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The effect of vocal hygiene and behavior modification instruction on the self-reported vocal health habits of public school music teachers

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Abstract

This study examined the effects of vocal hygiene and behavior modification instruction on self-reported behaviors of music teachers. Subjects ($N = 76$) reported daily behaviors for eight weeks: water consumption, warm-up, talking over music/noise, vocal rest, non-verbal commands, and vocal problems. Subjects were in experimental group 1 or 2, or the control group. Both experimental groups received vocal hygiene instruction. Experimental group 2 also received behavior modification information designed to help teachers individually identify and correct their vocal problems. Results showed experimental group 2 significantly increased vocal rest and significantly decreased reports of vocal problems in the weeks closest to treatment. Although differences provide limited information, the indications stress the importance of behavior modification's inclusion in vocal hygiene programs. Individual variance implies some subjects have difficulty managing vocal hygiene routines. Additional study of effects of multiple, varied treatment sessions may clarify the impact of treatments over extended periods of time.

Key words

changing habits, professional voice user, voice care, vocal rest

The music teaching profession requires an enormous amount of communication through speaking and singing. Although teachers are encouraged to develop healthy vocal habits, teaching schedules and large classes in many public schools throughout the world can make such a task difficult. Gaining more knowledge about vocal hygiene (care of the voice) and including it in teacher education programs has been a recurring theme in literature.

This study sought to answer the following research questions:

1. Will scores on a vocal hygiene instruction session post-test be significantly higher than scores on the pre-test, and how will subjects rate the effectiveness of treatment sessions?
2. Will there be any significant changes in self-reported behaviors after experimental subjects attend a vocal hygiene instruction session?

3. Will a presentation of vocal hygiene instruction compel subjects to make positive changes in behavior over time, or must it be combined with some type of behavior modification session in order to bring about significant differences?
4. Will any group of subjects report significant changes in the number of vocal problems?

Review of literature

Approximately 25 percent of the population in the USA has a career involving critical voice use (Ramig & Verdolini, 1998). Teachers have been identified as one of the largest groups of professional voice users in the USA (Titze, Lemke, & Montequin, 1997), and the teaching profession has been recognized (Gotaas & Starr, 1993; Herrington-Hall, Lee, Stemple, Niemi, & McHone, 1988; Smith, Lemke, Taylor, Kirchner, and Hoffman, 1998; Titze et al., 1997) as one of the occupations to report vocal problems most often. Smith, Kirchner, Taylor, Hoffman, and Lemke (1998) reported over 38 percent of teachers ($N = 554$) complained the profession had adversely affected their voice, and 39 percent of those teachers felt the need to reduce teaching activities as a result. In another study ($N = 237$), Sapir, Keidar, and Mathers-Schmidt (1993) observed a number of reported voice-related problems including missed work and interference with teaching responsibilities. Up to 22 percent of teachers responding to Russell, Oates, and Greenwood's (1998) survey ($N = 877$) 'experienced regular voice problems that interfere with their ability to use their voices as they wish' (p. 476).

In numerous studies, the need for vocal hygiene education is highlighted (Askren, 2000; Duffy & Hazlett, 2004; Hendry, 2001; Russell et al., 1998; Scrimgeour & Meyer, 2002; Simberg, Laine, Sala, & Rönnemaa, 2000; Smith, Lemke, et al., 1998). Approximately one-third of respondents in Askren's (2000) survey stated they received no vocal health training of any type in teacher education programs. A large percentage of voice use is simple communication through speech rather than in rigorous performance, and many voice problems develop out of improper speaking habits because of a tendency to disassociate the part of the voice used for singing from the part used for speaking (Lawrence, 1983; Sataloff, 1991).

