

The Adolescent Female Voice

Characteristics of Change and Stages of Development

by Lynne Gackle

Music educators and church musicians often approach the teaching and conducting of junior high age singers with uncertainty, anxiety, and even a certain amount of fear. Unfortunately, one reason for this is that music educators and choral conductors are often under-prepared for working effectively with the special needs of adolescent voices. Consequently, those who can most help adolescent young people appreciate their musical, vocal, and expressive potentials are themselves unaware of those considerable potentials.

When working with junior high age girls, the choral director is often faced with a choir of 55 students that may actually sound like only 15! Breathiness is apparent in the tone and may even diminish the overall performance. Intonation, tone quality, and blend are all affected by this non-focused, airy sound. In desperation, one may ask, "How can such a breathy sound be tuned?"

For those of us who work with junior high voices, our constant objective is to create a satisfying musical experience for our singers, despite the many different types of voices and vocal capabilities within our ensembles. With this goal in mind, teachers of junior high/middle school choirs need:

1. an understanding of how the adolescent voice matures in order to give proper guidance to the development of voice skills and the selection of music;

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2. an understanding of the potentials, limitations, characteristics, and unique qualities that may be encountered in individual adolescent voices;

3. a working knowledge of ways to assess the present vocal and musical abilities of each young singer, and ways to help them develop healthy, efficient personal voice skills for self-expression in speaking and singing;

4. a working knowledge of how to choose music that is within the physiological capabilities of young changing voices, and how to appropriately assign vocal parts so that vocal skills are facilitated rather than impeded; and

5. the ability to aurally recognize when adolescent voices are speaking and singing efficiently and healthily within their developmental capabilities, or are speaking and singing inefficiently and unhealthily.

The college/university education of junior high and middle school music teachers/conductors has been woefully inadequate from the standpoint of preparing the teacher for understanding the nature, care, and cultivation of adolescent changing

voices. Often, only a cursory overview of basic range capabilities is given the beginning teacher in the choral methods class. If information is presented, it is often given in an impractical setting without the benefit of actually hearing young voices. Though a great deal of study has been given to the male adolescent voice, very little of this information is made readily available to the beginning teacher. Education has been non-existent in female voice *change*.

In addition, voice lessons for pre-service teachers/conductors are generally oriented toward adult voices and operatic/art song skills rather than being centered on the child/adolescent voice. Choral training has been oriented toward creating a sound rather than building expressive voices. The *creating* tends to be in our own (adult) image rather than in helping young people find their own individual age-appropriate image that reflects who they are at the present moment.

Our challenge is to help young voices develop to their fullest present potential for personal self-expression. We must facilitate their vocal future rather than hinder that development or contribute to lifelong feelings of vocal inadequacy. We must also help students to understand that each voice is unique — that it *grows* or develops uniquely.

Female Adolescent Voice Change

Through the years, much study has been given to the male changing voice.¹ Information concerning the stages of change, the characteristics of each stage, methods of classification and teaching, as well as the psychological ramifications which affect the boy at this particular time

of his life, have been documented.

Minimal information exists, however, about the female changing voice. One possible reason for this lack of information may be that the changing process is not nearly as noticeable in females as it is in males. Generally, there is a recognition of and resignation to the breathy, thin, and often *colorless* adolescent girl's voice. Through the years, the assumption has been accepted that the female voice does not really *change*, but instead merely *develops* during the adolescent period. Father Finn states that "The girl's nature will develop rather than undergo change, and her throat will attest this fact by merely growing, escaping the anatomical readjustments of her brother."²

More recently, there has been increasing recognition that the female voice goes through various physical changes during adolescence, although these changes are not nearly as dramatic as those observed in the male.³ Exactly when these changes take place and how other biological factors affect voice change in adolescent females remains virtually unexplored.

In the past few years, female voice change has become the topic of study and active research. Currently, several researchers in this country are focusing their study on female voice change.⁴ This spring (1991) I plan to begin a longitudinal study with selected sixth grade girls covering a period of five

years. The study will examine the actual vocal changes in the students as compared to the stages of change outlined at the end of this article (which has been updated since the 1985 article published in the *Choral Journal*).⁵

The following discussion is offered as a synthesis of current professional opinion and as a review of research regarding the characteristics of the female changing voice.

Although voice change in females is not as dramatic as that observed in males, it does occur.

