

Leslie De'Ath, Associate Editor

Manual Mimicry in the Teaching and Learning of Phonemes for Singing

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THE INTEGRATION OF BODY MOVEMENT DURING vocalization is seamless and ubiquitous in both speaking and singing. Individuals frequently and synchronously gesture while speaking, and a growing body of literature is dedicated to the use of body movement in voice pedagogy.¹ The purpose of this article is to present a theoretical and pedagogical rationale for the use of manual mimicry gestures in the voice studio and choral rehearsal. It is proposed that manual mimicry gestures can facilitate the development of articulatory accuracy (pronunciation and enunciation), vowel resonance, textual expressivity, and unity of vocal articulation in an ensemble setting.

Manual mimicry gestures are hand movements that mirror the configuration of co-occurring movements of the speech articulators (i.e., tongue, lips, soft palate, jaw) in terms of space, time, and energy. For instance, a manual mimicry gesture for /p/ might close the fingertips tightly and then release the fingers outward to represent the movement of the lips in a bilabial stop plosive. With roots in speech science, manual mimicry gestures uniquely can isolate and modify how individual phonemes are produced.

BODY MOVEMENT AND GESTURE IN VOICE

The pedagogic uses of movement in music education date back to Émile Jaques-Dalcroze (1865–1950), a Swiss pedagogue who proposed the body as the primary instrument of musical perception.² For Jaques-Dalcroze, bodily movement was foundational to the development of a musician's technical proficiency and artistry.³ Dalcroze Eurhythmics, the teaching approach that has emerged from Jaques-Dalcroze's ideas, utilizes creative movement games to awaken the musician's physical coordination, aural musicianship, and sense of musical individuality through improvisation.⁴ Used in the studio or rehearsal setting, Dalcroze Eurhythmics games can be locomotor, as in stepping to the beat while singing a melody, or stationary, as in moving the hand or arm to demonstrate the trajectory of a musical phrase.

A significant literature base in vocal and choral pedagogy supports the benefit of embodied pedagogies, such as Dalcroze Eurhythmics. Choral and vocal pedagogues report using movement-based techniques to dispel physical tension, isolate a specific vocal technique, improve pitch and rhythm accuracy, and rehearse interpretive aspects of the repertoire.⁵ Several research studies

that have observed how exemplar choral conductors incorporate body movements and gesturing while they teach include sample taxonomies of gestures and intended vocal outcomes.⁶ Spinning a finger above one's head while singing, for example, is a gesture that can be used to engage greater breath energy for singing.⁷

Nafisi's 2010 survey revealed four broad categories of gestures used by voice teachers in studio settings: musical, physiological, sensation-related, and body-movement.⁸ It was shown that 71.5% of participating voice teachers reported using physiological gestures, or "gestures that visualize actual internal physiological mechanisms related to the singing process. The pedagogic intention behind these gestures is to make the depicted physiological actions known and understandable to the student or to facilitate the functioning of the visualized mechanism."⁹ Estill Voice Training[®] has codified a range of physiological gestures for use in singing, called hand signals. These gestures represent various functions of the vocal apparatus, such as the titling of the thyroid cartilage, or the onset of the true vocal folds.¹⁰

These types of physiological gestures reinforce a Dalcroze understanding of bodily movement, which aims to reciprocally align movements with sounds (e.g., a small arm gesture is represented by a soft sound). Further, a Dalcroze understanding of gesture couples the timing and muscular energy of a given bodily movement with its sound outcome (e.g., an accelerating movement is represented by a rise in dynamic or pitch of the sound). This reciprocal relationship is foundational to manual mimicry, where hand gestures mimic the timing, space, and muscular energy of a given vocal sound.

EMBODIMENT AND ENTRAINMENT

Manual mimicry is rooted in the broader theoretical and practical frameworks of embodiment and entrainment. Embodiment refers to the theoretical framework whereby cognitive and learning processes are integrated with how individuals move and interact with the world. Used in educational settings, embodied pedagogies provide learners with an alternative way to code and represent ideas, a practice that may be especially useful in the retention of knowledge.¹¹ Additionally, by moving our bodies when performing cognitive tasks, the overall cognitive load and processing is potentially decreased.¹²

Related to embodiment is the concept of entrainment, which refers to the coordination of two movement systems. Rooted in Dynamic Systems Theory, movement systems such as the hands and the vocal apparatus are said to be entrained when they influence one another mutually to "produce a single coordinated behavior, synchronous in time and space."¹³ In the case of manual mimicry, movements in time, space, and energy in one system (the hands) influence the timing, space, and energy of movements in the other system (vocal apparatus). The entrainment and embodiment of spatiotemporally analogous hand and vocal apparatus movements are posited to be a result of the shared neuroanatomical substrates of speech and hand movements. Areas such as the perisylvian cortex, supplementary motor cortex, premotor cortex, cerebellum, and Broca's area are activated for both hand and vocal apparatus movements.¹⁴

Though the discussion of embodied and entrained manual mimicry cues is novel in the field of voice pedagogy, there is a growing literature base on these topics in a variety of other disciplines, and most relatedly, in the field of speech-language pathology. For instance, researchers have established evidence for the temporal (timing) entrainment of speech and manual movements through investigating the alignment of pointing gestures with syllables with prosodic prominence.¹⁵ In a study with more strictly controlled experimental procedures, a tight coupling of finger tapping when taps were simultaneously produced with single, repeated syllables (e.g., "stak stak stak . . .") was revealed.¹⁶ This research also showed that when the amplitude and frequency of one movement was increased, the same parameters of the associated movement were increased. For instance, as one produces a syllable, "stak," with alternating stress (i.e., "STAK, stak, STAK, stak, STAK . . ."), finger-tapping movements change rate and amplitude in coordination with the speech movement, even when attempting to maintain a consistent rhythm.¹⁷

