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Practical Science in the Studio: "No-Tech" Strategies

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[**Editor's Note:** This article, an initiative of the NATS Voice Science Advisory Committee, is the first in a three-part series that seeks to introduce the reader to practical and cost effective strategies for using science to enhance singing instruction. The three articles in this series are divided into "no-tech," "low-tech," and "high-tech" segments. (RDS)]

Many singing instructors train students as they themselves were trained. The master/apprentice model has worked well for centuries, particularly for students whose voices are similar to our own. But when teachers encounter other voice types (not to mention the increasing demand to teach contemporary singing styles alongside classical technique), this model is not optimal. We have centuries of rich pedagogic tradition, but reluctance to learn from advances in science has slowed progress in our field. How can we build on our rich tradition, and also be forward looking in our practice? We believe that science offers us tools to enrich our tradition, but these tools are not without difficulties or controversies.

Singing pedagogues who view science with a dose of skepticism ask, "How is this helpful?" Even voice teachers who evince interest in science rightly ask, "What is the practical application of voice science?," and, "Where might I find these tools easily and inexpensively?" This last query is an important one, for many voice teachers equate voice science with cost prohibitive lab equipment that requires a sophisticated understanding of physics and acoustics. Even voice teachers who wish to pursue training in voice science may not have the basic background or the resources of time or money to pursue it. Given these constraints, it is not surprising that science continues to play a limited role in voice teaching, an unfortunate state of affairs is, especially in consideration of the great scientific advances of the past thirty years.

Teachers who espouse what may be called "science-informed" pedagogy believe that singing instruction should be based on facts, not fiction. Fortunately, the physical facts most useful to singers (such as the location and function of the once mythical diaphragm) are not only undisputed, but are now more readily available than ever before, thanks to the Internet.

Science-informed voice pedagogy is an evolving field, as is voice science itself. The origins of both are generally accorded to be the moment in history when the famous Spanish voice teacher Manuel Garcia II (1805–1906)

procured two dental mirrors, slid one into his mouth and aimed the other at just the right angle to catch a ray of sunlight, revealing the marvel of the human vocal folds. He subsequently published findings in his paper, "Physiological Observations on the Human Voice," in the *Proceedings of the Royal Society of London* in 1855. Garcia's publication permanently established an alternate, scientific track in the world of elite vocalism that established laryngeal physiology as the first pillar of voice science. As explained by musicologist and singer James Stark,

> Garcia polarized the whole field of vocal pedagogy with his introduction of the laryngoscope, [and] with his theories . . . Garcia's vocal pedagogy became the concern not only of traditional voice teachers, but also of scientists and medical doctors.[1]

Interest in voice science grew among pedagogues throughout the twentieth century. Swedish voice scientist Johan Sundberg's discovery of the "singer's formant" (the special resonance cluster that singers employ, allowing them to be heard over an orchestra) firmly established acoustics as the second pillar of voice science.[2] The twin pillars of laryngeal physiology and acoustics created such a firm foundation for the field of science-informed voice pedagogy, that they fairly defined voice science for much of the past fifty years.

Yet pedagogy is concerned not only with what teachers know, but how students learn. It is ironic that until very recently, the human mind, the delivery system and receptacle for information, was missing from science-informed voice pedagogy. The question how humans learn is the essential one of cognitive science. Thus, cognitive science must become the third pillar of science-informed voice pedagogy.[3]

Despite the abundance of science facts (physiological, acoustic, and cognitive), not all such facts are grasped easily, nor effortlessly applied. The authors hope that this article series will provide a gateway to "evidence-based voice pedagogy" and its practical application in the voice studio.[4] After all, science is not only for an exclusive cohort of science-trained singers. *Science is for all of us*. In the words of Dr. Scott McCoy,

> Science will never replace art in singing and teaching. But it can and does inform the art, enabling singers to perform with optimal beauty and vocal efficiency through a technique that is grounded in fact rather than wishful thinking.[5]

What is technology? The simplest definition is "a collection of tools." Nevertheless, most people have come to think of technology as necessarily digital or electronic. This initial article is dubbed "No-Tech Strategies" because the tools presented do not require technology more advanced than old fashioned paper and pen, though electronic formats may be used if desired. The following evidence-based strategies for singing instruction will be presented: 1) motivational interviewing; 2) goal setting; and 3) journaling.

