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Critical Review:

Does providing teachers with preventive vocal hygiene training reduce the likelihood of the development of voice-related impairments?

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This study reports a critical review of the literature on the relation between teachers' exposure to vocal hygiene training and the prevention of voice-related impairments. For the critical review, all eight studies evaluated used a Randomized Control Trial study design. Overall, findings from the critical review suggest that both indirect and direct formats of vocal hygiene training result in statistically significant improvement of voice quality in healthy teachers in spite of high vocal demands.

Introduction

Researchers have found a high prevalence of voice disorders among teachers world-wide (Mattiske et al., 1998; Bermudez de Alvear et al., 2011; Van Houtte et al., 2011; Nanjundeswaran et al., 2012). The workplace conditions teachers endure daily place them at high risk for this occupational hazard of developing voice-related impairments to occur at some point in their career (Roy et al., 2004). The acoustically poor physical environment, work demands, and stress all contribute to the habitual vocal abuse teachers ultimately suffer over time (Simberg et al., 2005).

The impact of voice-related impairments among teachers can be felt personally, professionally, and economically. A voice disorder can inhibit the teacher's ability to function in the classroom and on staff, resulting in costly absenteeism due to illness, speech therapy, and potentially surgery. A severe voice disorder can result in a teacher leaving the profession permanently (Mattiske et al., 1998).

Preventive vocal hygiene education is absent from most teacher training programs. (Roy & Tanner, 2013). Formal regulations monitoring occupational vocal health are non-existent in many jurisdictions (Gaskill & Weems, 2009). Deciding which agency should assume the responsibility for the development, implementation, and funding for such workplace safety programs for teachers is generally undetermined. (Roy & Tanner, 2013). In the meantime, estimates suggest there is a substantial economic cost for teachers' lost productivity as a consequence of the development of voice disorders (Gaskill & Weems, 2009).

Objectives

The primary objective of this paper is to critically review the existing literature on the effectiveness of vocal hygiene training for teachers to prevent voice-related impairments. The secondary objective is to offer evidence-based recommendations that apply to the elementary school as a workplace environment. Suggestions for further research will also be discussed.

Methods

Search Strategy

Computerized databases including CINAHL, PsychInfo, and PubMed were searched. The following key terms were used in this search: (voice hygiene) OR (vocal hygiene) AND training OR education AND teacher* AND prevent* AND (voice disorder*). Reference lists from retrieved articles were also used to find other relevant articles for review.

Selection Criteria

Studies selected for this review had elementary school teachers or student teachers with a healthy voice status voluntarily participating in a randomly assigned experimental study on the effectiveness of preventive vocal hygiene training. No stipulations were placed on the method of vocal hygiene training, the nature of the outcome measure, or the gender of the teachers.

Data Collection

Results of the literature search yielded eight articles that met the selection criteria described above. Each of these articles used a randomized control trial study design.

Results

A strength of each of the studies in this critical review is the use of a Random Control Trial (RCT) study design.

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Since it is assumed theoretically that the RCT groups are the same aside from the intervention, it is concluded that any statistically significant differences are directly attributable to the exposure to the intervention. Researchers consider the RCT as the "gold standard".(Greenhalgh, 2010)

Two of the studies used a particular type of RCT known as the Cluster RCT which is the randomized assignment of participants by whole groups chosen a priori (Pasa et al., 2007; Pizolato et al., 2013). One disadvantage of the Cluster RCT is that it requires more participants in order to obtain the same statistical power so as to avoid Type II errors (of erroneously failing to reject the null hypothesis when it is was false).

Chan (1994) investigated the effectiveness of a vocal hygiene program against a no-treatment control with 25 female kindergarten teachers. The treatment group participated in vocal hygiene education and two-months post-treatment. Appropriate statistical analysis demonstrated a statistically significant improvement in voice quality between pre- and post-treatment as measured by instrumental voice analysis (Relative Average Perturbation (RAP), Long Time Average Spectrum (LTAS)) and subjective assessment (frequency of self-reported vocal abuse over two-week period).

The strength of this study is the level of detail provided about the treatment program, allowing for accurate replication. A concern of this study is its generalizability to other elementary school teachers universally since these participants were exclusively Kindergarten teachers in China. The vocal demands of Kindergarten teachers in China are arguably greater than their North American counterparts due to larger class sizes, and traditional large-group, teacher-directed instruction. (Vaughan, 1993).

Overall, the results of this study demonstrate suggestive evidence that vocal hygiene education prevents the damaging voice use among teachers of young children.

Bovo, Galceran, Petruccelli, and Hatzopoulos (2007) conducted a study with 41 female elementary school teachers to compare the effectiveness of a preventative voice program relative to no-treatment controls. The groups of teachers were matched on age, working years, hoarseness rating, and vocal demand. The experimental condition included lectures, small group therapy sessions, educational reference materials, individualized at-home voice exercises, and a participant-completed Daily Vocal Misuse Report. Appropriate statistical analysis showed significant three-month post-treatment improvements in acoustical and perceptual voice measures and self-evaluation of voice disorders in the treatment group only. Statistical significance was maintained at 12 months post-treatment, although effect size was smaller.

