


Phonation

Development, Representation in Cerebral Palsy, Treatment



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Definition

- Voiced sound
- Column of air moves upward in the trachea
- Air flow meets adducted vocal folds – interruption of air flow
- Balance of forces/pressures results in phonation (voice) that can be adjusted in pitch, intensity and quality

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Development

- Newborn –
 - total body involved
 - vocalizations closely tied to movement
- Two Months –
 - vocalizations tied to movement
 - variety in cry – increased pitch and loudness

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Development

- Three Months –
 - length and quality variations in vocalizations
 - predominant open vowels
 - rhythmical sound play
 - changes in sound w/child's more active play
- Four Months –
 - Sounds directed by movement and position
 - Baby plays w/sounds – changing breathing, moving or oral play
 - More differentiated consonant formation

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Development

- Five Months–
 - Increased frequency/variety of sounds
 - Babbling
 - Explosive chains (increased intensity)
- Six Months –
 - Starts to imitate repetitive sound sequences
 - Sounds become gradually disassociated at this point
 - Play with volume/sound variation
 - May begin to use more negative expressive

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Development

- Seven Months–
 - Sound production beginning to separate from movement
 - Period of non-reduplicated babbling
 - Begins to acquire timing constraints – respiration/phonation/articulation
- Eight Months –
 - Chains of syllables, beginning to produce single syllables
 - First word/word approximation
 - Increased purposeful sound production (imitation)

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Development

- **Nine Months–**
 - Vocalization fully separated from body movement
 - Emerging isolated oral movements in sound production
 - Increased purposeful sound production (imitation)
- **Ten - Eleven Months –**
 - Greater imitation; reflects increased control and purposeful sound production (feed-forward)
 - Increased varied inflection and rhythm in vocal play – jargon
 - Variegated babbling

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Development

- **Twelve Months–**
 - Begin to alter gradual approximations of new words, new sounds produced (feed-back, feed-forward)
 - Facial expression and inflection convey considerable meaning
 - Speech development may go into quiet phase as walking is practiced



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Respiratory/Phonatory Process

- Phonation: production of sound
- Requirements:
 - Respiratory set
 - Abdominal/postural set to grade release of diaphragm
 - Timing/sequencing of air pressure
 - Alignment of vocal folds

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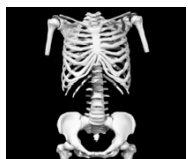

Phonation: Components

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Ribcage

- Anterior rib cage - points of mobility






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Ribcage

- Posterior rib cage - points of mobility





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Intercostals

- Role of intercostal length in mobility within the rib cage




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Movement: Implications for the rib cage

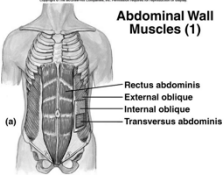
Role of transitions in shaping size, position and mobility of the ribcage



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Abdominals

- Rectus Abdominus
- External Oblique
- Internal Oblique
- Transversus Abdominus

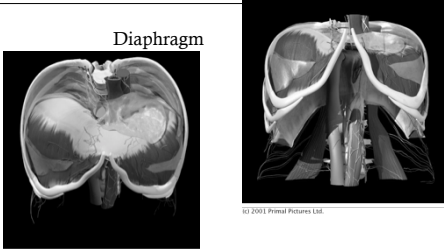


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Diaphragm

Diaphragm




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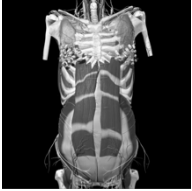
Respiratory/Phonatory Process

Intercostals



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Abdominals




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Digestive Issues

- Need for balance of thoracic and abdominal pressure impacts movement
 - Reflux
 - Constipation
 - Gastric Emptying



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Process: Phonation/ Articulation

- Respiratory valve (balance of diaphragm and abdominals) has to be able to set, hold and grade release of air
- Laryngeal valving – create voice
- Articulatory valving – modify voice through movement/contact of lips, tongue, jaw and velum

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Primitive Patterns of Phonation

