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The Utilization of Perceptual Motor-Learning Principles for the Acquisition of Head Voice in the Post-Adolescent Bass Voice

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The Utilization of Perceptual Motor-Learning Principles for the Acquisition of Head Voice in the Post-Adolescent Bass Voice

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University of Connecticut, 2018

Over the last two centuries, knowledge of the voice has grown exponentially due to advances in science, technology, and medicine. One no longer needs to guess regarding certain functions of the instrument through pure empiricism, but rather, principles or ideas can be brought to the laboratory and tested through simulation and studies. In the last few decades, scientists and pedagogues have realized that registration is not solely the result of laryngeal musculature, but also has implications in the acoustic environment of the vocal tract. This discovery has completely changed the way a teacher may look at training a voice, or fixing vocal issues.

One avenue of voice training and science that has not received the same level of interest is the process in which we learn to sing. Significant strides have been made recently in the science of perceptual motor learning and is utilized to great effect in the field of Speech and Language Pathology. Given that the musical use of the voice is a highly complex motor skill, it is easy to appreciate the possible implications of borrowing theories and principles from motor learning science in order to better train singers. This study offers a discussion regarding commonly used terms in male registration, as well as a brief look at the history of male high voice singing. In addition, it explores certain principles of motor learning and subsequently how they can be employed to train the upper range of the low male voice. Detailed examples of exercises are provided, as well as short repertoire extracts for context.
The Utilization of Perceptual Motor-Learning Principles for the Acquisition of Head Voice in the Post-adolescent Bass Voice

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Doctorate of Musical Arts Dissertation

The Utilization of Perceptual Motor-Learning Principles for the Acquisition of Head Voice in the Post-Adolescent Bass Voice

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Chapter One: Introduction

Much of modern vocal pedagogy has focused primarily on the mechanistic training of the singing voice. Many books have been dedicated to the understanding of the technical subsystems of elite operatic singing: breath management, posture, articulatory freedom, resonance, etc. This approach is founded on the belief that when all of these areas of technique are functioning optimally, an environment for beautiful and free singing will have been created. Unfortunately, this is seldom the case; moreover, these methods of training may ignore the process by which humans learn the motor skills involved in singing, which is through conscious experience with trial and self-correction.

For many years registration of the singing voice was thought to be solely the consequence of antagonistic movements of the intrinsic muscles of the larynx. Recent research into the acoustics of the male voice by Donald Miller and Kenneth Bozeman has effectively resolved any debate as to what constitutes male operatic head voice, which can now be easily identified, both acoustically and physiologically. Modern training manuals focus heavily on mechanistic instruction in order to achieve the desired result, but these books often overlook how one actually learns and assimilates the necessary skills. John Nix eloquently states that “music teaching has been oriented toward how information is most easily delivered to students rather than how teaching could be structured for optimal learning.”¹ How a student physically trains, is equally relevant to the information being communicated to them by their teacher.

Motor-learning science has made great strides recently in understanding how the human brain processes instruction, and also in identifying what approaches work best for obtaining a new motor skill. This dissertation will propose principles and practices for incorporating this new research into studio instruction.

Unfortunately, in the academic setting, a training regimen that centers itself around seemingly nebulous principles may be risky for the new teacher. Administrators want to see structured learning, colleagues want to track progress, and students want to be able to trust their instructor and feel appreciable improvement. This may be why mechanistic processes have become the preferred method of teaching, as it allows the instructor to feel as though they are “teaching by the book.” It is much easier to ask a student to do things such as “hold their ribs out,” or “place the tip of the tongue behind the bottom teeth,” instead of utilizing perceptual targets that align with what the instructor is hearing and the student’s own inherent feedback.

Training in this fashion may be slower and immediate improvement is normally not achieved or even the goal. Rather, long-term learning is the objective so the student may achieve automaticity and lasting results that allow for complete technical autonomy later on in their career. Automaticity produces the complete independence of technique from musical expression. It allows the singer to use their instincts, and as Cornelius Reid points out, “instinct is largely a product of kinesthetic awareness, and singers who rely upon the right “feel” of the tone for guidance understand their own voices in a very special way.”2 That is, the “feel” of a tone, or more importantly, the effect the tone has on the singer’s perception, can greatly aid one in the training of complex motor skills.

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In the sections that follow, I will briefly address the history of male operatic upper register singing, discuss pertinent pedagogical terms, provide an overview of perceptual motor learning, and suggest how all of this can be applied practically in the voice studio.

**History of the High Male Voice**

Throughout music history the landscape of operatic singing has evolved by means of aesthetic preferences and advances in voice pedagogy. Up until the early nineteenth century, male operatic singers would produce the notes above their chest register in what could be termed, a reinforced falsetto. This is in direct contrast to a pure or open chink falsetto, which is a breathy sound lacking complete glottal closure. Reinforced falsetto, though a lighter vocal timbre, possesses the carrying power to be heard over a small orchestra because the vocal folds are fully adducted like in chest voice but with minimal or no engagement of the vocalis muscle. Jason Vest cites reinforced falsetto as being less substantial than what the modern listener is accustomed to hearing from male singers at the opera house.³

The present day male opera singer is required to possess a technique in which his chest register is extended to the very top of his range. Unlike his female counterpart, where a noticeable change in voice production occurs at the primo passaggio, one rarely hears a male utilize his falsetto, save for certain comedic effects or extraordinarily intimate musical settings.⁴

Richard Wistreich cites the lowering of the larynx as the means by which singers can carry the

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⁴ Famous lieder and art song performers utilize a great deal of falsetto in recordings; however, this rarely translates in the acoustic setting of a recital hall.
chest register to the upper extremities of the voice. He also asserts that singers of the pre-
Romantic era strove for:

[a] clear differentiation of registers, strength in the lower and lightness in upper
(tenors, for example, sang notes above f1 [F4] in pure falsetto until the late
eighteenth century, and thereafter the change-over to producing higher tones in
chest register was gradual and often strongly resisted).\(^5\)

Contrastingly, modern trained singers strive for stentorian power and unified timbre throughout
the singing scale. Even lower voices of the time period, though admittedly their upper range was
exploited less than their tenor colleagues, used a lighter voice in their upper register. Wistreich
states that,

by the early seventeenth century, Monteverdi was remarking of a singer hoping to
be employed as a professional bass at San Marco in Venice, that the 'voice goes
into tenor with ease,' implying that the proper connection of two separate vocal
ranges, in this case perhaps even chest and falsetto registers, had already become a
hallmark of a properly trained singer.\(^6\)

Towards the end of the eighteenth century, David Mason reveals that a shift had begun of singers
delivering their high notes in a more powerful and brilliant manner. He cites the theorist William
Jackson stating that “instead of developing their voices so as to be soft at the top and full at the
bottom, singers are now achieving the opposite effect.”\(^7\) This could be a reference to Vest’s
theory that the pre-Romantic singers used a reinforced falsetto on top, not the pure falsetto that
was characterized by Wistreich.

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\(^5\) Richard Wistreich, “Reconstructing Pre-Romantic Singing Technique,” in *The Cambridge
Companion to Singing*, ed. John Potter and Jonathan Cross (Cambridge: Cambridge University
Press, 2000), 186.

\(^6\) Ibid., 184.

\(^7\) David Mason, “The Teaching (and Learning) of Singing,” in *The Cambridge Companion to
206.
Operatically speaking, Paris was a very important epicenter and bore wide influence throughout Europe in the early to mid-nineteenth century. The manner in which singers performed at the Paris Opéra produced strong ripples around the continent. Therefore, it is logical to deduce that singing technique that occurred on the stage of the Opéra was widely accepted performance practice. The singers of the day, especially tenors, were praised for their pure voices capable of extreme agility and range, “valu[ing] nuance and inflection over power.”

The seemingly superhuman feats of agility and range of these men can be attributed not only to their excellent training, but also their use of the lighter, less vocally taxing falsetto mechanism. Wistreich remarks that it was used because "it could enable great flexibility and speed of articulation." Its lighter vocal fold contact afforded incredible dexterity while requiring minimal effort by the singer. This entire aesthetic ideal was transformed with the debut of the *ut de poitrine*.

**The High C from Chest**

Gilbert-Louis Duprez (1806-96) turned the singing world on its head in 1837 after he performed the first high C in chest voice at the Paris Opéra in the role of Arnold in Rossini’s *Guillaume Tell*. Duprez’s studies in Italy had led him to a new mode of voice production that was being explored and pioneered by Italian singers, such as tenor Domenico Donzelli (1790-1873). Though Donzelli still performed his extreme upper register in falsetto, critics of the day like Henry Pleasants remarked that “he has a beautiful, mellifluous tenor with which he attacks the

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high A in full chest voice, without resorting to falsetto.”¹⁰ Stark cites Duprez as the “first tenor to gain celebrity for singing a high C⁵ in chest voice utilizing a vocal production that was referred to as voix sombrée ou couverte (dark covered voice).”¹¹ Traditionally, Duprez’s vocal accomplishment is associated with the two C⁵’s that come at the end of Arnold’s act IV aria “Asile héréditaire.” However, Vest argues that it was actually the “Suivez-moi” passage that drew acclamation from the audience members. He also notes that Berlioz wrote favorably of the singing in the second act trio:

the high B naturals of the andante, Ô ciel! ô ciel! je ne te verrai plus! with a force of resonance, a heartrendingly sorrowful accent and a beauty of sound of which nothing to the present day had ever given us any idea.¹²

The passage or notes in question is not overly significant; rather, the importance lies in what occurred that evening. A completely novel sound was introduced to the Parisian audience, and would lay the groundwork for a new, more heroic male upper register in all voice types.

**Implications of the Ut de poitrine**

Duprez’s debut opened a window that completely shifted the operatic world and what was expected of the male singer. It was no longer acceptable for the area above the passaggio to be approached with a lighter falsetto registration. Austin mentions that “by the middle of the nineteenth century, the tenor was expected to produce the top of his voice much like we know today, sometimes referred to as the ‘full operatic head voice.’”¹³ To get an adequate idea as to what full operatic head voice sounds like, one can witness via YouTube the great Luciano

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¹³ Austin, *Squawk*, 309.
Pavarotti demonstrating the shift to full operatic head voice during a masterclass. In this video, he speaks on how there must be a change for the voice to ascend to the upper register without straining. He describes this covered sound as more noble and allows for singing in the upper range of the voice without fatigue.\textsuperscript{14}

From the mid-nineteenth century to the present day, many voice methods and techniques have been directed towards training the male voice to acquire and integrate the “full head voice”. It is a necessity for the modern male operatic vocalist to possess this quality, not only for aesthetic reasons, but also because it is the most efficient manner in which the male voice can be carried over a full modern orchestra without amplification. It is without question that Duprez’s debut changed opera for good. From that day forth a strong, dark, and brilliant head voice was a necessity for a career in opera.

\textsuperscript{14} “Pavarotti About Covered Sound,” YouTube, 21 Jan, 2008 youtu.be/uo6dDQiBGyI.
Chapter 2: Discussion of Pedagogical Terms

Inside of a modern-day voice studio, a student may be exposed to a variety of different terms used throughout the course of their study. As in any other discipline, voice teaching has developed a lexicon that describes physical actions, kinesthetic feelings, and aural/acoustic phenomenon. It is important for the young teacher to have a clear understanding of these important terms as well as to know the origin of them. The goal of this chapter is to clarify ideas that are misused and misrepresented in the voice studio, with the intent to further the topic discussed in this paper while alerting the reader to the context in which they will be used later. The modern teacher should be concerned with fact-based pedagogy. That is, they should be relying on what is known to be true based on the advances afforded from science, research, and hundreds of years of tradition, while applying that knowledge through evidence-based practices.