Studies have revealed a gap between possessing knowledge about healthy vocal practices and actually making them habitual. Broaddus-Lawrence, Treole, McCabe, Allen, and Toppin (2000) and Chan (1994) discovered no significant difference in vocal habits of subjects before and after vocal hygiene education, although subjects reported a positive perceived value of the knowledge gained. Reviewers of this research claimed the studies 'focused primarily on indirect approaches (education and prevention), with no inclusion of direct approaches (teaching of specific vocal techniques)' (Mattiske, Oates, & Greenwood, 1998, p. 497). More direct approaches (very specific vocal hygiene information, targeted attempts at vocal abuse reduction, and vocal function exercises) with voice disorder patients (Holmberg, Hillman, Hammarberg, Södersten, & Doyle, 2001; Roy et al., 2001) produced positive results. In order for modification of vocal habits to be successful, target behaviors should be identified, defined and assessed (Johnson, 1985). However, Roy et al. (2002) concluded carrying out vocal health goals may be very difficult for teachers due to the demands of the teaching occupation, and future studies on the effectiveness of vocal hygiene programs with teachers should find creative ways to motivate subjects.

Behavior modification in exercise, dental hygiene, and weight control can be compared to behavior modification in vocal health; all involve reducing risk factors but require adherence to be effective. When reviewing literature on exercise compliance, Dishman (1982) concluded exercise should become habitual rather than just talked about as a health benefit. Keffer (1999) echoed this theme in a study of dental hygiene compliance; behavior

modification techniques are much more effective at changing habits than education programs alone. Subjects in weight control studies who received information tailored to their particular issues or needs were more likely to change behavior than subjects who received general information (Kreuter, Bull, Clark, & Oswald, 1999).

The self-report method of data collection is often preferred by researchers because of its versatility, and it is often used in studies of behavior change (Baranowski, 1988). Its appeal is positive to many researchers because results may be quickly and easily obtained without enormous cost (Baranowski, 1985). Scherer, Titze, Raphael, and Wood (1985) found subjects' self-reported perceptions of vocal fatigue were in agreement with medical assessment as well as listener evaluation. According to Kitch and Oates (1994), subjects who gave self-reports had the ability to recall the details of episodes of vocal fatigue quite well, in spite of earlier reports that recalling past experiences can be unreliable (Hollon & Bemis, 1981). Baranowski et al. (1984) suggested a daily report is more precise, however, because memory problems are not as prevalent when subjects record behavior frequently, and Verbrugge (1980) found daily data recording consistently shows greater frequency of activity than weekly reporting.

Method

Subjects ($N = 76$) were general and/or vocal music teachers from a large metropolitan area in the USA who volunteered to participate in 'The Vocal Health Project' by responding to a letter of invitation. Elementary ($n = 60$), middle/junior high ($n = 9$), and high school ($n = 7$) teachers were represented within the total group of subjects. A pre-project questionnaire collected reports of general vocal health, any past or present vocal problems, and demographic information including teaching experience, years of voice instruction, gender and age. Each teacher received a pre-project questionnaire, vocal health log sheets, an information and consent form, and stamped envelopes with instructions to return each week's data to the researcher. After indicating availability to attend treatment sessions, subjects were assigned to one of three groups: experimental group 1 ($n = 19$), experimental group 2 ($n = 11$), or control group ($n = 46$).

Experimental group 1 received vocal hygiene instruction (VHI) presented by a professional speech pathologist hired by the researcher. Experimental group 2 received vocal hygiene instruction plus additional information in a session on behavioral modification/teaching techniques (BMT). The treatment sessions were administered during week 3 of the eight-week recording period. Subjects in the control group were invited to attend identical sessions at the completion of the eight-week reporting phase of the project. The one-hour VHI session included a brief introduction to vocal anatomy, a video-excerpt of vocal folds in motion, discussion of behaviors that damage the voice, suggestions for keeping the voice healthy, specific vocal health suggestions for music teachers and time for questions. A pre-test and post-test developed by the speech pathologist was administered to determine the amount of knowledge gained in the session.

