

# The use of mental imagery in voice pedagogy and the teaching of the head voice register

MAÍRA DOS SANTOS JABER\*

## Abstract

This article aims to discuss the use of mental imagery in voice pedagogy and identify some mental images and metaphors used by singing teachers to teach head voice register. The exploratory research is predominantly qualitative and uses as data collection tools online survey, besides cognitive sciences and voice pedagogy literature analysis. Ten singing teachers answered the survey: five of them are specialized in contemporary commercial music styles (CCM), four are specialized in teaching classical singing, and one is specialized in teaching Musical Theatre and CCM styles. The teachers have more than seventeen years of experience, and they are in activity at the moment of the research. The results reveal that all the teachers use mental imagery in their pedagogical vocabulary, and 90% admit they use it to teach head voice. Four different mental strategies are identified in this study as pedagogical tools used by the teachers, linking sensory and physiological phenomena. Explanations in cognitive literature combined with the analysis of the terms and concepts related by the teachers suggest that mental imagery and metaphors, as cognitive instruments the human mind uses to structure thoughts and actions, can be a helpful tool to connect mind and body when the singing students need to structure a new concept—like head voice register. Further investigation is required to test this hypothesis with the students.

**Keywords:** mental imagery, voice pedagogy, vocal registers, head voice

## O uso de imagens mentais na pedagogia da voz e o ensino do registro de voz de cabeça

### Resumo

Este artigo discute o uso da imagética mental na pedagogia da voz e identifica algumas imagens mentais e metáforas utilizadas por professores de canto para o ensino do registro de voz de cabeça. A pesquisa exploratória é predominantemente qualitativa e utiliza como ferramenta de coleta de dados questionário *online*, além da análise da literatura das ciências cognitivas e da pedagogia da voz. A pesquisa foi respondida por 10 professores de canto: cinco deles são especializados em estilos de música comercial contemporânea (CCM), quatro são especializados no ensino de canto lírico e um é especializado no ensino dos estilos de Teatro Musical e CCM. Os professores possuem mais de 17 anos de experiência e encontravam-se em atividade no momento da pesquisa. Os resultados revelam que todos os professores utilizam a imagética mental no vocabulário pedagógico e 90% admitem que a utilizam para o ensino da voz de cabeça. Quatro estratégias mentais diferentes são identificadas neste estudo como ferramentas pedagógicas utilizadas pelos professores, vinculando fenômenos sensoriais e fisiológicos. Explicações na literatura cognitiva combinadas com a análise dos termos e conceitos relacionados pelos professores sugerem que imagens mentais e metáforas, como instrumentos cognitivos usados pela mente humana para estruturar pensamentos e ações, podem ser uma ferramenta útil para conectar mente e corpo quando os alunos de canto precisam estruturar um novo conceito—como o registro de voz de cabeça. Uma investigação mais aprofundada faz-se necessária para testar esta hipótese com os alunos.

**Palavras-chave:** imagens mentais, pedagogia da voz, registros vocais, voz de cabeça

\* Universidade Federal do Rio de Janeiro – UFRJ

E-mail: [mairajaber@singstudio.org](mailto:mairajaber@singstudio.org)

## Introduction

Voice pedagogy is an area whose transmission of knowledge is largely metaphorical since it deals with the human body as a musical instrument that needs to find its internal adjustments (which cannot be seen or touched) to produce the desired voice quality. We know that, through the years, the use of various scientific instruments (such as rigid laryngoscopy, flexible laryngoscopy, stroboscopy, electroglottography, Magnetic Resonance Image, and others) has been helping to reveal some secrets of the speaking and singing voice. Voice science research plays a significant role in clarifying some concepts about voice production (Kent & Read, 1992; Miller, 1996; Miller, 2008; Sundberg, 1987, 1994; Titze, 1994). Today, the knowledge of voice science is a fundamental tool for the singing teacher to understand the anatomy, physiology, and acoustics of the singing voice and be able to help the student achieve the results wanted. Often, trying to make it easier for the students to access these results, the teacher usually seeks analogies with situations and daily experiences familiar to them. In order to analyze the use of metaphors and mental imagery in the teaching of vocal registers, this article aims to study, in light of the cognitive sciences, some expressions used by singing teachers to teach the head voice register for their singing students. The main objective is to identify metaphors and mental images used by singing teachers to teach this specific vocal register. Is there any physiological correspondence between the mental imagery used by the teacher and its result in the student performance? When using these expressions, which results the teachers expect in the singer's physiological behavior?

Traditionally, mental images and metaphors have been used by voice pedagogy, passed down through generations, often without explanation to the students. According to Vennard (1967, p. iii), "the knowledge of literal fact is the only justifiable basis for the use of imagery and other indirect methods." He identifies that many singing teachers have a superficial acoustic vocabulary, filling their pedagogy with terms that confuse students more than help them. For him, if singing teachers know the fundamentals of science and vocal acoustics, their pedagogy will be more effective. Clements (2008) considers that the use of metaphors can make singing learning more fun. Still, its nonuse could make the study "dry and difficult to understand for many students, especially beginners" (Clements, 2008, p. 1). For him, the ideal method of teaching singing should link the use of mental imagery to voice science. That's what we believe too. We should know how to integrate these two approaches and use imagery to be efficient as a pedagogic tool. With this study, we wish to cross voice pedagogy and cognitive sciences, discussing the use of mental imagery in voice

pedagogy and analyzing some mental images used by singing teachers as a strategy to teach the head voice register.