Symptoms of Female Adolescent Voice Change

The following indications have been proposed as symptomatic of female adolescent voice change:

1. insecurity of pitch;
2. development of noticeable register breaks;
3. increased huskiness in the voice;
4. decreased and inconsistent range capabilities;
5. voice cracking;

6. hoarseness;
7. generally uncomfortable singing or difficulty in phonation.⁸

Early indications of change also include the loss of ease in singing high tones as well as the feelings of "heavy, breathy, or rough" tone production.⁷ Charles Hoffer also cites the breathy, thin quality of the adolescent girl's voice and claims that it is the result of many factors, including "...muscular immaturity, lack of control and coordination of the breathing muscles, and insufficient voice development."⁸

Physiological Changes in the Female Adolescent Voice

Some of the physiological changes that appear to cause these signs of female voice change have been cited by various laryngologists. One of the first indications of voice change is a slight huskiness of the voice. Seth and Guthrie state that this is due to the incomplete closure of the posterior part (back) of the glottis (the space lying between the vocal folds).⁹ As early as 1866, Fournier (cited by Weiss), described the openness in the glottis, which was later termed the "mutational triangle" by Flateau and Glutzman.¹⁰ William Vennard notes that this gap or "mutational chink" represents a weakness of the interarytenoid muscles, and is heard as a rustling of "wild air" through the chink. This incomplete closure occurs when the membranous portion (front) of the vocal folds are adducted (closed) and vibrate normally, while the cartilagenous portion (back) remains abducted (open) due to insufficient contraction of the interarytenoid muscles, thus creating a gap or triangle at the rear of the vocal folds.¹¹

The vocal folds of the female adolescent increase in size approximately 3-4 mm, while the vocal folds of the male adolescent increase up to 1 cm.¹² This increase in size of the vocal organs causes a general lowering in range capabilities. The lower limit of the girl's vocal range falls about the interval of a third, and the upper limit rises slightly, while the boy's lower limit falls a whole octave and the upper limit lowers about the interval of a sixth.¹³

Weiss observed that the principal difference between the pubertal development of the male and female



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*Pronounced KA-THOU-ME-WH. Coast Salish Indian word meaning "a gathering together of different peoples."

larynx concerns the direction of laryngeal growth. Prior to puberty, the larynx of both sexes is approximately equal in size. During pubertal development, the male larynx grows primarily in the "anterior-posterior" (front to back) direction, leading to the angular protrusion of the thyroid cartilage, or Adam's apple. The female larynx increases more in height than in width, thus becoming distinctly different from that of the adolescent male.¹⁴

Our challenge is to help young voices develop to their fullest present potential for personal self-expression. We must facilitate their vocal future rather than hinder that development or contribute to lifelong feelings of vocal inadequacy. We must also help students to understand that each voice is unique — that it grows or develops uniquely.

Other growth changes noted by Weiss include:

1. greater breath capacity due to increased chest circumference and length;
2. the lengthening of the vocal tract with the descent of the larynx in relation to the spine;
3. the development of the oral-facial structures which are related to resonance.

Weiss noted that these anatomical developments result in greater voice "power," the "deepening" of the voice, and an increase in resonance capabilities.¹⁵

Other observable physiological changes in the female adolescent that can be indicators of voice change are:

1. overall physical growth (height, weight, size, etc.);
2. skeletal development - which is considered a more reliable correlate than chronological age;
3. appearance of secondary molars;

Comparison of the Male and Female Adolescent Voice

	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.	Stays within the treble range and ultimately increases; Tessituras decrease and greatly fluctuate.
Voice Quality:	Lacks clarity; has huskiness/breathiness; Changes dramatically.	Lacks clarity; has huskiness/breathiness; changes in <i>weight, color, or timbre</i> .
Register Development:	Transition notes/lift points change throughout development; falsetto becomes apparent.	Transition notes/lift points change throughout development; adult <i>passaggi</i> become apparent.
Vocal Instability:	Yes	Yes

* = Lower Terminal Pitch
 ** = Upper Terminal Pitch

4. growth of pubic hair;
5. breast development (thelarche);
6. onset of menstruation (menarche).¹⁶

Though no conclusive research exists linking female voice change to menarche, Brodnitz suggests that the start of menstruation and the lowering of pitch in the female voice are simultaneous. He further suggests that the menstrual cycle may produce

transient changes in the coordination of the voice during singing.¹⁷ Luchsinger and Arnold state that small submucous hemorrhages, loss of high tones, and uncertainty of pitch may result during and prior to menstruation.¹⁸ It is interesting to note that these characteristics closely parallel those exhibited by the female adolescent voice.