The spatial entrainment of speech and hand movement is less commonly discussed in speech-language pathology, but evidence for the spatiotemporal entrainment of grasping and speech movements provides additional evidence of motoric integration of the speech and manual systems.¹⁸ Gentilucci et al. demonstrated that the size of grasped objects affects the size of mouth open-

ing and the amplitude of syllable production. When a small object, for example, a cherry, was picked up by the hand, simultaneous syllable production was significantly smaller according to acoustic and kinematic measures, compared to when an apple was manipulated. These effects were still present if the participant viewed another individual grasping the object, and application that may be important for voice pedagogy.¹⁹

There is also a strong precedent for the use of gesture cues in therapeutic speech-language contexts. Gestures are used to facilitate changes in the speech system for individuals with speech sound disorders and are integral to a variety of intervention approaches, including multisensory therapy,²⁰ Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT),²¹ and Cued Speech.²² Recently, an empirical study demonstrated that the use of a manual mimicry gesture for /r/ (i.e., tighten the hand with the palm down and move it up and back) led to clinically significant gains in accuracy of /r/ production for a young woman with persisting childhood apraxia of speech.²³ Emerging data also supported the use of manual mimicry gestures to facilitate speech sound accuracy for younger children with childhood apraxia of speech.²⁴

MANUAL MIMICRY IN VOICE PEDAGOGY

For use in the voice studio and choral rehearsal, manual mimicry gestures are a practical tool for modelling, modifying, and unifying sung phonemes (vowels and consonants). More specifically, manual mimicry gestures assist in (1) identifying and isolating a phoneme for improved technical production of the sound; (2) modifying or migrating a phoneme toward another phoneme for improved resonance; (3) unifying the articulation of a phoneme among a group of singers, as in the vocal ensemble context; and (4) developing a shared gestural vocabulary for self-practice, lessons, and rehearsals.

Manual mimicry gestures are developed based on the spatiotemporal location and movement of the vocal apparatus during articulation. For vowels, these gestures show the specific parameters of vowel height (height of the tongue), advancement (front to back positioning of the tongue), muscular energy (tension of the tongue muscles), and movement of the articulators as in a diphthong. For consonants, these gestures demonstrate the

place (location of articulation), manner (interaction of the articulators), and voicing (presence of vocal fold vibration), based on the codification of consonants by type (fricatives, stops, glides, etc.). Manual mimicry gestures can be static in nature, to demonstrate a still shape of the vocal tract shape, or dynamic in nature, to demonstrate the movement in the articulators in a given speech sound.

In a 2019 study of college-aged voice majors ($n=24$), the authors investigated the effect of manual mimicry gestures on the learning and performance of four German speech sounds for singing: [Y], [y], [x], and [ç]. Preliminary results indicate that manual mimicry gestures facilitated both the articulatory accuracy and technical performance of singers who viewed the instructor using these gestures while teaching. There was also a positive effect on articulatory accuracy of these phonemes when transferred to the singing of a naturalistic German phrase, “Ich bin so müde aber es ist ein Glück dass die Nacht kommt.”²⁵

Identify and Isolate

The first application of manual mimicry to the voice studio or choral rehearsal helps singers to identify and isolate specific phonemes for singing. Often, singers have only a vague awareness of how vowels and consonants are formed, but manual mimicry gestures can serve to amplify and concretize these nuances. For example, in singing German, the difference in the positioning of the tongue for /i/ versus /e/ is essential to accurate pronunciation of the language. A simple hand gesture can highlight the difference in the height of the tongue to help singers identify and isolate this sound.

Figures 2–4 illustrate a sample taxonomy of manual mimicry gestures developed by the authors based on the vowel quadrilateral (Figure 1), a visual representation of vowel placement based on positioning of the tongue, high to low, and front to back. In the following gestures, the hand is used to mimic tongue positioning.

The vowels along the top of the quadrilateral are classified as high vowels, whereas those on the bottom of the quadrilateral are low vowels. The gestures of Figure 2 elucidate this difference in tongue height.

The vowels along the left of the vowel quadrilateral are classified as front vowels, whereas those on the right of the quadrilateral are back vowels. Gestures that elucidate this difference in tongue advancement are seen in Figure 3.

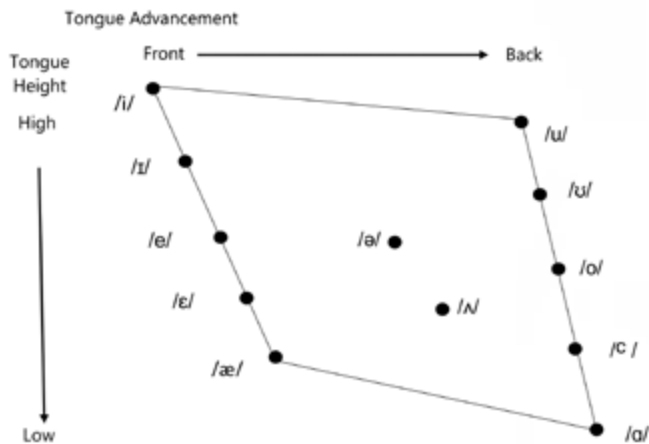


Figure 1. Vowel quadrilateral.

The vowel quadrilateral also captures differences in the muscular energy of the tongue. Vowels are classified as tense or lax based on the muscular engagement of the tongue. For example, /i/ and /u/ are tense vowels, whereas /ɪ/ and /ʊ/ are lax vowels. The gestures shown in Figure 4 elucidate this difference in tongue muscular energy (fingers are separated to indicate laxity of the /ɪ/ vowel).