MOTIVATIONAL INTERVIEWING

Singing pedagogues don't teach voice, they teach people. They help students grow by eliciting vocal changes as the instrument develops. But voice and identity are usually intertwined, and vocal change can be psychologically expensive. How the teacher responds to the student's stress and resistance is a central component of motivational interviewing (MI). This counseling technique uses behavioral science to help clients overcome their resistance to change. It is rooted in addiction sciences, and while voice teachers are (usually) not licensed therapists, many MI principles can be ethically used in teaching singing.

Before delving into the main components of MI, we should first discuss the "therapeutic alliance" in psychotherapy. This term refers to the working relationship between therapist and client, and the quality of this relationship will greatly influence the progress the client may make. Indeed, this working relationship is perhaps more important than the specific therapeutic approach the clinician uses with the client. If we apply this concept to singing voice instruction, one could hypothesize that *what* one teaches may be less important than *how* one teaches. The quality of the student-teacher relationship may influence the student's vocal progress more than any other single factor.

Motivational interviewing (MI) views the therapeutic alliance as a democratic partnership, where both the client and the therapist are equally invested in solving the patient's problems. A typical singer-teacher relationship is usually less democratic; the instructor has authorita-

tive knowledge that the student needs to absorb to correct vocal faults. In MI, the therapist's role is to direct the conversation, understanding that behavior change comes from the client. If a client is working on smoking cessation, the therapist doesn't simply say, "You really should stop smoking." Of course, the client knows this already. In the same way, a voice teacher saying to the student, "You should practice more often" often will not change the student's behavior.

Ambivalence is an important concept in MI. People with addictions are usually aware of the dangers but continue their destructive behavior. They want to stop, but at the same time they do not want to. In singing, students may know they need to spend time working alone on a technical issue, but they may also avoid it. If the teacher interprets student ambivalence as denial or resistance, friction can occur and the therapeutic alliance (and consequently student progress) suffers. Ambivalence may appear to be a lack of motivation, and therefore is often the main obstacle to behavior change; nevertheless, ambivalence is a natural part of the behavior change process.

Motivational interviewing helps counselors facilitate behavior change in clients through five main principles: 1) express empathy, 2) develop discrepancy, 3) avoid argument, 4) adjust to client resistance, and 5) support self-efficacy. These principles are briefly discussed below, but for a more in-depth explanation, see "Enhancing Motivation for Change in Substance Abuse Treatment" available from the National Institutes of Health.[6]

1. *Express empathy* through reflective listening. Voice pedagogues are trained to attune to minute differences in vocal sound, but they should consider engaging in reflective listening during the lesson. Teachers may assume (without checking) that they know what the student means, but they often may fail to hear *all* that is being said. If teachers listen reflectively and verify that they understand the student correctly, the empathic relationship is strengthened, vocal challenges are more deeply explored, and student motivation is improved. Reflective listening is particularly appropriate with new students, as it reduces the likelihood of resistance, encourages them to keep talking, and communicates respect to the student.[7]
2. *Develop discrepancy* between the what students say and what they do. How does their current behavior differ from the ideal or desired behavior? For example, if intonation is an issue, recordings of the student's singing could be used (checked against a piano) to increase their awareness of pitch inaccuracies. Some MI sources even suggest the teacher/clinician feign confusion or uncertainty to motivate the student to take control of the problem.[8] Of course, this strategy should be used sparingly. Separating the behavior from the person is especially useful as well.
3. *Avoid argument* and direct confrontation. This can be a challenge when the teacher and student are not in agreement on an issue. Nonetheless, arguments can greatly damage a student-teacher relationship. They are counterproductive and can rapidly degenerate into a power struggle. Trying to convince students that a problem exists could make them dig in their heels and increase resistance. The goal of MI is to "walk" with clients through the treatment process, not "drag" them along. Similarly, teachers accompany students, guiding them as they grow vocally and artistically. In the words of Miller and Rollnick, "We advocate starting with clients wherever they are, and altering their self-perceptions, not by arguing about labels, but through substantially more effective means."[9]
4. *Adjust to client resistance* rather than opposing it directly. Resistance is common and indicates that the student views the situation differently than the teacher. Types of resistance frequently discussed in MI are arguing, interrupting, denying, and ignoring. When resistance occurs, consider changing direction or listen more carefully to what the singer is saying about the problem. In MI the client is a valuable resource in finding solutions to problems. This attitude is directly applicable to singing instruction, provided the teacher can step back from a controlling attitude and "roll" with the student's resistance. Doing so allows the teacher to express empathy, maintain respect, and avoid becoming judgmental. Specific strategies for addressing resistance are found in "Enhancing Motivation for Change in Substance Abuse Treatment" above.
5. *Support self-efficacy* and optimism. Appropriate and achievable goals should be discussed regularly in voice lessons, as will be elucidated later in this article. If the student believes that reaching these