## 1. Vocal register overview

Registration is a controversial subject in voice science and pedagogy. Through the years, we have been finding the term vocal register related by different authors with different approaches (Behlau & Rehder, 1997; Garcia, 1847; Hollien, 1974; Lovetri, 2006; Mancini, 1777; Miller, D. G. 2008; Miller, R. 1996, 2000; Pinho & Pontes, 2008; Reid, 1983; Rubim, 2019; Sundberg, 1987; Titze, 1988, 1994; Tosi, 1723; Wilcox, 1945).

Until the 19th century, the primary way to obtain information about vocal registers in singing was through auditory perception and sensations in the singer's body. But when the first laryngoscope was invented by the voice scientist and singing teacher Manuel Garcia, it revealed the human voice as a completely new world to be explored. Garcia was a pioneer in defining vocal register by observing the vocal folds' movement and not only by auditory perception or proprioceptive sensations. He defines vocal register as "a series of consecutive and homogeneous sounds, produced by the same mechanical means, and differing essentially from other sounds originating in mechanical means of a different kind" (Garcia, 1847, p. 4). But new technological inventions were on the way, especially from the second half of the 20th century, which contributed to add to Garcia's definition essential information about the nature of the vocal registers.

In the 21st century, researchers worldwide have continued to understand better vocal register phenomena using new technological tools. Nowadays, one of the most used definitions for the vocal register is: "perceptually distinct regions of vocal quality that can be maintained over some ranges of pitch and loudness." (Titze, 1994, p. 282). Also, voice science and pedagogy literature agree that the intrinsic muscles of the larynx play a fundamental whole in the production of the different vocal registers. But, although the literature seems to agree about this point, there are many divergent aspects regarding the terminology and the number of vocal registers adopted by different authors (Behlau & Rehder, 1997; Garcia, 1847; Hollien, 1974; Lovetri, 2006; Mancini, 1777; Miller, D. G. 2008; Miller, R. 1996, 2000; Pinho & Pontes, 2008; Reid, 1983; Rubim, 2019; Sundberg, 1987; Titze, 1988, 1994; Tosi, 1723; Wilcox, 1945), which makes this a very controversial issue for voice science and pedagogy.

In this work, we will adopt the terminology used by Donald Gray Miller (2008): chest and head, what he calls "natural registers." For him, any discussion about registration needs to begin with these two registers, which present two basic "contrasting modes of vocal fold vibration" (p. 49). As scientific knowledge about the anatomy and physiology

of the human voice was very restricted before the 19th century, the first concepts and terminologies about registration were based fundamentally on singers' proprioceptive sensations. When singers were singing in their low pitch range, they felt as their chest was vibrating. Probably, for this reason, "they interpreted those sensations as meaning that their voices were "coming from" their chests and would call that way of singing their chest voice" (Thurman et al., 2004, p. 4). But when singers were performing in their high pitch range, the vibration of the chest became less intense the more they went higher on the pitch, making them experience as if the sound was going up and the vibrations could be felt in their heads. It's possible that due to the experience of having these sensations, they presumed that "their voices were "coming from" their heads, so, logically, they would call that way of singing head voice" (Thurman et al., 2004, p. 4).

As we can see, the names "chest voice" and "head voice" are metaphoric expressions. Still, we know that the interaction between the intrinsic muscles of the larynx is the real responsible for producing the sound quality of different vocal registers. These muscles control voice frequency and intensity, promoting "vocal folds tension, vibrating mass modifications and variations in subglottic air pressure" (Pinho & Pontes, 2008, p. 20). They give to the vocal folds different movements, forms, and vibrating patterns.

Between the many intrinsic muscles of the larynx, two groups of muscles are predominant in controlling the phonation frequency: the thyroarytenoid muscles (or TA) and cricothyroid muscles (or CT). TA and CT produce two basic and contrasting patterns of vibration. When the TA muscles are contracted, the vocal folds become thicker and shorter, the contact between the vocal folds (adduction) increases, and the vibration pattern is slower, producing low frequencies. On the other hand, there are the CT muscles in antagonistic action with the TA muscles. When the CT muscles contract, the vocal folds become thinner and longer, producing a faster and less adducted vibration pattern, which gives rise to high frequencies (Lovetri, 2006; Miller, D. G. 2008; Miller, R. 1996; Pinho & Pontes, 2008; Salomão, 2008; Sousa, 2013; Thurman et al., 2004). The sound quality produced with more contraction of the CT muscles and less contraction of the TA is called head register. That says, the CT muscles do not act alone for the production of the head register, but their action occur in interaction with the TA muscles. Both are contracted simultaneously to produce this sound quality, although CT prevails, being more contracted than TA at that moment. So, the natural registers, chest, and head, are produced by two contrasting vibration patterns of the vocal folds, which give rise to contrasting sound characteristics. Between these two basic registers, there's still a third register, which emerges by combining both

chest and head voice: it's the mix voice (Lovetri, 2006). The mix register deals primarily with the singer's middle range and has many muscle coordination possibilities, with both TA and CT muscles present in a more balanced way. It can be a CT dominant mix, also called head mix (a lighter mix), or a TA dominant mix, also called chest mix (a heavier mix). Between both, there is an infinite amount of colors and vocal nuances possibilities.

This study will focus on mental imagery strategies used by singing teachers to teach the head voice register.

