The Child's Voice: A Closer Look at Pedagogy and Science

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Journal of Singing, May/June 2007 Volume 63, No. 5, pp. 537–544 Copyright © 2007 National Association of Teachers of Singing I have found it an art by itself to teach children singing. It requires the *most* careful gentle treatment, much more so than the cultivation of the voices of adults demands; and therefore only the best teachers should be trusted with the cultivation of children's voices.¹

ANY TEACHERS SHY AWAY from the issue of voice pedagogy for children and adolescents. While some may have a firm belief that serious voice training should not take place before the completion of puberty, for many there is simply insufficient consensus on what teaching young singers entails. Most likely it is not the issue of teaching children to sing itself that worries voice pedagogues, but rather how such instruction can proceed responsibly and effectively. For example, on one hand, someone may celebrate an adolescent boy's capability of "singing solo songs and choral music skillfully and expressively."² On the other hand (the stronger one with the pointing finger), one feels obliged to include a warning such as: "During voice transformation, with the rapid growth of cartilages, muscles, ligaments, and other tissues, the larynx is particularly susceptible to misuse and abuse."³ Such a dichotomy is all the more surprising when one realizes that there is little scientific confirmation of a child's vocal vulnerability.

Throughout the literature there is an undertone of controversy; understandably, many are reluctant to put themselves (as teachers) or others (unsuspecting and defenseless children) at risk. Pedagogic debates certainly will never cease; however, with the findings of voice science it is possible to establish some fundamental principles from which this debate may take place reasonably. The present article seeks to present the facts of vocal fold development as they are now understood, and then hypothesize what this implies for practical application in the voice studio. To begin, I offer a brief introduction to the first major study on the child's voice. Then, following a brief comparison of voice mutation of male and female voices, I attempt to establish a chronology of vocal fold development from prepuberty through adolescence to adult. By drawing on scientific literature, it will become evident that there is a serious gap in physiologic knowledge that is vital to understanding vocal development in young voices, specifically the period preceding puberty. Ultimately several fundamental principles for working with young singers will be suggested, as will directions for further pedagogic and scientific research.

In the Beginning...

The Child's Voice: Its Treatment with Regard to After Development (1885) by Emil Behnke and Lennox Browne was the first extended commentary specifically on the child's voice. The work was originally intended as an appendix to the 1883 Voice, Song, and Speech by the same authors; however, the subject required so much attention that the appendix expanded into a book of its own. Both Behnke and Browne were widely published in the area of voice science, and much of The Child's Voice involves descriptions and explanations of voice physiology. In addition to their own ideas, Behnke and Browne surveyed and compiled the ideas and experiences of 810 individuals. These responses, many of them transcribed in the treatise, demonstrate the controversy much in the same way it exists today. The strength of The Child's Voice is that these empirical results exist alongside the scientific findings of Behnke and Browne, who are clear in their purpose of dispelling at least some myths about working with the young singer. The Child's Voice remains the most comprehensive combination of pedagogic and scientific information on the subject today.

Considering the magnitude of *The Child's Voice*, and the profound influence it had on subsequent work in the field up to the middle of the twentiety century, it is surprising that since then no one has undertaken a project of similar scope.⁴ A contemporary version of *The Child's Voice* drawing on the responses of today's voice pedagogues and choral conductors would be a fascinating way to see how the attitudes and approaches to teaching young singers have, or have not changed since 1885. Similarly, to hold these responses up to our current understanding of child vocal physiology could result in a significant step toward working with children singers more seriously and responsibly. Yet there remain serious gaps in our scientific awareness that first must be addressed and pursued.

Comparing Young Male and Female Voices

The conclusions of Behnke and Browne still seem to pervade the general understanding of prepubescent boys and girls: "The truth would seem to be that, as there is no anatomical or physiological difference between the vocal organs of boys and of girls, so there can be no *material* difference between their voices."⁵ Although there may be no "anatomical or physiological difference" in the larynges of prepubescent boys and girls,⁶ general physicality undoubtedly affects overall vocal sound. Early works on children's voices make reference to the fact that boys generally were physically stronger and more active than girls. Thus, while the anatomy of the larynx itself may have been the same, the breath support of boys generally permitted the capability of more powerful singing. Certainly this gender distinction was more relevant 100 years ago; however, even today it is fair to assume that increased physical strength and activity play a part in the distinction between the vocal qualities of children.