If the onset of menstruation proves to be an issue in voice change,

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medical research provides some important considerations. Tanner contends that the sequences of change during adolescence have remained relatively unchanged throughout the years. However, the age at which these changes begin is much earlier than previously recorded. In fact, menarcheal age appears to be occurring 3 - 4 months earlier per decade.¹⁹

What relevance does this have for those of us working with young voices? We may expect to find voice changes occurring earlier. Teachers are observing voice change in elementary school rather than just junior high. Rutkowski observed that boys generally progress through the vocal stages outlined by John Cooksey²⁰ but noted that they consistently enter classifications Midvoice II, Midvoice IIA, and New Baritone one year earlier than originally stated by Cooksey.²¹ Such evidence further supports the possibility that voice change is occurring earlier than previously reported.

Obviously, we as teachers are limited in our ability to observe all the physiological changes previously

mentioned. But, if we have a general knowledge of the sequence of adolescent development, we can better anticipate vocal growth in our students. For instance, according to

It is important to remember that during adolescent voice change, all voices should be categorized as light soprano or rich soprano. (There are no real sopranos or altos — in the adult sense of the terms — at this age. Never confuse a prominent lower register with true adult alto quality.)

Tanner, menarche occurs late in the development sequence after breast budding and the development of pubic hair, and generally, after the peak of the height spurt has passed.²² If a student has gone through an

obvious growth spurt, and there is noticeable overall anatomical development (hands, feet, breast development, facial features, etc.), then we can suspect that the onset of menstruation most likely has occurred or will follow shortly thereafter. Therefore, these obvious physiological changes can aid the teacher in assessing possible voice change.

Research suggests that the lowering of average speaking fundamental frequency (pitch) may also be an indicator of the onset and/or completion of puberty. Duffy notes a difference of one semitone in mean speaking fundamental frequency between 13-year-old pre-menarcheal and 13-year-old post-menarcheal females. The 13-year-old post-menarcheal females also exhibit a much higher incidence of voice breaks, suggesting that the onset of menarche may be associated with a period of vocal instability in addition to a decrease (lowering) in speaking fundamental frequency.²³ Hollien notes that the lowering in fundamental speaking pitch of the female voice is more gradual than in that of the male, possibly only one semitone per year over the four or five pre-adolescent and early adolescent years.²⁴

According to Cyrier, a female upper register transitional pitch area (lift point) tends to be higher in 14-year-old and 15-year-old females than in 10-year-old and 11-year-old females, suggesting that lift points may be higher for older adolescent girls.²⁵ In working with girls' voices, I have also observed this upward trend in the upper register transition area with age. In fact, as the voice continues to mature, this upper register transition area begins to approximate the adult soprano passaggio generally observed at D⁵-F-sharp⁵.

In my doctoral dissertation, I examined the effects of selected vocalises on the improvement of tone production in the junior high school female voice. Although analysis of the data revealed no statistically significant differences based on judges' ratings of perceived tone quality, analysis of objective data revealed significant differences on phonation duration (controlled exhalation) and pitch perturbation (a quantitative way of evaluating whether the vocal folds are vibrating normally or abnormally by measuring cycle to cycle changes that occur in fundamental frequency).

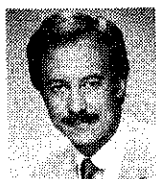
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It was concluded that the selected techniques were effective in improving breath management skills and in promoting more efficient, healthful use of the voice (efficiency inferred from the decrease in pitch perturbation.)²⁰

Stages of Development in the Adolescent Female Voice

From the review of current literature, it is obvious that female voice change is characterized by:

1. lowering of speaking fundamental frequency;
2. development of noticeable register breaks (quality changes);
3. increased breathiness or huskiness in the voice;
4. decreased and inconsistent range capabilities (tessitura tends to fluctuate);
5. uncomfortable singing or difficulty in phonation;
6. heavy, breathy, "rough" tone production and/or colorless, breathy, thin tone quality;
7. voice cracking;
8. hoarseness.