Automaticity

The Oxford Dictionary of Sports & Medicine defines automaticity as

the ability to perform a task by automatic processing independent of conscious control and attention. Strong automaticity is almost entirely automatic and can be carried out without attention. Partial automaticity refers to processing that can be performed without conscious control, but which is performed better with attention.¹⁵

For the purpose of this discussion, strong automaticity will be referred to as automaticity, while partial automaticity will not be used and will be considered part of the process of obtaining

complete automaticity, as it still requires attention by the performer.\textsuperscript{16} In the performing arts, especially singing, automaticity is extremely attractive because of the inherent implications for stage craft and musical expression. To be able to free oneself from the shackles of technique opens up of possibilities of extraordinarily in-depth character development, while also allowing for musical expression of the text. When automaticity is experienced “performance is considered to be fast, effortless, and without need for attention.”\textsuperscript{17} This definition could be associated with the often-heard admonition to “let go” or “just do it” when performing a complicated motor task. Once the student has acquired sufficient technical skill they must trust that their automatic reflexes will take over.

**Register Event vs Register Violation**

The discussion of registration in the voice studio can be rife with semantic pitfalls and confusion for the young singer. In fact, up until quite recently, many believed that registration was a product exclusively of laryngeal muscular antagonism. One is reminded of Manuel García’s famous characterization of a register:

> By the word register we mean a series of consecutive and homogenous tones going from low to high, produced by the development of the same mechanical principle, and whose nature differs essentially from another series of tones equally consecutive and homogenous produced by another mechanical principle. All the tones belonging to the same register are consequently of the same nature, whatever may be the modifications of timbre or of force to which one subjects them.\textsuperscript{18}

\textsuperscript{16} Partial automaticity can be useful in the practice studio, but for the singer to be completely immersed in the performance, all attention must be placed on interpretation and not technique.\textsuperscript{17} Robert N. Singer, Ronnie Lidor, and James H. Cauraugh, “To Be Aware or Not Aware? What to Think About While Learning and Performing a Motor Skill,” *The Sport Psychologist* 7 (1993): 20.

It is clear that Garcia felt that a register was the consequence of muscular or “mechanical” factors of the larynx and not affected by vocal tract shape. However, pedagogues such as Bozeman, McCoy, and Donald Miller have revealed specific acoustic principles that heavily dictate the registration of the singer, especially the male voice. The implications of their work have had broad reaching effects on how one understands the training of the male head voice and applies specifically to the topic considered in this document.

Register event and register violation are not terms normally encountered in voice studios. Instructors find other acceptable, user-friendly language to elucidate the same concepts to the young singer. Donald Miller defines a register event as

moving upward (or downward) to a note which seems to the singer (or listener) to be produced in a clearly different way from the previous one, insofar as this difference is not merely the result of differences in pitch, intensity and vowel, is ascribed to 'registration', a category which is generally thought to pertain to the manner of vibration of the vocal folds." 159

Conversely, he describes a register violation as “the sense of using an inappropriate register (usually a higher note produced with a register appropriate to a lower segment of the voice).”19 A register violation of gross quantity is something that the untrained ear of the amateur singer or concert attendee can discern quite easily, e.g. a man shouting high notes, or a female with a breathy low voice. It is much more difficult however, to distinguish when a singer has passed from the efficient usage of a register to a state of negligence, especially concerning skilled singers.

In order to understand how access to the male head voice is accomplished, one has to accept that it is a condition met by means of a register event. This signifies that the range of

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notes above the chest voice must be produced in a way differing from the notes leading up to the event. D. Miller points out the long-held belief that a register violation is the result of a “static overbalance of thyroarytenoid over cricothyroid.”20 However, due to recent findings it is clear that there is an acoustic component that is vital to the correct traversing of the passaggio and the emergence of the head voice.

**Male Head Voice: Cover**

The term “cover,” as it applies to classical singing, refers to an acoustic event that occurs in the operatic male singing voice, thus allowing the singer to ascend into the upper register while maintaining a chiaroscuro tonal balance. This is not to be confused with the often-used adjective “covered,” which can describe an overly darkened and muddled voice production, as in “the baritone’s voice was very covered sounding.” Doscher characterizes covered voice by “a comfortably low laryngeal position, a strong fundamental, appropriate vowel modification and a rich spectrum of higher harmonics.”21 Ank Reinders quotes Meribeth Bunch as citing an enlarged pharynx that accompanies the lowered larynx in covered voice.22

Another phrase that can be used interchangeably with cover is *voce chiusa* or closed voice. Richard Miller describes *voce chiusa* as a “timbre that should prevail throughout the singing voice regardless of range, as opposed to “open voice” (*voce aperta*), there is a stabilized laryngeal position—relatively low—and a somewhat widened pharynx. These conditions

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together with proper vowel modification (*aggiustamento*) produce the so-called ‘covered sound’ of the upper range.”\(^{23}\) One can notice the similarities between these accounts of the physiological conditions of “cover.” R. Miller adds the Italian term *aggiustamento* (vowel modification) which he feels is essential to the equalization of the singing scale in order to rid the voice of any noticeable changes at registration points. Bozeman has a slightly different interpretation of *voce chiusa* and *aperta*, stating that “open timbre” is an acoustic condition that is welcome in the lower voice, whereas *voce chiusa* is a product of a well-executed register event.\(^{24}\)

The difference in these accounts is one of pure semantics. Multiple terms and phrases can be applied to the specific timbral shift that occurs at certain points in the singing scale. It should be noted that it is never the goal of the singer to “telegraph” these changes to the listener. A unified, even singing scale is always the objective. It is paramount to the learning process that both teacher and singer are not only aware of these important changes but also respect their existence, and allow them to occur. Whether one refers to the head voice as *voce chiusa*, cover, turning over, or vowel modification is not as important as their awareness of its perceptual and aural characteristics, moreover when and where it should be utilized. In the interest of simplification, “head voice” will be used from now on when referring to the register event in question; however, multiple terms might be used in order to describe the student’s perception of accessing head voice.

To better understand the phenomenon of male head voice, it is essential to possess a basic understanding of its acoustic principles. Therefore, a discussion of vowel formants and

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harmonics is necessary. Behrman defines formants as “characteristic resonances of the vocal tract, independent of the presence or absence of a sound source.”\textsuperscript{25} These areas of resonance, especially formants 1 and 2, are capable of movement up or down in frequency through changes of laryngeal position and the articulatory system. The position of formants 1 and 2 largely determine what vowel will be heard by the listener. Harmonics are integer multiples of the fundamental frequency, and form a complex sound source to be filtered by the vocal tract. These harmonics are filtered by the areas of resonance (formants) through the radiation of certain frequencies and the attenuation of others. The listener perceives the radiated frequencies of the formants as a vowel sound.\textsuperscript{26} An analogy to this would be putting a stencil over a light source. The light represents the fundamental frequency and harmonics, while the stencil is the specific arrangement of formant frequencies turning the broad spectrum light source into a shape that can be seen and recognized on the wall.

Most conversational sounds produced by human beings consist of two or more harmonics below the first formant of a particular pitch. The listener perceives this sound as “open timbre.” Low voiced male singers function quite well utilizing open timbre in the lower to middle regions of their singing voice. However, Bozeman explains that

\begin{quote}
\textit{once the second harmonic approaches the peak frequency of the first formant, a strong acoustic F1/H2 coupling occurs, which if carried above that pitch, soon becomes a yell with increasingly pressed phonation.}\textsuperscript{27}
\end{quote}

Put more simply, as pitch raises, the singer can make adjustments to preserve the F1/H2 coupling (raising the larynx, opening the mouth) but at the expense of vocal beauty and health, thus

\textsuperscript{26} Ibid., 246.
committing a register violation. This type of singing is often used in popular genres like musical theater, but is not considered stylistically appropriate in classical voice performance. Again, it is worth repeating that the singer’s range is very limited when an approach to the upper voice is facilitated in this manner.

In order to prevent this coupling of F1/H2, F1 must hold its position and allow the second harmonic to pass through it. Then as H1 approaches the area of F1 it becomes the “dominant low frequency” thus “temporarily creating a somewhat lower perceptual F1.” Accordingly, the sound retains its chiaroscuro, or light-dark balance as the student ascends to his highest pitches. If the singer can allow this sweeping of H2 through F1 then they are successfully producing head voice.

**Head Voice and its Relation to the Traditional Passaggio**

In the bass voice, the traditional *zona di passaggio* (zone of the passage) can lie anywhere from G3-A3 for the *primo passaggio* to C4-D4 for the *seondo passaggio*, depending on the sub-categorization of the voice in question, e.g. basso profundo versus bass-baritone. Typically, discussion regarding head voice is not undertaken before the singer has entered the *passaggio*. One can observe the teaching of Richard Miller, where he speaks about vowel modification applied incrementally through the *zona di passaggio*, which he equates to the practice of head voice (cover). However, it appears that Miller takes for granted the *voce chiusa* quality of the voice that must be present before any modification can occur, or at least with regard to the closed vowels [i] and[u]. Given their low first formant frequency, both vowels turn over to head voice.

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28 Ibid., 293.
well before the *primo passaggio*. If the voice has not taken on the “closed” quality, any vowel modification to a more open vowel will lead to a laryngeal rise and result in a pressed, yelled production.

Bozeman has devised a systematic approach to training the male head voice utilizing a technique termed “passive vowel modification.” Through the use of the Madde Synthesizer, he has proven that by not changing the tube length, i.e. maintaining a stabilized floating laryngeal position, the male voice will make the appropriate registrational shifts and laryngeal adjustments in order to switch into head voice. He proposes a systematic method through identifying the approximate locations of F1 for the cardinal vowels (see figure 2.1), so that one can anticipate where a register event should take place through the maintenance of a stable tube length and static vowel shape. Bozeman utilizes short and easy exercises that jump over and pass through these regions of the voice in order to familiarize the singer with the acoustic event. He employs the use of the closed vowels [i] and [u] first because their F1 frequency is the lowest of all of the vowels. This way a register event has occurred below the treacherous area of the traditional *passaggio*. Hence, the singer can become accustomed to its application and properties before attempting more open vowels that have a higher first formant, and subsequently more difficult transfers. Through the preservation of a stable laryngeal position, the vocal folds are also permitted to make the movement to a lighter mode 1 registration.\(^{30}\) To reiterate, this timbral shift that occurs should be considered the head voice. Through passive vowel modification one enters closed voice; upon ascending the scale, remaining in this timbral quality, the vowel can be opened to preserve the chiaroscuro balance (*aggiustamento*). Bozeman notes that if the singer

\(^{30}\)Bozeman, *First Formant*, 295.
does not open the vowel (raise the first formant), then the tone would become increasingly thinner and convert to what he terms “whoop” voice, which resembles falsetto.

Given this new understanding of the male operatic head voice and how it relates to the traditional *passaggio*, the instructor can skillfully guide the student armed with practical and predictable means to passaggio training.