Of course, it is during puberty when the most marked difference between male and female voices first is present. The rapid voice mutation during puberty, where male and female voices gain their distinctiveness, generally takes place over a period of six months to one year, sometimes extending to two or three years.7 Lynne Gackle offers a comprehensive descriptive comparison of male and female adolescent voice change (see Chart 1). I maintain that Gackle's chart offers a "descriptive" comparison, because the points are those things that can be seen and heard externally. Each of these points, however, coincides with a physiologic mutation in the larynx and body itself. While laryngeal and physiologic changes continue well into adult life, by the end of puberty voices fall into the classification categories common in contemporary literature on voice pedagogy.8 For the purposes of understanding such changes it is now necessary to turn to scientific research.

Establishing a Chronology for Laryngeal Growth and Development

Chart 2 is both chronological and comparative. Where possible, measurements have been noted, both of the macroanatomy and microanatomy of the larynx. Of the categories in Chart 2, up to the age of six is of little interest to most voice teachers. The period of puberty is described in Chart 1, and will be addressed again in the conclusion. Adult singers fall outside the scope of this article. The period from approximately age six to puberty is a neglected area of research. For most children this period of stable laryngeal proportions lasts five to seven years. On this exact point, Francis E.

	Male Voice	Female Voice
Laryngeal growth	Greatest growth is posterior-anterior (length); protrusion of Adam's apple.	Comparatively, the overall growth is much less, but still the greatest growth is superior (height).
Pitch (LTP)* (UTP)**	Lowers one octave; lowers a sixth.	Lowers a third; rises slightly.
Range	Lowers and decreases; ultimately increases again. Tessituras decrease and greatly fluctuate.	Stays within the treble range and ultimately increases.
Voice quality	Lacks clarity; has huskiness/breathiness; changes dramatically.	Lacks clarity; has huskiness/breathiness; changes in weight, color, or timbre.
Register development	Transition notes or "lift points" change throughout development; falsetto becomes apparent.	Transition notes or "lift points" change throughout development; adult <i>passaggi</i> become apparent.
Vocal instability	Yes.	Yes.

CHART 1. Comparison of male and female adolescent voice change.†

* = Lower Terminal Pitch

** = Upper Terminal Pitch

*Adapted from Lynne Gackle, "Female Adolescent Transforming Voices: Voice Classification, Voice Skill Development, and Music Literature Selection," in Leon Thurman and Graham Welch, *Bodymind & Voice: Foundations of Voice Education* (Collegeville: Voicecare Network, 2000), 815.

Howard stated in 1898: "... undoubtedly, during these years, there is a constant gaining of firmness and strength, in both the cartilages and their connecting membranes and muscles."⁹

Figures 1, 2, and 3 include several histological sections and schematic representations of human vocal folds. Vocal folds are generally described as a tripartite structure (cover-transition-body; see Figure 1). When comparing the newborn with the adult vocal fold, it is clear that these structures become stronger and more defined with age; the lamina propria (LP) itself develops into three distinct layers. Obviously, the time span from newborn to adult is vast, and unfortunately there is little information to determine, first, the stages between these two points, and second, how/if the microanatomy of the larynx within these stages differs between singers and nonsingers.

In "The Structure of the Vocal Folds," M. Hirano et al. charted the size of forty-eight male vocal folds of various ages. Those charts documenting complete length and length of the membranous portion basically detail a steady increase in length up to the age of twenty.¹⁰ The chart of the length of the cartilaginous portion is slightly less clear, though this may be a result of the more minute change of just 2 mm.¹¹ Perhaps of more interest is the chart comparing the ratio of length of the membranous portion to that of the cartilaginous portion.¹² This chart seems to present a dramatic increase around age ten with relatively stable proportions before and after (compare also to Chart 2, "to puberty").

The Hirano source states: "Vibratory movements of the vocal fold take place chiefly at the membranous portion," and that their results "suggest that adults have a greater capability for regulating vocal parameters, such as pitch, intensity and quality of voice, than do children."¹³ However, is it merely a distinction between child and adult? Is it solely the length of the membranous portion, or more the ratio to the cartilaginous portion that is important?