Subjects in experimental group 2 attended the VHI session immediately followed by a one-hour behavior BMT) session. This session was led by a university music education professor with extensive experience in teacher training and behavioral techniques. Raphael and Sataloff (1991) stated: 'Many vocal stresses are controlled by eliminating psychological stress, understanding room acoustics, organizing materials to be presented, and through other similar preparations' (p. 359). This session was designed to help teachers consider teaching environments and techniques in order to identify and plan for correction of vocal

problems. Segments of the presentation included effective teaching approaches, self-modification of behavior techniques, applied techniques and specific examples for music classroom teaching. At the beginning of the session, teachers listed the top three perceived behavioral obstacles to their own vocal health. During the session, techniques to change these behaviors were discussed in detail. At the end of the session, teachers selected one item from their list and were instructed to apply a behavior modification technique learned in the session to overcome the obstacle.

Although multiple session times were offered, several subjects in the experimental groups reported scheduling conflicts. Subjects indicating an inability to attend a VHI session were asked to take an electronic version of the same pre-test, read an electronic version of material presented at the session, and electronically take the post-test. Analysis of pre-test and post-test scores found no significant difference between subjects attending the live session and those reading outline materials. Because attendance at the BMT session was crucial to inclusion in experimental group 2, no paper alternative was offered. For this reason, the size of experimental group 2 (VHI + BMT) was less than desirable. However, after taking group size into consideration, it was decided that inferential statistical analysis for all groups would be appropriate.

Subjects in all groups completed a daily (Monday to Friday) checklist for eight weeks. Responses on the daily log form served as the dependent measures for the study. Each subject received a packet of eight weekly sheets with dates and subject numbers pre-printed at the top. The daily log collected reports of water consumption, minutes of daily vocal warm-up, number of vocal breaks taken (complete voice rest), and whether teachers talked over noise and/or used non-verbal commands during the day. Teachers also reported vocal problems for each day based on Bernstorff and Burk's (1996) conclusion that individuals vulnerable to voice disorders often have problems with 'hoarseness, pitch breaks, vocal fatigue, or pain' (p. 380).

Self-report rather than a live observation data collection method was chosen based on extant research conclusions that self-report and face-to-face interviews return approximately the same results (Kaplan, Hilton, Park-Tanjasiri, & Perez-Stable, 2001). Self-report was also chosen in order to avoid classroom disruption and to make data collection more feasible with a large subject pool.

The researcher had previously determined (Hackworth, 2002) the advantages of using a reward system to encourage daily log returns. By returning logs at the end of each week teachers earned chances to win a \$50 music catalog gift certificate. At the conclusion of the study, two teachers' names were drawn and each received a certificate.

Results

Pre-test and post-test scores from the VHI session were analyzed to examine possible effects of two different presentation methods (attending live sessions or reading the materials electronically) in experimental group 1 (VHI). Additionally, scores were analyzed for pre-test to post-test gains. A 2 × 2 mixed factors analysis of variance (ANOVA) was applied (between subjects, two-level: live versus paper; repeated measures, two-level: pre-test versus post-test scores) in order to accomplish both of these tasks simultaneously. Results showed no significant differences ($p > .05$) between live and paper presentation formats, $F(1, 20) = .27$, $p = .61$. Significantly fewer errors ($p < .001$) were found on the post-test scores compared to pre-test scores, $F(1, 20) = 54.03$, $p = .001$, and as a result, all subjects in experimental group 1 (VHI) were considered as one group regardless of presentation format.

A post-project questionnaire asked subjects to rate the effectiveness of sessions on a 10-point Likert scale with 10 representing 'highly effective'. The mean rating for the VHI session was 8.04 (SD = .32), and the BMT session mean rating was 8.36 (SD = .24).

