Managing Vocal Endurance Through Active Recovery

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Author Justin John Moniz addresses the evolving demands of operatic, musical theatre, and popular styles of singing, and the need for active recovery both during and after vocal activities. A discussion surrounding rate of perceived exertion as it relates to a singer's heart rate, breath rate, sweating, and fatigue, provides the framework for self-assessment principles which serve as tools to assist in cultivating longevity and success.

INTRODUCTION

The physical demands of singing in the world of opera date back to the Baroque period in which composers such as George Frederic Handel often tasked singers with interpreting virtuosic arias and individually realized ornamental figures. In Handel's *Alcina*, for example, Bradamante's aria "Vorrei vendicarmi" includes a seventy-two-note melismatic passage in the second phrase. Even composers of the Classical period, such as Wolfang Amadeus Mozart, challenged compositional norms through their writing for characters such as Die Königen der Nacht in *Die Zauberflöte*. This role includes multiple instances of F_6, such as during the Act 2 aria, "Der Hölle Rache."

Gaetano Donizetti presented a similar challenge for the character Tonio in his opera, *La fille du Régiment*. During the celebrated aria, "Ah mes amis," Donizetti includes nine instances of C_5 for the tenor. More recently, Thomas Ades' opera *The Exterminating Angel*, requires the soprano to sing an A_6, surpassing the G_6 Ades required in his previous opera, *The Tempest*.[1] The incorporation of A_6 is one of the most extreme examples of range exploitation in operatic history.

Musical theatre composers have also pushed the boundaries of the singing voice. Andrew Lloyd Weber's musical, *Evita*, is one of the earliest examples in musical theatre of a composer moving towards great extremes in range, tessitura, and registration, particularly as it relates to the AFAB (assigned female at birth) voice and the role of Eva Peron. Before *Evita*, most musical theatre composers called for an AFAB voice to belt up to C_5 as the highest pitch. Since the introduction of *Evita*, however, a belt aesthetic is now required up to F_5.

In the musical *Wicked*, composer Stephen Schwartz utilizes a similar framework with the incorporation of F_5 during the end of Elphaba's "Defying Gravity." In Mark Schoenfield and Barri McPherson's musical *Brooklyn*, the title character must perform a $G^{\#}{}_5$ during the last phrase of "Once Upon A Time." Just as AFAB musical theatre artists had to adapt their vocal technique

Journal of Singing, January/February 2024
Volume 80, No. 3, pp. 321–325
https://doi.org/10.53830/sing.00008

to produce the Broadway belt sound in the 1930's, current AFAB musical theatre singers have had to adjust their resonance models and curtail register events to balance both vocal production and endurance.[2]

Pop and rock songwriters have a storied history of exploring vocal extremes. In the song "Barracuda," as performed by Heart, the vocal line jumps from an E_4 to an $F^{\#}_5$ with a call for the utilization of a heavy belt mechanism during the end of the first chorus.[3] A second example is "Dream On," as performed by the band Aerosmith, which presents several considerable challenges for the AMAB (assigned male at birth) voice. First, the text-driven and necessary rhythmic delivery of this song make it difficult to micromanage vowel shapes at the desired performance tempo. These challenges, combined with the tessitura of the chorus (F_4–$A^{\flat}_4$), before the vocal line jumps up an octave to F_5–$A^{\flat}_5$, all require a significant level of endurance to effectively execute.

Whether through classical, musical theatre, or popular singing styles, the many vocal demands placed on singers regarding range, tessitura, and registration are ever evolving. Considerations must also be made for increased levels of intensity as they relate to volume, resonance and stylistic parameters impacting vocal load—specifically as they pertain to any imbalance placed upon the vocal apparatus. Finally, and no less a priority, is the duration of any vocal activity and its impact on a singer's ability to generate endurance.[4]

MANAGING ENDURANCE

"Endurance" is a term often used to describe one's ability to sustain a specific task for any calculated length of time. In the world of sports medicine, endurance activities are characterized by repeated isotonic contractions of large skeletal muscle groups.[5] As we consider these descriptions of endurance in the context of vocal production, we must recognize that "the whole larynx is composed of skeletal muscles [and] if we are to apply exercise physiology principles to voice function, the focus is on the muscular aspects of laryngeal function."[6]

The need for a significant level of vocal athleticism has long been a topic of discussion among performers and voice teachers alike, especially as composers have continued to challenge both traditional norms and established limitations of the singing voice based on type. The process of singing is so similar to a myriad of athletic activities that the term "vocal athlete" is commonly utilized in pedagogic discourse.[7] Many researchers have begun to identify parallels between athletes and singers in training models.