In a newborn, no vocal ligament is observed. The entire lamina propria looks rather uniform and pliable in structure. The fibrous components are slightly dense only at the ends of the vocal fold. In a four-year-old child, a thin and immature vocal ligament [transition] is observed. The vocal ligament is still immature at the ages of 12 and 16. It is only after puberty that a mature layer structure forms.¹⁴

Age	Male		Female
newborn		length of larynx: 7–10 mm length of vocal fold: 3 mm membranous portion: 2 mm cartilaginous portion: 1 mm	
to age 3	grows rapidly		
to age 6		grows less rapidly	
to puberty	length of larynx: 15–17 mm no alteration in its proportions very much same in boys and girls		
puberty		rapid growth 6 months to 2/3 years	
	larynx size increases 60–70%	laryn	x size increases 20–30%
adult	male/female size ratio approximately 3:2		
	length of larynx: 28 mm	len	gth of larynx: 23 mm
	length of vocal fold: 19-20 mm	length	of vocal fold: 13-14 mm
	membranous portion: 15 mm	memb	pranous portion: 10 mm
	cartilaginous portion: 4 mm	cartila	iginous portion: 3.5 mm
	area of entire glottis: 80 mm ²	area	of entire glottis: 52 mm ²
	height: 70mm		height: 38 mm
	width: 40 mm		width: 35 mm
	depth: 30 mm		depth: 24 mm
	length of vocal chink: 25 mm	lengt	h of vocal chink: 15 mm

CHART 2. Differences of the larynx in children, women, and men (measurements are approximate).+

⁺Compiled from Emil Behnke, *The Mechanism of the Human Voice* (London: J. Curwen & Sons, 1880), 62–65; M. Hirano, et al., "The Structure of the Vocal Folds," in Kenneth N. Stevens and Minoru Hirano, *Vocal Fold Physiology* (Tokyo: University of Tokyo Press, 1981), 33–43; J. C. Kahane, "Postnatal Development and Aging of the Human Larynx," *Seminar in Speech and Language* (1983): 189–203; Minoru Hirano, Kensuke Kiyokawa, and Shigejiro Kurita, "Laryngeal Muscles and Glottic Shaping," in Osamu Fujimura, *Vocal Fold Physiology, Volume 2: Vocal Physiology: Voice Production, Mechanisms and Functions* (New York: Raven Press, 1988), 49–65.



Figure 1. (a) Histological section (coronal) of adult human vocal fold. (b) Schematic representation of the layered structure. E-Epithelium; LP-Lamina propria; s-superficial layer; i-intermediate layer; d-deep layer; VOC-Vocalis muscle; EC-Elastic conus. Steven D. Gray, Minoru Hirano, and Kiminori Sato, "Molecular and Cellular Structure of Vocal Fold Tissue," in Ingo R. Titze, *Vocal Fold Physiology: Frontiers in Basic Science* (London: Whurr Publishers, 1993), 3.

Yet exactly how "immature" is the vocal ligament at ages twelve and sixteen? More importantly, does the vocal ligament "mature" as a result of physical growth alone? Or, does this "maturity" of the vocal ligament stem from voice use? Considering the level of vocal control some children around the age of ten attain, I would suggest that voice training (rather than vocal growth alone) can have a significant impact on a young singer's capability for regulating vocal parameters. Certainly an increase in vocal control implies a more acute coordination of the vocal mechanism, but perhaps voice training even expedites the development of laryngeal musculature.

As Kahane noted, "more research is needed on soft tissue changes in the adolescent larynx and vocal musculature, using histochemical and electromicroscopic approaches."¹⁵ However, such research alone may not inform the voice pedagogue sufficiently. In truth, a



Figure 2. (a) Histological section (horizontal) of adult human vocal fold. (b) Schematic representation of the structure. TC-Thyroid cartilage; ACT-Anterior Commissure tendon; AMF-Anterior macula flava; PMF-Posterior macula flava; AC-Arytenoid cartilage; E, LPs, LPi, LPd, VOC—see Figure 1. Grey, Hirano, and Sato, 4.

study focusing on adolescents must compare normal (nonsinging) subjects with subjects with trained voices. For practical purposes, therefore, it is still necessary to rely on indirect knowledge of the young voice from those with experience in that field.

Practical Applications for Working with Young Voices

If one were to consider the number of children that sing, the need for a more thorough understanding of how one should instruct a young singer is clear. Most music festivals include competition categories for children. More importantly, the magnitude of participation in children's choirs world-wide is astronomical, and many of these ensembles cater to singers from the age of six through the end of high school. A few of these children's choirs now incorporate a voice coaching program of some degree, wherein many or all of the singers receive some private tuition. Where such systems are in place the musical results are often on par with many of the world's professional adult choirs.¹⁶ Whether such networks for young singers stem from a centuries-old tradition, or a newly established organization, the vocal and musical skills children are capable of achieving and employing is often vastly underestimated.