To answer the second research question and to facilitate analysis of all 40 reporting days, data were first aggregated by week, enabling responses to be considered in weekly units. Combining the data by week also allowed the yes/no responses of talking over noise and using non-verbal commands to be treated as interval data (zero to five possible yes/no answers each week). To analyze weekly data, a 3 × 8 mixed factors ANOVA was performed (between subjects, three-level: group assignment; repeated measures, eight-level: week) for each category on the daily log. Results showed no significant differences ($p > .05$) across all weeks for any group of subjects in any category. The control group had the least amount of variance in reported behavioral changes.

Variability across the eight weeks made interpretation of results difficult. In all categories, the further away from the treatment period (week 3), the more varied the behavioral reports. To better understand the effect of proximity of treatment on self-reported behaviors, reports from two selected weeks (the week prior to and immediately following treatment) were analyzed further for possible interaction. To accomplish this task, a 3 × 2 mixed factors ANOVA was performed (between subjects, three-level: group assignment; repeated measures, two-level: week) for each category. Results showed a significant increase ($p < .05$) in the number of vocal breaks taken, $F(2, 71) = 3.35$, $p = .04$ and significantly fewer ($p < .05$) vocal problems, $F(1, 71) = 4.10$, $p = .05$ for experimental group 2 (VHI + BMT) between weeks 2 and 4. ANOVA results for vocal breaks and vocal problems are shown in Tables 1 and 2, respectively. Graphic representations are shown in Figure 1.

Table 1 Summary of ANOVA, number of vocal breaks taken before and after treatment

Source	Sum of squares	d.f.	MS	F	p
Within subjects:					
Weeks 2 and 4	1.96	1	1.96	.36	.55
Weeks 2 and 4 × group	36.06	2	18.03	3.35*	.04
Error	381.68	71	5.38		
Between subjects:					
Group	13.87	2	6.94	.48	.62
Error	1032.53	71	14.54		

* $p < .05$

Table 2 Summary of ANOVA, number of vocal problems reported before and after treatment

Source	Sum of squares	d.f.	MS	F	p
Within subjects:					
Weeks 2 and 4	28.94	1	28.94	4.10*	.05
Weeks 2 and 4 × group	42.64	2	21.32	3.02	.06
Error	500.80	71	7.05		
Between subjects:					
Group	19.65	2	9.82	.96	.39
Error	730.19	71	10.28		