> In truth, some of the primary principles of muscle training are obvious in the voice training protocols and pedagogies that are used in both studio and clinic. There is little argument to the exercise performance premise that excellent technique is necessary for optimal function. Excellent technique for a tennis serve will generally translate to more consistently accurate tennis serves. The same is also supported in vocal training, as excellent vocal technique will lead to optimal vocal function.[8]

As we investigate sustainable practices as they relate to endurance, it is worth acknowledging the common principles present in both singing and exercise physiology. Any consistent technique is one that can be sustained. More specifically, an effective vocal technique relies on a singer's ability to replicate a process built on favorable, efficient choices which provide balance within the vocal mechanism. As we further consider how to effectively manage endurance within the context of singing, the primary focus is on muscular aspects of laryngeal function.[9]

DEFINING ACTIVE RECOVERY

The goal of any recovery technique is to allow the body to stabilize operations and restore a sense of homeostasis throughout its systems. Following any increased levels of exertion, cool down exercises (or simply "cool-downs") offer the body an opportunity to reduce blood pressure and restore the heart rate to pre-performance levels.

> Singers are taught the importance of warming up the voice from the beginning of vocal studies. They become a crucial part of a classical singer's training and routine. This study indicates that also including a cool-down regimen after a heavy voice load is equally important. Perceptually, vocal cool-downs lead to faster recovery time, return the speaking voice to normal more quickly, and create a significantly improved overall sense of vocal well-being after significant length of singing.[10]

Then, of course, there is also the time between cool downs and the subsequent physical activity in which an athlete must consider active recovery. There are two scenarios which one might utilize active recovery. First,

active recovery is one that might take place between intense periods of vocal usage. For instance, a Broadway performer might engage in active recovery during a dark day, since levels of exertion are much lower than on a performance day. An active recovery in this case might include vocal activity with a low vocal load, a low perceived level of exertion, or both. This could be something as simple as a series of SOVT exercises through the middle voice to assist the singer in balancing pressure thresholds at speech level. Alternatively, an active recovery might be in the form of myofascial release, specifically laryngeal massage. Myofascial release is also referred to as "trigger point therapy." These trigger points can be identified as stiff points in the tissue which restrict both muscle and joint movement.[11] Additionally, the utilization of a foam roller or lacrosse ball could provide considerable benefits by facilitating the reduction of muscle *adhesions* throughout the body. Muscle adhesions disrupt the mobility of tissue throughout the body. Adhesions are sometimes dismissed as lumps or knots in the muscle, but are essentially a type of scar tissue that forms between two surfaces (most commonly between muscles and nerves). Adhesions can cause pain, limited range of motion, and weakness.

A singer might also consider active recovery during the physical activity itself. For comparison, let us identify pacing levels as they relate to running. We will refer to six miles per hour as a jog, seven miles per hour as a light run, eight miles per hour as a base run, nine miles per hour as a push pace, and ten miles per hour as a sprint. In the context of any distance training, it is imperative for a runner to carefully consider their pacing as it has a direct impact on the overall success of the run. In the context of a marathon, for instance, many inexperienced runners struggle to find a start pace that is conducive for generating and sustaining endurance. For runners who perform with a listening device, the energy at the start line paired with a song that has a high beats per minute (BPM) rate can place the athlete into overdrive early on and negatively impact their performance throughout the remainder of the race.

