VOCAL FATIGUE

Can scientific study of the voice assist choral singers?

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The concept that vocal performance is an athletic activity, as well as an artistic presentation, is now well-established among scientists and clinicians of the voice. Today's requirements for workplace insurance, workers' compensation and occupational medicine have led to the study of voice fatigue, similar to other kinds of repetitive activity that can result in an over-use syndrome or repetitive strain injury.

The definition of voice fatigue is usually associated with increased vocal effort, reduced pitch range and flexibility, and a reduction in power or projection or quality. Possible causes are that the muscles of the voice box or respiratory system tire, and the brain (which acts as the 'command centre' to activate the muscles) responds less effectively to the ongoing vocal task. The vocal cords (or vocal folds) are composed of several different layers – muscle, connective tissue and a moist lining called mucosa – all of which move independently during the cycle in which the vocal cords open and close. These layers all respond differently to factors such as dehydration, blood flow, inflammation and mechanical impact.

Current literature suggests that the most important determinant of fatigue is not the vocal cord muscles themselves, but changes in the tension of the external laryngeal muscles. This results in a rise of the vertical position of the larynx and the use of muscles in the neck, which in turn requires more force to bring the vocal cords into a position where vibration can occur with the expired breath.

Fatigue is most likely to occur at sustained high pitch and loud intensity, with some vocalists being more susceptible due to underlying genetic, anatomic and emotional factors. The pre-existence of vocal tract abnormalities, such as inflammation or structural conditions like vocal nodules, will further aggravate the onset of fatigue as the air pressure needed to activate the chordal vibration is higher.

Vocal teachers and experienced singers will be able to recognise the position and functioning of the internal and external muscles better than untrained voice users and can therefore develop compensatory techniques.

But how does this information assist the amateur choral singer who may be facing increased or fluctuating demands for rehearsal leading up to performance?
First, a choral director or vocal coach can assist in certain aspects of technique including:

- allocating the singer to the appropriate voice part
- suggesting vowel modifications to reduce strain for high or sustained repertoire
- encouraging better projection with reduced effort
- use of warm-up exercises

- giving guidance on singing during or after illness.

Other factors that may reduce fatigue include:

- balancing a demanding repertoire with rest periods or less fatiguing items during performance
- avoiding prolonged standing
- encouraging adequate rest and good itinerary planning, particularly on tours
- using silent periods prior to performance
- restricting vocalisation over auxiliary noise (e.g. on planes or coaches)
- maintaining good hydration, especially in dry or dusty environments

Dietary modification can also help – for example, avoiding large or fatty meals before performance, as these foods are retained longer in the stomach and may reduce chest and abdominal movement. Similarly, caffeine and spicy foods tend to cause heartburn, that can irritate the voice box, and are also dehydrating. Alcohol has the potential to impair the ability of the brain, and high glycaemic index foods, such as simple sugars, cause fluctuating blood sugar and energy levels.

In summary, scientific studies and perceptual observations suggest that human vocalisation is both intricate and adaptive. It is incumbent on the singer to learn about the triggers and to know the mechanisms that can reduce fatigue and improve performance, enjoyment and quality.

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