

## Critical Review:

### Is vocal hygiene education effective for the prevention and management of voice difficulties among singers?

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This critical review examines the effectiveness of vocal hygiene education in the prevention and management of voice difficulties encountered by professional and non-professional singers. Five studies are evaluated for the purposes of this review, including a cross-sectional survey research study, a prospective cohort study, a case-series pre-posttest study and two randomized clinical trials. Overall, the findings of this review suggest that vocal hygiene education may not be an effective intervention for singers, however, future research is recommended due to the limitations of the studies examined. Clinical implications are discussed in relation to the role of the speech-language pathologist (SLP).

#### *Introduction*

Professional voice users, such as singers, are at a significantly increased risk of developing voice problems because of the unique demands that are placed on the vocal mechanism. As a result, singers are more likely to report high rates of vocal disability, diagnosed vocal conditions and handicap, in comparison to non-singers (Phyland, Oates, & Greenwood, 1999).

Studies have shown that singers have an interest in increasing their knowledge in areas such as the care of the vocal mechanism and voice disorders, among others, but that they also have existing misconceptions about vocal anatomy and physiology (Braun-Janzen & Zeine 2008; Kwak, Strasney, Hathway, Minard & Ongkasuwan, 2013). Additionally, singers are unlikely to seek medical advice until after they have encountered a major voice problem. When this occurs, the singing teacher, as opposed to a medical professional, such as a SLP, acts as the most common and first source of information (Kwak et al., 2013).

Overall, singers report a lack of knowledge about the role of SLPs in the treatment and prevention of voice disorders (Braun-Janzen et al., 2008; Kwak et al., 2013). There are mixed reports in the literature as to whether or not voice training from the singing teacher provides a sufficient degree of education in areas such as vocal hygiene education. Tepe, Deutsch, Sampson, Lawless, Reilly & Sataloff (2002), demonstrated that there was no difference between young choral singers who had a history of vocal lessons and those who did not, in risk of voice difficulties. On the contrary, another study determined that musical theatre performance students with vocal training had better vocal hygiene, in contrast to untrained students (Donahue, LeBorgne, Brehm & Weinrich, 2013).

Awareness of the importance of collaboration between singing teachers and medical professionals has improved and their partnership will better support singers (American Speech and Hearing Association, 2005). In order to best serve this client population, it is important for SLPs to know under what circumstances vocal hygiene education is an effective intervention to provide for this client population.

#### *Objective*

The objective of this paper is to critically evaluate the existing literature regarding the effectiveness of vocal hygiene education for the prevention and management of voice issues in singers.

#### *Methods*

##### Search Strategy

Online databases, including Google Scholar, PubMed, and Web of Science, were used to find articles related to the topic of interest. Keywords for the search were as follows:

[(vocal) OR (voice)] AND (hygiene) AND [(education) OR (training)] AND (sing\*)

The search was limited to journal articles written in English between 2000 and 2018. Additionally, the reference lists of selected articles were used to find relevant studies.

##### Selection Criteria

Articles were selected for this review if some or all of the participants were singers (nonprofessional or professional) and the intervention had a component related to vocal hygiene education, whether that be a dedicated vocal hygiene education course or implementation or analysis of vocal hygiene practices.

### Data Collection

The results of the literature search yielded five articles that met the inclusion criteria. This included a cross-sectional survey research study, a prospective cohort study, a case series pre-posttest study and two randomized clinical trials.

## *Results*

### Survey Research

Survey research is nonexperimental and usually provides quantitative information about a population. This research is relatively easy to administer and allows the researcher to collect a large sample and a wide range of information. The possibility of bias must be considered in relation to participant motivation, question interpretation and the number of responses collected, among other factors.

**Achey, He and Akst (2016)** presented findings from a cross-sectional survey study that assessed classical singing students' compliance with vocal hygiene practices, and the relationship between self-reported vocal hygiene practice and singing voice handicap.

Surveys were distributed to 215 students, aged 16 to 63 (mean age of 22), from two major conservatory voice programs, of which 104 were anonymously completed and returned.