**Figure 2.1**

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Chapter 3: Motor-Learning Theory and Research

Motor-learning is defined by the Medical Dictionary for the Health Professionals and Nursing as “the process of acquiring a skill by which the learner, through practice and assimilation, refines and makes automatic the desired movement.”

Like any other learned skill or coordination, not only is practice important, but how that practice is applied is crucial as well. Vocal pedagogy literature is rife with information regarding acoustics, breath management, posture, and resonance. However, these often do not speak on exactly how to train the voice and more importantly how the student learns most effectively. If one were to walk from voice studio to voice studio of their local music school, they would undoubtedly encounter a new approach to teaching in each studio. Perhaps all of the information being taught would be the same; however, the tactics used would be unique to that particular teacher. Over the years that particular instructor has developed a personalized approach in which they can communicate—by the simplest means possible—directions to execute a complex motor skill such as singing. Recent research into the field of motor-learning theory has taught us that certain conditions can be met in order to maximize long-term learning.

Titze and Verdolini lay out 5 core issues and concepts pertaining to motor learning that must be kept in mind during training:

1. Memories that result from motor learning are not to be considered a fixed state but rather a process. In other words, they are not bits of information stored in the brain, they are mental processes that will be used again and changed from future exposure.

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32 Medical Dictionary for the Health Professions and Nursing, s.v. "motor learning."
2. We do not observe learning directly, “we can only infer it from observation of performance changes that follow practice or exposure.”

3. Improvement during a training session does not imply learning. Learning can only be said to occur when progress is mapped over long-term periods, keeping track of retention and transfer.

4. Variables must be present in practice in order for learning to occur.

5. Learning can only be assumed if the results are directly from practice or exposure, not from synthetic means such as drugs.

These core concepts and ideas are crucial guidelines that provide the instructor insight not only into how to train a motor skill, but how to recognize when learning has occurred. During the course of this paper, these concepts and issues will be addressed through the lens of training the male head voice.

**Stages of Motor Learning**

Understanding and recognizing the stages of motor learning helps the instructor by providing them with the structure necessary to create a training program that appears random and varied to the student. For example, the feedback and level of variability are quite different between stages 1 and 2 and the instructor must be sensitive to this factor while lesson planning.

In the first stage, or Verbal/Cognitive Stage, the student seeks to obtain sensory information about the motor skill or target in question. Cognitive processing takes longer in this phase, and it is suitable to progress at a slower pace until it is apparent that the student can produce the biomechanical target easily and predictably. Moving slowly during this stage is more

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beneficial to the student so they may process information. Variability and randomization should be quite low during at this point inasmuch as the student might not have a firm grasp on the target and variability would only cause confusion.

The next stage, the Motor Learning Stage, is by far the longest of the three stages and is where the bulk of learning takes place. The student has become skillful at producing the target and is now able to "self-monitor" for mistakes. Feedback should be given less at this stage as the student must be able to detect and resolve problems on their own. They must begin to develop a "feel" for what is correct and efficient. Feedback, or lack thereof, is something that is crucial in all three stages and will be discussed at a later time.

The final stage is termed the Automatic Stage. The goal of any training regimen is to develop a skill or coordination to such a high degree that it becomes automatic. During this period “the learner has quick error detection and self-correction. Very little active processing occurs at this stage.” The automatic stage is the goal of the entire training program; unfortunately, many singers never achieve this level of learning.

To better understand motor learning theory, a look into the two types of “knowledge” a human can store and utilize is needed. These types of knowledge are referred to as procedural and declarative. Declarative memories are bits of knowledge that can be recalled when asked for information such as, “what year was the Declaration of Independence signed?” On the other hand, procedural learning is gathered through experience or practice and is “not revealed by asking people to report what they know, but rather by asking them to engage in a previously

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35 LeBorgne and Rosenberg, Vocal Athlete, 261.
practiced task. Procedural memories are revealed without conscious knowledge of what has been learned.”36 In a recent interview, world famous bass René Pape can be quoted as speaking about his voice, “I couldn’t even tell you how it works…it’s more instinct, it’s more natural feeling.”37 His account of his vocal technique is very telling and quite common for elite performers and athletes. Technically speaking, they often do not know what they are doing when performing; rather, they rely on the feeling and sounds that they have programmed in their brain as correct. The job of the instructor is to effectively communicate their “know-that” (declarative) information to the student so they may turn that information into “know-how (procedural).”38 This must occur without allowing for conscious thought on mechanics of the motor skill while also not becoming too dependent on the teacher.

The battle between mechanistic and perceptual/sensory instruction begins with internal and external focus or put simply, where the student directs their attention. For years, and still today, many training methods for the acquisition of a motor skill involve conscious awareness of movements and positioning. For example, if one were to attend a golf lesson today, much of the lesson would consist of verbal instructions on keeping the left arm straight (if right handed), how you grip the club, and allowing a full shoulder turn while keeping the left heel on the ground through the backswing. Studies show that these instructions may actually hinder the student’s ability to assimilate long-term changes to their golf swing, on top of obscuring the actual goal of simply hitting the ball.39 A better use of time would be specific exercises devised by the

37 “Classic Talk: Renè Pape,” *YouTube*, 31 Oct, 2016 youtu.be/LXzu0CgwTfM.
instructor that train the golfer to hit the desired biomechanical target without allowing declarative thought processes to interfere.

Galwey has devised an ingenious exercise he refers to as the “Back, Hit, Stop.” The golfer must say the word “back” when they believe they are at the top of their backswing, the word “hit” upon contact with the ball, and “stop” at the end of their follow-through. By concentrating on aligning the words with crucial points in their swing, it takes the declarative side of the brain out of the equation, smooths the tempo of their swing, and creates a way for the golfer to gauge their perceptual awareness of where these events are truly happening. Many times, the student is surprised that they are not saying these words at the desired points in their swing; however, it does not take long for the body to learn the appropriate correction through self-awareness. All the while, they have begun hitting the ball consistently longer and straighter without “trying” or conscious thought toward mechanics.40

Titze and Verdolini believe that receiving instruction regarding a motor skill as declarative information is not beneficial because the human brain is not able to process all of the information and incorporate it. They state, “verbal instructions about the biomechanics of a task are at best gross, inadequate descriptors of action, often exceeding people’s processing capabilities.”41 They go on to suggest that the effect of a gesture is a more beneficial point of focus rather than the mechanics of the gesture. With regards to singing, LeBorgne and Rosenberg recommend drawing the student’s attention to the desired goal, instead of each separate subsystem of the voice, i.e. breathing, articulation, resonance, etc. (internal focus). The conscious manipulation of these subsystems may be harmful to learning and the student is encouraged to

41 Titze and Verdolini, *Vocology*, 230.
direct their attention to the outcome of the gesture (external focus). More specifically as it pertains to head voice, once the target is hit, then the subsystems may be discussed in order to solidify what sensations are occurring. It is rarely the case that a particular mechanical focus will yield the correct results, i.e. the lifting of the soft palate or opening of the rib cage. Instructions like these often take the inherent “feel” out of the motor skill performance.

Metaphors have been used in voice studios for years to convey certain acoustic and physiological conditions that create beautiful singing. Motor learning science has discovered that these metaphors that we often come across are not as helpful as once thought. Research has found that metaphors can trigger a switch from procedural learning to declarative learning, essentially pulling the singer out of subconscious action. For instance, a metaphor used by teachers for keeping warmth in the sound as the singer ascends, could be imagining the voice as an elevator. As the elevator goes up (pitch), the counter weight goes down (depth or warmth of the tone). Unbeknownst to the instructor the student’s thought process has changed from procedural learning to the conscious, semantically-rooted world of declarative learning. The instructor would be better suited to utilize sensory and perceptual cues in order to assist the student in hitting the target. One suggestion could be to ask them to sing an [u] vowel that appears very dark and pharyngeal to the singer on an ascending passage. This allows them to focus on a target while also utilizing subconscious controls. After they have appropriately acquired the target sound (depth of resonance), ask them to then carry that same depth and warmth to other vowels. This way the instructor is helping the student program a behavior that is hardwired into their nervous system, rather than having them chase an illusory image that may or may not evoke the proper response every time.\textsuperscript{42}

\textsuperscript{42} Titze and Verdolini, \textit{Vocology}, 230.
The “What” and the “How” of Motor Learning

When developing a training program, it is important to understand what is considered beneficial for long-term learning and how one structures the actual training. There are multiple facets to be considered by the instructor in motor learning: internal vs external focus (attention as previously discussed), feedback and its timing (augmented and inherent), variability of practice, random vs blocked practice, and sensory information. All of these parameters are involved in the aforementioned stages of motor learning and play important roles in each. Through understanding motor training and its stages, a practical and predictable course of training can be constructed for each individual student.

Inherent and Augmented Feedback

Feedback is one of the most valuable tools of the voice studio. It is the primary form of communicating “right” and “wrong” from teacher to student and has the potential to be the largest catalyst for progress. In motor learning, one has access to two main forms of feedback, augmented and inherent. Augmented feedback “consists of information, other than sensory, provided to the learner from any source outside of the learner’s own body, such as a mechanical device or an instructor.” Under the category of augmented feedback there are two subdivisions, Knowledge of Results and Knowledge of Performance. KR is the feedback given about the outcome of the performance, or how close the student was to hitting the target. KP focuses on the

mechanics of performance, and the efficiency/effectiveness of the attempt.\textsuperscript{44} To illustrate the difference between the two, let us examine teaching a blind folded person to throw a dart at a bullseye. After the first attempt, if the instructor were to say “the dart hit below the bullseye and to the left, try using more force in order to throw the dart higher on the board,” they would be using KR. Conversely, if they said “the dart hit below the bullseye and the left. Make sure you are holding the dart with your thumb, index and middle finger. Then flex your elbow out in front of your body in the shape of an ‘L’ pointing the tip of the dart at the board. Next be aware that you are flexing your elbow enough so that your hand almost touches your shoulder before moving your hand away from your body at a higher rate of speed than the previous attempt.” These much more mechanically minded directions would be considered KP. For the purpose of motor learning, studies have shown that KR is more advantageous to KP when learning a motor skill.\textsuperscript{45}

Inherent feedback consists of the sensory information gathered from the student attempting the motor skill. In other words, it is the feedback that one gives themselves after they perform a given task. This information can come in two forms: proprioceptive and exteroceptive. Data that is gained from one’s own body tissue, i.e. physical sensations, can be considered proprioceptive; any information gathered from vision or hearing is exteroceptive.\textsuperscript{46}

Both augmented and inherent are extremely important to the process of learning a complex motor task such as singing. Not only is the type crucial—augmented vs inherent—but also when and how often it is given bears a strong consequence on long-term learning.

\textsuperscript{44} Ibid., 472-473.
\textsuperscript{45} Titze and Verdolini, \textit{Vocology}, 232.
\textsuperscript{46} Maxfield, \textit{Improving Your Feedback}, 472.
Current research has shown a paradoxical relationship between the frequency of AF and long-term learning. Verdolini states, “instructional strategies that enhance performance during sessions often reduce long-term learning, and vice versa.”47 Thus, frequent use of AF during a training session will likely boost the performance of the student; however, long-term it may greatly hinder their learning ability. As stated before, frequent AF will be much more useful in the first stage of motor learning, but not as effective in the second. Less feedback given at infrequent intervals during training is ideal as the student’s progress advances. “Even if our lessons do not seem as impressive, our students will actually learn more if they have to do a lot of the mental work during training,” believes Verdolini.48 John Nix brings up what Lynn Helding has termed the “Master Class Syndrome.” He states,

consider a master class where a singer performs better than before, thanks to the guidance of a clinician. However, the next day, the singer is frustrated when recapturing the same level proves elusive. Short term performance was enhanced, but learning did not occur.49

This example brilliantly describes what Verdolini has discovered in her research. Improvement cannot be assumed until it has been tracked of extended periods of time and is observable by the instructor.