Given these characteristics of change, current research has shown that the development of sequenced pedagogical techniques applied through the choral experience can provide opportunities for the development of improved vocal efficiency, breath management techniques, and voice building.

Although voice change in females is not as dramatic as that observed in males, it does occur. The Comparison of the Male and Female Adolescent Voice chart on page 19 identifies several factors in both voices which are affected as the result of voice change.

Perceptually, female voice change can best be described as *shades of change*. If the color blue is suggested, the mind may conjure many different shades of blue — from azure to royal or navy blue — with many colors represented in between. In many ways, color association is an appropriate way to aid in understanding the development of the female voice. The overall color is that of a treble sound — it does not change. However, in terms of *richness, depth, and warmth*, the quality changes noticeably, and those stages of change can readily be identified by a trained listener.

Listening to each junior high age singer is important in order to assess vocal development. Fluctuations in range tend to be sporadic, and during the peak of mutation, unpredictable. Often, a girl who has been singing first soprano will experience decreased range, uncomfortable singing, or voice cracking. A change of voice part (to alto or second soprano) for a short period of time may be advantageous.

In addition to utilizing equal-voiced music for changing female voices (all musical parts have equal pitch ranges), allow the students to switch parts in regular scores so that they have the opportunity to sing all of the two or three parts for female voices — as long as the ranges are comfortable.

If this occurs, vocalization should continue throughout the vocal range, always striving to avoid any unnecessary strain in the lower or upper range. Although the student may now be singing alto, it is important to remember that this does

not mean that she *is* an alto. In fact, it is important to remember that during adolescent voice change, all voices should be categorized as light soprano or rich soprano. (There are no real sopranos or altos — in the adult sense of the terms — at this age. Never confuse a prominent lower register with true adult alto quality.)

In addition to utilizing equal-voiced music for changing female voices (all musical parts have equal pitch ranges), allow the students to switch parts in regular scores so that they have the opportunity to sing all of the two or three parts for female voices — as long as the ranges are comfortable. Musical independence and growth will result.

Characteristic Stages of Development in the Female Adolescent Voice

The following developmental stages are the result of 10 years of observation with female adolescent voices. Chronological ages are given as general guides and are not to be used as definitive rules of classification. In classifying female changing voices, the following criteria are used:

1. mean speaking pitch;
2. vocal range/tessitura;
3. register breaks (quality changes);
4. voice quality.

The acceptable limits of habitual speaking pitch areas of each stage indicated below are from research by

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Wilson.²⁷ Tessitura is defined as the range of pitches most easily and freely produced within the total vocal range. Register breaks are identified as changes in quality within the total vocal range. Voice quality is

determined by the perceived color, weight, and overall timbre of the tone. Again, chronological ages are given as general guides and certainly should not be used as definitive indications of each stage of change.

**Characteristic Stages of Development
 In the Adolescent Female Voice**

Note: Chronological ages are given as general guides and certainly should not be used as definitive rules.

Stage I:

Prepubertal - Ages 8 - 10 (11).

Speaking Voice: Average fundamental frequency - 260 Hz - 290 Hz (C⁴ - D⁴);

* Acceptable limits: 225 Hz - 350 Hz (A³ - F⁴).

Singing Voice: Light, flute-like quality;

- No apparent register breaks;
- Soprano quality;
- Flexible, able to manage intervallic skips;
- Much like the male voice at the same age with the exception that the female voice is lighter in weight because the volume potential is generally not as great.

Depending on other physiological changes (i.e., breast development, menarche) this stage could continue through age 12 or 13.

Stage IIA:

Pubescence/Pre-Menarcheal: Ages 11 to 12 (13); Beginning of mutation; First signs of physical maturation begin (breast development, height increase, pubic hair, etc.).

Speaking Voice: Average fundamental frequency is 245 Hz - 275 Hz (B³ - C-sharp⁴);

* Acceptable limits - 235 Hz - 290 Hz (A-sharp³ - D⁴).

Singing Voice: Breathiness in the tone due to appearance of mutational *chink*, an inadequate closure of the vocal folds as growth occurs in the laryngeal area;

- Register break appears between C⁴ and B⁴;
- If not using lower (chest) voice, there is apparent loss of lower range - around C⁴ (Some girls have trouble producing chest voice at this time.).

