Critical Review:
Are dysphonia prevention training programs effective in reducing the incidence of voice disorders in teachers?

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This critical review examines the efficacy of dysphonia prevention training programs for teachers in reducing the incidence of dysphonia. Five articles obtained through online computer databases were evaluated, all of which were randomized clinical trials. Overall, the results of this review suggest that both voice training and vocal hygiene programs are effective in reducing the incidence of voice disorders in teachers by maintaining or improving voice quality. Recommendations for clinical practice and implications for future research are discussed.

Introduction

The prevalence of voice disorders in teachers is significantly greater than in the normal population, with approximately 9-11% of teachers currently reporting a voice disorder, compared to 3-6% in the normal population. Teachers also report greater incidence of dysphonia over time, with 51-58% of teachers reporting a voice disorder occurring at least once in their career, compared to 26-29% in the normal population (Angelillo et al., 2009; Roy et al., 2004). Additionally, the symptoms of dysphonia in teachers tend to be more problematic, such as pain and discomfort, hoarseness, hypophonia and tiring quickly, often occurring concomitantly and with increased severity. As many as 23% of teachers report missing at least one day of work specifically because of a voice disorder, compared to 5% in the normal population (Angelillo et al., 2009).

Despite the increased prevalence and severity of dysphonia, most teachers do not seek voice treatment from speech-language pathologists or other healthcare professionals, even when they are experiencing symptoms (Russell et al., 1998). Moreover, many student teachers receive no formal vocal hygiene information or voice training during their education. The psychological burden of these voice disorders falls on teachers, who report a lower quality of life and decreased job performance when dysphonia symptoms are present (Van Houtte et al., 2011). Students may also suffer because of teachers' decreased job performance, and those with hearing loss may struggle to hear teachers who are experiencing hypophonia. The financial burden of voice disorders was examined in a recent study by Rosow et al. (2015), which evaluated the economic impact of voice disorders in Miami-Dade County, Florida, USA. The authors estimated the cost of hoarseness-related absenteeism in the district (n = 20646) as $1,013,750 (USD) per year, whereas hoarseness-related presenteeism, as measured by loss in teacher productivity, was a staggering $11,913,375 per year for this school district alone.

Amir et al. (2005) compared the effects of a group voice course on a group of those with a vocal pathology to those with no vocal complaints or pathologies. The authors showed that a group voice course benefits both those with and those without pathologies. This study provided evidence for the efficacy of prevention programs in the general population and their effectiveness on improving voice quality in those without voice disorders.

Preventing voice disorders in teachers could provide many potential benefits, including reducing the financial strain on school boards, increasing quality of life for teachers, and improving the learning environment for students, especially those with special needs. A successful application of a voice disorder prevention program could also have implications for other professional voice users, including singers, actors, telecommunication workers and public speakers.

Objectives

The primary objective of this paper is to critically evaluate current literature regarding the effectiveness and efficacy of voice training programs for teachers in reducing incidence of dysphonia. The secondary objective of this paper is to make recommendations for clinical practice and implications for future research.

Methods

Search Strategy

Articles were found through searches of online computerized databases, including PubMed and Scopus, using the following terms: (voice disorders OR dysphonia) AND (prevention or preventative) AND teachers. Reference lists of selected papers were also manually searched for additional articles.

Selection Criteria

Articles that met inclusion criteria were required to address voice disorder prevention in teachers or student teachers who did not already have a voice disorder. Articles were excluded if they did not explicitly deal with teachers or student teachers without current voice disorders or if there was no preventative treatment provided. Selection of articles was not limited by study design or date of publication.

Data Collection

Five articles from the literature search met the selection criteria. Articles consisted of three randomized clinical trials and two pseudo-randomized trials.

Results

Duffy and Hazlett (2003) was one of the first articles to address primary prevention as a method to reduce the incidence of voice disorders in the teaching population. This randomized control trial evaluated the acoustic, perceptual (self-rating) and functional impact of indirect training, direct training or no training on student teachers enrolled in a Postgraduate Certificate in Education course. The participants had no known voice problems at the time the study commenced. Fifty-five student teachers out of a class of 200 volunteered to take part in the study. They were randomly grouped into an indirect, direct and a control group. The indirect group received one session, which included information on voice production mechanics and vocal hygiene, while the direct group received both the above information session and also one hands-on training session aimed at improving voice production and reducing inappropriate or compensatory behaviours. The control group received no intervention. Measurements were taken at baseline and after the first teaching practice using perceptual and acoustic measures, the Voice Handicap Index (VHI) (Jacobson et al., 1997), and an author-created self-perception questionnaire.

Results of the study were not significant on any measures, perhaps due to the limited power and high attrition. There were, however, interesting trends in the data that approached significance. For instance, the direct training group showed improvement in voice quality measures after treatment, whereas the control group showed deterioration of quality and the indirect training group showed no change. In contrast, the control group showed improvements in self-perceived vocal quality, as measured by the VHI (Jacobson et al., 1997), whereas the direct group showed no change and the indirect group showed deterioration. This dissimilarity in self-perception from acoustic measures could be explained by an increase in awareness of inappropriate vocal behaviours for the treatment groups.