For the teacher in a university music program where students must sing juries every semester, it can appear counterintuitive to refrain from trying to fix every detail during the course of a lesson. Even more interesting, Titze and Verdolini cite data to indicate that over time,

48 Ibid., 49.
“fading out the amount of KR across practice may benefit learning.”

Again, this cognitively stresses the student to make the necessary changes in order to hit the specified target. If the instructor is consistently interrupting the exercises or song, then they are inhibiting the student’s ability to perceive what happened, process that information, and make the proper adjustments.

Research has shown that feedback given at the conclusion of the performance of a motor task (immediate terminal feedback) is much more beneficial than that of concurrent feedback. The interval of time that passes after a given attempt is also crucial to learning. Maxfield cites Swinnen et al discovery that “delayed terminal feedback” was the most efficacious for long-term learning of a motor skill. This delay should be at least 3 seconds after completion in order to allow the student to mentally process what just occurred. Maxfield explains that assuming that the student is cognitively attentive to the learning process, offering a few seconds between the attempt and the feedback allows for the student to hone his or her own error detection skills, which are necessary for successful completion of the task in a performance environment where augmented feedback is not available.

The instructor is essentially slowly making the student–without their knowledge–responsible for their own instrument. The importance of this cannot be overstated because dependency on augmented feedback is often a pitfall of young singers. The student needs to be able to function independently in the practice studio, recital hall, and opera theater.

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50 Titze and Verdolini, *Vocology*, 233.
51 One of the most important things an instructor wants to hear from their students is “I know what I did wrong there,” before they even have a chance to correct them.
The Variability Factor

Ostensibly, something as simple as variability appears obvious to voice instructors. Most, if not all, begin their lessons with a variety of vocalises that exercise the voice for coordination, flexibility, and longevity. However, it is equally likely that one could witness that same teacher settling into a “routine” of voice exercises for every student that enters their studio (allowing for slight changes with regards to voice type and skill level). Exercises that, if mastered, would bear the promise of a complete technique that allows for functional freedom. The maxim, “it worked for me” often comes to mind when encountering such teaching styles. Although these teaching and practice techniques may work to instruct a student to perform a motor skill at a reasonable level, research has found that it may also have negative effects on their long-term retention of a skill, on top of not being the most time-efficient strategy.

There is a longstanding tradition in the world of instrumental music of utilizing “constant” practice to master a particular skill. Constant practice is reiterating the same skill in repetition without any variance. One could witness a pianist “wood shedding” a certain passage and repeating it hundreds of times to acquire the “muscle memory.” It is logical then for vocalists to utilize the same technique in order to improve their proficiency at certain passages or melismatic figures. In contradiction, a better strategy “to maximize learning and generalization of motor skills,” would be to create an environment where errors are encouraged so that actual learning may take place. A more valuable use of the student’s time would be to add randomized variables into their practice routine in order to promote consistency of hitting the target across multiple planes. For example, instead of singing the same scale up and down by half or whole steps, one could potentially jump by thirds or another interval. The student could

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53 Leborgne and Rosenberg, *Vocal Athlete*, 264.
also change vowels mid-stream, and vary the dynamics spontaneously (much like in a song or aria!). A change in room size could be conceived as a new variable, or having a colleague watch you as you practice. Different emotions could be placed on each reiteration of the scale to expose a new response. The multitude of possibilities is endless.

In Figure 3.1, one can see that multiple variables can be attached to a given target at any time. All and any of the variables can be applied in different combinations in order to create an environment to stress the student’s cognitive processing and force errors. The diagram may be used as a blueprint to construct exercises that enact some or all of the variables.

**Figure 3.1 Visual aid for practice variability mapping inspired from Verdolini and Titze**
This style of practice, though it may hinder immediate improvement (and add considerable frustration), forces the student to make mistakes and therefore constantly forget and reconstruct how they accomplished the motor skill.\textsuperscript{54} This prevents the student from going on “autopilot” and “is forced to generate and/or retrieve a new motor paradigm for each new skill.”\textsuperscript{55} Leborgne and Rosenberg refer to this idea as “The Forgetting Hypothesis,” and Verdolini and Titze call it the “contextual interference hypothesis.” Either way, it is geared to making the student apply the new skill (head voice) across multiple variables constantly.

The next concept to consider with regards to the variability factor is blocked versus random practice. There appears to be some confusion or disagreement as to what actually constitutes random vs blocked practice. In her article, “Learning Science Applied to Voice Training: The Value of Being ‘In the Moment,’” Verdolini categorizes blocked practice as focusing on one skill at a time, e.g. breathing exercises, then moving onto focus, etc. These facets are to be studied or practiced separately without consideration given to each other. On the other hand, she gives the example of random practice incorporating both breathing and focus into single trials with consideration towards both being regarded.\textsuperscript{56} However, in the book \textit{Vocology}, her and Titze become more specific and they state it has to do with exercises rather than parts of technique. To clarify, instead of focusing on one exercise over and over, random practice should move to different exercises quite frequently in order to force the brain into a “full memory reboot.” They point out that “random practice” is very similar to “variable practice”; however, the authors believe that variable practice is a sub-division of random. In \textit{Vocology} they rename

\begin{flushright}
\textsuperscript{54} Titze and Verdolini, \textit{Vocology}, 234. \\
\textsuperscript{55} Leborgne and Rosenberg, \textit{Vocal Athlete}, 265. \\
\textsuperscript{56} Verdolini, \textit{In the Moment}, 49.
\end{flushright}
“random practice” to “Part-Whole” practice, and cite how studies show long-term learning increases when you incorporate multiple parts of the whole when practicing as opposed to separating them.\textsuperscript{57}

\textsuperscript{57} Titze and Verdolini, \textit{Vocology}, 234.
Chapter 4: The Approach

Physiologically, the larynx and its surrounding musculature is identical for both men and women. However, most teachers and singers would agree that each voice category has their own specific issues inherent to the fach, the bass voice and its subcategories being no different.

Access to operatic head voice can be a very difficult proposition for the young bass voice for a multitude of reasons. Much of the repertoire sung by the bass is predominantly—especially for a young bass—performed in the chest voice. This means they must make the transition into head voice less frequently, and if they are asked to sing in that range, they are less likely to remain in that part of the voice for a sustained amount of time. A lyric baritone singing the role of Rossini’s Figaro will find himself traversing the notes of C4 to F4 quite frequently, and is required to hold that tessitura for much of the opera. Similarly, Verdi baritone roles were written to continuously exploit this range of the voice. However, it is rarely asked of the bass voice, with the exception of Wagner.

Over the course of this chapter, specific pedagogical issues will be addressed, as well as sample exercises applied in a mock training regimen. It must be kept in mind that the application and timing of any exercise is just as important as its functional purpose in voice training.

The Energy Factor

In his aptly named article, “Vocal Pedagogy: The Energy Crisis,” Scott McCoy states that “unamplified singing is an active endeavor that requires significant, sustained
energy."\textsuperscript{58} McCoy’s comment goes right to the core with concern to classical singing pedagogy. Throughout history and still today, there are schools of teaching that ask the singer to utilize minimal amounts of effort in order to achieve a singing technique devoid of any interfering tension. This theory can be summed up by Chicago singer and choral conductor from the early twentieth century, David Alva Clippinger, who stated that “the most important physical sensation [in singing] is that of the absence of all effort.”\textsuperscript{59} Unfortunately, what constitutes interfering tension is often not agreed upon by teachers. Proponents of low-effort singing believe that high levels of energy expended during the act of phonation are unnecessary and may be hazardous to the singer’s vocal health. It is worth noting that the appearance of the “no-effort” school was a direct reaction to Garcia’s famed \textit{coup de la glotte}. Although it is pedagogically safe to invite students to “just relax,” this rarely amounts to a vibrant, balanced chiaroscuro timbre that can be heard over an orchestra.

In order for the young bass or bass-baritone to successfully traverse the area of the traditional passaggio and beyond, A3 to D3 (leaving a half step in either direction), sufficient energy must be used to ensure chiaroscuro timbre. Richard Miller notes that the singer must be reminded that more breath energy should be used and “does not denote a boost in volume nor in vocal effort.”\textsuperscript{60} The student may feel a marked increase in the antagonistic relationship of the breathing musculature as well as a need for more external frame support, i.e. noble or axial posture. As long as inadequate amounts of breath and vocal energy are used in the area of the traditional passaggio, development of full operatic head voice will be hindered.

\textsuperscript{59} Stark, \textit{Bel Canto}, 19.
\textsuperscript{60} Miller, \textit{Securing}, 58.
Stage 1: Cognitive/Verbal

When training the student to habituate head voice, they must first experience the switch that occurs between the two registers. In this beginning stage, the teacher may provide more verbal instruction than in later stages; however, they must be careful not to overburden the singer with too much information.

An attempt must be made to assign a perceptual biomechanical target that evokes the correct response of the vocal mechanism without the student having to monitor all of the subsystems of the voice. McCarther refers to a singer’s attention as a “finite resource,” and that the “human brain is capable of registering, processing, and responding to only a finite number of stimuli.”\(^{61}\) Having a BM target in mind focuses the student’s attention on a particular goal. For instance, in speech therapy, a biomechanical target of “resonant voice” is often the therapy goal for a patient experiencing voice problems. Having the patient focus on nothing but “anchoring” their speaking voice in the mask gives them a simple perceptual goal that accomplishes a multitude of functional conditions. Therefore, they have one aspect to focus on instead of breathing, tongue position, jaw movement, vowel color, etc. During therapy sessions, the patient is asked to habituate the sensation of forward placement in order to place the vocal folds in a position of healthy phonation. This would be referred to as focusing on the effect of a gesture rather than the cause.

In order to apply this training process, one must first guide the student to experience the target, routine the target, and introduce variables in order to challenge the student while still attaining the target. There are two perceptual avenues that are at the disposal of student and teacher: 1) the student’s inherent feedback (how does it feel, sensations, hearing, vision); and 2) augmented feedback from the teacher. Both should be used actively in the first phase of training so as to solidify the proper perceptual relation between the correct motor function and hitting the target.

During the first stage of motor training it is important to remember that perfection is by no means the goal. The instructor must facilitate exercises intentionally coercing the student to access head voice and moreover, must have the aural acuity to recognize its appearance. Whatever the exercise, once the target is acquired, it should be drilled before any feedback is given by the teacher. It is natural that once a “break through” occurs to stop the lesson, congratulate the student, and perhaps ask questions such as “what did you do there?” or “how did that feel?” Resisting this temptation, however, may allow the student to habituate the target without self-conscious awareness and therefore not overthink the process or “try” to get the same result. Although the student should be aware and paying attention to what they are doing, they should not be exerting specific cognitive effort to attempt to solve the motor problems, but rather by focusing on acquiring the target they can allow the non-conscious mind to do the work. The student should be solely focused on *doing* rather than *thinking* until after the attempt is over. Following repeated successful attempts the instructor can give augmented feedback, or even better, allow for student initiated feedback. What follows is a sampling of exercises that can assist in eliciting a head voice response from the singer.