goals is possible, their motivation will improve. For example, a student who is terrified of singing a full recital could create a semester-long lesson plan with weekly preparation benchmarks. In MI, clients come to believe they are responsible for their own growth, and things that initially feel overwhelming can be broken down into discrete small steps. Teachers should also recognize the student's strengths and mention them as appropriate to reinforce student self-efficacy.

In summary, voice teachers can incorporate motivational interviewing principles by doing the following:

- Remember that the student is a valuable resource for discovering answers to vocal problems. The student-teacher relationship can be a democratic partnership.
- Encourage the student to do most of the talking in the lesson by asking open-ended questions that don't have a particular "correct" response. This helps the teacher understand the student's point of view and builds the student-teacher relationship.
- Listen reflectively to make sure they understand what the student means, as well as what the students says. This encourages a deeper exploration of the vocal faults being addressed and builds empathy.
- Affirm the student's experience. This recognizes the challenges they are experiencing and reinforces the student's self-efficacy. Affirming student feelings and difficulties in their singing can help them take action and address the vocal problems.

Motivational interviewing is a powerful tool to help our students effect behavior change. We will next examine the process of identifying goals and establishing measurable objectives and timeframes for student success.

GOAL SETTING

Goal setting theory has a long research history that spans more than five decades, particularly within organizational psychology, which has historically concerned itself with understanding human motivation in order to elicit the most productivity from individuals or teams of people.[10] More recently, goal setting research has extended to the world of sports, particularly via expertise studies, yet little research has been conducted on musicians *per se*.[11] It is important to note that while a half century of goal setting research has demonstrated (in the words of two of its pioneers) "high internal and external validity," it has done so by generating literally hundreds of studies.[12] This, combined with the fact that goal setting is inextricably bound to human motivation, means that we cannot possibly account for all the possible threads that interweave throughout goal setting research in this short section. Nevertheless, it is not only possible to extrapolate several key findings from goal setting research and apply them in the voice studio; it is recommended for those who wish to incorporate evidence-based practices in the voice studio.

An overview of the general benefits of goal setting reveals that this practice has been shown to stimulate motivation in the short term, and to actually increase achievement in the long run. In other words, goal setting ignites volition, which is a key ingredient in attention, the first step to learning. Over time, with goal setting as an aide to learning, we might expect positive outcomes. Goal setting therefore promotes focus and cultivates self-regulation by aiding impulse control (another key ingredient in attention). In so doing, it helps the student musician calibrate efficient use of time and financial resources. These various benefits accrue to promote positive feelings, which, in turn, are likely to nurture yet more motivation within the learner.

Some of the most important parameters for both voice teachers and student singers to consider before using this technique are self-efficacy, specificity, format, level of difficulty, and process. Let us consider each of these parameters and why they have been shown to be important in order for goal setting to be effective. Teachers and students can use these parameters to construct their own goal setting assignment.