## 2. Mental imagery overview

Mental imagery is referred to as "representations and the accompanying experience of sensory information without a direct external stimulus. Such representations are recalled from memory and lead one to re-experience a version of the original stimulus or some novel combination of stimuli" (Pearson et al., 2015, p. 590). It's a product of our cognitive abilities, enabling us to retrieve, construct and manipulate mental representations of the world as we experience it in our bodies. Cognitive sciences reveal that rational thought is embodied, that is, it has its origin in the human body, in our interaction with the world through our senses. Therefore, mind and body are inseparable, and both are indispensable for the formation of rational thought (Lakoff & Johnson, 1999). Our mind categorizes everything that comes to us through our bodily experience, most of the time, automatically and unconsciously. We can recognize, differentiate and classify everything around us, creating groups of categories in our minds. These categories result from our experience, and through the experience, the body generates meaning (categorizes).

Musical experience is part of our abstract world. Concepts called abstract cannot be touched or seen, but somehow, they are based on our bodily experiences with space and the relationships our minds can create from it. Abstract concepts such as "singing high are going up" or "singing low is going down," for example, only exist because we have a body, from which we establish a relationship between concrete experiences already conceptualized and the new senses we produce in the abstract domain (Nogueira, 2009). Much of our understanding of the world has its origin, therefore, in spatial concepts and in the senses that we metaphorically transfer from our experiences with what is concrete to understand the experience with the abstract. Mental imagery gives rise to this metaphorical process. Most of the experiences we have with the abstract (if not all) are conceptualized by us from more familiar concrete concepts that we form in contact with the visible and material world. The mental device that enables us to conceptualize our abstract



experiences and base them on our concrete experience is called a conceptual metaphor by Lakoff and Johnson (1999).

Conceptual metaphor is used as a cognitive instrument in the structuring of our thoughts and actions, without we can realize it (Lakoff & Johnson, 1980, 1999). Metaphors are present in everything we do and think, in the way we categorize the world around us, in the way we structure everything we perceive, how we behave, and relate to people. Our conceptual system “is essentially metaphorical in nature” (Lakoff & Johnson, 1980, p. 4), that is, the mental processes that give rise to our thoughts and actions are primarily based on metaphors. They are the ones that organize and define our conceptual system. The metaphorical expressions in our language exist only because metaphors are present in our conceptual system. The conceptual metaphor is, therefore, a process through which one idea is understood from another. In our daily lives, it is present in the way we communicate, think, or act, and it is based on our sensorimotor system. We have concrete experiences with the world from our body, and from these experiences, we give rise to new concepts. Thus, the body plays a fundamental role in forming the mind (Nogueira, 2009).

40

Singing is an activity controlled by the human brain. Producing a single note is a complex activity that needs the coordination of many groups of muscles “from inhalation to the approximation of the vocal folds and movement of articulators (i.e., mouth, jaw, tongue, lips)” (Kleber & Zarat, 2014, p. 257). The production of the different vocal registers is a complex phenomenon controlled by the human brain and immerse in our abstract world. Also, “the singer is usually unaware of the neural networks that govern and coordinate all of these muscle groups” (Kleber & Zarat, 2014, p. 257) involved in this process. According to Sacks (2007, pp.33–34), “deliberate, conscious and voluntary mental imagery involves not only auditory and motor cortex, but regions of the frontal cortex, involved in choosing and planning. Such deliberate mental imagery is clearly crucial to professional musicians”. It is possible that mental imagery if physiologically related to the teacher's vocal behavior wants the student to achieve, can help the student's mind conceptualize abstract concepts, such as head voice register, making the student's brain work more efficiently to achieve the desired results.

Cognitive sciences have shown different modalities of mental imagery, which contain elements that refer to all senses: vision, touch, audition, smell, and taste (Schifferstein, 2008). How would a singing teacher know what the best modality to use with a student is? It depends on the student. It's important to mention that each student is unique. All of them were submitted to different experiences and have created different memories throughout their lives. So, to have efficient

communication with a student, the teacher needs to establish an image vocabulary that can make sense to this student, knowing that, based on the different experiences lived, some specific images can make a better connection between the student's mind and his/her body. To establish an image vocabulary, "a teacher must become acquainted with the student. This can be done in a variety of ways: direct questioning, light conversation, written questionnaire, or a combination of all three" (Clements, 2008, p. 13). Knowing better the student, the teacher can choose which images can make more sense for this student during the learning process.

### 3. The method

This article aims to identify some mental imagery used by teachers of singing as a strategy to teach the head voice register.

#### 3.1 Data collection and participants

With a predominantly qualitative approach, this exploratory research uses a data collection tool, an online survey sent to singing teachers of different singing styles: Classical, Musical Theatre, and Contemporary Commercial Music styles (CCM styles), besides voice pedagogy and cognitive sciences literature analyze. Ten singing teachers answered the questions: five from Brazil and five from the United States (three men and seven women). As criteria of selection, the subjects should have more than ten years of teaching, and they should be in activity at the moment of the research, teaching voice in a university or a private studio, in Brazil or the USA.

Subjects contacted have from 17 to 43 years of teaching, and all are in activity at the moment of the research. They work as singing teachers in a university (undergraduate or graduate programs) or a private studio with singers of different levels and ages. Although each teacher has their style specialization, many of them can teach different singing styles. The subjects were contacted by email, social media, or text message to be informed about the research. Then, a link with the survey was sent for them with a deadline to answer (two weeks). The survey was designed for this study, inspired by the questions used by Sousa and fellows (2010).