This paper represented an early contribution to the literature in justifying the need for a voice training course for student teachers. This study used valid randomization procedures and appropriate outcome measures. Limitations of the study included a small sample size that was not powerful enough to show significance, and high attrition, especially in the groups receiving intervention, which affected the randomization post-hoc.

Overall, this study provided preliminary, slightly suggestive evidence that direct vocal training for student teachers could improve voice quality and that indirect training could serve to maintain voice quality over time as students become new teachers.

Bovo et al. (2007) examined the efficacy of a vocal care course in reducing the incidence of vocal dysfunction on 41 female kindergarten or elementary school teachers with no history of dysphonia treatment. The teachers who participated in this randomized clinical trial were randomly assigned to either the treatment group or the control group. The treatment group (n = 21) attended a four-session course on professional use of the voice, made daily journal reports on vocal abuse habits used, received written information, and followed a vocal exercise regimen based on their individual needs. The control group (n = 20) received no treatment during the course of the 12-month clinical trial. Measurements were taken at baseline, 3 months and 12 months, and included videolaryngostroboscopy, acoustic measurements, blinded perceptual evaluation, the VHI (Jacobson et al., 1997), and an author-created questionnaire at the 3- and 12-month point about the perceived benefits of the program.

Significant improvement was demonstrated for the treatment group on the perceptual measures, maximum phonation time, and jitter and shimmer. No difference was found in either group on the videolaryngo-stroboscopic evaluation, perhaps due to the relative absence of vocal cord abnormalities in the sample. The VHI (Jacobson et al., 1997), revealed significant benefits reported by the treatment group between the baseline and 3-month point, with a significant worsening from 3 to 12 months, though still improved from baseline, while the control group demonstrated no change.

This paper used valid randomization procedures and appropriate outcome measures. Strengths of this study included a high compliance rate with both strategies

and journal entries, as well as a measurement of change over the course of the full year timespan of the study. Noted weaknesses included a high rate of attrition and a limited possibility of replication due to the details of the course not being outlined.

Overall, this study provided suggestive evidence of the effectiveness of a vocal care course in improving overall vocal function in female teachers. It provided only equivocal evidence that a vocal care course can prevent vocal dysfunction in female teachers, perhaps due to the small sample size and high attrition rate.

Pasa, Oates and Dacakis (2007) compared vocal hygiene education to vocal function exercises in 37 primary school teachers and the impact on vocal symptoms, misuse, knowledge and acoustic measures relative to controls. Participants in this randomized control trial were randomly allocated into a vocal hygiene group, a vocal exercise group or a non-treatment control. Before treatment, baseline measurements were taken of the three groups, which included questionnaires about voice knowledge, current voice function, dysphonia symptoms, maximum phonation time and maximum frequency range. The vocal hygiene group and the the vocal function exercise group each received a 2-hour training session at week 1, and a 30-minute review session at week 3 and 6. The vocal function exercise group received an additional audio CD with exercises to be practiced twice a day for the 6-week period, and the vocal hygiene group received supplementary written information. The baseline measurements were repeated for all groups at the 6-week mark and then again at week 10. A questionnaire about the impact of the program was given to the treatment groups at the end of the study.

Results of the study showed a significant improvement in vocal care knowledge for the group who received vocal hygiene training, both at post-treatment and follow-up, whereas the vocal function exercise group showed improvements that did not reach significance, with no change in the control group. While there were no significant interactions for reports of vocal misuse behaviours between the measurement intervals, there was an observable trend between baseline and week 10 that shows the vocal hygiene group decreased in misuse behaviours, while the control group increased and the vocal function exercise group showed no change in number of misuse behaviours. A similar pattern emerged when looking at the vocal symptom variable, with the vocal hygiene group reporting significantly fewer symptoms, the control group showing significantly more symptoms, and the vocal function exercise group showing no significant change in symptoms at follow-up. Maximum phonation time values did not show significance, but the same pattern as above was observed.

Overall, this article showed moderately suggestive evidence of the benefits of a vocal hygiene training program on reducing symptoms of vocal dysfunction. This study represented an easily replicable model for future studies with increased power. A large weakness of this study was the lack of acoustic and perceptual measurements, which would have provided more information about voice quality changes over time.

Nanjundeswaran et al. (2012) compared the effects of a 4-week home vocal hygiene intervention program with or without additional vocal training on a group of student teachers versus a control group. Participants of this randomized control trial were students who were entering their 4-week practicum within a limited interval after the start of the trial. The participants were randomly allocated into one of three groups, a vocal hygiene group, a vocal hygiene + voice therapy program group, and a non-treatment control group. The vocal hygiene program used was simplified into three core principles: proper hydration, reducing inflammation, and abstinence from yelling, with additional one-on-one therapy time allotted for each participant with a speech pathologist to make the program more personalized and tailored to individual need. In addition to the vocal hygiene training, a separate voice therapy program was provided for a second group of subjects, who were given a 4-hour group seminar and set of practice exercises that they would complete at least twice a week, audiorecord and send to the clinicians. The clinicians would then provide email feedback on their audiorecorded samples. The third group served as a control and participants were provided with no training or information during the course of the trial. Groups were further divided into high and low symptomatic starters based on baseline measurements. The VHI (Jacobson et al., 1997) was used to measure results at baseline, 4-weeks and 8-weeks post intervention.