Manual mimicry gestures can also help to elucidate the articulatory differences between monophthongs and diphthongs. For example, with the common /aɪ/ sound found in singing English, a dynamic manual mimicry gesture can help to identify the two vowel sounds that are needed and to isolate the timing of articulation (typically, the first vowel is sustained as long as possible).

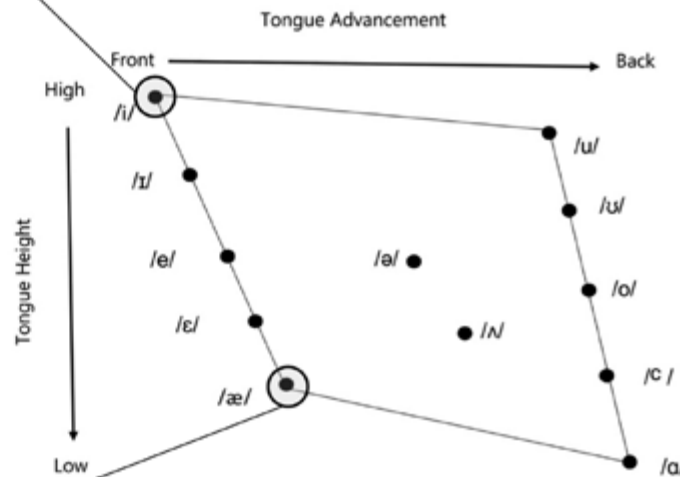
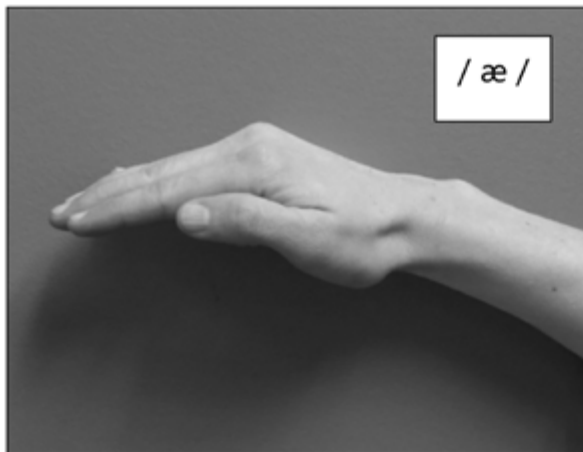
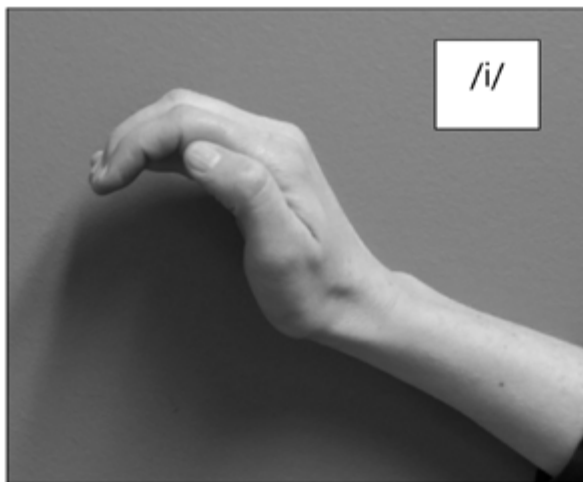


Figure 2. High-front /i/ vowel vs. low-front /æ/ vowel.