The survey assessed four major areas including demographics, risk factors for voice problems, singing voice handicap and vocal hygiene practices as measured by a vocal hygiene index developed by the researchers. Additional measures addressed length of training, vocal health history and primary goals for singing. Actual vocal hygiene practices were not measured since only subjective data was collected. The researchers performed appropriate statistical analyses using suitable statistical models.

Results indicated that students consider vocal hygiene factors more during performance periods than nonperformance periods. Of the 11 vocal hygiene factors analyzed, consideration of singing voice use during performance periods is significantly correlated with reduced vocal handicap. In contrast, consideration of stress reduction for both performance and nonperformance periods is significantly correlated with increased vocal handicap. All other vocal hygiene factors did not significantly correlate with voice handicap.

Limitations of this study include that some of the survey questions resulted in poor data because of their

ambiguity and the survey was not piloted as it was developed by the researchers for the purpose of this investigation. The researchers also acknowledged that studies have shown that voice handicap indices such as the one used for this investigation are not always accurate predictors of vocal fold pathology, and thus the results from this measure should be carefully analyzed as to not draw inappropriate conclusions.

Overall, the results of this study provide suggestive evidence that classical singing students consider vocal hygiene factors more during performance periods than nonperformance periods and that vocal hygiene education does not have a major impact on vocal handicap.

### Cohort Study

Cohort studies explore how a single group's outcomes are impacted over time by exposure to specific conditions. This type of study is useful when conditions are difficult to replicate in an experimental setting. However, cohort studies can be time-consuming, expensive, and are not beneficial for the evaluation of rare diseases or disorders.

A study by **Rangarathnam, Paramby and McCullough (2018)** used a prospective cohort study to investigate the effects of intensive stage rehearsal and performance on the perceptual, acoustic and aerodynamic measures of voice and the impact of knowledge and practice of vocal hygiene on measures of voice during intensive vocal performance.

The participants included 19 stage actors, aged 19 to 74 years of age, who were participating in the Arkansas Shakespeare Theatre festival. Of the participants, 13 had received vocal hygiene education and 16 had received professional voice training. Participants reported varying amounts of singing involved in their performance (e.g., no response, none, minimal, half, most, all).

Participants completed a Vocal Hygiene and Training Questionnaire documenting their vocal use, vocal hygiene and previous vocal training, and were divided into two groups based on their knowledge of vocal hygiene and training. Additionally, before and after 1 month of intensive rehearsals and stage performances, participants completed auditory-perceptual, acoustic, aerodynamic and Quality of Life (QOL) measures. Throughout the study participants also kept a logbook of voice use and other daily activities. The researchers performed appropriate statistical analyses for the methodology and measures collected.

Results showed that participants had statistically significant deterioration in auditory-perceptual and aerodynamic measures following 1 month of intense voice use. For the most part, knowledge of vocal hygiene or vocal training did not have a significant impact on the changes noted in participants' voices, except for some common sense practices like alcohol consumption and water intake.

Limitations of this study include small sample size and a lack of clearly defined questions about professional voice training and vocal hygiene practices for the questionnaire used to establish groups. It was not clear as to whether or not the two groups analyzed in terms of vocal hygiene education and training were balanced for other factors like age, sex, and amount of singing involved in their performances.

Overall, this study provides suggestive evidence that vocal hygiene education does not have a major impact on vocal issues encountered by stage actors following intensive stage rehearsals and performances.

#### Case Series Pre-posttest Study

Case series pre-posttest studies examine the effects of the same treatment or known exposure on a group of individuals. These studies can be easier and more cost effective to conduct but the internal validity of these studies is often low because of the absence of a comparison group. In turn, researchers are limited in drawing conclusions about how participants compare to individuals with a different treatment or condition.

**Broaddus-Lawrence, Treole, McCabe, Allen and Toppin (2000)** conducted a case series pre-posttest study to investigate the effects of vocal hygiene education on the vocal hygiene behaviours and perceptual vocal characteristics of untrained singers.

