow in the pharynx, it causes phoneme-specific nasal emission (PSNE)
- It sounds like VPI but it’s not.
Therapy for a Lateral or Pharyngeal Fricative

• The technique for correction is exactly the same
• The beginning incorrect placement (whether in the pharynx or the oral cavity) is irrelevant
• The goal of therapy for both is to achieve normal placement and anterior airflow in the oral cavity
Therapy for a Lateral or Pharyngeal Fricative

• Have the child produce a /t/ sound
• Provide auditory and tactile feedback of the anterior airflow:
  • Have the child put his hand in front of his mouth and feel the airstream during production
  • Have the child put a straw in front of his teeth and push the air into the straw during production
Therapy for a Lateral or Pharyngeal Fricative

• Have produce the /t/ with the teeth closed
• Have the child prolong the production until it becomes /tssss/ with air going through the straw
• Transition to the syllable by inserting an /h/ between the /s/ and vowel
• Use this technique for /ʃ/ if needed
Therapy for a Lateral or Pharyngeal Fricative

• Note: /h/ is a good transition sound between corrected sounds and the vowel
Video 13: Therapy for a Lateral or Pharyngeal Fricative
Video 14: Therapy for a Lateral or Pharyngeal Fricative

• Insertion of /h/ for transition from consonant to the vowel
Video 15: Therapy for a Lateral or Pharyngeal Fricative
Video 16: Therapy for a Lateral or Pharyngeal Fricative

• Feedback using a straw
Video 17: Therapy for a Lateral or Pharyngeal Fricative

- Feedback using a straw or a listening tube
Video 18: Therapy for a Lateral or Pharyngeal Fricative

- Correcting placement eliminates the phoneme-specific nasal emission (PSNE)
Blends

• It’s important to divide the consonants into individual components and then blend them together slowly
/l/ Blends

• Plosives + /l/: Add the /ah/ vowel as a transition
  • Play = pa... lay
  • Blue = ba... lu
  • Clay = ca... lay
  • Clue = ca... lue
/l/ Blends

• Fricative + /l/: Prolong the fricative and then produce the /l/ with the rest of the word
  • flew = fff... lu
  • slay = sss... lay
/s/ Blends

• When /s/ is followed by the letters “p,” “t,” or “k,” these sounds are actually voiced.

• Therefore, /s/ blends with a plosive should be divided as follows:
  • spell = s... bell
  • stop = s... dop
  • skate = s... gate
/r/ Blends

• Have the child produce the sound before the “r” in a syllable with the vocalic /ɚ/
  • Tree = ter... ee
  • Fry = fer... y
General Principles of Speech Therapy
Priorities

Considerations in determining phoneme priorities:

• Stimulability
• Intelligibility
• Continuants
• Placement of production
• Word position
Stimulability

• Determine the sound(s) with good stimulability
• Start out with the easiest sounds for quick success
Intelligibility

• Choose the sound(s) which will have the greatest impact on intelligibility (i.e., /s/ before /f/)
Continuants

• When working on placement, always start with a continuant (which you can hold), if possible

• Examples include:
  • Bilabials: /m/
  • Lingual-alveolars: /n/
  • Velars: /ŋ/
Place of Production

• Start with anterior sounds before posterior sounds
• Examples: bilabials and lingual-alveolars before velars
Word Position

• Start with CV productions, and then the initial position before the medial or final position

• The exception is “r”
  • Final /ə/ should be corrected before the initial or medial /r/
Oral-Motor Exercises

• “Exercises” do not work!!!
• There is NO evidence that exercises help with speech sound disorders
• Strengthening muscles doesn’t even make sense


MOTOR LEARNING & MOTOR MEMORY FOR CARRYOVER
Motor Learning & Motor Memory

• Speech requires motor movement that is fast, complex, automatic and effortless

• This is accomplished by motor learning and motor memory

Motor Learning

Motor learning: Acquisition of new motor skills in order to execute complex motor movements and sequences

Motor learning is dependent on:

• Instructions
• Trial and error
• Feedback
Motor Learning

• Results in the development, change or refinement of a motor program (i.e., change in production of a speech sound)

• This is what occurs in speech therapy when the SLP teaches placement and provides feedback
Motor Memory

- **Motor memory**: Develops automaticity of the newly learned motor movement
- Is dependent on constant repetition (e.g., PRACTICE!)
Practice

• Results in brain reorganization due to neural plasticity
• Allows movement to be done without conscious thought
• Results in “carry-over” into connected speech
Practice

• Practice is necessary for all types of motor learning
• Examples:
  • Ballroom dancing
  • Sports
  • Playing a musical instrument
  • Speech

Practice Dose

• **Dose:** Number of correct responses in a practice session (in therapy or at home)

• Higher dose per practice session is directly related to the rate of progress

Practice in Therapy

• Use tokens and work quickly
• DRILL to increase the dose
Practice in Therapy

Procedure

• Hold the token by the side of your mouth
  • This brings the child’s attention to your face
• Have the child imitate a sound or word
• Put the token in the container quickly and say “Good talking” or something similar
• Work fast to get as many tokens as possible
Practice Distribution

• Distributed practice (practice throughout the week) facilitates both short-term performance and long-term learning

• Home practice is ESSENTIAL!
Practice at Home

• Speech therapy is like taking piano lessons—if you don’t practice at home, you don’t learn to play the piano!
Practice at Home

• Need to train the parents/family members to work with the patient at home
Practice at Home

• Frequent short practice sessions throughout the day and week are better than a few long sessions
• A 30 second practice session counts
Practice at Home

• Practice throughout the day (i.e., while doing daily chores, just before dinner, during a bath)
• Have practice material in the car and on the iPad.
• Have the child sing with favorite songs using the target sound and a vowel.
• Incorporate practice into homework. Have the child read out loud.
Practice at Home

Child’s Name: _______________ Practice Log Start Date: _______________

Practice between sessions will greatly increase your child’s success in speech therapy. It is better to practice several times each a day, than to practice a long time once a day. A practice session can be as short as 30 seconds.

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Cincinnati Children's
changing the outcome together
Summary: What to Do

- Increase sensory awareness of correct versus incorrect sound production
- Use appropriate placement techniques
- Incorporate daily practice and drill work for motor memory and carry-over
Summary: What NOT to do

• Do not work on obligatory distortions due to abnormal structure
• Do not use oral-motor “exercises” or blowing and sucking
Goal of Treatment

• Normal speech production in connected speech
Handouts

[Website Link]

www.cincinnatichildrens.org/speech

For Healthcare Professionals

Lecture Notes
SLP Tools

To sign up for SLP Tools from Cincinnati Children’s, go to the following link:

http://www.speechpathology.com/files/a/01300/01399/cp0616cchmcenews15151-2.png
QUESTIONS?
Thanks for your interest!