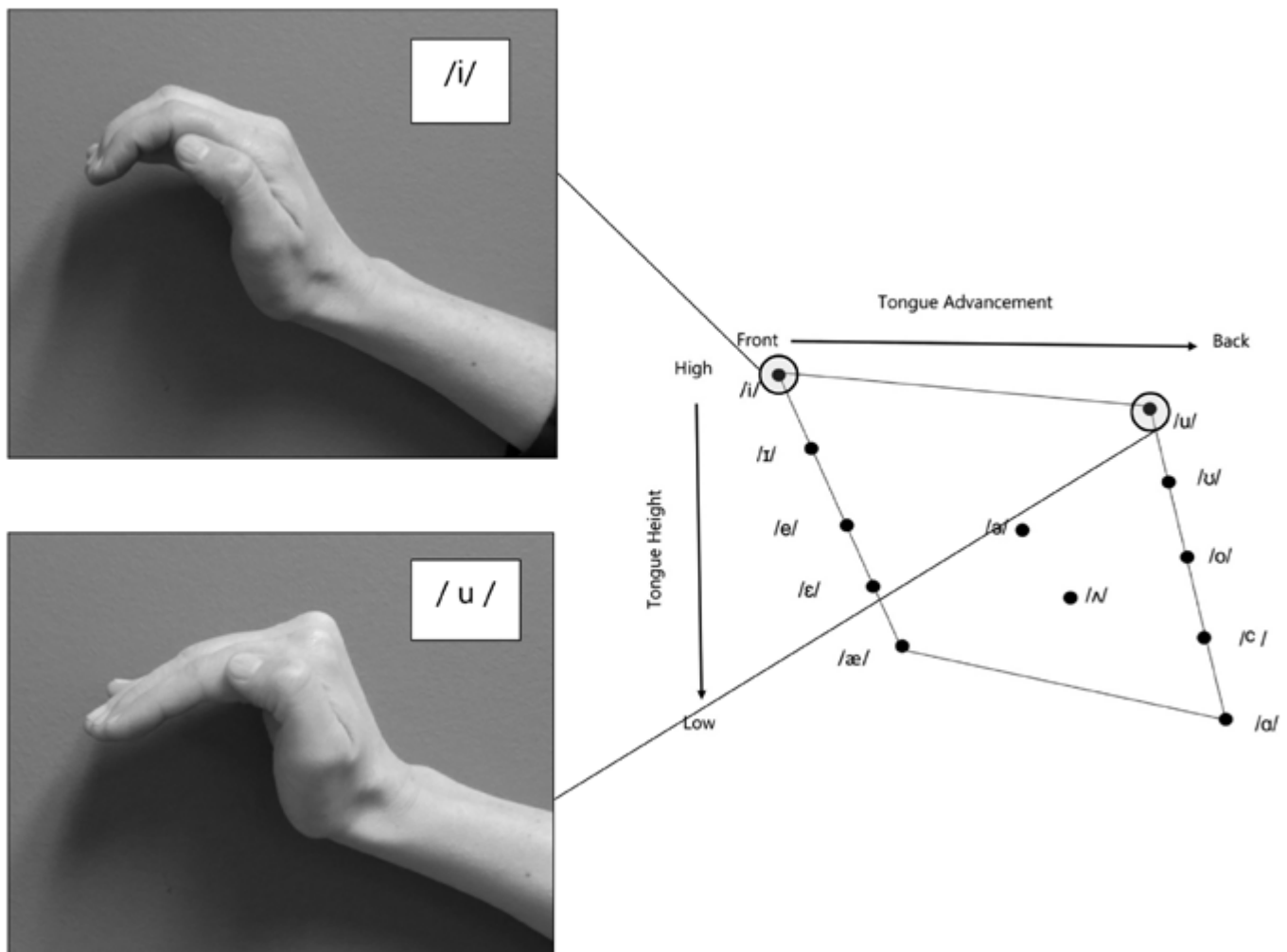


Figure 3. High-front /i/ vowel vs. high-back /u/ vowel.

For consonants, the authors have developed manual mimicry gestures based on the consonant chart, which classifies consonants based on manner, voicing, and place (Table 1). In the case of consonants, the vocal articulators are engaged in myriad types of shaping and dynamic movement, parameters that can be effectively mirrored in manual mimicry gestures. For example, an exaggerated two-handed gesture can demonstrate the difference in place of articulation between /t/ (front of mouth) and /k/ (back of mouth; Figure 5).

Similarly, the fingers can be used to imitate the dynamic movement of the lips, as in the bilabial consonants /p/ and /b/. The gestures in Figure 6 could be used for /p/ (voiceless) or /b/ (voiced). In this case, the difference in articulation is in voicing, not in place. Singers can

place their other hand lightly on the voice box (throat) to explore the voicing of the consonant.

Manual mimicry gestures can be particularly helpful in exploring the manner of a consonant, or the interaction of articulators. Fricatives require consistent movement of air through the vocal tract, whereas plosive consonants require holding air back and then releasing it. In articulating /s/, for example, air flows through a semi-obstructed vocal tract, movement that can be represented in the following gesture (Figure 7).

Lastly, manual mimicry gestures can be particularly useful in the teaching of consonant sounds that are not natively found in English, such as *ich-laut* and *ach-laut* in German (Figure 8). In this case, the manual mimicry gestures convey three important pieces of information