- Hard glottal attack – sudden approximation of vocal folds with phonation, reduced regulation of force
- Melody pattern – smooth rising/falling patterns in voice
- Voice quality- normal voice quality described as non-tense, lacking in extraneous noise, non-breathy, and easily produced

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Atypical Vocal Patterns

- Tense – tightness or tension to voice
- Hoarse – appearance of laryngitis, strained and slightly breathy
- Breathy – vocal fold approximation is weak and poorly timed
- Strangled – tightness with added breathiness, short bursts of phonation

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CP - Atypical Vocal Patterns

- Atypical patterns not observed in developing infant
- Laryngeal blocks (open/closed)
- Weak, quiet voice
- Abnormally high pitch
- Falling – rising melody pattern during crying

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Cerebral Palsy

Characteristic Phonatory/Speech Patterns



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Cerebral Palsy – Spastic Type

- Increased nasality
- Hard glottal attack to initiate phonation
- Slow rate of speech
- Monopitch, monoloudness
- Decreased intelligibility with increased length of utterance/communicative exchange and with repetition of utterance

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Cerebral Palsy – Spastic Type

- Tight facial expression
- Use of tone to accomplish valving
- Treatment:
 - Use movement to increase intonation and pitch changes (move out of saggital plane)
 - Inhibition to facilitate/initiate phonation

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Cerebral Palsy – Athetoid/Dystonic Type

- Inappropriate coordination of valving (onset of phonation, voicing, articulation)
- Excessive loudness variation
- Reduced control over pitch variation
- Wider ranges of facial expression
- Tongue movement is more forward: wider ranges of movement

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Cerebral Palsy – Athetoid/Dystonic Type

- Oral movement is more constant; more inconsistent
- Entire process is arrhythmical – sequencing is greatest difficulty
- Treatment – increase stability (postural, shoulder girdle, oral) before speech production

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Hypotonia

- Decreased active and precise oral movements for speech
- Reduced ability to rapidly sequence oral movements for speech
- Decreased speech intelligibility
- Decreased vocal intensity/respiratory volume

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Hypotonia

- May also see decreased motor planning and/or decreased sensory registry
- Treatment:
 - Activities to alert/arouse respiratory/phonatory system and oral movements

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Ataxia

- Considerable difficulty with coordination of processes for phonation
- Patterns of fixing (particularly jaw fixing) that interfere with articulation
- Vocal quality: variable in pitch, breathiness and loudness

- Treatment:
 - Stability and deep proprioceptive input are helpful

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Cerebral Palsy: Hemiplegia

- Wide variety of limitations related to phonation/ articulation
 - May see apraxia/motor planning issues in some cases
- May see asymmetry in rib cage
- May see some degree of oral asymmetry, but not hallmark characteristic

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Cerebral Palsy: Diplegia

- General issues of reduced volume and timing/ coordination of respiratory/phonatory process impact intelligibility
- Articulation is not typically affected

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Treatment

- Step One – Assessment/ Analysis
- Is child able to establish adequate respiratory volume?
- Adequate mobility within the rib cage?
- Adequate stability through trunk to counteract forces of diaphragm for gradual release?

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Treatment

- Adequate stability/alignment through laryngeal mechanism for voicing?
- Adequate oral valving?
 - Jaw extension/retraction (graded response)
 - Range of mobility for labial closure
 - Lingual mobility
 - Movement for articulatory contacts
 - Shaping for vowel sound distinction

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Treatment

- Adequate ability to valve oral/nasal air flow?
- Sensory registration?
- Motivation?
- Intention?
- Cognition?

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Treatment Strategies

- Vibration
- Variation in use of vibration as respiratory set
- Movement
- Alignment/position
- Sensory input – arousal, proprioception
- Motivation – must always have reason for phonation
- Intention to communicate – eye contact

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Tips in Treatment

- Reinforce any phonation immediately/consistently
- Facilitate automatic phonation vs. directed
- Expect and wait
- Initiate voicing activities with family immediately
- Use gravity to advantage

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