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Establishing the Target

It is worth noting that any training regimen aimed at range extension should not be undertaken until sufficient functional freedom is acquired in the chest voice. For most bass and bass-baritones, the speech range terminates somewhere between E3 and B3 depending on the vowel being sung. To immediately explore the upper range of the voice without establishing this freedom is analogous to running before walking. There are too many variables with which the singer must cope, potentially leading to greater problems throughout the entire instrument.

Once freedom has been established through proper posture, breathing, and onset, the instructor may introduce exercises that allow the head voice to appear. Ken Bozeman’s approach of first leaping over the “turn” (where the vowel switches to chiusa or cover) with closed vowels is particularly effective. The interval used is a fifth, therefore it should be an easily accomplished exercise enabling the student to focus solely on the vowel.

Figure 4.1

Generally, [u] is the most beneficial with which to begin because if left open (H2 chasing F1), the sound will become spread and diffuse almost immediately, resembling the vowel [ʊ]. Fortunately, Bozeman has tracked and charted where the first formant frequencies are located for each cardinal vowel (Fig 2.1) giving the instructor an idea of where the student’s voice should move to head voice. For the bass or bass-baritone voice, [u] turns over in the area of E3-F#3 depending on intensity; therefore, the exercise should leap over those pitches. To begin, have the student sing an ascending interval of a fifth from D3-A3 utilizing [u]. Encourage that they keep the closeness of the vowel and warmth of tone upon moving to A3. For many students, this will
be a foreign sensation because if accomplished correctly the larynx will have stayed in a stable posture. The instructor must be unrelenting and insist upon the closeness of the vowel, warmth and depth of tone, and axial body posture. These factors will ensure that the voice not only turns over, but chiaroscuro tone quality is present throughout.

Incorporating these aspects of voice production may seem daunting to the new voice student, especially young men who are not accustomed to exerting higher levels of effort while singing. A truly closed [u] can feel overdone, dark, and pharyngeal; however, it is the perfect vowel to train the singer in proper laryngeal stabilization. Its rounded mouth position provides a tight occlusion at the lips acting as a down-stream resister which can aid in vocal fold vibration. Also, its relative low pitch in relation to the traditional passagio affords a reduced level of vocal energy when turning over.

For the student to kinesthetically map this new vowel posture, a mirror is a great device for utilizing exteroceptive feedback to match what information they are receiving from proprioceptive feedback. Quite simply, it is often the case that the student believes they are making a rounded mouth posture, but in reality, it is not sufficient. Seeing themselves in real-time allows for correction of faults and new mapping patterns of the articulators without any feedback necessary from the instructor. The mirror not only allows them to track lip and jaw posture, but also tongue position and facial expression. Both G. and F. Lamperti insisted that their students practice in front of the mirror.

One might think that having the student focus on tongue position would be violating the idea of internal vs external focus; however, utilizing the mirror allows the student to tap into

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63 Titze and Verdolini, *Vocology*, 303-304.
exteroceptive feedback. In other words, instead of them making sure that the tip of the tongue is touching their bottom teeth (without the mirror), they can see what the tongue is doing and make adjustments accordingly.

During the course of this exercise the student may say that it “takes more effort to sing,” or “I feel new tension.” If a high laryngeal posture is habitual behavior for the student then it is quite normal for them to experience more effortful voice production—meaning more breath energy and postural stability—than what was previously “natural.” In fact, Shipp cites that singers utilizing a higher than resting laryngeal posture expend less effort than singers who stabilize the larynx. A student that complains of more effort when training the head voice may actually be experiencing symptoms of technical growth. This effort can manifest itself in different areas. If the student suffers from a sunken sternum and forward curled shoulders, then standing axial will seem effortful and unnatural. If they are not accustomed to the increased breath energy that is needed for vocalizing in the passaggio they may at first find it uncomfortable. Certain muscles of the abdominal wall may seem tired and somewhat sore. It is up to the instructor to listen carefully and advise the student when the effort levels rise to a level that is not healthy. Assuring the student through regular positive augmented feedback during this stage is important because new sensations can be alarming to them.

Once the student is successfully making the transition into head voice (hitting the biomechanical target) it is important to immediately broaden their perceptual boundaries with “negative practice.” Having the pupil execute the same exercise incorrectly (missing the target) and then immediately correctly, provides excellent perceptual context to the sensations that are

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being experienced. Within this scope, they should over-exaggerate the openness of their mouth position (progressing towards [ɔ] or even [ɔ] and conversely over close [u] so that the edge of both extremes can be felt and experienced. Being able to successively produce the target back-to-back against intentional misses ensures that the student now has some volitional control in producing the head voice.

The next step is transferring this new found laryngeal stability to other vowels, mainly [i], [e], and [o]. The instructor now has a choice: one can move to the next closed vowel [i], or progress to the more open [o]. Essentially, the teacher wants to slowly move toward more open vowels carrying the same head voice sensation over to them.

Acoustic science has proven that as the mouth aperture opens, the frequency of the first formant increases as well.\(^6\) This fact is important to understand as it provides clues to the behavior of vowels on the singing scale. For the sake of argument, suppose the instructor decides to progress next to [o] for the purposes of training, instead of [i]. Both the teacher and student would soon realize that [o] does not turn over at the same pitch level as [u]. Since the mouth has now opened slightly to form the [o], the frequency of F1 has raised, thus delaying the transition into head voice because the vowel requires a higher fundamental frequency in order for the second harmonic to pass through the now elevated first formant. Again, it is imperative that the instructor be familiar with the student’s voice and have awareness of where crucial harmonic and formant crossings will occur. Being cognizant of these relationships can greatly dictate where the training regimen should be taken day to day. The same exercise should be put into practice, i.e. an ascending leap of a fifth, but this time from F3 to C4. Following the same guidelines from the

[u], one should not move on until the student has volitional control of head voice on [o], [e], and [i].

**Oren Brown Exercises**

Oren Brown was a proponent of a system of speaking and singing centered around what he termed the “primal sound.” He felt that through the rediscovery of this innate human response the voice could be improved and coordinated. This primal sound, “huh,” can be elicited by having the singer react to unexpected—but not overly shocking—news. Thankfully, Mr. Brown provides the reader with a recording that gives examples of all of his exercises, including the primal sound. Once the singer or speaker can produce this sound easily and without tension they are prompted to begin vocalizing on the primal sound in descending patterns modeled after a sigh. Descending patterns are used in order to prevent the student from using too much weight in the voice, a tactic that can be traced to other pedagogues such as William Vennard and W. Stephen Smith.

Beginning on a descending 5-note scale in D major, encourage them to feel as though each onset is purely a release of air and sound. Continue down by half to the bottom of their range. This may appear to the singer as “yawn-like” in production but is exactly what is needed for easy, unpressurized progression up the scale. This breathy, hollow sensation helps the larynx remain in a passive low position and can provide the student with the perceptual feedback associated with full head voice without any squeezing of the vocal folds. This is one area where the energy factor has to be strictly regulated by the singer, as vigorous amounts of breath or

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vocal energy may inhibit the student’s ability to produce the correct sound. The primal sound exercise is especially useful for young men who bring too much vocal weight to their sound.

Once the singer can produce the primal sound throughout the lower range, movement up the scale is in order. Remaining with the 5-note descending scale, the instructor should then guide the student upwards slowly by half step from D major. There should be no evidence or attempts of reaching for notes by the singer. Brown recommends even allowing the student to drop the head anteriorly as in the position of a “ragdoll” so no effort is used in the upper torso or neck to obtain the note. If the particular student in question is high energy and predisposed to stiffness in their singing, i.e. an “over-doer,” then exercises such as this can provide the proprioceptive awareness of singing with less effort than what is habitual for them. If reaching is encountered the student and teacher will be made immediately aware of a register violation. The student should be reminded that it should feel like nothing more than an energized sigh on a neutral syllable [hə].

There are multiple wonderful exercises in Brown’s book, Discover Your Voice, that can be utilized in building a technique. However, for the purposes of head voice development, exercise VIIa can be very beneficial. (See Figure 4.2). As one can see, it is a simple ascending arpeggio moving from the primal sound to [u]. Urge the student to sing very legato evoking the sigh feeling of the previous exercise. Instruct them to simply and gently round the lips to an [u] at the top of the scale while making sure to preserve the pharyngeal setting of the primal sound [ə]. Remind them that a slightly breathy, hollow sound is needed as they ascend the scale. The student can place their hands gently on the masseter muscles in order to ensure it does not tense and collapse the resonant space of the [ə] as they move to [u].

For the bass-baritone voice, begin on C3 and for the bass Bb3 or B3. If executed correctly, the head voice should emerge quite easily. Again, be sure to allow for multiple successful repetitions before stopping to discuss feedback with the student and encourage proprioceptive and exteroceptive comments from the student. This exercise is not meant to produce polished sounds, but rather impart a temporary lower laryngeal posture so that the student can feel and identify head voice in the middle/upper passaggio. Remind them that the larynx should float in a low position throughout the exercise, and have them utilize their own hands in mimicking where they believe their laryngeal posture is throughout the scale. By using their hands, it gives them a kinesthetic reminder that the larynx should remain stable.

As seen in Figure 4.3, there are two main functional targets that should be combined to the form the head voice: closed vowel position and a stable laryngeal posture. The closeness of the vowel (small mouth aperture), automatically lowers the frequency of F1. Along with a stable laryngeal position, the harmonics of the fundamental frequency are free to move through the areas of the formants.

The stable laryngeal posture can be difficult to achieve because the student may not experience success immediately. Moreover, it is a vocal response that is not native to many people. Instinctively, human beings raise the larynx in order to yell or call at high dynamic levels and pitch. It is part of our flight or fight response. The stable larynx, however, allows us to
manipulate the acoustic environment in order to more efficiently (and beautifully) create sounds outside of the normal pitch range. There is much disagreement between pedagogues, teachers, and singers as to how to keep the larynx stable and at what position it should be during singing. Austin believes that the larynx should remain “low and still,” and trained to be positioned below resting height through the use of round vowels such as [u], and [o]. Perceptually he states that the singer may feel “pressure in the throat.”

On the other hand, Richard Miller is very much against any feeling of openness in the pharyngeal area, encouraging quiet inhalation and a feeling of openness in the nasopharynx (facial area) instead. Miller believes that the larynx should remain at the natural resting height of the singer and not descend appreciably below. To confuse matters even further, almost every teacher and singer has their own personal views on laryngeal position ranging from avoiding its existence to tracking it position on every vowel and pitch. The author believes that a relatively stable position—near resting position—is enough to facilitate the appropriate acoustic environment for the head voice to appear.

In the following graph taken from Kenneth Bozeman’s article “The Role of the First Formant in Training the Male Singing Voice,” one can see the sweeping of the second harmonic through the area of the first formant. The stable laryngeal posture combined with a closed vowel promotes the healthy emergence of the head voice.