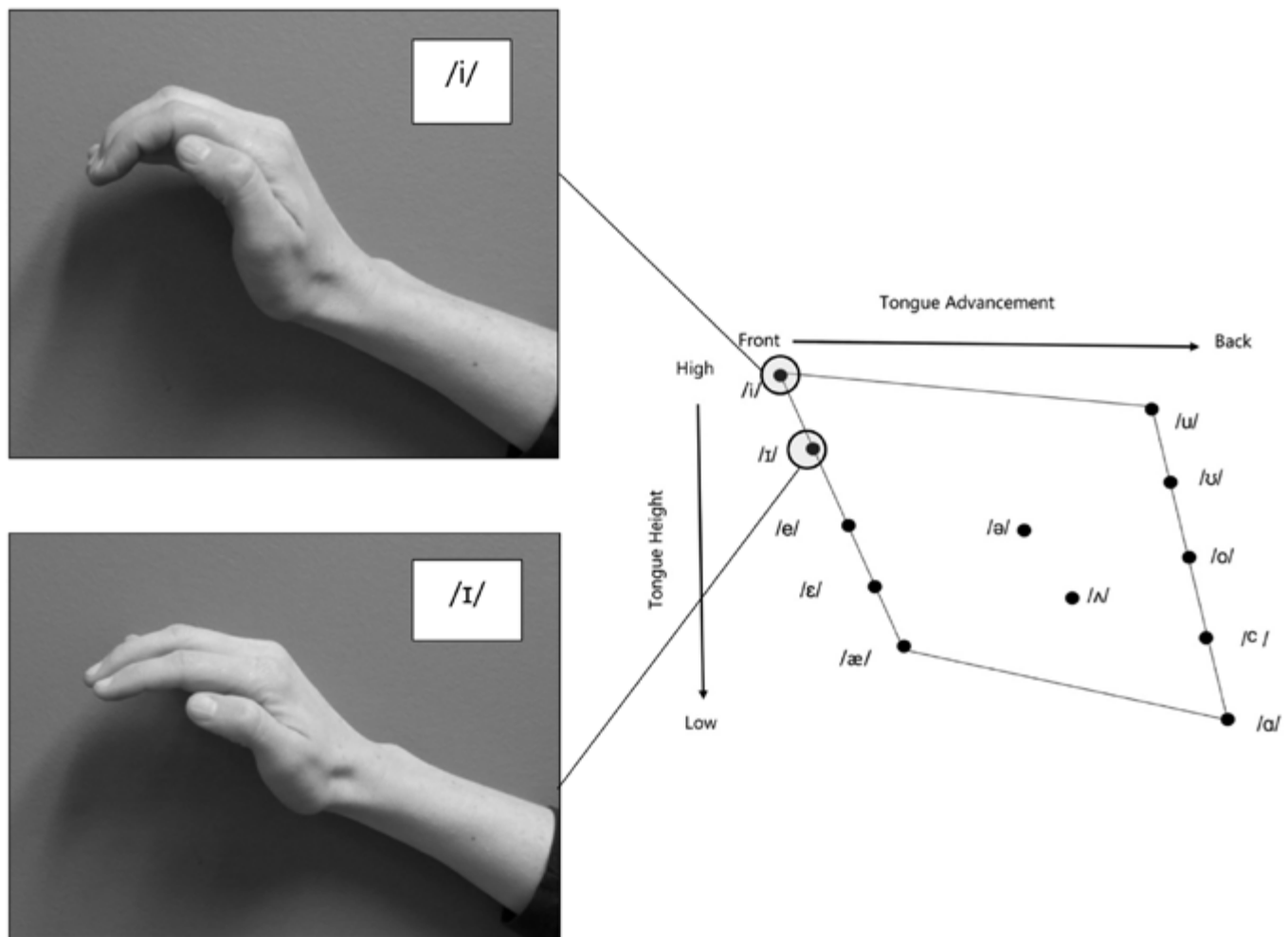


Figure 4. Tense /i/ vowel vs. lax /ɪ/ vowel.

about these phonemes: (1) the desired base-vowel, /i/ in the case of the ich-laut, and /a/ in the case of the ach-laut, (2) the place of articulation, either toward the palate for the ich-laut or toward the velum for the ach-laut, and (3) the manner of articulation as a voiceless fricative, with the stream of air moving forward or back in the mouth. Similarly, two-handed manual mimicry gestures can be developed to show the integration of vowels in a mixed vowel phoneme, as in /y/ or /Y/.

Migrate and Modify

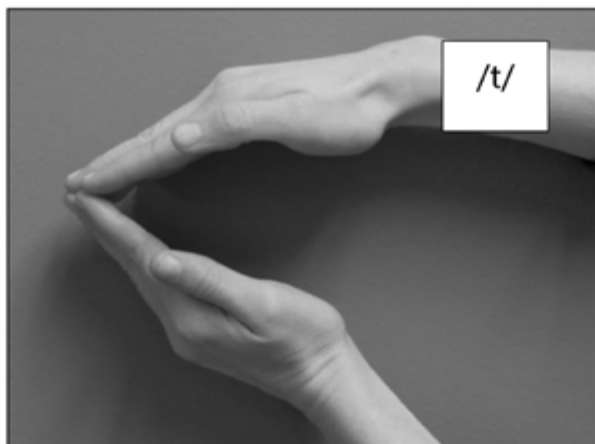
The identification and isolation of phonemes for singing is an application of manual mimicry focused on accuracy in articulation. Used in this way, hand gestures provide an archetypal model for a given sound to increase specificity in singing. Contrastingly, manual mimicry gestures

can be used to dynamically shape a given sound model by manipulating the various parameters of positioning, timing, and motoric effort. A dynamic manipulation of a gesture allows teachers and singers to make small changes to the quality of the vocal attack or resonance, thereby improving sound quality and advancing musical artistry.

Manual mimicry gestures can be used to migrate one phoneme toward another phoneme, for example, migrating the /ɪ/ sound, a high-front-lax vowel, toward the /i/ sound, a high-front-tense vowel for improved resonance. Or, migrating a voiced velar stop combination, /gɪ/, toward a voiceless velar stop, /kɪ/, for improved amplitude of vocal attack as in the word “gloria” in Latin. This application may be particularly useful in singing different styles of music, for example in contemporary commercial music, where specific vowel colors may be desired.

TABLE 1. Consonant chart.

Manner	Voicing	Place						
		Bilabial	Labio-Dental	Lingua-Dental	Lingua-Alveolar	Lingua-Palatal	Velar	Glottal
Stop-plosive	Voiceless	p			t		k	
	Voiced	b			d		g	h
Fricative	Voiceless		f	θ	s	ʃ		
	Voiced		v	ð	z	ʒ		
Affricate	Voiceless					tʃ		
	Voiced					dʒ		
Nasal	Voiced	m			n		ŋ	
Liquid-Lateral	Voiced				l			
Liquid-Rhotic	Voiced					r		
Glide	Voiced	w				j		



Manner	Voicing	Place						
		Bilabial	Labio-Dental	Lingua-Dental	Lingua-Alveolar	Lingua-Palatal	Velar	Glottal
Stop-plosive	Voiceless	p			t		k	
	Voiced	b			d		g	h
Fricative	Voiceless		f	θ	s	ʃ		
	Voiced		v	ð	z	ʒ		
Affricate	Voiceless					tʃ		
	Voiced					dʒ		
Nasal	Voiced	m			n		ŋ	
Liquid-Lateral	Voiced				l			
Liquid-Rhotic	Voiced					r		
Glide	Voiced	w				j		

Figure 5. Place of articulation in /t/ and /k/.