The survey was divided into two parts. The first part was constituted of six closed (structured) questions in which the teachers should sign the answer that better fit with their reality. That part aimed to know better who the teachers are, what music style they sing and teach, where they teach, how many years they teach, who their students are, and their highest education level. The second part of the survey was constituted of three open (unstructured) questions, where the teachers should answer about the use (or not) of mental imagery and metaphors

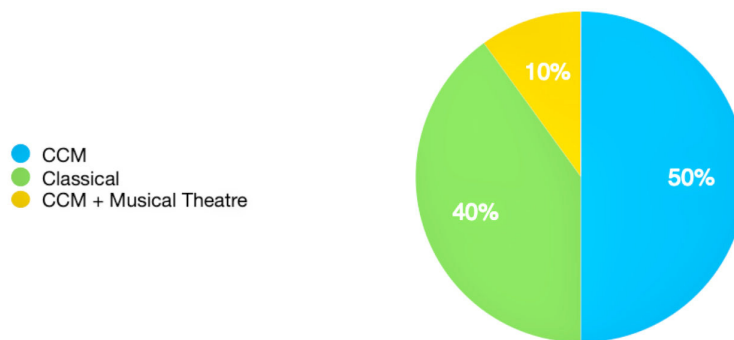
as a pedagogic tool in their pedagogical approach, if they use (or not) mental imagery and metaphors in the teaching of head voice register. They were asked to quote a mental imagery they use to teach the head voice and what results they expect to achieve from that approach.

### 3.2. Data analysis

#### 3.2.1 First Part (Closed questions)

Ten subjects are going to be part of this analysis. The first question was about their singing style specialization. Five of them are specialized in teaching CCM styles, four are specialized in Classical singing and one in both Musical Theatre and CCM, as we can see on the graphic 1.

**Graphic 1**  
Styles specialization.



Although they are specialized in some singing style, many of them can also teach other styles. So, the second question was about which singing styles they can teach. Seven of them can teach all the styles mentioned (Classical, Musical Theatre, and CCM styles), one can teach only Classical and Musical Theatre, one can teach only CCM and Musical Theatre, and one can teach only Classical. Teachers' total separated by styles they can teach is: eight can teach CCM styles, even if it's not their specialization, nine can teach Classical, and nine can teach Musical Theatre (graphic 2).

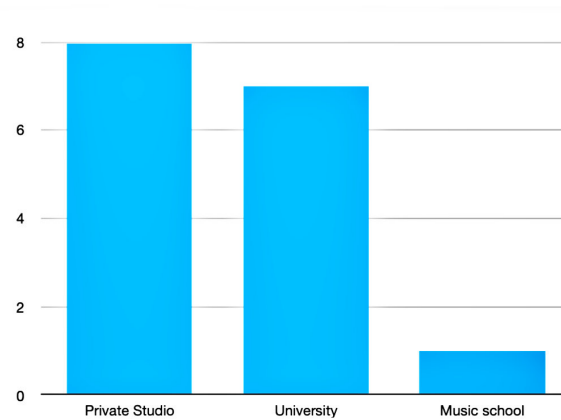
About the place where they teach, some of them teach in more than one place. Eight teachers work in a private studio, five of them also work in a university, and one also works in a musical school (non-degree program). Two teachers work only in a university. Teachers' total separated by the places where they teach is: eight teaches in a private studio, seven teaches in a university (all in an undergraduate program and four also in a graduate program), and one teaches in a music school (non-degree program).

All of them work with adults. Nine of them also work with young people, three of them also work with children, and three of them also work with seniors (graphic 3).

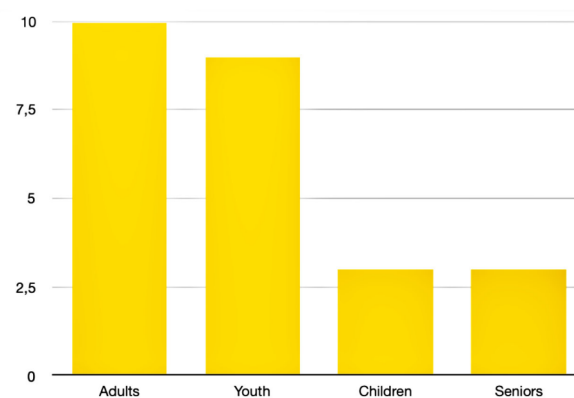


**Graphic 2**

Places where they teach.

**Graphic 3**

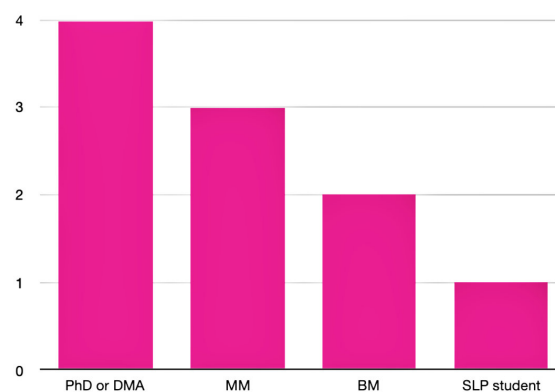
The students.



Regarding their highest level of education, four have a Doctoral Degree in Music (two have a Ph.D. in Music, one has a DMA in Voice Performance and one has a DMA in Voice Pedagogy); two have a Master Degree in Music (one in Musicology and one in Voice Performance); three teachers have a Bachelor's Degree in Voice Performance, and one is a Speech-Language Pathologist student (graphic 4).