Due to a small sample size (N = 18), inferential statistics were not used, so only data trends were reported. For the low symptomatic starters, the vocal hygiene education was sufficient to maintain their vocal status during their practicum. Participants in the vocal hygiene plus vocal training group also maintained their voices, but not appreciably more than the vocal hygiene only group. For those student teachers with high symptoms at baseline, the vocal hygiene plus vocal training improved their VHI (Jacobson et al., 1997) scores more than the vocal hygiene only.

One strength of this study was its low attrition rate of 5-17%, which the authors credit to be because of the simple-to-follow, tailored program. There were many weaknesses of this study, which included a low number of participants, lack of inferential statistical analyses, and an absence of instrumental examination results.
Overall, this study presented equivocal evidence that a voice hygiene program was effective at maintaining a good voice quality of student teachers, and that voice hygiene plus vocal training was effective in improving voice quality impact on student teachers with subclinical symptoms of vocal dysfunction.

Richter et al. (2015) most recently addressed prevention of voice disorders in student teachers though a relatively large randomized control trial (N = 204) that assessed the effectiveness of a 10-session voice training program that was integrated into the students' curriculum over 1.5 years. Participants were randomly assigned to either a treatment group or a non-treatment control group. The treatment group received ten 90-minute sessions on a variety of topics, including vocal hygiene, posture, breathing, vocal intensity and other variables. Measurements used included videostroboscopy, the VHI (Jacobson et al., 1997), perceptual and acoustic measures of voice quality, and a vocal loading test, which included reading a passage for 10 minutes at an intensity level >80 dB, followed by a repeated perceptual and acoustic evaluation.

Results showed that there was a significant improvement in perceptual and acoustic voice quality measurements for the treatment group, and a significant decrease in quality for the control group at 9 months post-training. VHI (Jacobson et al., 1997) scores showed a similar pattern, with the control group worsening over time and the treatment group showing significant improvement.

Overall, this study presented compelling evidence for the efficacy of an integrated dysphonia prevention program in improving voice quality in student teachers. It also added further evidence of the deterioration of voice quality in teachers at the beginning of their careers.

Discussion

Current literature provides mostly suggestive evidence for the effectiveness of dysphonia prevention programs in improving voice quality in teachers and student teachers, with one study presenting compelling evidence. While improving voice quality has been shown to be possible, it is important to note that maintenance of voice quality is enough when considering prevention. A previous literature review in the area of voice disorder prevention by Ruotsalainen et al. (2007) focused on the deficiency of evidence for improving voice quality in professional voice users, however it is important to remember that those with no history of voice disorders need only to maintain their current adequate quality to make a program effective theoretically. The five articles appraised in this updated literature review all provided evidence that maintenance can be achieved with dysphonia prevention programs, and many also showed a significant trend of deterioration of voice quality in those who received no such training.

Despite encouraging results across all studies for the effectiveness of dysphonia prevention programs, results should be interpreted with caution because of small sample sizes, high levels of attrition, and inadequate descriptions of methods used, which leads to challenges with replication and verification of results. While Richter et al. (2015) provided more compelling evidence, this is the only study thus far to do so, so these results must be replicated and verified. Furthermore, it is as yet unclear whether vocal hygiene education, vocal exercises or a combination of both is more effective in preventing dysphonia in teachers. However, even with this uncertainty, results indicate at least a maintenance of voice quality across both vocal hygiene and vocal exercise variables. While both appear to be beneficial, more research needs to be done to show which of these methods is most successful and cost effective.

Notwithstanding minor flaws in the research, four of the studies presented suggestive evidence that voice quality maintenance can be achieved through training, and at least one study provided compelling evidence that voice quality can even be improved with such programs. The ability to maintain or even improve voice quality in teachers could lessen the financial impact on school boards, as well as improve quality of life for teachers and quality of teaching that students receive.

Clinical Implications and Future Research

The evidence discussed in this review provides support for the implementation of dysphonia prevention programs for early teachers and/or in student teacher training programs. Speech-language pathologists (SLPs) are in a position to be able to advocate for the funding of such services at the provincial level, and the research discussed here suggests the importance of such advocacy in the profession.

Future research in this area should focus on the synthesis of these and other data on prevention of voice

disorders across multiple populations into a meta-analysis to increase the level of support for these programs. Research is also needed to further examine the different benefits of vocal hygiene education versus vocal exercise programs in this population in order to determine the variables that provide the best outcomes for teachers in the long-term. Furthermore, as stated previously, Richter et al. (2015) should be replicated to provide evidence of the study's validity, and longitudinal data should be provided to determine the long-term effectiveness of these programs. Finally, methodologies of future studies should be outlined in greater detail in order to guide SLPs and other voice professionals when implementing these programs in a clinical setting.

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