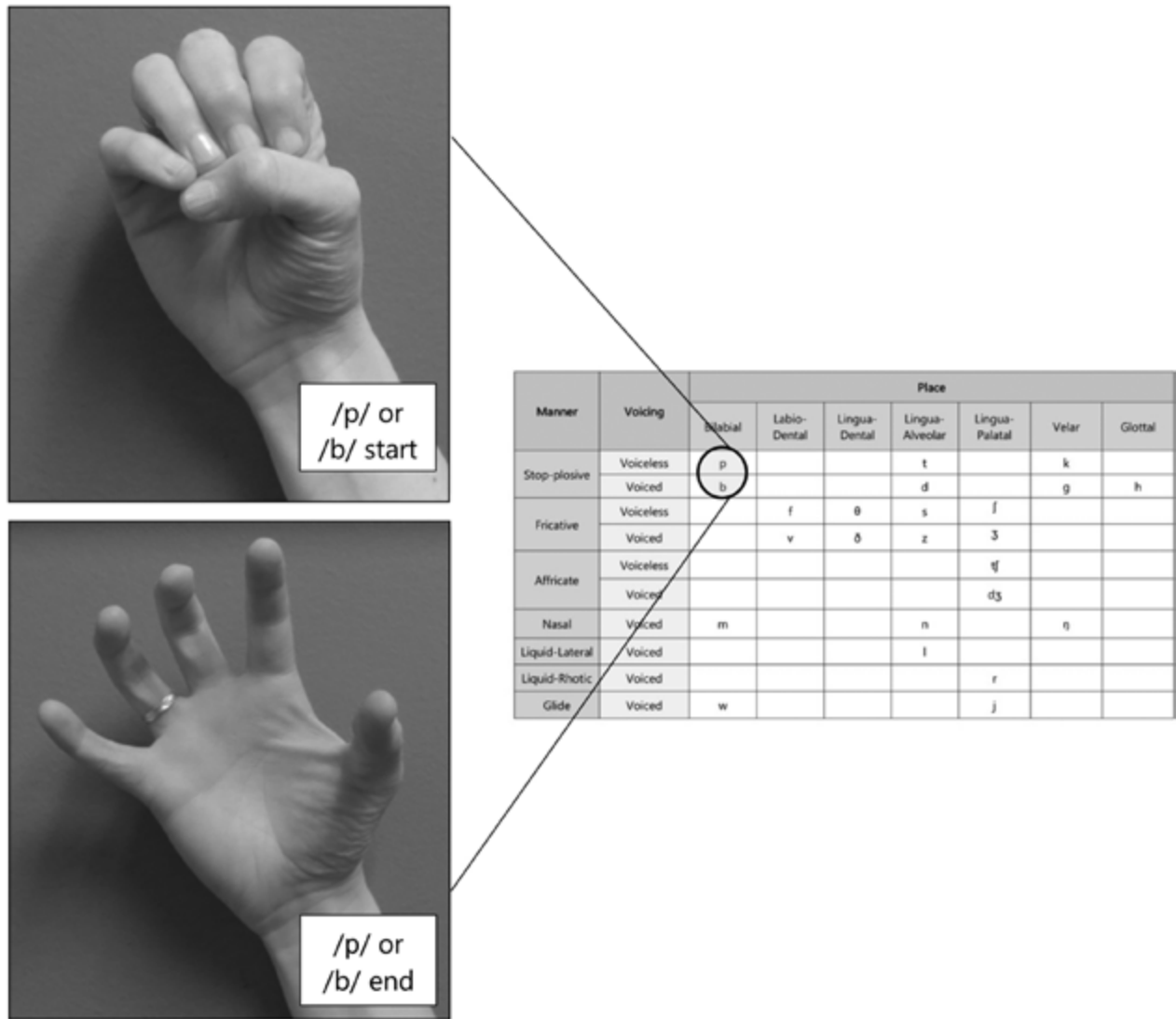


Figure 6. Voicing in /p/ and /b/.

Manual mimicry gestures can also be used to modify a given phoneme for expressive or artistic effect. This application relies on altering the timing or motoric effort of the gesture. For example, to elongate the /s/ of “soft” for expressive purposes, a slower hand gesture can be used. Or, to make the voiceless fricative /f/ more present, a larger gesture can be used. This application of manual mimicry also relates to vocal projection.

Unity of Articulation

The applications of manual mimicry extend beyond the one on one lesson. In the choral, opera, and chamber ensemble setting, there is often a need to balance

the uniqueness of each singer’s instrument with the desire to unify vocal articulation across an ensemble. Manual mimicry gestures give the teacher/conductor a concrete means to visually demonstrate a desired sound for adoption by the entire group. When these gestures are also completed by singers, they serve to visually and kinesthetically cue the action of the vocal apparatus. The impact of gestures in the group setting may be particularly strong, as singers have the additional visual input of seeing one another’s movement and can rely on the teacher’s/conductor’s ongoing gesturing to reinforce practiced articulations throughout a rehearsal or performance.