Figure 3. (a) Histological section (coronal) of newborn vocal fold. (b) Schematic representation of the structure. (c) Histological section (horizontal) of newborn vocal fold. (d) Schematic representation. See Figures 1 and 2 for abbreviations. Grey, Hirano, and Sato, 6

It is the author's belief that the period from approximately age six to puberty is a period in which vocal training can take place safely. Moreover, within this period of five to seven years, children can gain an outstanding vocal technique, and learn to sing both musically and expressively. Certainly those musical and expressive skills learned at a young age will remain with the individual throughout puberty and into adult life. Similarly, many of the technical skills learned at a young age can remain consistent even after laryngeal mutation.

In addition, some believe that the majority of singers that receive early training will manage voice mutation more gradually during puberty than those that do not; that these singers' voices will not "break," to use the all-too-common terminology. Cooksey remarks: "With appropriate voice education and care—that begins well

CHART 3. W. Norman Mellalieu's 11 main points.†

- 1. Use the medium register as the point of departure when the change in voice begins.
- 2. Attend to position of chest, breathing, and control over the breath.
- 3. Aim for beauty of tone, not power or forcing in adolescent singing.
- 4. The boy must use his speaking voice carefully during the changing period.
- 5. Pay great attention to clear enunciation, and to the position and shape of the lips required for each vowel.
- 6. The boy should be encouraged to report immediately to the teacher any difficulty that he experiences in producing his voice.
- 7. Test voices frequently, and individually, and classify accordingly.
- 8. Use part-songs, and give the boy the voice part that suits his compass for the time being.
- 9. In unison songs, transpose the tune to suit the compass of the voices.
- 10. Aural memory and aural imagination must receive training at each lesson.
- 11. Enthusiasm, method, patience, and indomitable perseverance on the part of the teacher are absolutely essential.

†W. Norman Mellalieu, The Boy's Changing Voice (London: Oxford University Press, 1935), 34.

before voice change—transforming voices can maintain considerable vocal stability throughout *all* of the maturational stages."¹⁷

There are, of course, the extremists who believe that during puberty all singing should cease. Perhaps an experiment in which children cease to use their voices in any capacity during puberty (i.e., in song and speech) may yield interesting results (as well as be pleasing to irate parents); however, the possibility is simply not an option. Most importantly, if voice use is not regulated in some way during puberty, the use of the new speaking voice is far more likely to cause damage to the vocal folds than singing lessons by a trained and competent voice instructor.

For the boy whose voice appears to change quickly, training during this period (which will likely last only a short time) is probably best avoided. As the authors of *The Child's Voice* summarize:

Either the boy's voice changes gradually and imperceptibly—and then there is no break; in this case singing *may* possibly be continued, under the guidance of a competent master, without detriment. Or the voice breaks—that is to say, a sudden change takes place . . . It is perfectly clear that under such circumstances voice-use becomes an impossibility.¹⁸

The same is true of the young female, though the likelihood of vocal instability (as many boys experience) is minimal.

Ultimately, in working with young singers, common sense is the best guide. McKenzie's treatise *Training the Boy's Changing Voice*, though occasionally suggesting questionable models, ultimately decides that the "comfortable range" policy is best.¹⁹ Chart 3 lists Mellalieu's points for working with the boy's changing voice. Like many of the works quoted in this article, Mellalieu's ideas stem from the English choral tradition which still has a large focus on boys. However, the points are adaptable, if not equally attributable to girls. Also, though one would be in a good mind not to ignore the numerous warnings and cautionary remarks of those writing on the subject, one should not be overshadowed by fear (for self or other). The voice at all ages is delicate; yet it is also remarkably resilient. Therefore, there is no reason not to teach children to sing with a healthy, supported, and resonant sound.

Conclusions

There are children who cannot sing, but there are none who cannot be taught to sing.²⁰

As mentioned in the introduction, the most useful research in the area of voice pedagogy for young singers would be a contemporary version of *The Child's Voice*. Such a project would present the experiences of many voice pedagogues and choral conductors working with children and adolescents. These ideas could then be compared to scientific research on voice physiology in young singers. In the field of voice science three separate projects require further exploration: first, a more precise understanding of laryngeal growth of the prepubescent child; second, it is important to decipher the extent that voice use (as opposed to physical growth) affects vocal fold maturation, specifically comparing

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normal children to those with voice training; third, it would be useful to know whether prepubescent vocal fold development alters the manner in which vocal mutation occurs during puberty, specifically whether a singing child's voice gives the impression of changing more gradually than does a nonsinging child's voice. Most importantly, singing teachers must accept that children have a profound capacity for singing artistically with outstanding technique, and such potential can be realized safely and effectively.

