Uncovering meaning in voice change: Esteem, identity, transformation
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Pediatric Pedagogy: An Overview of the Child and Adolescent Voice

_Vocal music is especially potent, emanating from deep within the human body itself rather than an external object. Being unmediated, singing is a peculiarly intense expression and exploration of the inner self._
Crabbe, 2005

Thoughts and Theory on the Voice and Communication in Infancy and Early Childhood

Human beings communicate to survive and thrive

- It is an innate and interactive action (Thurman and Grambsch, 1991)
- Parent-Child bonding is predicated on this developmental disposition
  - Impacts emotional expressivity
  - Informs cognitive learning
- The human voice is a primary means of psychological and safety needs (Maslow, 1943 and Thurman and Grambsch, 1991)
  - In patterns of response modeled by the caregiver, Babies’ non-verbal vocalizations are “manipulation[s] of pitch, timbre, rhythm and dynamics that [form] the basis of their communications system.” (Hodges and Sebold, 2011)
  - The voice then wields a connection to the essence of humanity and possesses the ability to reveal, “who we are.” (Thurman and Grambsch, 1991)

“Developing Singers” (Welch, 1991)

- Documented vocalizations _in utero_ at 20 weeks (Sataloff, 1999)
- Pitch match ability at 3-6 months (Thurman and Grambsch, 1991)
- Accurate pitch in _babble_ (Gordon, 1987)
- “Symbolic behavior” and access to human expression through song (Thurman and Grambsch, 1991)
- Song deconstruction and sequencing in the “developing singer” (Welch, 1991)
  - Child who are singers are “developing singers”
  - Neural processing and auditory acumen results from song deconstruction
Deconstructing song through essential elements will “facilitate exploration, play, and mastery through subsequent recombination,” enabling children to gain the tools of music making. (Welch, 1991)

- **Audiation** as “the foundation of musicianship” in early childhood. (Gordon, 1990)
  - “Audiation is to music what thought is to speech.” (Gordon, 1990)
  - Audiation occurs when music is both internally heard and comprehended by the brain. (Bluestine, 2000)

- Comprehension of melodic patterns indicates singing readiness (Welch, 1991)
  - Incorporate healthy modeling
  - Actively stimulating sound environments

**Fetal, Infant, and Child Anatomy**

*Teachers and conductors who work with children must have the appropriate knowledge regarding voice use for the young and changing voice.*

Smith and Sataloff, 2003

**Fetal**

Cickebicisi, Keles, and Uyar (2008) studied 40 fetuses from both the 2nd and 3rd trimesters for laryngeal structure. A comparison of vocal fold length follows:

### Data illustrating comparison in mean vocal fold length in fetuses

<table>
<thead>
<tr>
<th>Vocal Fold = VC</th>
<th>Second Trimester (Length in Millimeters)</th>
<th>Third Trimester (Length in Millimeters)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male Mean ± Standard Deviation</td>
<td>Female Mean ± Standard Deviation</td>
</tr>
<tr>
<td>VC- right</td>
<td>1.87 ± 0.24</td>
<td>2.00 ± 0.44</td>
</tr>
<tr>
<td>VC- left</td>
<td>1.87 ± 0.24</td>
<td>2.00 ± 0.44</td>
</tr>
</tbody>
</table>

*Source: Data adapted from Cickebicisi et al, 2008.*

Variation in comparative length is not notably significant.
Infant and Child Structural Findings (cadaveric)

Eckel et al. (1999) did exhaustive research on larynges of infants and children from ages 0-5 years.

- Subglottal airway (the region below the vocal folds) grew rapidly between 0-24 months. This changes the length of the neck and the position of the larynx in the pharynx.
- No sexual dimorphism (gender difference) in children this age.
- The child larynx is not a miniature of the adult larynx. Differences include:
  - Position relative to the vertebral column
  - Composition of cartilages and soft tissues
  - Environmental adaptability

### Comparison of Infant and Adult Vocal Fold Length

<table>
<thead>
<tr>
<th>Age</th>
<th>Overall Vocal Fold Length*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newborn</td>
<td>7-11 mm</td>
</tr>
<tr>
<td>Adult Females</td>
<td>11-19 mm</td>
</tr>
<tr>
<td>Adult Males</td>
<td>17-29 mm</td>
</tr>
</tbody>
</table>


The Larynx is an Organ in the Respiratory System

- The genesis of the vocal mechanism lay in the bronchial or pharyngeal arches in utero
- The basic structure, specifically the hyoid bone, laryngeal cartilages, and epiglottis begins as early as the 4th week of gestation.
- The Bronchial Arches
  - The mandible generates from arch I
  - The hyoid bone generates from arches II and III
  - The thyroid and cricoid cartilages generate from arches IV, V, VI

### Length of the Vocal Folds at Midline from Infancy through Adulthood

<table>
<thead>
<tr>
<th>Sex</th>
<th>Infant (0-2 years)</th>
<th>Child (3-7 years)</th>
<th>Pubescent (8-12 years)</th>
<th>Adult (unspecified)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>10.5 mm</td>
<td>12.0 mm</td>
<td>18.9 mm</td>
<td>29.6 mm</td>
</tr>
<tr>
<td>Female</td>
<td>7.3 mm</td>
<td>14.5 mm</td>
<td>18.3 mm</td>
<td>19.2 mm</td>
</tr>
</tbody>
</table>

Evidentiary growth in females begins in childhood rather than puberty.
  - double in length (chubby third graders)
  - male growth at same time not evidentiary

**Adult Vocal Fold Physiology**

![Diagram of Adult Vocal Fold Physiology]


The difference in the structure between child vocal fold and adult vocal fold is notable.

**Child**
  - The Superficial Layer of the Lamina Propria (large, composite structure that makes up part of the vocal fold) is 5x larger than that of an adult
  - This layer is comprised of elastin and collagen
  - The grouping of elastin and collagen, though fairly evenly dispersed are amorphous
    - Ingo Titze likens this gelatinous measure of protection to "water balloons" (Titze, 1994)
    - They are of all shapes and sizes creating a resilient layer
  - The vocal ligament, though double banded, has not yet gained the fibrous integrity it will at the end of adolescence
Comparison of Child and Adult Vocal Fold