The findings of this study would also be relatively generalizable to most elementary school teachers since the study's sample is representative of a division of the profession that is predominantly held by females. A concern of this study is the high attrition rate, mostly due to drop out. However, the reported findings were based only on the statistical analysis conducted on the completed scores of the remaining 41 subjects.

Overall, this study offers suggestive evidence in support of comprehensive voice care programs for teachers.

Ilomaki, Laukkanen, Leppanen, and Vilman (2008) compared the effectiveness of an indirect vocal hygiene education control group and a direct voice training experimental treatment group with 60 randomly assigned female elementary school teachers. The indirect education involved a three hour lecture raising awareness about basic voice use and factors causing vocal abuse. The direct training course included five small-group voice training sessions over nine weeks involving active practice using voice production endurance techniques. Acoustic, perceptual, and self-report measures were assessed. The results of appropriate statistical analysis suggest a significant improvement in some of the acoustic and perceptual measures after direct voice training.

A strength of this study is the use of three experienced voice trainers responsible for evaluating the perceptual outcome measures of voice quality. There were acceptable inter-rater reliability coefficients for voice quality (0.69) and for firmness of phonation (0.75). A concern with this study is that one of the inclusion criteria of "vocally functionally healthy voice professionals" was established by self-assessment. This method of determining eligibility to participate in the study appears weak in comparison to other studies in this critical review that use either well-established subjective screening methods or objective measures of voice quality.

Overall, this study offers suggestive evidence in support of indirect theoretical vocal hygiene education paired with direct practical voice training for teachers.

Timmermans, Coveliers, Wuyts, and Van Looy (2012) compared the effectiveness of a threefold voice training module against a no-treatment control group with 81 randomly assigned student teachers (two-thirds female). The threefold voice training module included

indirect theoretical vocal hygiene education, direct practical voice exercise training, and individual voice coaching. Acoustic and perceptual measures were taken pre-treatment and four months post-treatment. Appropriate statistical analysis indicated a significant treatment effect on student teacher voice use, with more benefit being experienced by the female student teachers.

One strength of this study is the use of the multidimensional voice assessment protocol recommended by the European Laryngological Society. The battery of acoustic and perceptual measures is a thorough evaluation of voice quality. The researchers of this study also included very detailed appendices describing the treatment protocol in depth, presumably for replication purposes. A concern of this study is that the researchers failed to consider incorporating a self-report measure as a part of their analyses. Subjective, self-report measures like the VHI or the V-RQOL are helpful tools to measure the biopsychosocial impact of voice-related impairments and the changes in clients' self-perception after treatment. The addition of such a measure may have given us a broader view on the analysis of the results in comparison to objective outcome measures.

Overall, this study offers suggestive evidence in support of indirect theoretical vocal hygiene education combined with direct practical voice exercise training and individual voice coaching for student teachers.

Pasa, Oates, and Dacakis (2007) compared the effectiveness of an indirect voice hygiene training program and direct vocal function exercise regime against a no-treatment control with 37 elementary school teachers (34 female). Acoustic and self-report measures were assessed. Appropriate statistical analysis of the findings indicated that the vocal hygiene participants showed statistically significant greater improvement than the vocal function exercise group or the control group on subjective outcome measures only.

A strength of this study is the researchers' attempt to replicate and compare the effectiveness of two experimental conditions from different studies within the existing literature. A concern with this study is the assignment of participants to groups, achieved using a Cluster RCT with schools being chosen a priori on a convenience basis. The researchers determined that each group must have a sample size of at least 13 participants after conducting a power analysis. One of the three groups had a sample size of only 10 due to attrition.

Overall, this study offers suggestive evidence in support of indirect theoretical vocal hygiene education training for teachers.

P**izolato et al. (2013)** compared the effectiveness of a vocal hygiene with vocal exercise training group against a vocal hygiene only control group with 70 elementary school teachers (57 female). The subjective, self-report measure known as the Voice-Related Quality of Life instrument (V-QOL) (Brazilian version –adaptation and translation) was used at baseline and at three-months post-treatment. Appropriate statistical analysis found a statistically significant difference within-group. However, no between-group differences were identified.

One strength of the study was the use of the subjective, self-report measure, the V-RQOL; it is reliable, valid, and sensitive to changes in self-perceived voice ratings. (Hogikyan & Sethuraman,1999). A concern with this study is the lack of inclusion of objective, acoustic measures in their voice assessment protocol. Analyzing of objective measures scores may have served to corroborate or dispute the findings of the subjective measures.

These findings offer suggestive evidence of both the control condition and experimental condition equally providing benefit towards improving teachers' voice-related quality of life.