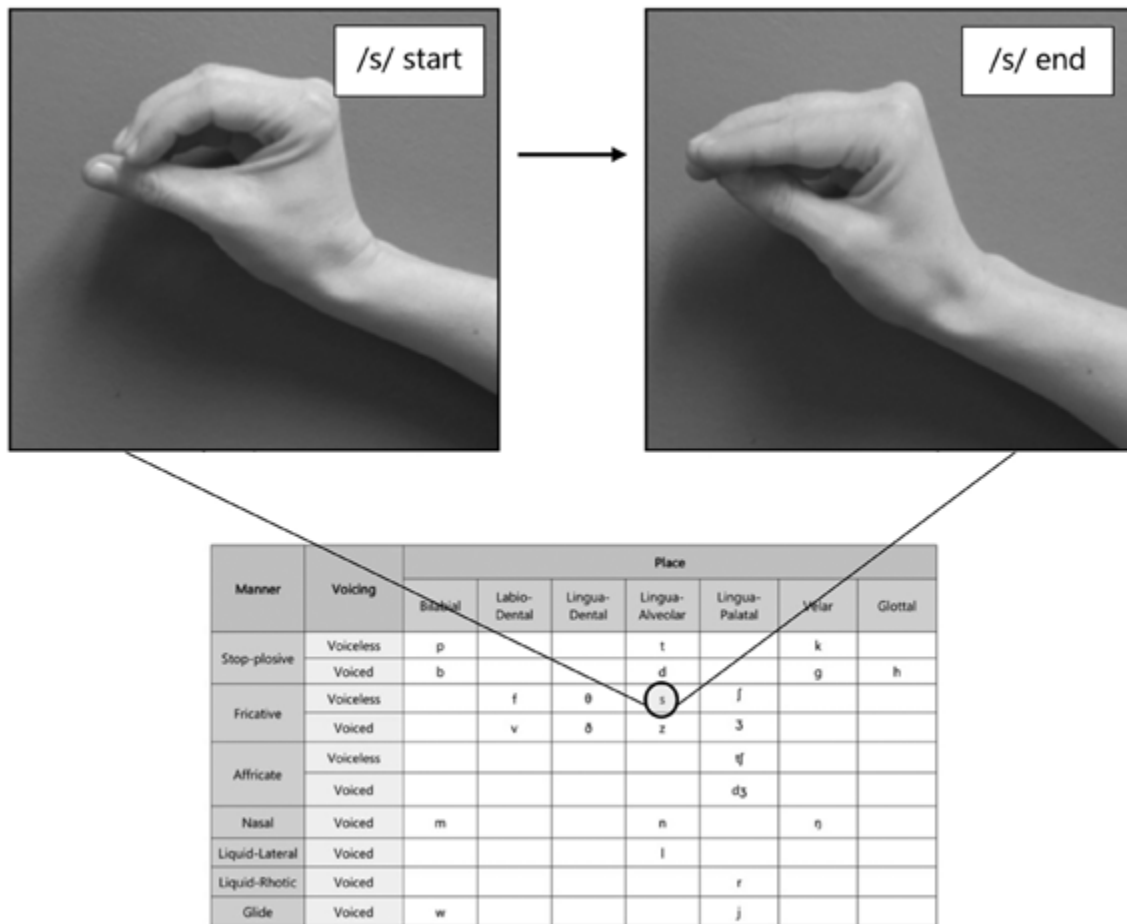


Figure 7. Manner in /s/-start and /s/-end.

In targeting unity of a given sound in the ensemble context, it is most advantageous to have singers both “see” and “do” a given gesture. Often, teachers and conductors model a desired sound by demonstrating a gesture, but fail to ask singers to complete that same gesture. Demonstration alone has a weaker effect in the recall and retention of new information related to the phonetics of speech.²⁶ A three-part teaching sequence can be adopted to help teachers and conductors integrate manual mimicry in the group vocal context. First, teachers/conductors should model the hand gesture while speaking or singing the desired phoneme. Second, teacher/conductors should ask singers to mimic the gesture while they simultaneously speak or sing. Third, a version of that same gesture should be incorporated into future segments of the rehearsal, or into performance conducting (Figure 9).

Shared Gestural Vocabulary

Over time, manual mimicry can become a reliable and memorable pedagogic tool. As gestures are used and repeated, teacher and student develop a shared vocal vocabulary, which in turn develops a shared understanding of vocal tone. Because manual mimicry gestures map directly onto the vocal apparatus, these gestures become associated with specific physical sensations. Singers gain a sense of what a given vocal sound feels like and begin to remember these physical sensations for future use. This type of nonverbal learning serves to reinforce, and in some instances to replace, the use of verbal instruction in voice pedagogy.

When singers become accustomed to using a gestural vocabulary, body movements can also be integrated into personal practice. Gestural self-cuing is an important way for singers to inform and modify their own singing.

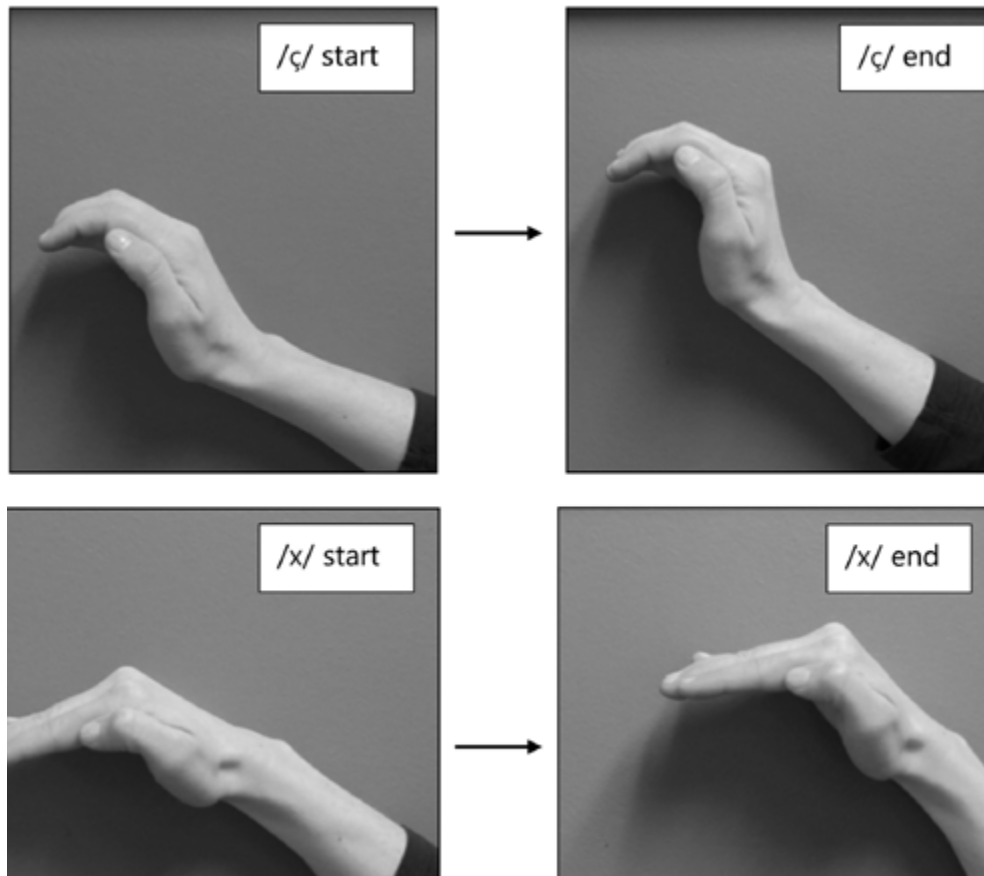


Figure 8. Ich-laut /ç/ and ach-laut /x/.