**Graphic 4**

Highest level of education.



All of them have a great experience as singing teachers, once they have from 17 to 43 years of teaching. The average time that these teachers have taught singing lessons is 25 years of teaching. The resume of the information collected in this first part is in the table 1.

**Table 1**  
Collected information.

Teacher	Country	Highest Education	Style Specialization	Style of Teaching	Teaches Singing at	Works with	Years of Teaching
V*	Brazil	PhD in Music	Classical	Classical	- University (Graduate and Undergraduate programs) - Private studio	- Youth - Adults	20 years
M*	Brazil	DMA in Voice Performance	Classical	- CCM - Classical - Musical Theater	- University (Graduate and Undergraduate programs) - Private Studio	- Children - Youth - Adults - Seniors	30 years
S*	Brazil	PhD in Music	Classical	- CCM - Classical - Musical Theater	- University (Graduate and Undergraduate programs) - Private studio	- Youth - Adults	20 years
E*	USA	DMA in Voice Pedagogy	- CCM - Musical Theater	- CCM - Musical Theater	- University (Graduate and Undergraduate programs) - Private Studio	- Youth - Adults	17 years
K*	USA	MM in Voice Performance	Classical	- Classical - Musical Theater	- University (Undergraduate program)	- Youth - Adults	43 years
C*	Brazil	MM in Musicology/SLP	CCM	- CCM - Classical - Musical Theater	- Music School (Non-degree program) - Private Studio	- Youth - Adults	19 years
D*	USA	BM in Voice Performance	CCM	- CCM - Classical - Musical Theater	- University (Undergraduate program)	- Youth - Adults	23 years
G*	USA	BM in Voice Performance	CCM	- CCM - Classical - Musical Theater	- University (Undergraduate program) - Private studio	- Adults	30 years
J*	USA	BM in Vocal Performance	CCM	- CCM - Classical - Musical Theater	- Private studio	- Children - Youth - Adults - Seniors	23 years
A*	Brazil	SLP Student	CCM	- CCM - Classical - Musical Theater	- Private studio	- Children - Youth - Adults - Seniors	25 years

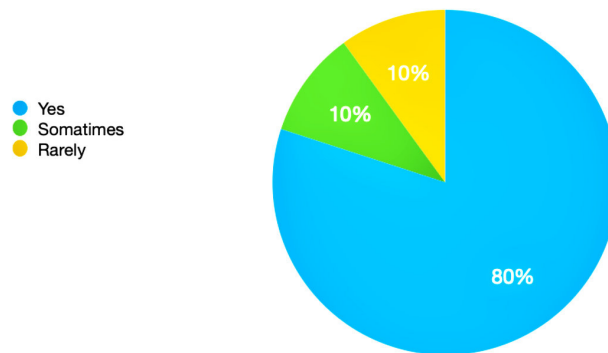
*Note.* The identity of the participants will be preserved for ethical reasons.

### 3.2.2 Second Part (Open questions)

In this second part, the teachers were asked about their pedagogic strategies and mental imagery as a teaching tool. In the first question, they should answer if they use mental imagery or metaphors as a pedagogic tool in their work. All of them answered they used some kind of mental imagery or metaphor in their practice: eight of them answered yes, one uses it sometimes, and one uses it rarely (graphic 5). The subjects justified their answers, as we can see in table 2.

**Graphic 5**

Mental imagery as a pedagogic tool.

**Table 2**

Mental imagery as a pedagogic tool.

Teacher	Do you use Mental Imagery or Metaphors as a pedagogic tool? Why?
V*	Yes. Because it helps the student to understand the mechanisms of vocal production and resonance.
M*	Always. Mental and visual images promote a more complete brain association that facilitates the fixation of learning, both in the aspect of mental organization and in the ludic aspect that intensifies the fixation. Memory has a connection with favorable emotional states, and imagery reinforce synapses.
S*	Sometimes yes, but I signal to the student that it is a metaphor. I use it when I feel it can facilitate the student's self-perception or understanding of what I want to explain.
E*	Rarely. I find most of my clientele respond better when given anatomical adjustments that allow them to experience a new sensation which they can label for themselves (including imagery).
K*	Yes. Humans respond well to metaphors-indeed all language is in some sense metaphorical. But my pedagogy is science-informed.
C*	Yes. Because it facilitates student understanding.
D*	Yes. I use it for description purposes.
G*	Yes. It helps to break through mental barriers.
J*	Yes. Because it helps people to better visualize how to do things with their throat that they can't see.
A*	Yes. I use metaphors mainly with beginner students because they have more difficulty of assimilating the mechanism of the voice with its action itself.

*Note.* The identity of the participants will be preserved for ethical reasons.

In the second question, the teachers were asked if they use mental images and/or metaphors as a pedagogical approach when teaching a student how to access the head voice register. In this question, if the answer were yes, they should mention one exercise they apply to teach the head voice register, having mental imagery or metaphors as a strategy to achieve some concrete result. Then, they should explain the concrete results expected and how that exercise should contribute to this achievement (table 3).