* $p < .05$

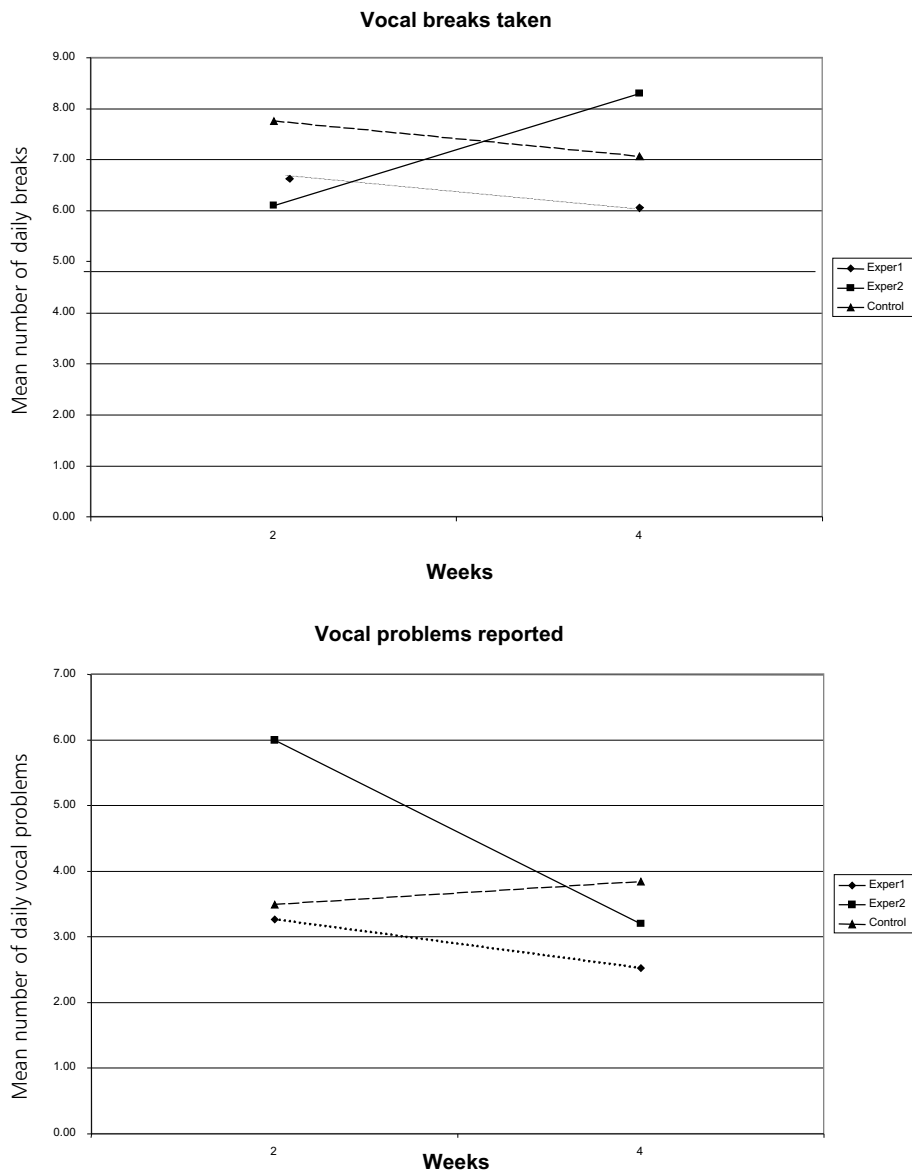


Figure 1 Graphic representation of vocal breaks taken and vocal problems reported in weeks 2 and 4.

Discussion

Subjects in the experimental groups scored significantly higher on the VHI session's post-test than on the pre-test. This result indicates receiving instruction improved subjects' immediate knowledge of basic vocal hygiene even if it did not have a lasting effect. The type of presentation format did not result in significant differences in pre-test and post-test scores. Subjects were able to comprehend the information well enough to score better on the post-test, and the way in which the information was communicated had no effect on scores.

Research questions 2 and 3 specifically examined the possible effects of treatment sessions on self-reports. In an attempt to answer these questions, data were first analyzed over the entire eight weeks. Even though no significant differences were discovered, it was interesting to observe the high degree of variance in reports. In addition to examining the statistical results, a closer inspection of the maximum and minimum raw daily scores compared to means and standard deviations revealed an abundance of variance. Trying to determine the effect of a treatment given one time in week 3 against data reported as far away from the treatment as weeks 7 and 8 proved unsuccessful. Analysis determined more treatment sessions spread across time would have been a more effective measuring tool than one treatment session.

Statistical tests performed for data in weeks 2 and 4 revealed significant differences for experimental group 2 (VHI + BMT) in two categories, an increase in the number of vocal breaks taken and a decrease in the number of vocal problems reported. These findings indicate treatment had a significant, although short-term effect on self-reported behaviors. Just as the long-term effect of knowledge gained in the VHI session is unknown, the long-term effect of treatment on vocal breaks and vocal problems cannot be determined in this study. Again, more treatment sessions or a method of follow-up supplementing or enhancing the initial information may have a more lasting effect.

Subjects in experimental groups were asked to rate effectiveness of the VHI session and the BMT session on a 10-point Likert scale. The mean ratings, 8.04 and 8.36 respectively, and many positive comments given by subjects indicate that subjects enjoyed the sessions and benefited from materials presented. The two findings of statistical significance were both achieved by changes in the behavior of experimental group 2 (VHI + BMT). This finding indicates vocal hygiene instruction alone did not significantly impact the self-reported vocal habits of subjects in this study; a behavioral modification session was needed in order to significantly change reports. This finding supports Dishman's (1982) conclusions and implies changes in behavior should be combined with vocal hygiene instruction in order to help good vocal habits become habitual.