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Figure 4.3

Stage 2: Motor Learning Stage

The motor learning stage is the longest of all three and most frustrating for the student. During Stage 2, augmented feedback from the instructor becomes less frequent and the student must begin to rely more on their own inherent feedback. At the beginning of this stage, the target sound has been identified, acquired, and now must be drilled for the ultimate goal of automaticity. Counterintuitively, it is important for the student to make mistakes during this stage and for the teacher to actively encourage the occurrence of errors through increasing variability. Verdolini points out that even though the vocal “break-through” for the student can

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71 Bozeman, *First Formant*, 292.
be satisfying for teacher and student alike, it can hinder long-term growth. Centering entire lessons around attempting to elicit a breakthrough can be, in fact, counterproductive.\(^72\)

During this stage, it is more beneficial for the student to struggle with hitting the target. One sees this practice in sports training. For example, if a young basketball player only practiced their foul shots in a quiet gym, by themselves, with the same ball, same basket, etc., then it is logical to assume they will falter during a game situation when all parameters have changed. It is the job of the coach to create a game-like atmosphere during practice so it does not appear unfamiliar when confronted. Coaches will fatigue players, put them under pressure of punishment for the rest of the team (laps around the gym for each missed foul shot with shooter watching their teammates run), play loud recordings of crowd noise or music, draw their attention with visual distractions, the possibilities are quite endless in what can be utilized to force mistakes from the players. When the player is challenged with conditions that can create errors, long-term learning ensues, requiring them to be flexible and adapt to situations in real time.

Given that the singer can consistently hit the target, the instructor can refer to Figure 4.4 in order to devise a training plan for each lesson. By employing exercises utilizing the variables contained in the boxes on the left in random and successive order, the student is being exposed to high levels of variability in the lesson. Working in this way requires lesson planning and familiarity with a wide assortment of exercises so that the student does not grow accustomed to routine.

\(^72\) Verdolini, *In the Moment*, 49.
It is advisable to begin slowly while focusing on one or two boxes at a time. The diagram is just a sampling of what could applied in honing the skills of the student. Creativity is encouraged and should be used by the instructor. An example of a training session during a lesson is as follows:
Exercise 1

Begin with Bozeman’s exercise on closed vowels [i] and [u] to make sure that the proper turn is being is employed by the singer. This simple exercise brings two major boxes into play: closed vowel and upward approach. Again, urge the singer to produce a very closed mouth posture as well as retaining the warmth of the tone to aid with laryngeal stability.

Figure 4.5

Exercise 2

Without providing feedback (unless there were extensive issues with ex. 1) move immediately to ex. 2 which incorporates upward movement, faster rhythmic tempo, closed vowel, and an upward approach.

Figure 4.6

This is an exercise that Richard Miller used quite extensively in training the low voice male to alert them to the subtle changes that occur between notes in and around the passaggio. One can witness its effectiveness in his training video, Covering in the Male Low Singing Voice.\(^73\) When utilizing closed vowels, it is important to remind the singer to feel the vowel move to a more closed position in this range of the voice. If the student is having difficulty with turning [i] over,

\(^{73}\) Covering in the Male Low Singing, Richard Miller (Oberlin Conservatory of Music, 1995)
one can induce a more active lowering of F1 by rounding the lips around an [i] tongue position. It may feel and sound like [y] to the singer, but most likely not to the outside ear. Again, it is a gentle rounding (or verticality) of the lips and not a full-blown [u] lip embouchure.

**Exercise 3**

Although *falsetto* is not a vocal quality that is usable on the operatic and recital stage, it does possess some inherent functional uses that can assist in the development of the male head voice. In fact, Cornelius Reid based much of his pedagogical outlook on the training, strengthening, and coordinating the *falsetto* in order to extend the range of the voice. In this context, it is used as a means to alert the singer to the correct amount of vocal fold closure without the risk of over-pressurization of the sound.

**Figure 4.7**

One of the pitfalls of utilizing *falsetto* is the tendency of the larynx to rise if sufficient energy is not used. The student should not feel any squeezing of the pharynx when singing *falsetto* and use of vibrato should be avoided.  

Before beginning, the singer should be aware of which note they are to switch to modal (chest) voice. Yodeling a few times can assist in acquainting them with this switch because often times young men can be vocally uncoordinated and find it difficult. In fact, there is historical precedent for this practice.

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74 A “hooty” timbre should be used and can be elicited by having the student emulate the sound of Julia Childs or more recently, Robin Williams as Mrs. Doubtfire.

The point of this exercise is not to make a smooth transition, thereby assuring the young singer that a large flip or crack may occur. Its purpose lies in the student being able to map and modify the amount of thyro-arytenoid contraction, while not squeezing the vocal folds together.\textsuperscript{76} Barbara Doscher describes the maneuver well in her text \textit{The Functional Unity of the Singing Voice}:

During this major transition from falsetto to full head voice, there is a sudden closure along the entire vocal fold length, an abrupt decrease in air flow and an increase in subglottic pressure, a much longer closed portion of the oscillatory cycle, and greater vocal fold mass.\textsuperscript{77}

Also, encourage a closed vowel posture to aid in the appearance of the head voice once the thyro-arytenoid muscle has been engaged.

Now that the student has found the correct vocal fold closure in this range, add a \textit{messa di voce} on the last note. This will challenge them to increase breath pressure commensurate with vocal fold activity, while also making adjustments for resonance. Once more, allowing the student to make mistakes and begin self-correcting is very important. Do not look for immediate improvement, but rather ensure that the student understands the goal, so when practicing, there is no confusion about the objective.

\textbf{Exercise 4}

At this point it may be a good time to pause and prompt feedback from the student. Questions such as “how does that feel different from before?” or having them describe specific sensations can be very helpful for the instructor. Moreover, it is beneficial to the student to verbalize what

\textsuperscript{76} Titze and Verdolini, \textit{Vocology}, 271-272.
\textsuperscript{77} Doscher, \textit{Functional Unity}, 186.
they are feeling and thus engage in cognitive processing. Exercise 4 (Figure 4.8) utilizes all five cardinal vowels, melismatic movement, a clean onset in and around the passaggio, and a quick tempo.

**Figure 4.8**

![Figure 4.8 Image]

The student may or may not be aware that most vowels will close at the pitch level of C4, namely [i], [o], [u], and perhaps [e] depending on the closeness of the vowel formation and bass vs bass-baritone. However, all vowels should and will move to *voce aperta* during the descending passage. The instructor should be listening carefully that the singer is managing the switch appropriately. It is important that the student feels the distinctive change between *voce chiusa* and *voce aperta*; however, it is not ideal that the untrained listener can discern the two, in fact the switch should be as obscured as possible. Since this exercise begins on a higher pitch and descends it should help engender a “thin edge” response from the vocal folds without overburdening the singer with too much weight at the bottom of the passaggio. A primal sound beginning to the vocalise, *à la* Oren Brown, should also inhibit the student from utilizing too much vocal heft.

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Instruct the student to breath silently and easily between each descending movement. At first, the inhalations may need to be taken out of tempo if the singer is not accustomed to breathing in this fashion. The eventual goal is for them to perform the exercise with a steady and constant tempo, renewing the breath instantaneously between passages.

**Exercise 5**

Exercise 5 (Figure 4.9) introduces large upward leaps into the area of the passaggio beginning on closed vowels and progresses to open vowels with higher first formants. As the voice ascends from the 3\(^{rd}\) to the octave, the singer must be aware that some of the vowels will shift to head voice. This is predicated upon the singer not allowing the larynx to rise with the elevation in pitch. As with the previous exercises, insist that the pupil watch himself in the mirror in order to keep track of their laryngeal position as well as any extraneous movements of the head, neck, and face. Self-palpitation of the thyroid notch could also be encouraged for the student to track laryngeal position.

**Figure 4.9**

Though this exercise is presented here in C major, it is prudent to move up and down by half-step so the singer may feel the difference in *voce chiusa/aperta* production on the various vowels. For example, if one were to have a bass-baritone voice of medium weight and size begin in D major, the vowels [i] and [u] would most certainly close on the second note. This is because
their first formant frequencies are located somewhere around the pitches F3-G3. Given the predictability of first formant locations, the teacher will know that the tonic pitch will be produced in *voce aperta*, the 5th in *chiusa*, the 3rd *aperta*, and the octave *chiusa* again. This is perhaps tedious to micro-classify these differences; however, it becomes very important for the young singer to understand these changes and be able to blend them into the unified scale. The problem most encountered by young men is laryngeal elevation during pitch ascension, thus inhibiting the proper acoustic environment for head voice to function.

Another important distinction of which the student should be aware is how the different vowels begin their closure at varying pitches. It is the duty of the instructor to educate them on where the various vowels close and open. Unfortunately, this is not the same for every voice, and the degree of closure is individualized as well. Experimentation must be used by both the student and teacher in order to become aware of these points of transition. Put simply, the more open the vowel, the higher the first formant frequency will be, and thus the pitch in which it turns over will be higher. For example, the relation between [i] and [a] is quite dramatic. The vowel [i] has a low first formant and closes somewhere around F3-G3, while [a] in the area of D4-E4. This is founded on the fact that a stable laryngeal posture has been maintained while also proper energy levels are being used throughout. If the energy levels are too slack, the larynx will rise and the vocal fold adjustment will not be ideal for full-voiced chiaroscuro vocalism.

Another variable that can be introduced during this exercise is the mixing of vowels mid-phrase: for example, beginning on [u] and moving to [a] on the octave, or starting with [i] and traversing all five vowels in order of front to back. Any combination is encouraged as it allows for flexible articulation and creates more confusion for the student.
Exercise 6

This exercise incorporates Italian words in order to acclimate the student to moving the buccal-pharyngeal cavity while still being able to hit the target. In the key provided of D major, our singer from the previous example would experience a shift into head voice on the 5th and octave, however moving quickly back into voce aperta when returning to the 5th. It may be possible to remain in voce chiusa; however, the production would be stricken with extra weight and the resultant tone would lack clarity (register violation).

Figure 4.10

This exercise lends itself to much variability: 1) It can be performed slowly in a sostenuto fashion; 2) quickly as in executing fioratura or patter; 3) specific notes can be held79; 4) the pattern can be moved up and down by step thereby changing the pivotal registration points of some of the vowels; 5) and it can also be inverted, thus changing when certain vowels transition to head voice. Again, insist the student make mental note of when the voice turns over and on what vowels.

79 This can be applied to almost any exercise. Notify the student ahead of time that you will raise your hand (or some other agreed upon signal) when you want a note to be held. This will be a total surprise to the student allowing for more spontaneity in exercise that they might have otherwise began to “master.” Variability is key.
Exercise 7

Oftentimes the most difficult vowel for the bass voice to produce in head voice is [a]. The difficulty is caused by its high pitch level relative to its first formant location. Since the [a] turns over later than any other vowel, the vocal energy being expended by the singer can be quite high. As stated earlier, it is technically easier for the young singer to simply continue to the top of his range with the 2nd harmonic chasing the 1st formant rather than making the necessary acoustic adjustment. Not only does this render the voice thinner and less colorful in the upper extremities of the voice, it also places an unwanted workload on the vocal folds.

The following exercise should be undertaken once the pupil is producing the correct shift into head voice on all of the other vowels. For this document, it is being presented in the key of F# major, but iterations should be performed in lower keys before progressing upward by half steps. Also, in lower keys, less modification (or none at all) will be necessary.