The participants included 11 untrained singers (3 men, 8 women) aged 18 to 22 years. All of the participants had received less than 2 years of formal voice training, no vocal hygiene training and were deemed vocally healthy. Participants attended four 1-hour group sessions on vocal hygiene covering a range of topics including but not limited to vocally abusive behaviours, voice disorders commonly seen in singers and the anatomy and physiology of the vocal mechanism.

The researchers collected demographic information and determined vocal hygiene knowledge from a pre-instructional survey. A baseline survey about daily vocal habits and abuses and participants' perceptions of their voice was collected pre and 6 weeks post final session. These surveys, which were developed by the

researchers, provided subjective measures. Appropriate statistical analyses were conducted and corrections were made to control for family-wise error.

Results showed no statistically significant changes in reported vocally abusive behaviours, vocal hygiene behaviours, perceptions of their singing or speaking voices or perceptions of their use of vocal hygiene knowledge following the intervention. However, all participants indicated that they valued the knowledge from the vocal hygiene education and agreed or strongly agreed with the statements "I would recommend a class like this to a fellow singer", and "I have a better understanding of my vocal instrument now than I had before the class began".

Limitations for this study include small sample size and the possible presence of confounding variables. In addition, the participants were not balanced based on sex and recruitment and selection criteria were not clearly outlined. Objective measures, such as instrumental analysis of acoustic voice parameters were not included which may have provided more concrete data to show vocal change. The time interval between pre and posttest may not have been sufficient to show a statistically significant change in the dependent variables.

Overall, this case series pre-posttest study research is equivocal that vocal hygiene education does not impact vocal hygiene behaviours and perceptual vocal characteristics of untrained singers.

#### Randomized Clinical Trial

Randomized clinical trials aim to reduce bias and establish causation by randomly allocating participants to one of two groups. For this reason, these studies represent the highest levels of evidence when conducted appropriately. In some cases, randomized clinical trials are not ethical because they can involve withholding a certain treatment from a group. They can also be costly and time-consuming. Results may not be generalizable if the intervention conditions are not representative of real-world circumstances.

**Rodríguez-Parra, Adrián and Casado (2011)** used a randomized clinical trial with a limited multi-dimensional protocol to compare voice therapy and vocal hygiene interventions in individuals with dysphonia.

The participants of the study were 42 individuals with voice disorders (39 women, 3 men), aged 16 to 65 years. Two of the participants were professional singers. Participants were divided into two groups; one group

receiving voice therapy over the course of 24 sessions, and the other group receiving vocal hygiene education during a single 60-minute session. Each individual's vocal function was assessed with an ABAAA design before and 3 times following treatment (initially after treatment, 4 weeks post-1, 12 weeks post-2).

Assessments included laryngostroboscopic, perceptual, acoustic and spectrographic measures administered by an ENT specialist and SLP, as well as acoustic/aerodynamic measures and self-rating questionnaires administered by a SLP and psychologist. Appropriate statistical tests were conducted to analyze quantitative and qualitative measures and compare groups.

Results indicated that there were no significant differences between groups at baseline for most of the variables considered. After treatment (post-1), significant differences were noted between groups for 5 out of 8 continuous variables measured in favour of voice therapy. Qualitative measures also confirmed this result. Participants in the voice therapy group also showed greater progress over time.

A major limitation of this research is that the vocal hygiene education course was very brief in comparison to voice therapy. Vocal hygiene education was also incorporated into the voice therapy protocol which may have contributed to its success when delivered with greater frequency. The study did not use blind evaluators which adds an element of potential bias. Only two of the participants in the study were singers which makes it challenging to generalize the results to singers.

Overall, this research is suggestive that vocal hygiene education alone is less effective than voice therapy for individuals with voice disorders, including professional singers.

A study by **Yiu and Chan (2003)** used a randomized clinical trial to determine the amount of singing that would lead to vocal fatigue and the effects that vocal hygiene practices during singing have on voice quality and function.