Neither the VHI nor the BMT session had a significant impact on the self-reported water consumption; vocal warm-up time; talking over singing, recorded music, or instruments while delivering instruction; or use of non-verbal commands of experimental subjects. The amount of variability revealed in this study implies a need for more individual attention to each of these categories in future studies. The varying degree of responses in all categories may indicate extreme ease or extreme difficulty in maintaining a healthy voice for subjects. Different teaching responsibilities and schedules in different schools may also have impacted response.

Experimental group 2 (VHI + BMT) reported a significant increase in the number of daily vocal breaks taken after treatment. Because subjects were asked to identify their most difficult vocal problems in the BMT session, it can be assumed a large number of subjects in this group identified a personal need for more vocal breaks. This group also showed a significant decrease of vocal problems immediately following treatment. It is not possible to determine if this significant decrease is a direct result of treatment, however, because a decrease in vocal problem reports could also be related to better health in general. Thirty-seven percent of the optional comments given by subjects each day were related to general health, including allergies, lack of sleep and illness. It is very possible improvement in these areas could have coincided with week 3's treatment and contributed to the decrease in problem reports. It should also be noted subjects were only asked to report data on the days they taught. The high number of vocal problems reported for some subjects on teaching days (as opposed to sick days taken) may reflect a trend found in other studies that vocal complaints are common among teachers who work despite their vocal discomforts (Rantala, Paavola, Körkkö, & Vilkmán, 1998; Sapir et al., 1993).

Subjects were asked to indicate on a 10-point Likert scale how much the possibility of winning a prize motivated them to return each week's log. Although several teachers gave the highest possible rating (10), the two winning teachers both gave the lowest possible rating (1). The ratings ($M = 5.18$, $SD = 3.50$, range = 1–10) showed a wide variance of responses and an average impact on the outcome.

Vocal hygiene's impact on vocal health must be studied more extensively. Investigating the effect of multiple treatments and closer attention to behavior modification in the area of vocal health would be a valuable follow-up to the present study. The short-term findings of significance in this study provide limited information. Maintaining a behavioral change over time is an issue that must be addressed in future studies. Additionally, a study incorporating more follow-up with subjects over time might be beneficial. Direct observation of subjects may be a consideration for future research on this subject. Although a large body of research indicates positive and valid reasons for using self-report, direct observation might give a more accurate picture of behaviors. The difficulty and costs of such an endeavor could be a good argument for the inclusion of fewer subjects.

The amount of variance among subjects may indicate the categories chosen for examination may be very difficult or very easy for some subjects to manage. Future research may divide the six categories examined in this study into single areas of vocal health research for a more precise assessment. A more concentrated study of the effects of multiple treatment sessions would help pinpoint the treatment's impact over a longer period of time. Research findings from this and future studies will hopefully give a better understanding of the benefits of healthy vocal habits to teachers, administrators, and music educators who train future teachers. If behavior modification is the key to improving vocal health, its inclusion in music teacher education programs could have an enormous benefit on the vocal health of all music teachers.

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Abstracts

L'effet d'un enseignement d'hygiène vocale sur les habitudes vocales des professeurs de musique de l'Ecole publique