It is obvious why one should consider how active recovery might play a significant role during the race itself. If a runner spends two minutes at their fast pace of nine miles per hour, they might spend the next minute in a light run of seven miles per hour. This reduction in effort and level of exertion offers the runner an opportunity to engage in a brief recovery period as their heart rate drops and their breathing pattern stabilizes. Similarly, in the context of a distance race, a sprint speed would be most easily achieved with the appropriate setup (for example, potentially avoiding extending time at a fast pace in the minutes leading up to a sprint). Offering the body an opportunity to recover prior to increasing the load provides an invaluable period of active recovery. Endurance athletes must carefully monitor their perceived levels of exertion to optimize their performance and delay increased fatigue.

PRACTICAL APPLICATION

As voice practitioners, we might consider the use of active recovery in the context of a role. It is first important to recognize that the terrain and trajectory of such a journey are determined by the composer and the demands they place on the artist through the vocal writing itself. Considerations of range, tessitura, and orchestration are important parameters to examine when mapping out a plan of action. Just as a runner would consider a course's overall length and elevation gain, the vocal athlete will gauge preparations following a careful and thorough assessment of the unique challenges of the course.

Like the novice runner, many less experienced or early career artists find themselves grappling with the adrenaline and increased momentum of a performance, sometimes too early on. The pacing and overall success of any endeavor may be sacrificed when levels of exertion are not effectively balanced or appropriately timed. In exercise physiology, a rate of perceived exertion (RPE) scale is a tool used by an athlete to express their sense of difficulty during exercise. Nerys Williams addresses exertion as something uniquely individual.

> The symptom of exertion is unique to an individual and can be used as a subjective estimate of the work intensity undertaken across a variety of populations. The intensity of work is important because of the risks of musculoskeletal injuries and disorders arising from a mismatch between the worker's capability and the physical demands of their job.[12]

There is no greater priority than reducing the risk of injury. In the 1950s, Swedish researcher Gunnar Borg

TABLE 1. BORG RPE Scale

Rating	Perceived Exertion Level
6	
7	Very, very light
8	
9	Very light
10	
11	Fairly light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Very, very hard
20	

created the Borg Rating of Perceived Exertion (RPE) Scale to measure an individual's perceived effort and exertion based on the physical sensations experienced during physical activity. These categories include alterations in breath rate, heart rate, sweating, and muscle fatigue.[13] Table 1 represents the BORG RPE Scale. Although a subjective model of assessment, it has been proven to be an effective tool as it allows the athlete to regulate their levels of intensity more easily throughout an activity. For example, when a runner wants to engage in a moderate level of intensity, they would work toward a range of 12–14, "somewhat hard." If they describe their breathing and muscle fatigue as a 9, "very light," they will aim to increase the intensity. However, if the runner assessed themselves at a 19, "very, very hard," they might consider reducing their speed to adjust to a more moderate level of intensity to effectively manage their endurance.

The RPE scale now exists in two forms. Table 2 provides the RPE scale most used today, according to the National Academy of Sports Medicine.[14] The RPE scale of 0–10 has been found to be a bit more user friendly.

CONCLUSION

Recently, the distinction between the tasks of singers and athletes has been blurred, as singers are continually being required to achieve even greater levels of stabilization, flexibility, strength, and endurance. One's ability to operate within a framework of sustainability is dependent upon their competence to self-assess levels of exertion and vocal loading before, during, and after vocal usage. A heightened sense of awareness equips the vocal athlete with an ability to make the appropriate adjustments throughout any practice session, rehearsal, or performance.

TABLE 2. Rate of Exertion (RPE) Scale

Rating	Perceived Exertion Level
0	No exertion, at rest
1	Very light
2–3	Light
4–5	Moderate, somewhat hard
6–7	High, vigorous
8–9	Very hard
10	Maximum effort, highest possible

Regardless of classical, musical theatre, or popular styles of singing, the vocal athlete's ability to manage endurance in any genre is essential for long-term vocal health and wellness. While further research is necessary to expound upon perceived levels of exertion as they relate to a singer's heart rate, breath rate, sweating, and fatigue, a greater understanding of those guiding self-assessment principles will serve as an effective tool to assist in both longevity and success. This framework should continue to inform future pedagogic discourse through evidence-based practice.

NOTES

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