Participants of the study included 20 untrained singers (10 men, 10 women), aged 20 to 25 years. The participants were randomly assigned to two groups; one group was given hydration and short periods of vocal rest at regular intervals during singing, and the other group was instructed to sing continuously without taking any vocal hygiene precautions. All participants were instructed to sing until they reported feeling vocal

fatigue. The study took place in a quiet room with karaoke capabilities.

Voice recordings of a sustained /a/ and a spoken sentence were analyzed for several acoustic and perceptual measures at baseline, two times during singing, and one time immediately after singing. Voice recordings of low and high pitches at different loudness levels were also analyzed for phonetogram analysis. Appropriate statistical analyses were conducted, accommodating for the small sample size.

Results showed that singers who practiced vocal hygiene sang significantly longer before experiencing vocal fatigue than those singers who did not. The vocal hygiene group showed no significant changes in any of the acoustic, perceptual or phonetogram measures. In comparison, singers that did not use vocal hygiene practices showed significant changes in acoustic and phonetogram measures.

Although this study contained well-defined participant criteria, a major limitation is the small sample size. In addition, the data collected pertaining to vocal fatigue was based solely on subjective data from the participants and was not clearly defined. The phonetogram tasks completed were very vocally demanding and time intensive which may have added to vocal fatigue. During each voice recording session, participants made three recordings and were directed to choose the one they believed sounded best for analysis, instead of using all data collected. The songs performed during the study were varied based on the singer's preference, therefore some singers may have caused more vocal fatigue by choosing songs that were inappropriate for their voice.

Overall, this research is equivocal that vocal hygiene practices allow untrained singers to perform longer and prevent vocal issues during karaoke singing.

### ***Discussion***

The studies examined for this critical review were extremely varied in their research methods and four of the five studies examined uncovered that vocal hygiene education is not an effective intervention for singers (Rodríguez-Parra et al., 2011; Rangarathnam et al. 2018; Achey et al., 2016; Broaddus-Lawrence et al., 2000). The single study in support of vocal hygiene education for singers is equivocal (Yiu et al., 2003). As a result, it is difficult to determine how to best serve this unique client population.

It is important to consider how each of the studies examined defined vocal hygiene. Each study took into

consideration a variety of different factors, from caffeine intake to throat clearing or medications, so it is unclear what aspects of vocal hygiene are best to evaluate and have the greatest implications for voice users. The vocal hygiene behaviours that were noted to have significant effects included alcohol consumption, water intake, and stress.

The participants from the studies in this review included both non-professional and professional singers, therefore, it is difficult to generalize the data to one particular group. In addition, professional and non-professional singers may have different levels of incentive to implement vocal hygiene education or have more awareness of changes in their voice because of the different demands on their voice. Professional singers may be more motivated since their instrument is their primary source of income. This may have impacted the results collected from subjective measures.

Future research should examine the effects of longer and more in-depth vocal hygiene education intervention. The vocal hygiene education in the studies examined ranged from immediate teaching and implementation to four 1-hour sessions. Researchers acknowledged that the amount of intervention in some studies may not be enough to record a significant change in voice measures. Although the goal of many SLPs, and institutions in general, is to achieve the greatest possible positive effects and changes with the least amount of sessions, this may not be feasible for vocal hygiene education. It is plausible that vocal hygiene education implemented over a longer time period or in a different setting, such as the singing lesson, might be more effective.

All of the studies except for the survey research study had the limitation of small sample size. Additionally, all of the studies examined included limited or no objective measures of voice. These are two reoccurring major limitations that need to be considered for future research. Future studies should also aim to be balanced for sex and include a wide range of ages.

### ***Clinical Implications***

SLPs may cautiously recommend or conduct vocal hygiene education intervention for singers for the prevention and management of voice difficulties. The research analyzed for this critical review contained several limitations and overall, there was an absence of compelling evidence in favour of vocal hygiene education. Even though participants in the Achey et al. (2016) study shared that they highly valued the knowledge that they gained regardless of the lack of changes in voice measures, vocal hygiene education

may not be an effective use of clinicians' time and resources if no significant changes are made. More research is needed to determine what delivery of vocal hygiene education if any is effective in voice prevention and rehabilitation for singers.

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