Figure 4.11

![Figure 4.11](image_url)

This exercise helps to acclimate the student’s perception of the gradual modification that must take place to successfully transfer [a] into head voice. Often when the student does make an efficient change into head voice on [a], a drastic shift will occur that will sound to the listener as if it has “fallen back” and out of line with the rest of the voice. This exercise provides a bridge with which the head voice can be joined with the chest. The proximity of the top pitches allows the student to feel how close the upper most pitches are with relation to the amount of modification needed.
Use of a mirror is very beneficial in particular for this vocalise because mouth shape and degree of opening of \([a]\) can be exceedingly difficult for the young singer to track. Much like the \([u]\) of the earlier mentioned Bozeman exercise, the student often needs to see themselves in real-time to execute the proper vowel adjustment. This insures the student’s inherent feedback is aligned with that of their exteroceptive.

If the proper shift to head voice occurs, the instructor will hear a balanced chiaroscuro tone and slight shift in timbre that accentuates the fundamental frequency of the pitch. The student may comment on a change in sensation as they make the proper modification. Bozeman cites this phenomenon as a “migration of acoustic sensation across range.”\(^{80}\) The student should be encouraged to observe these sensations in tandem with what they hear and see in order to create a complete perceptual mapping of the target. Again, resist inundating the student with augmented feedback, save for affirmation of target attainment, but rather allow for experimentation and discussion, prompted preferably by the student. Any information given by them is possible semantic language for the reacquisition of the target.

**Exercise 8**

Exercise 8 (Figure 4.12) is the first given with specific dynamic markings that are important to the execution of the exercise. It incorporates multiple variables including changes in volume (dynamic), vowel, melismatic/sostenuto, and most importantly, compels the singer to switch from *voce chiusa* to *aperta* on a single vowel. After beginning the vocalise with a healthy *mezzo forte* dynamic, the singer will ascend and decrescendo to a closed \([o]\). This should facilitate the

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switch to head voice on C#4. As the singer begins the crescendo ask them to open the vowel towards [ɔ] in order to experience the acoustic shift from head voice to chest voice.

Like many of these exercises, variation is encouraged and creativity is crucial to keeping things “fresh” to the student. One example could be the extension of the held C#4 and have the singer perform a messa di voce beginning on the closed vowel, opening it, and then returning to the closed position. Movement up and down the scale is important as well so they may see where the pitch becomes too low to shift into head voice, and conversely where the pitch becomes too high for them to make the move to open timbre. Another variation would be the use of a mixed vowel such as [ø] in order to facilitate a higher tongue position but with a rounded mouth opening more like that of [o]. To reiterate, creativity on the part of the instructor is vital so that a healthy *chiaroscuro* balance is maintained even as the voice moves into head production.

**Figure 4.12**

![Figure 4.12](image)

**Practical Application**

Each of these exercises serves a specific purpose throughout the course of a voice lesson. The way in which they are applied should constantly be varied in order for the interaction to remain spontaneous. Time spent in the movement from exercise to exercise must be altered along with volume, tempo, and vowel combination as well. In support of this, Leborgne states that “we want to create a practice environment where the learner generates errors by constantly having them switch from one task to another.” This is in contrast to the traditional voice lesson where one
progresses slowly through one exercise before moving onto the next, which falls in line with the belief that “performance will indeed improve with uninterrupted repetition.” Once the vocalise has made improvements to the voice, the instructor moves to the next, etc. However, Leborgne goes on to state that performance will improve “but only by virtue of the repetition not because of learning.” From this it becomes apparent that training for specific skills, though helpful for immediate improvement, may not have the lasting impact desired by the instructor. It is more beneficial that once the singer is aware of each exercise, the teacher should introduce different combinations of them at varying speeds.

Additionally, environmental factors should be altered as well. Group lessons are a great way to introduce new environmental factors to the student. Things such as audience members (other studio members), new rooms/halls in which to sing, distractions caused by audience members, and body movements (acting) will dramatically stress the singers cognitive processing power thus eliciting completely new responses. Lena Doria Devine, famous teacher and pupil of Francesco Lamperti, stated that he would teach his lessons in groups of 3 to 4. Devine states,

not only is the pupil’s perception of the tonal quality sharpened by hearing the faults of others constantly corrected, but it accustoms one to sing before others, and when the time comes to sing in public, there will be less self-consciousness.  

81 Leborgne and Rosenberg, Vocal Athlete, 265

83 Lena Doria Devine, “Francesco Lamperti and His Methods,” Etude Magazine, 1908, 260

accessed May 28, 2018
Although Lamperti did not have scientific data to back up this practice, the empirical evidence and advantages of working in this fashion were obvious. It is not feasible for a modern voice instructor at a college or university to have students available for multiple group lessons a semester; however, even one to two sessions could make a significant impact on their perceptual awareness as well as their performance abilities.

Examples from Repertoire for Studio Application

When moving from exercises to repertoire, it is imperative that the instructor remain aware of the pivotal transition points for all the vowels, as well as the individual pivot points for that particular singer. There are no “hard and fast” rules when it comes to acoustic pedagogy and how it relates to the individual physiology of a singer. For instance, two singers of equal vocal weight, range, and timbre may have slightly different vowel transition points because of differences in articulators or vocal tract length and size. Specific attention to the voice of the singer in question is of paramount importance when repertoire is assigned.

O Isis und Osiris, from Mozart’s *Die Zauberflöte*

The first example is often sung by young basses as a first aria, given its limited range (F2-C4), and easily learned melody. Superficially, it appears quite simple but can prove fiendishly difficult if registration factors are not addressed.

**Figure 4.13**

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O Isis und Osiris, schen ket
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The first 4 bars of this aria can alert the singer immediately to the change in registration that occurs for closed vowels low in their range. The three [i]’s of Isis, and Osiris should make the switch to head voice given their position on the staff. Many teachers equate this sound with “keeping the voice vertical”; however, it is the 2nd harmonic passing through the area of the 1st formant which places more emphasis on the fundamental frequency as it approaches the first formant, giving the listener the aural impression of the voice being “lined up.”

Ask the student to perform the phrase once without any preparation or preconceived ideas on turning over into head voice. If proper care was taken during vocalises the singer should instinctively allow for the passive vowel modification to occur on its own. However, many times this is not the case, and habits of lifting the larynx and opening the vowel towards [I] are too ingrained to make the immediate jump to repertoire. Remind the student that the vowel should be very closed and the warmth of their voice should remain as they make the ascending leaps. Both of these perceptual cues assist in keeping a low first formant and laryngeal stability. After they have successfully accomplished the phrase, ask them to immediately perform it the “wrong way” and then again with the correct registrational shifts. Negative practice can often heighten alertness to kinesthetic sensations and create context for what is right and wrong to the student. At this point, prompt them to give detailed verbal feedback about what sensations they perceived while doing it incorrectly and correctly. This not only cements their understanding of what is happening in their own body, but also gives the instructor insight into the language they should use when attempting to provoke the same response in the future.

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The first [i] can sometimes be left open for a more forte dynamic, or if the singer is a bass-baritone.
Another excerpt that can prove useful is from Gabriel Fauré’s *Lydia*. This passage offers a nice lesson in passaggio management for the young low-voiced male. The combination of mixed vowels and higher tessitura, while also requiring tenderness in the tonal delivery, creates a difficult challenge for the singer.

**Figure 4.14**

To execute the phrase successfully some pre-planning may be beneficial. Given that one knows the approximate location of when certain vowels will turn over, a strategic plan can be set into action before the first attempt ever takes place. In fact, research has shown in sports science that “systematically ready[ing] oneself, imag[ing] the act, focus[ing] attention on a cue, execut[ing] without thought, and evaluat[ing] the act” leads to better learning results.\(^{85}\) Have the student discuss which vowels they believe will move into head voice. Ask them to visualize what the phrase will sound like when performed correctly. Then instruct the student to mark these notes and vowels in their music so they have a visual cue while performing the phrase. It is important the student does not think of what they are doing while they make the attempt. Again, time will be spent after to evaluate and critic. Although no conscious “trying” by the student is encouraged, they should still be observing—not judging—what they feel and hear.

For this passage in particular, the bass or bass-baritone will most likely attack the first note in chest voice (*voce aperta*). For many basses and bass-baritones, head voice on [ə] at Bb3

\(^{85}\) Singer et al, *Aware or Not Aware*, 19.
will render the vocal production too heavy. While there may be exceptions for voices of extreme depth, they are rare. The tone production should not be that of the “raw” chest voice, but rather have a rounded quality. This phenomenon is what Bozeman describes as a “mini turning.” Acoustically speaking, this means that multiple harmonics have passed through the area of the first formant; however, not the crucial second harmonic. These mini-turnings are important because 1) they signify that laryngeal stability has been maintained; and 2) it allows for easier access to head voice and vowel modification later in the ascending scale.

As the singer moves to C4 on the words “jour qui lui,” the full head voice should appear and a slight texture change will occur in the voice. If not, the vowels will spread and sound “shouty” to the listener. These three words set the voice up for a smooth transition up to Eb4. When proceeding to the word “est,” care must be taken by the singer to not allow the vowel [ɛ] to spread or open. A slight rounding of the lips or inverted megaphone shape carried over from the word “le” can be used to preserve verticality in the sound while also sustaining a low first formant. The next two notes, D4 and Eb4, have vowels that will feel very similar to the singer. Again, utilizing the [ə] lip position from the word “le,” the singer should move the tongue slightly towards [ɛ] for the first syllable in the word “meilleur.” To the student it may not sound like the correct vowel; however, assure them that if pure unmodified vowels were sung in that range, their vocal production would resemble that of a yell. The final note is a leap back down to B-flat3 on [œ] where the singer should allow the second harmonic to pass down through the first formant again back into chest voice or voce aperta.

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87 Negative practice could be very useful here once correct execution is acquired.
Fear no more the o’ the sun

Gerald Finzi’s Let Us Garlands Bring is a wonderful song set for the young low-voiced male to introduce them to the world of English art song. All of these songs present their own specific difficulties; however, “Fear no more the heat o’ the sun” with its slow tempo and expansive range can be the most difficult of the group. The passage given shows a climatic step-wise ascent to Eb4 on the word “golden.”

Like the previous example, be sure to preplan with the student which vowels will be produced in head voice and which in chest. This is an important step as it allows for attempts that are devoid of self-conscious thought.

Given the formant locations set forth by Bozeman, one could speculate that the first note to turn over into head voice for this passage would be C4 on the word “ta’en.” Given that the diphthong for this word is [eːɪ], one can be sure that it should completely turn over on C4. To reiterate, closeness of vowel and warmth of tone are vital for the biomechanical target to be achieved. Immediately following is the word “thy” on C4. A quick movement back to open production will be needed for the beginning half of the diphthong [aːɪ]. However, to properly execute the second half of the diphthong, head voice should reappear in order to move smoothly to the word “wages” on D4, both diphthong and vowel [eːɪ] and [ə] respectively.

The most difficult part of the phrase comes when a breath must be taken after “wages” with an immediate re-onset in head voice on the sound [go]. The [g] presents a challenge for the singer because the acoustic space is shut an instant before the vowel must be formed. Urge the student to use a very lightly voiced consonant with a tongue position that is closer to [k] than [g]. Practicing it a few times just speaking, should alert them to the correct articulation. The quality of the timbre must be that of the preceding notes before it. It is more natural for the singer to
allow the vowel on the Eb4 to explode out of the fabric of the vocal line, consequently sounding more like the vowel [a] or [ɔ] instead of the pure [o]. If laryngeal stability has been maintained, then head voice should be present throughout the [oː] and [ɔ] of “golden.” The switch to chest voice ought to occur after the word “golden” and remain for the rest of the phrase.