Cette étude a porté sur l'effet d'un enseignement d'hygiène vocale que pouvait avoir sur les habitudes vocales des professeurs de musique de l'Ecole publique. Les sujets (N = 76) ont raconté leurs comportements quotidiens pendant 8 semaines: la consommation en eau, l'échauffement vocal, le fait de parler par dessus de la musique et du bruit, le repos vocal, les réflexes non-verbaux, et les problèmes vocaux. Les sujets étaient dans le groupe expérimental un ou deux, ou le groupe contrôle. Les deux groupes expérimentaux ont reçu des cours d'hygiène vocale. Le groupe expérimental a eu aussi des informations qui peuvent les aider individuellement à identifier et corriger leurs problèmes vocaux. Les résultats ont montré un plus grand repos vocal du groupe expérimental deux et une diminution sensible des problèmes vocaux dans les proches semaines du traitement. Bien que les différences fournissent des informations limitées, les indications soulignent l'importance de l'introduction des programmes d'hygiène vocale sur les modifications des comportements. Les différences individuelles montrent que certains sujets ont de la difficulté à gérer leurs habitudes d'hygiène vocale. Une étude additionnelle sur les effets multiples et sur les séances de différents traitements pourrait aider à comprendre l'impact de celle-ci pendant de plus longues périodes.

Die Wirkung von Informationen über Stimmhygiene und Verhaltensmodifikation auf die Selbsteinschätzung der Stimmgesundheit bei Musiklehrern an öffentlichen Schulen

Die Studie prüft die Wirkung der Information über Stimmhygiene und Verhaltensmodifikation auf die Selbsteinschätzung von Musiklehrern. Die Versuchspersonen (N = 76) berichteten acht Wochen lang täglich über ihr Verhalten: Wasserverbrauch, Einsingen, Sprechen gegen Musik/Geräusche, Stimm-pausen, nonverbale Anweisungen und Stimmprobleme. Die Versuchsteilnehmer wurden in zwei Experimentalgruppen und eine Kontrollgruppe eingeteilt. Beide Experimentalgruppen erhielten eine Unterweisung in Stimmhygiene. Zusätzlich erhielt Experimentalgruppe 2 Informationen zur Verhaltensmodifikation, die darauf abgestimmt war, den Lehrern zu helfen, selbst ihre Stimmprobleme zu erkennen und zu korrigieren. Die Ergebnisse zeigten, dass Experimentalgruppe 2 deutlich mehr Stimm-pausen einlegte und in den Wochen unmittelbar nach der Behandlung über erheblich weniger Stimmprobleme berichtete. Obwohl die Unterschiede nur beschränkt aussagekräftig sind, verweisen sie doch auf die Bedeutung der Verhaltenssteuerung bei der Stimmhygiene. Individuelle Unterschiede belegen, dass einige Personen Schwierigkeiten mit der Umsetzung der Stimmhygiene haben. Weitere Studien zur Wirkung verschiedener Behandlungsformen könnten die Wichtigkeit der Behandlung über längere Zeiträume aufzeigen.

El efecto de la higiene vocal y las instrucciones para mejorar la conducta en los hábitos de salud vocal reportados por los mismos maestros de música de la escuela pública

Este estudio examina el efecto de la higiene vocal y las instrucciones para modificar la conducta reportada por los mismos maestros. Durante 8 semanas los sujetos ($N = 76$) informaron diariamente sobre las siguientes conductas: ingesta de agua, calentamiento, hablar por encima de la música/ruido, descanso vocal, órdenes no verbales y problemas vocales. Los sujetos participaron en los grupos experimentales 1 o 2, o en el grupo control. Ambos grupos experimentales recibieron instrucciones sobre higiene vocal. El grupo experimental dos también recibió información sobre modificación de la conducta, para ayudar a los maestros a identificar y corregir individualmente sus problemas vocales. Los resultados mostraron que el grupo experimental dos incrementó significativamente el descanso vocal y disminuyó significativamente la cantidad de informes sobre problemas vocales en las semanas finales del tratamiento. Si bien las diferencias aportaron información limitada, las indicaciones enfatizan la importancia de la inclusión de modificaciones de conductas en el programa de higiene vocal. La variancia individual indica que algunos sujetos tuvieron dificultad para manejar las rutinas de higiene vocal. Un estudio adicional sobre los efectos de múltiples y variadas sesiones de tratamiento, podría clarificar el impacto de tratamientos durante períodos prolongados.