NOTES

- Madame Emma Seiler, quoted in G. Edward Stubbs, *Practical Hints on the Training of Choir Boys*, introduction by Rev. J. S. B. Hodges (London: Novello, Ewer & Co., 1897), 12.
- John Cooksey, "Male Adolescent Transforming Voices: Voice Classification, Voice Skill Development, and Music Literature Selection," in Leon Thurman and Graham Welch, *Bodymind* and Voice: Foundations of Voice Education (Collegeville: Voicecare Network, 2000), 822.
- 3. Ibid., 833.
- 4. Several books focusing on children and singing have appeared; however, the majority of these attempt to enlighten the nonvoice specialist in the instruction of children within a general music curriculum. Often these books are plagued with over-generalizations of voice function, and/or present pedagogic models for voice instruction that can ignore a child's unique vocal characteristics. For a discussion of several of these works, see Kenneth H. Phillips, *Teaching Kids to Sing* (New York: Schirmer Books, 1992), 5–15, 20–22.
- Emil Behnke and Lennox Browne, The Child's Voice: Its Treatment with Regard to After Development (London: Sampson Low, Marston, Searle, & Rivington, 1885), 2–3.
- For a contemporary study on the comparison of the voices of boys and girls, see David Howard, John Szymanski, and Graham Welch, "Listeners' Perception of English Cathedral Girl and Boy Choristers," *Music Perception* 20 (2002): 35–49.
- Lennox Browne and Emil Behnke, Voice, Song, and Speech: A Practical Guide for Singers and Speakers (London: Sampson Low, Marston, Searle, and Rivington, 1883), 83; Barbara M. Doscher, The Functional Unity of the Singing Voice, 2nd ed. (London: The Scarecrow Press, Inc., 1994), 241.
- 8. Richard Miller, "Unifying the Registers of Male Voice," and "Unifying the Registers of the Female Voice," in *The Structure of Singing: System and Art in Vocal Technique* (New York: Schirmer Books, 1986), 115–149.

- Francis E. Howard, The Child-Voice in Singing, New and Revised Edition (New York: Novello, Ewer & Co., 1898), 20.
- M. Hirano, S. Kurita, and T. Nakashima, "The Structure of the Vocal Folds," in Kenneth N. Stevens and Minoru Hirano, *Vocal Fold Physiology* (Tokyo: University of Tokyo Press, 1981): 36–37.
- 11. Ibid., 37.
- 12. Ibid., 38.
- 13. Ibid.
- 14. Ibid., 39.
- Joel C. Kahane, "Growth of the Human Pre-Pubertal and Pubertal Larynx," *Journal of Speech and Hearing Research* 25 (1982): 453.
- 16. From personal experience alone: St. Mary's Children's Choir (Eileen Baldwin, director) and Bach Children's Choir (Linda Beaupré, director), Ontario, Canada; the trebles of New College, Oxford (Edward Higginbottom, director), United Kingdom.
- 17. Cooksey, 828.
- 18. Behnke and Browne, The Child's Voice, 91-92.
- 19. Duncan McKenzie, *Training the Boy's Changing Voice* (London: Faber and Faber, 1956), 34. McKenzie also briefly



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discusses the "Effect of the Long Vacation," a valuable point to keep in mind, and one oft forgotten.

20. Emilie Christina Curtis, *Children's Voices: How Harmed and How Helped* (Cincinnati: The John Church Co., 1895), 63.

Kevin D. Skelton (tenor) has performed on five continents with a wide array of musical ensembles. With a voice and musical sensitivity particularly suited to early music, Kevin specializes in seventeenth century repertoire, French Baroque opera, and the Bach evangelist roles. In Toronto, Kevin has sung as a soloist with all the major early music ensembles including the Toronto Consort, Toronto Chamber Choir, Aradia, Opera Atelier, and Tafelmusik. Further afield, Kevin has performed with the Indianapolis Symphony Orchestra, Internationale Bachakademie Stuttgart, Düsseldorf Symphoniker, Nederlandse Bachvereniging, New Chamber Opera, and the choir of New College, Oxford. On recordings, Kevin can be heard as a soloist with the World Chamber Choir (Dynamic), World Youth Choir (Carus-Verlag), Brabant Ensemble (Signum), Toronto Consort (Marquis), and the Tafelmusik Chamber Choir (CBC Records).

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