Figure 4.15

Non più andrai

The role of Figaro from Mozart’s Le nozze di Figaro is a wonderful role for the young artist bass-baritone that has secured some reliable freedom in the zona di passaggio. One of the more difficult arias from this opera, Non più andrai, provides the singer with a mixture of passaggio singing, as well as important characterization elements. This aria has an ascending figure that repeats itself six times throughout the duration of the piece and if not dealt with properly can result in the singer getting fatigued.

Figure 4.16

As one can see, the passage ascends from C3 to E4 while traversing through a series of lateral and rounded vowel positions. The singer will not have issue with the first four notes on the phrase, given that proper onset and breath energy are used; however, beginning on the word turbando, careful consideration by the student should be given with regards to vowel closure and opening. Since the [u] of turbando is located on G3, for many young basses and bass-baritones,
this will be a note in which the voice has turned over. Immediately following is the syllable “ban” or vowel [a] on C4, which will reopen but still possess some of the roundness of the preceding vowel and note. The last syllable of turbando returns to G3 on [ɔ], which should reopen and then elide with the definite article il. Il will subsequently reintroduce head voice before ascending to the first syllable of riposo. Again, the [i] of riposo will be produced in head voice and should facilitate the [ɔ] on E4 with ample voce chiusa without having to make any noticeable timbral shifts. The singer should be careful not to place too much emphasis or pressure on the bilabial plosive [p] because it can compromise phonation and vocal fold closure in that range of the voice. The final [ɔ] on C4 will be produced in chest voice.

To some this may appear pedantic, but if practiced slowly and in small sections at the beginning of learning the aria, it can alert the singer to the correct registrational events as well as giving them solid perceptual benchmarks from which they can practice. This is a technique that is often used at high levels of professional golf. By slowing down the golf swing and pausing at key moments, it allows the golfer to map the correct swing points as well as develop “feel” for the golf club. For instance, one could rehearse the phrase at half speed and place a fermata over every note that requires a switch into head voice. This would ensure the security needed for the notes leading up to the high note, and would stress the importance of them to the young singer. One often hears the rubric that it is “the note before the note” that is crucial to the success of a high note. This very tedious attention to detail is taking that idea and making it part of your student’s development and practice routine.

The purpose of the repertoire examples provided is to act as a blue print of how the instructor can work with the student in a productive manner utilizing the principles put forth in
this text. In many ways, this is a transitional phase between stages 2 and 3, but it can always be employed when learning new repertoire or making new habits in older pieces.

**Stage 3: Automatic Stage**

Upon moving into the automatic stage of motor skill development, the teacher will notice the singer consistently and correctly incorporating use of the head voice at pedagogically desirable areas of the voice. Register violations will never occur, save for the occasional conscious decision made by the singer for dramatic effect or continuity of vocal line. *Chiaroscuro* timbre will be apparent throughout the entire functional range of the voice. Singer et al refers to this as a state where “highly skilled athletes lose all conscious thought when they perform at their best.” They go on to explain that it can be more colloquially known as “letting go” or not consciously trying to make something happen.

While achieving automaticity in any skill sounds ideal to the performer or athlete, the question of “how does one attain automaticity?” arises. As of right now, it appears that experimentation with trial and self-correction is the only way to attain the required coordination to truly be “in the moment” when performing a motor skill. The job of the instructor is to act as a guide for the student and “facilitate learning through experience.” Galwey believes that the role of the instructor is not to teach, but to help the student learn. This is an important distinction that cannot be overstated. In many voice studios the amount of real learning can be limited. This is because students are forced to undertake behaviors and preconceived models rooted in their teacher’s singing that are drilled into the student’s behavior patterns by rote repetition. This may

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89 “An Association for Coaching Video – Timothy Gallwey,” *YouTube*, 4 July, 2012, youtu.be/q8X0v1NgXgQ.
yield satisfactory results but often leads to student dependency issues given the lack of long-term learning. This is especially prevalent in the results-driven world of academia.

One often hears stories of very accomplished singers having to go back to their teacher often for a tune-up because they have experienced problems with their voice while performing. This is a potential red flag that the student has not progressed to the desired level of automaticity and still must rely on the teacher’s feedback in order to successfully keep hitting a specified target.\textsuperscript{90} Leborgne states that “the overarching goal during instruction is to reduce learner dependency on teacher feedback, so that the learner can self-monitor.”\textsuperscript{91} If the teacher has been meticulous in their approach to internal vs external focus, feedback and its timing (augmented and inherent), variability of practice, random vs blocked practice, and sensory information, then the student should have the ability to learn and thrive independently. The student not only performs with automaticity but has achieved complete autonomy of their technique.

**Compliance**

In the world of rehabilitation therapies, patient compliance is often one of the most challenging facets of the profession. Persuading someone to continue exercises and behaviors once they leave the office or facility is a taunting task that can mean the difference between success or failure of the therapy. Katherine Verdolini refers to this as the “If” of training, questioning whether if the patient (student) will utilize the bio-mechanical target and exercises given outside of a training session.\textsuperscript{92}

\textsuperscript{90} This could be the reason for so many young singers who appear early on the international level, but soon burn out because of a perceivable lack of technique.

\textsuperscript{91} LeBorgne and Rosenberg, *Vocal Athlete*, 267-268.

Voice teachers encounter a very similar issue in the studio. Often a student is seen for one hour per week, and then is left to their own devices when practicing what they have learned on their own. Given the somewhat complex nature of the training system described in this text, it is unreasonable to ask a student to practice in the manner described, e.g. high variability of exercise, vowel, pace, etc. Not only would it be confusing for the beginner, but more time and energy would be directed towards planning and executing the regimen than simply concentrating on the act of singing.

One solution would be to assign the student a particular exercise or series of them to practice on their own. Through the use a personal recording device they could record themselves making multiple attempts and then listen and analyze how successful they were in acquiring the target. With the simplicity of a single goal to accomplish, e.g., producing head voice on [u], they are able to focus on being attentive to what they are doing. Encourage the student to always practice in front of a mirror in order to utilize another avenue of perceptual feedback.

Many times, practice sessions are not as beneficial as they could be because of a lack of direction on top of too many skills that are being practiced simultaneously. McCarther states that “often [a student’s] focus wanes not from lack of goals, but either trying to focus on too many different goals at one time, or by not refining and specifying their goals enough.” By assigning the student to focus their efforts on a single goal and allowing them only to critique via recording, the time spent practicing will be much more fruitful for them. This in turn will hopefully yield positive results for them and promote more practice going forward.

In lieu of utilizing recording devices, another option would be to encourage them to practice in groups of 2 or 3. That way they have yet another variable to add to their rehearsal, but

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also more feedback at their disposal. Either way, the encouragement of useful and thoughtful practice should be put forward by the instructor.

**Conclusion**

Understanding the science of motor learning can be a useful training tool for teachers seeking to expand their ability to effectively communicate with students. It is by no means the only way to train a singer; but given the athletic and complex nature of singing, it should be considered part of a diverse and holistic approach to achieving a seamless, unified singing scale. The more ways an instructor has to attack a problem or remap a behavior, the likelihood of correcting difficulties increases.

In attempting to obtain efficient and confident use of the head voice, student and teacher will likely run into issues that have not been addressed directly in this text. However, it is worth mentioning a few important tenets of vocal training that the singer must be proficient with in order to successfully negotiate their upper register.

The coordinated onset is without a doubt one of the most important facets of vocal training to master. It takes into account breath management, vowel definition, laryngeal response and glottal freedom. Miller asserts that

> how a singer begins the sound determines the degree of freedom in the rest of the phrase…Only when the onset is precise, the sound vibrant, the vowel well defined, and the breath renewal reflexive, can free vocalism emerge.\(^4\)

Any attempt at negotiating the upper register with ease and beauty will be done in vain if the proper onset has not been learned and drilled. Miller takes a structured and systematic approach to “routining” the onset, utilizing short descending patterns on quarter notes

with silent inhalation in between each onset. Through slow and repetitive exercises, one learns to reflexively renew the breath without audible breathing sounds or taking too much air into the body.\(^95\) The principles of motor learning, such as timed feedback, utilization of a biomechanical target, etc., can be injected into this structured learning method in order to promote greater long-term learning potential. Understanding the three stages of motor learning, applying augmented and inherent feedback, and variability could help ensure long-term retention of the coordinated onset.

Another factor that requires discussion is articulatory flexibility while maintaining uniformity of timbre and resonance. With all of the issues one is presented with in singing, articulatory flexibility often gets overlooked, or worse yet, a method is undertaken to control the articulatory system in a way foreign to natural phonetic postures. Systems of singing that force the articulatory system into set positions create an imbalance between the resonator (vocal tract), and the vibrator (vocal folds).\(^96\) For instance, when attempting to access the upper range of the male voice there are many teachers that will advocate a puckered lip position for all vowels. As stated before, a slight rounding of the lips can help lower the first formant as well as assist in laryngeal stability. However, giving preference to a rounded lip posture in all areas of the voice—especially the head voice—can cause problems of language intelligibility and weighty vocal production.\(^97\)

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\(^95\) Miller, *Securing*, 14.
\(^96\) Das APCS Bulletin pg 2 Si canta
There should be no “set” mouth position by the singer at any time as it upsets the natural filtering capability of the vocal tract and articulators while also rendering the singer unable to provide the necessary facial movement to portray the meaning of the text. It is most useful for the student to be aware of their mouth and tongue positions at all times through the use of a hand mirror. There is no need to artificially place the jaw, tongue, or lips in specific positions to enhance resonance, but rather find their innate phonetic postures through speaking the vowels or words and subsequently singing them in a comfortable range. Modification should occur as they ascend through the area of the passaggio, but functional freedom should first be ascertained in the speech range first. Time can be spent balancing resonance through flexibly moving from front vowels such as [i] to back vowels such as [o] and vice versa. This is another avenue that requires perceptual work by the student in order to remember particular sensations and sounds while then transferring them from vowel to vowel and eventually from word to word.

Lastly, there is the issue of laryngeal position. In this document, perceptual targets, such as timbral warmth of the sound and tactile palpation, are used in order to achieve a stable laryngeal position. Whatever method is used, it is imperative for the young male singer to establish the habit of not allowing for laryngeal elevation with pitch. The male operatic head voice cannot emerge if the larynx is allowed to move upward, especially in the region of the passaggio. To the young student, more energy may be expended than they are accustomed to using. It is the duty of the instructor to be persistent and assure the singer that although they may be utilizing more bodily energy, it helps ensure vocal longevity.
The principal goal of any voice training regimen is the acquisition and maintenance of a freely produced singing voice that allows for spontaneous and unfettered artistic expression by the singer. Attaining this goal requires patience from the student in the form of mastering multiple components of vocalism such as breath management, onset, sostenuto, agility, vowel differentiation, registration (head voice), and vowel modification. These skills must then be synthesized into a usable product that can be assimilated into repertoire. Oftentimes, students can be very good at singing vocal exercises but cannot transfer those skills over to music. Through the utilization of perceptual motor learning principles with the ultimate goal of achieving automaticity, the teacher may better prepare the student for the tremendous amount of cognitive processing that must occur when performing. Moreover, it may provide instructors with a quicker way to train singers for the rigors of a full-time performance career within the limited confines of the academic setting.
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