#### 4. Results

The results reveal that all the teachers in this study use mental imagery or metaphors to reach desirable results. Besides, 90% admit they use it, even on a small scale, as a pedagogic tool when teaching the head voice register. The teachers justify using mental imagery and metaphors,

**Table 3**  
Mental imagery in the teaching of head voice register.

Teacher	Mental Imagery/ Metaphors used to teach head voice register	Expected results
V*	Thinking as if the voice is coming out from the top of the head.	The physical perception of resonance and muscular adjustments.
M*	As an image for the head voice, I ask the student to think that the sound is floating, like a kind of whipped cream above the note. It is important to say that there may be whipped cream both in the high notes and in the low notes, both in the head voice and chest voice.	I wish the scale should be executed with softness, flexibility and lightness. Mental imagery and metaphors must always be used in association with the scientific phenomenon itself. There will always be a scientific phenomenon associated with the term that is used to express such phenomena. With this, the singer and teacher of singing will always be coherent in their pedagogy.
S*	I use more objective parameters to provoke the head voice, as dynamics, favorable vowels and favorable region. However, we know that in producing registers, the student forms a mental image always. The imagination is not subject to exclusion in the process of learning to sing, which, in my opinion, is positive.	I hope to get the student to produce the head register easily and realize the difference between head and chest register, as well as the varieties of "mixed" voice that he may be accustomed to produce. I also hope that he will be able to produce the register intentionally and without my guidance, with autonomy.
E*	I think the closest I come to conceptual metaphors would be telling them to imagine they are calling to someone across a field or to let their air and voice fill up the room.	Calling elicits primal voice and higher amplitude. The idea of letting their air and voice out to fill the room is an indirect approach to increasing transglottal airflow while relaxing the constrictor muscles.
K*	I use yodeling, whooping, domed, images of the sound sensation moving higher in the head, above the mouth.	A shift from TA to CT dominant muscular adjustment and a smoother, rounder tonal timbre. Greater ease in range access.
C*	I ask them to think about producing the voice with softness, always thinking about the support (even if the voice is at low volume).	Balancing the muscle and ligament work for singing vocal production. Producing the voice throughout the vocal range with greater vocal stability and little difference of the tone (homogeneous resonance) between the registers.
D*	I ask them to speak like a baby	To free up their self-image and to relax them.
G*	I ask the students to think of hooting like an owl on an "ooh" vowel.	The students are able to access the head voice when using imagery along with flattening the tongue and creating space in the pharyngeal cavity.
J*	We often use sirens to slide up and down the head voice - a waterfall is coming down is good too. With children we have a situation where they imagine putting their voice into a box and doing different things with it, like throwing it, juggling or dribbling it like a ball. For older students that have trouble accessing head voice (which is rare) having them imagine the sound going out through their forehead and sending it out the window can help.	These exercises help the singer to let go and sing more freely without gripping to reach high note.
A*	For children and teenagers, I correlate notes positions with spatial positions: high notes/ head voice = the sound is going up. And I like to direct them to feel it in their bodies (to feel the sensation of the sound vibrations going up, from chest to head).	Making the student to feel the sensations of the sound vibrations in the body is important for their understanding of how to shift from one register to another.

*Note.* The identity of the participants will be preserved for ethical reasons.

saying that it helps the student during the learning process, facilitating the understanding of complex and abstract concepts, promoting self-perception, and making it easier for the student to produce the sound that the teachers want. Also, they say that metaphors and mental imagery can break through mental barriers and involve the brain to a better association of new concepts, facilitating the mental organization, intensifying the fixation, and reinforcing synapses by the ludic aspect. Only one teacher mentioned she doesn't use mental imagery in the

teaching of head voice register. She prefers to use objective parameters, like dynamics, favorable vowels, and favorable region. However, she admits that imagination is not subject to exclusion in the learning process of singing.

All the teachers in this study demonstrated to be well informed about the head voice register's physiological aspects. All could explain which concrete results they expected each exercise could physically promote on the student. It's important to understand that mental imagery as a pedagogic tool for singing teachers can be considered for the learning process only if connected with the physiological event. Every time the teacher chooses to use mental imagery to communicate the action to the student (and obtain a specific reaction from them), it needs to be necessarily associated with the scientific phenomenon once the results expected by this approach are physical. As one of the teachers mentioned: "nothing will make sense if we do not know the true cause of the phenomenon: and this is science. Pedagogy is how we transmit the phenomenon with coherence and knowledge" (teacher M\*).

The results also attest that singing teachers, in different ways, can use mental imagery. Through each mental imagery mentioned by the teachers, the student can be submitted to other sensory stimuli, and, based on these mental stimuli, different physical reactions can be experienced.

## 5. Discussion

By analyzing the teachers' answers, it's possible to identify some different mental strategies used to teach the head voice register for their students. They use various sensory, cognitive strategies as a pedagogic tool, recognized as visual imagery, auditory imagery, tactile imagery, and kinesthetic imagery.

**1. Visual imagery** - Some teachers mention exercises that use mainly visual mental images as a cognitive strategy to visualize internal mechanisms of voice production or any other visualization that can contribute to the learning process. These mental pictures can be produced by memories of visual experiences or by imagination. Visual imagery is based on the sense of sight. Once the students can't see what happens inside their larynx, these teachers believe that the mental visualization of some visual images can help the students connect their brain with the concrete action that their body needs to be involved in producing the sound. Visual imagery deals basically with shapes, size, and colors.