Goal setting Assignment: Parameters

- **Who is the goal setter?** Given the high degree of independence needed in mastering any instrument, including voice, the goal setter must be the student singer—not teacher, parents, or friends. Simple math can demonstrate that during an average week, the percentage of time that voice students spend in a lesson (8%) is far outweighed by the percentage of time they spend practicing on their own (92%).[13] Self-efficacy in music study is therefore a prerequisite condition for learning. Persistence and willingness to fail are additional conditions necessary for learning, but are

perilously weak or altogether absent in noncommitted students.

- **Goals should be valued by the goal setter.** Goal setters must be committed to their goals and view them as actually valuable. Aspirations that are not one's own are doomed from the outset. In addition, dreams that are freighted with the wishes of others (parents, for example) can severely compromise the mental health of the learner who takes on another's vision, as biographies of *Wunderkind*s in both music and sports have sadly attested.
- **Goals should be specific, yet focused on learning, not performance.** Goals that are specific ("I want to develop a more stable registration strategy") are more likely to be attained than goals that are vague ("I want to become a better singer"). Yet if goals are too specific, and especially if they are overly focused on performance (called "short term performance gains" from motor learning theory), these emphases can lead to a kind of "tunnel vision" among students that impedes learning. A better approach is to direct learners to focus on "acquiring the skills required to reach the goal" rather than reaching the goal itself.[14] This gets to the heart of the fundamental difference between performance and learning.

  > *Learning* is the process by which one acquires skill or knowledge. *Performance* refers to the manner or quality with which someone functions . . . learning is dynamic, unstable, and messy. Performance, on the other hand, is like the freeze-frame button on a video projector—it captures where the learner stands at a certain point in time along the learning continuum. Because of this frozen quality, most of us want our performances to be as polished as we can manage—the opposite of unstable and messy . . . The goals of learning and performance are—and *should* be—not just different, but diametrically opposed. When this is not well understood, the goals of learning and performance are conflated, and both typically suffer.[15]

- **Goals require commitment.** Goals that are written down, and especially those that are shared (either with a teacher or a learning community) are more likely to be heeded than those that simply exist in the learner's mind.
- **Goals should be challenging.** Learners can follow the old adage, "don't bite off more than you can chew," but teachers are enormously influential in this category as well, by setting learning parameters that are challenging, yet achievable. This decision is best guided by the so-called "Goldilocks Rule," which is not too hard, and not too soft, but just right. Nevertheless, given certain cultural predilections not to push learners too hard, teachers may be interested to know that research has shown that moderately high to frankly high levels of difficulty are best for learning.[16] Similarly, researchers have concluded that the solutions learners work out for themselves, through effort, are most deeply learned. Cognitive psychologist Robert Bjork poetically labeled these efforts "desirable difficulties."[17]
- **Goal lists should be comprised of both short-term and long-term goals.** Learners will likely stay more motivated if they can experience success relatively quickly with a short-term goal, while keeping their eyes on the prize of a long-term goal. The exercise of toggling between short- and long-term goals helps learners cognitively scaffold what is needed to improve in the motor realm. These are the "cognitive demands of deliberate practice."[18] Teachers can help by designing a few goals that virtually guarantee some early accomplishment, while adding others that feature "desirable difficulties."
- **Goal lists should answer the question, "How"?** In keeping with the tenets of specificity and commitment, students should be required to not only state their goals, but also write exactly how they intended to achieve them. Rather than, "I will practice a lot," which is vague, developing musicians could assess how much practice time they can devote to their instrument per week, draft a schedule, and then commit to it.
- **Goals require feedback.** Teachers typically do give regular feedback in the weekly voice lesson. But research has shown that learners improved most when that feedback concerned dimensions for which students had previously stated goals.[19] This alone can give weekly voice lessons a valuable structure and cohesiveness. Teachers in both private and academic settings can require students to complete a written goal setting assignment at the beginning of their relationship. This document should be periodically referenced, for it can serve as a lodestar for the duration of the student/teacher relationship and updated as skills are mastered, or goals are altered.