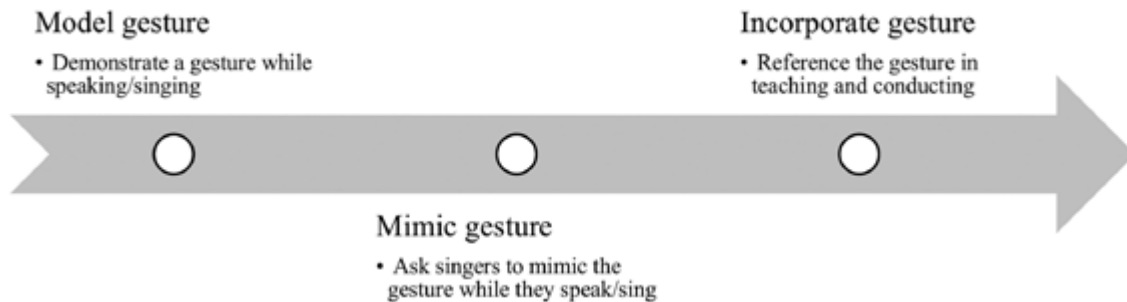


Figure 9. Manual mimicry 3-part teaching sequence.

This form of self-teaching promotes exploratory learning, connecting singers more strongly to their embodied instrument. Another important extension of gestural self-cuing is to the teacher's or conductor's self-practice. As teachers and conductors learn new scores and prepare for instruction, manual mimicry gestures can be used to explore the sound qualities inherent in the music. These

gestures can later be integrated into instruction, and in the case of the conductor, these gestures may become a primary means of communication on the podium.

Embodied pedagogies facilitate singer's awareness and coordination of the vocal instrument by targeting the complex integration of mind and body. Dalcroze Eurhythmics provides an archetype for this type of

whole-body integration, inviting the principles of both embodiment and entrainment into singers' learning. Manual mimicry, similarly, engages singers in hand gestures that directly influence the articulation of vowels and consonants to improve vocal intelligibility, resonance, and sense of artistry.

Manual mimicry is a tool for teachers and for singers. For the teacher, these techniques help to convey principles that are often mysterious in voice pedagogy. For singers, these gestures correlate physiological experience with vocal sound to promote a greater sense of mind-body connection in learning. Manual mimicry is equally provocative at all levels of instruction, and can be used with beginning singers, learning to place vocal tone, or with professionals, looking to achieve optimal vocal resonance or expressive diction.

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Caron Daley is Director of Choral Activities, Assistant Professor of Music, and Ensembles Coordinator at the Mary Pappert School of Music at Duquesne University in Pittsburgh, PA. Choirs under her direction have performed across the Northeast, including an invited performance at the 2019 National Collegiate Choral Organization Conference. A native of Halifax, Nova Scotia, she has held past conducting appointments with the University of Toronto, Toronto Mendelssohn Choir, National Youth Choir of Canada, Salem Academy and College, and St. Michael’s Choir School. She regularly guest conducts festival choirs in Canada and the USA.

Caron’s research explores the application of embodied pedagogies in choral and conducting pedagogy and injury prevention for conductors. She is a certified Dalcroze Eurhythmics teacher and frequently lectures on the sound-gesture relationship as it applies to score study, rehearsal technique, and conducting gesture. Caron is published in *Anacrusis*, *Canadian Music Educator*, *Research Memorandum Series* of Chorus America, *Teaching Music through Performance in Choir Vol. 4* and *Vol. 5*, *Choral Journal*, and *The Choral Scholar*.

A third generation music educator, Caron holds a DMA (Choral Conducting) from the University of Toronto, an MM (Choral Conducting) and MA (Vocal Pedagogy) from The Ohio State University, an Artist Diploma (Voice) and BM (Music Education) from Western University, and an ARCT (Voice) from the Royal Conservatory of Canada. She currently serves as President of the American Choral Directors Association of Pennsylvania.

Heather Leavy Rusiewicz, PhD, CCC-SLP is an Associate Professor in the Department of Speech-Language Pathology at Duquesne University in Pittsburgh, PA. She is also Program Director of the Speech Production Clinic within the Duquesne University Speech-Language-Hearing Clinic. She received her bachelor, master, and doctoral degrees in Communication Science and Disorders from the University of Pittsburgh.

Dr. Rusiewicz’s clinical and research experiences are focused on children and adults with speech sound disorders. Her areas of interest include gestures, prosody, and speech sound production in children and adults. She is particularly interested in the dynamic entrainment of speech and manual movements. Dr. Rusiewicz explores dynamic coordination of speech and hand movements for both clinical application for developmental and disordered processes of speech and for improved pedagogic practices.

Dr. Rusiewicz also has several ongoing research endeavors that investigate the interaction of music, gestures, and speech production. These scholarly activities include collaborative projects in the areas of voice pedagogy, music theory, and beatboxing.

Additionally, Dr. Rusiewicz is interested in the scholarship of teaching and learning in the education of students studying communication sciences and disorders with a particular emphasis on the use of technology for teaching and learning. Lastly, Dr. Rusiewicz is involved in community-engaged teaching and research with the aim to promote the discipline of SLP, embolden students to be civic-minded advocates for their clients, and to sustain relationships with community partners to serve the local and broader community.