**2. Auditory Imagery** - Other teachers prefer exercises that use mainly mental images of specific sounds as a reference to the student. Auditory Imagery is based on our experience with the sense of hearing and



our ability to reproduce a sound without external auditory stimuli. On the use of auditory imagery, the teacher brings the student the memory of a sound produced by some sound fountain (an animal, a person, an object, an environment) in order to reach some concrete result. The use of auditory imagery as a pedagogical tool in the teaching of singing deals with the students' auditory memory, their ability to mentally re-experience a sound they have already experienced in the past. It brings the students to concrete action when trying to use their voice to create their version of this sound. This mental strategy is usually connected with the visual image of the sound fountain.

**3. Tactile Imagery** - Some teachers choose exercises that use mental images that appeal to the sense of touch to describe some characteristics of the sound of the head voice register. Tactile imagery deals with textures and is based on what we physically experience by our skin. Every time the teachers describe the sensation of touching something to make the student understand some characteristics of the voice quality wanted, they are using tactile imagery. Head voice register sound quality is usually described as soft, fluffy, tender, velvety, smooth, warm, all tactile images of the sense of touch. This mental strategy is usually connected with the visual image of some textured surface, and many times it is used with a metaphorical approach.

**4. Kinesthetic Imagery** - Other teachers mention exercises that promote the perception of the body and the perception of the physical sensations that the head voice produces in the student. To that end, some use conceptual metaphors as a strategy to help the "placement" of the sound where they want. Kinesthetic imagery deals with our body and refers to our movements or actions. Conceptual metaphors are based on our bodily experiences with space and the relationships created from it by our minds. When the teacher refers to gestural, postural, any other action or body sensation that makes the students re-experience situations when their bodies are engaged in some activity or sensation, they use kinesthetic imagery.

These four types of mental imagery generally do not appear isolated. Still, we can find a combination of two or more in the exercises proposed by the teachers, suggesting a multi-sensorial imagery experience, although one mental imagery can be predominant. The exercises are classified in the table 4.

By classifying and analyzing the exercises proposed, we can find connections between the mental strategies recognized and some critical information about the production of the head voice register.

Emerging research indicates that mental imagery can activate the same neural networks that are also engaged in motor control and perception (Lima et al., 2016; Kleber & Zarat, 2014). Auditory imagery, for

**Table 4**  
Mental strategy classification.

Imagery	Mental strategy
Thinking as if the voice is coming out from the top of the head.	visual, kinesthetic
Thinking that the sound is floating, like a whipped cream above the note.	visual, kinesthetic, tactile
Imagining they are calling to someone across a field.	visual, kinesthetic, auditory
Letting their air and voice fill up the room.	visual, kinesthetic
Images of the sound sensation moving higher in the head, above the mouth.	kinesthetic, visual
Thinking about producing their voice softer.	tactile, visual
Speaking like a baby.	auditory, visual
Thinking of hooting like an owl on an "ooh" vowel.	auditory, visual
Thinking of sirens to slide up to the head voice register.	auditory, visual
Imagining the sound going out through their forehead.	visual, kinesthetic
Sending the sound out the window.	kinesthetic, visual
Correlating notes positions with spacial positions, directing them to feel it in their body.	kinesthetic, visual

example, can activate a supplementary motor area of the brain (Lima et al., 2016). This information suggests that auditory imagery can offer the singing student an important tool in the learning process. The sound quality produced by owls, sirens, and babies is associated with what we call head voice register. Once the students already have these sounds in memory, auditory imagery can help them to access the muscular adjustments necessary to produce the head voice register while trying to imitate these familiar sounds.

Also, tactile imagery seems to be efficient in helping the students reproduce some characteristics that the sound quality of the head voice register needs to have. Thinking of producing a softer voice when going to their upper range will probably lead the students to decrease in the intensity of the sound, automatically shifting from TA to CT dominant muscular adjustment, that is, accessing head voice. Even if the students don't have full control of this mechanism yet, we can say they are on the way to work on it.

Talking about kinesthetic imagery, we know that our bodily experiences can support us to understand more complex and abstract concepts, helping us make relationships between the concrete and the abstract world. Kinesthetic imagery can increase the student's bodily conscience (posture, gestures, movements, muscular awareness), which is fundamental for the singing activity. When the teacher tries to access the head voice register using this pedagogical tool, the student can be benefited from the bodily conscience promoted by this kind of imagery.

In addition, a key feature of the head voice register is lightness, which is a metaphor-based on kinesthesia. The head register is also called the “light mechanism” by some authors (Rubim, 2019; Vennard, 1967; Wilcox, 1945). When a teacher asks a student to think about a floating sound, he/she is using this mental strategy. As with the metaphor of a softer voice, thinking about singing in a light voice will likely cause the student to decrease vocal intensity in higher pitches and get closer to the physiological characteristics of the head register, accessing CT dominant muscle adjustments.

Regarding visual imagery, mental representations of shapes, sizes, and colors are commonly used in the voice pedagogy vocabulary. Some general voice quality characteristics that can be associated with the head voice register are also expressed by these kinds of mental representations, such as: covered, small, sharp, rounded, white, dark, or bright voice. But we can't guarantee that these images alone will automatically conduct the student to produce the head voice register. This fact leads us to suggest that visual imagery could be more efficient if combined with auditory, tactile, or kinesthetic imagery.

This study does not aim to validate the efficacy of these exercises in teaching the head voice register since we did not test these strategies with the singing students. Further investigations would be necessary to check this hypothesis. We are going to do it in future work.