Symptomatic Signs:

- Difficulty or discomfort with singing;
- Difficulty in achieving volume (especially in middle and upper range);
- Breathiness throughout upper range (head voice).
- Fuller tone in lower/chest range; obvious *flip* into breathy, child-like, fluty voice at transition from lower to upper registers.

Stage IIB:

Puberty/Post-Menarcheal: Ages 13 - 14 (15); Peak of Mutation.

Speaking Voice: Average fundamental frequency: 225 Hz - 275 Hz (A³ - C-sharp⁴);

* Acceptable limits: 195 Hz - 290 Hz (G³ - D⁴);

Huskiness is inherent, but the voice begins to change in weight and timbre.

Singing voice: Very critical time; After the Stage IIA, (Pre-Menarcheal), tessituras can move up or down, or sometimes, can narrow at either end, yielding basically a five- or six-note range of comfortable singing.

- Register breaks still apparent between G⁴ and B⁴, and also at D⁵ to F-sharp⁵;

- At times, lower notes are more easily produced, yielding an illusion of an alto quality; singing in this range may be easier and can be recommended for short periods of time; singing only in the lower range for an indefinite period of time can be injurious to the young unsettled voice because of the tendency to overuse the lower (chest) register.

- Vocalization should occur throughout the vocal range, always striving to avoid any unnecessary strain in the lower or upper range.

- Because the changes during this stage are sporadic and unpredictable, it is necessary to listen to individual voices frequently in order to assess vocal development.

Symptomatic Signs:

- Hoarseness without upper respiratory infection;
- Voice cracking;
- Difficulty or discomfort with singing;
- Lack of clarity in the tone.

Stage III: Young Adult Female/Post-Menarcheal: Ages 14 - 15 (16).

Speaking Voice: Average fundamental frequency is 210 Hz - 245 Hz (G-sharp³ B³);

* Acceptable limits: 185 Hz - 260 Hz (F-sharp³ - C⁴);

- Timbre approximates that of adult female;
- More richness appears in the voice quality.

Singing Voice:

- Overall range capabilities increase. (At times, range does not decrease during the time of mutation. One characteristic of a quality singing voice is that it encompasses a large range. This does not imply that any voice is an alto at age 15-16 simply because those tones are within the young singer's capability);

- Greater consistency occurs between registers; voice breaks are more apparent at passaggio D⁵ - F-sharp⁵ (more typical of adult voice);

- Breathiness appears to decrease;

- Tone, though not as full as mature adult, is deeper and richer;

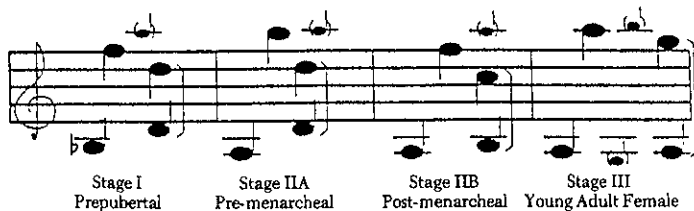
- Ease returns in the singing process;

- Vibrato appears in the voice;

- Volume, resonance, and vocal agility increase.

* Acceptable limits were derived from *Voice Problems of Children* by Kenneth Wilson, and do not necessarily reflect physically efficient use of voice in speech.

ADOLESCENT FEMALE VOICE RANGES AND TESSITURAS



Note: Complete development if the voice continues after post mutation

* Brackets indicate tessituras



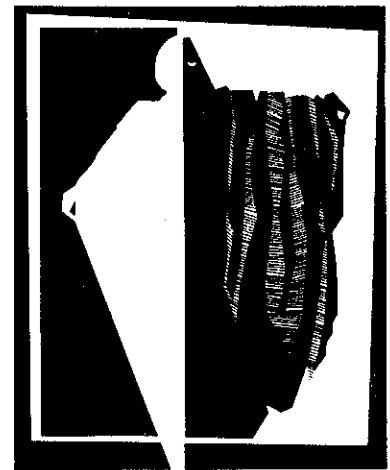
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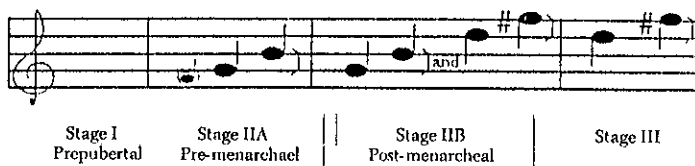
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