- **Goals should foster metacognition.** The ultimate outcome of the music teacher to student relationship—for the singer—should not just be the ability to give a great performance, but an increased and even unending capacity to learn. Self-efficacy in music study is not just a prerequisite condition for learning, it is vital to sustaining the singer throughout her singing life. We teachers must be in the business not only of teaching how to sing, but also teaching how to learn. Similarly, self-efficacy demands that singers not only learn how to sing but learn how to learn. This "learning about learning" is called *metacognition,* and one of its most effective tools is goal setting.[20]
- **Goals require maintenance and adjustment.** These are accomplished via periodic updates to the goal list based upon such obvious parameters as feedback from the teacher and goal attainment. In a perfect world, singers grow at a steady rate and mastery is obtained in linear fashion. Yet this utopian world does not exist, and goals must be regularly adjusted due to myriad causes, both negative and positive, such as injury or changed life circumstances.

Now let us consider a more regular, repeated writing assignment that offers a nimble vehicle not only for the maintenance and adjustment of goals, but also as a tool for implementing these goal setting parameters, the weekly journal.

JOURNALING, MOTOR SIMULATION AND MIRROR NEURONS

What is journaling? The simplest definition is, the act of writing down one's observations and thoughts. Journalists can open their lens wide to account for all events that one experiences within a specific time frame (such as travel journaling, for example, which includes sights, sounds, and tastes), or confine observations to one pursuit, like the development of a skill. It is the latter that can be of enormous benefit to learners if it is practiced as a cognitive exercise, not simply a record of one's feelings. It is also important to note at the outset that journaling, in the context of this article, is intended to be practiced regularly—ideally, weekly. Let us first consider the links between goal setting and journaling.

As already stated, goals must be written down in order to more likely be realized. While there is evidence that merely committing one's goals to paper (or in digital form) is enough to move the needle in the direction of accomplishment, unless learners make a concerted effort to revisit often this written pact they made with themselves, goals may be easily forgotten. This is due to notoriously labile human memory.

Any process of absorbing new information necessarily will collide with our previous memories, so in order to calm the collision and make sense of it all, we recombine new information with the memories we already own. This dynamic moment in the learning process is called *constructive memory,* and its product we may call a "constructed memory," which we loosely may liken to a dairy treat in which the vanilla ice cream base is like the foundation of our memories, and the chocolate chips, nuts, and multicolored sprinkles mixed in are the bits of accumulated new information.

The main benefit of constructive memory is its cumulative quality. We use past experiences to change our actions in the present, and also to imagine the future. We learn from our mistakes and build on our little victories. But detriments due to constructive memory abound, chief among them being memory's fallibility. It is now known that human memory is enormously prone to distortion and outright error. Because the information we absorb (the chocolate) is always mixed in with what we already know or think we know (the vanilla ice cream base), our memories are constantly in flux, and never completely pure or stable.[21]

Researchers note that while this flexibility may seem "highly dysfunctional, especially given the havoc that memory distortions can wreak in real-world contexts," constructive memory may serve an adaptive purpose.[22] The simple explanation is, our brains eject information deemed unimportant (this partially explains why it is so easy to forget where one has parked the car during a routine grocery shop, for example). Our brains flag information as important in a variety of ways; strong emotion is one, while practice and repetition are others. Regular journaling can function as that flag, by continually ruminating (in writing) about one's stated goals. In this way, weekly journaling can be the connective tissue between the ideation of goals and their actualization by functioning both as a record of the learner's progression and a roadmap that points the way toward future improvement. These benefits can be realized by

weekly journaling, a distinctly "no-tech" practice that nevertheless enjoys the same evidence-based support as goal setting since it is so closely related to that practice.