50

## Conclusion

The singing student is immersed in an abstract world, full of terminologies that still can't be wholly understood and techniques that can't be entirely controlled yet, especially by the beginners. In learning further information and conceptualizing it, mental imagery can help students access some memorized experiences of the concrete world they are part of. Learning singing is a complex activity controlled by the human brain that integrates various modalities of perception. This study identified four mental strategies used as pedagogic tools in teaching the head voice register, linking sensory and physiological phenomena: visual imagery, auditory imagery, tactile imagery, and kinesthetic imagery. Each one of these is based on a sense, and they do not appear isolated, but we can find a combination of two or more in the exercises proposed by the teachers. Explanations in the literature combined with the terms and concepts related by the teachers suggest that mental imagery and metaphors, as cognitive instruments the human mind uses to structure thoughts and actions, can be a helpful tool to connect mind and body when the singing students need to structure a new concept like head voice register. It's possible that the ability to manipulate mental representations can help singing students to access more easily head voice register adjustments and sensations by bringing to mind

memories of sounds and experiences they have lived or felt before with their bodies. Further investigation is needed to test this hypothesis with the students.

## References

- Behlau, M., & Rehder, M. I. (1997). *Higiene vocal para o canto coral*. Revinter.
- Clements, J. F. (2008). The use of imagery in teaching voice to the twenty-first century student [Unpublished doctoral dissertation]. Florida State University College of Music.
- Garcia, M. (1972). *New treatise: Complete treatise on the art of singing*. [Donald V. Pasche, Trans.]. Da Capo Press. (Original work published 1847)
- Hollien, H. (1974). On vocal registers. *Journal of Phonetics*, 2(2), 125–143.
- Kent, R., & Read, C. (1992). *The acoustic analysis of speech*. Singular Publishing Group.
- Kleber, B. A., & Zarate, J. M. (2014). *The neuroscience of singing*. The Oxford Handbook of Singing.
- Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. University of Chicago.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought*. Basic Books.
- Lima, C., Krishnan, S., & Scott, S. (2016). Roles of supplementary motor areas in auditory processing and auditory imagery. *Trends in Neurosciences*, 39, 527–542.
- Lovetri, J. (2006). *Somatic voicework: The Lovetri Method - Level 1 workbook*. The Voice Workshop.
- Mancini, G. (1777). *Riflessioni pratiche sul canto figurato*. 9(Facsimile da edic, ão)
- Miller, D. G. (2008). *Resonance in singing: Voice building through acoustic feedback*. Inside View Press.
- Miller, R. (1996). *On the art of singing*. Oxford University Press.
- Miller, R. (2000). Registers in singing: Empirical and systematic studies in the theory of the singing voice. University of Groningen.
- Nogueira, M. (2009). A semântica do entendimento musical. In: B. Ilari, & R. C. Araújo (Orgs.), *Mentes em música* (pp. 37–64). Deartes-UFPR.
- Pearson, J., Naselaris, T., Hilmes, E. A., & Kosslyn, S. M. Mental imagery: Functional mechanisms and clinical applications. *Trends in Cognitive Sciences*, 19, 590–602.
- Pinho, S. M. R., & Pontes, P. (2008). *Músculos intrínsecos da laringe e dinâmica vocal*. Revinter.
- Reid, C. L. (1983). *A dictionary of vocal terminology: An analysis*. Joseph Patelsohn Music House.
- Rubim, M. (2019). *Voz, corpo, equilíbrio*. Thieme Revinter.
- Sacks, O. (2007). *Musicophilia: Tales of music and the brain*. Vintage Books.
- Salomão, G. L. (2008). Registros vocais no canto: Aspectos perceptivos, aerodinâmicos e fisiológicos da voz modal e da voz de falsete. [Unpublished doctoral dissertation]. Pontifícia Universidade Católica de São Paulo.
- Schifferstein, H. (2008). Comparing mental imagery across the sensory modalities. *Imagination, Cognition and Personality*, 28(4), 371–388.
- Sousa, J. M., Silva, M. A. A., & Ferreira, L. P. (2010). O uso de metáforas como recurso didático no ensino do canto: Diferentes abordagens. *Revista da Sociedade Brasileira de Fonoaudiologia*, 15(3), 317–328.
- Sousa, J. (2013). Entre a expressão e a técnica: A terminologia do professor de canto - um estudo de caso em pedagogia vocal de canto erudito e popular no eixo Rio-São Paulo. [Unpublished doctoral dissertation]. Universidade Estadual Paulista. Disponível em: <http://hdl.handle.net/11449/110657>

- Sundberg, J. (1987). *The science of the singing voice*. Northern Illinois University Press.
- Sundberg, J. (1994). Perceptual aspects of singing. *Journal of Voice*, 7, 106–122.
- Titze, I. R. (1988). A framework for the study of vocal registers. *Journal of Voice*, 2(3), 183–194.
- Titze, I. R. (1994). *Principles of voice production*. Prentice Hall, Englewood Cliffs.
- Thurman, L., Welch, G., Theimer, A., & Klitzke, C. (2004). Addressing vocal register discrepancies: An alternative, science-based theory of register phenomena. *Second International Symposium on the Physiology and Acoustics of Singing*, at National Center for Voice and Speech. Denver, Colorado.
- Tosi, P. F. (1968). *Opinioni de' cantori antichi e moderni, o sieno osservazione sopra il canto figurato*. Broude Brothers. (Originally published 1723, Lelio dalla Volpe)
- Vennard, W. (1967). *Singing: The mechanism and the technique*. Carl Fischer.
- Wilcox, J. C. (1945). *The living voice: A study guide for song and speech*. Carl Fischer.