These attributes alone are enough to strongly recommend journaling as a vitamin pack for learning. But the explosion of neuroscience research in the 1990s (the presidentially decreed "Decade of the Brain") brought forth one amazing revelation after another about the inner workings of the brain. Brain imaging showed that merely thinking about an action actually causes the related motor program in the brain to activate.[23] This hugely important finding was dubbed *motor simulation theory*, also known as the *functional equivalence hypothesis.*[24] In acknowledgment to Team Music, note that one of the earliest fMRI studies successfully tested the functional equivalence hypothesis in pianists.[25]

A similar discovery arose during the same decade, in which a similar behavior in monkeys was observed. But in this case, the animals' motor programs fired when watching other animals eat.[26] The neurons that fired in the monkey's brains were christened *mirror neurons,* for their ability to "mirror" others' actions. This discovery got a huge boost by the famous neuroscientist V. S. Ramachandran, who declared mirror neurons as nothing less than "the driving force behind the great leap forward in human evolution."[27]

Hyperbolic connections between the MNS and many other human conditions (like autism and empathy) soon followed in the popular press, earning the MNS the dubious distinction as "the most hyped concept in neuroscience."[28] Hyperbole now has been set firmly aside, for the discovery of human mirror neurons and the related motor simulation theory can be neatly summed up this way: "Whether one moves, or one is planning to move, or thinking about someone else moving, overlapping neural networks are activated."[29] But it seems that one crucial condition must be met in order for our motor neurons to be stirred without doing: We have to have actually learned to do the activity enough ourselves to have developed our own motor memories (or motor *program)* of the action; or in the words of the popular mantra, "Go with the flow," as long as we have "flow" to begin, we may have enough of a neural basis to simply think (albeit in a concentrated way) about the action of singing and experience some benefit. This is where journaling comes in, but with an important caveat.

In order for journaling to leverage motor simulation theory and activate the human MNS, the singer must engage in one of the most vital aspects of mental practice: discipline. This can be accomplished in one of two ways, by either 1) actually feeling themselves "singing in their minds" (known as kinesthetic imagery) while writing about the experience, or 2) observing themselves singing on a video or audio recording (for observation can be solely aural) while journaling. In both methods, singers would be harnessing the power of the brain to practice the neural pathways necessary for fine singing, yet without uttering a sound. It is recommended that singers use a combination of these two methods to capture one week's equivalence of voice practice in a weekly practice journal. In order to derive the most benefit from journaling, teachers are advised to construct a journal assignment that guides the writer to stay within certain boundaries; this is best accomplished with the use of "prompts," that is, clear directives meant to keep the writer focused. In the same way that goals must be specific and not vague, prompts should also ask specific questions. For example, a directive, "Name three phrases of music of no more than four bars each that were challenging for you this week, and why," is superior to "How was your practice this week?," or even "What was challenging for you this week?"[30]

CONCLUSION

The three "no-tech" strategies presented in this paper are based in cognitive and behavioral sciences. These evidence-based tools can be utilized with technology as simple as pen and paper, yet they provide practical methods for incorporating science in the singing voice studio. "Low-tech" and "high-tech" tools will follow in the continuation of this series presented by the NATS Voice Science Advisory Committee. The committee members hope that these scientific tools may be practically useful for all singing instructors.

NOTES

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A leading scholar and researcher of the singing voice, **Dr. David Meyer** is an active performer, teacher, clinician, and voice scientist. He serves as associate professor of voice and voice pedagogy at Shenandoah Conservatory, and is Director of the Janette Ogg Voice Research Center. He is also a member of the Scientific Advisory Board of the Voice Foundation and is co-chairman of the Voice Science Advisory Committee of the National Association of Teachers of Singing. In 2010 he received the Van L. Lawrence Fellowship, a prestigious national award in recognition of his contributions to the field of teaching singing and the use of voice science. Dr. Meyer's students have won numerous awards and have sung in major venues worldwide.

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What can be said in New Year rhymes,
That not's been said a thousand times?

The new years come, the old years go,
We know we dream, we dream we know.

We rise up laughing with the light,
We lie down weeping with the night.

We hug the world until it sings,
We curse it then and sigh for wings.

We live, we love, we woo, we wed,
We wreathe our brides, we sheet our dead.

We laugh, we weep, we hope, we fear,
And that's the burden of the year.

"The Year," Ella Wheeler Wilcox