Nanjundeswaran, Li, Chan, Wong, Yiu, and Verdolini-Abbott (2012) compared the effectiveness of two experimental conditions against a no-treatment control group, with 31 randomly assigned student teachers (29 female). Both experimental groups participated in the voice hygiene program which included a single lecture and individualized clinical consultation. The combined voice hygiene with voice training program included an additional four-hour group seminar which was a modified version of the Lessac-Madsen Resonant Voice Therapy. This experimental group also completed homework practice twice weekly over four weeks, receiving individualized feedback from clinicians after speech sample audio files were analyzed. The researchers conducted the VHI pre-treatment, then at four and eight weeks post-treatment. Descriptive analyses of the results suggest that a vocal hygiene only program was sufficient in preventing voice problems in this group of healthy student teachers. However, the student teachers identified as having pre-existing voice problems within this study benefited more from receiving voice training intervention in addition. Inferential statistics were not performed due to small sample size.

A strength of this study was addition of the perceptual

assessments completed by an experienced voice-specialized speech-language pathologist to validate the self-reported healthy vocal status of the participants during recruitment. A concern of the study is the relatively small sample size in both the Pittsburgh and Hong Kong research sites, in part due to attrition. Due to the small sample size and descriptive analyses being performed only, these findings cannot be generalized to the larger population of student teachers. Also, due to logistical constraints, there was no eight-week follow-up data obtained at the Hong Kong site.

In light of the small sample size, these findings offer only equivocal evidence in support of vocal hygiene training preventing voice-related impairment among student teachers.

Duffy and Hazlett (2004) compared the effectiveness of two different voice care prevention training programs (indirect vocal hygiene education, and direct practical techniques) against a no-treatment control with 55 student teachers (gender not specified). The indirect experimental condition involved one session educating the participants about normal voice production and factors contributing to vocal abuse. The direct experimental condition involved both the indirect training and one session of learning practical techniques that support healthy vocal behaviour (e.g. posture, respiration, release of tension in the larynx, resonance, and voice projection). Appropriate statistical analysis demonstrated a trend in the data toward post-treatment improvement in voice quality for the direct condition and maintenance of voice quality for the indirect condition, with deterioration of voice quality for control group participants.

One of the strengths of this study was the attempt to specifically determine the contributing factors that would lead to the significant effect of specific vocal hygiene training approaches in previous research (indirect or direct). Another strength of this study is the focus on providing primary prevention to student teachers in an attempt to expose them to healthy voice use habits before voice-related impairment develops at all. A concern with this study is the attrition in the direct training group condition. The researchers did not provide details about the original recruitment numbers or the drop-out rate. It is assumed that the extra time commitment required for participation within this group resulted in several subjects dropping out, resulting in unequal and smaller participant numbers in the direct group. The researchers expressed concern that the remaining participants may have been more motivated, thus creating a selection bias. However, evaluation of some of the pre-treatment subjective measure scores did not indicate greater awareness of voice difficulties. It is also of concern that the student teachers were evaluated after only having completed their first practice teaching placement, which may make it difficult for the results to be generalized to a full-time employed teacher population.

These findings are suggestive that a both preventative voice care training approaches are beneficial for student teachers.

Discussion

Overall, the findings from these studies reveal suggestive evidence of the impact vocal hygiene education has on preventing teachers from developing voice-related impairment. However, it is important to consider some of the limitations of the studies collectively. Firstly, there was no standard protocol for determining "healthy voice status" as a part of the inclusion criteria. One researcher used the VHI, a reliable and valid self report measure (Nanjundeswaran et al., 2012), while another used self-report questionnaires with no known psychometric properties (Ilomaki et al, 2008). In another study, potential subjects with voice complaints had to be assessed by an ENT specialist before inclusion in the study was considered (Timmermans et al., 2012). Several studies stipulated that the participant had to be 55 or younger, so as to avoid introducing bias into the study as a result of effects of aging on voice (Pasa et al. 2007; Pizolato et al., 2013). However, most studies had the exclusion criteria of a history of voice disorder. This inclusion criteria inconsistency could negatively impact the results if clinically voice-disordered participants were unknowing included in the sample. The findings would not accurately reflect the strength of the preventive impact. Secondly, the delivery of treatment protocols were variable (indirect, direct, or a combination), making it difficult to specify which elements within the treatments contributed more greatly to the resulting significant correlations. Finally, it is of concern that the assessment protocols were variable. There was a compilation of different traditionally used objective acoustic measures to determine voice quality. Unfortunately no "gold standard" of evaluating voice quality acoustically exists to date. The comparison of these statistically significant findings would be stronger if the identical combination of acoustic, perceptual, and self-assessment measures were used universally investigating this research question.

Conclusion

In spite of the variable treatment delivery models included in these studies, all served to raise awareness among teachers about vocal abuse and preventive

techniques in some capacity, empowering them to gain control over their own voice health. The significant findings from studies combining indirect and direct treatment highlight the importance of both informing teachers of appropriate vocal care, and teaching them how to incorporate these practices in the workplace.

The inclusion of primarily female participants in these studies reflect the status quo in the current teaching profession with substantially more female teachers employed in elementary schools (OCT, Professionally Speaking, 2007; National Center for Education Statistics, 2006); therefore, many of these findings are generalizable to the greater population.

Recommendations

Follow-up studies need to be conducted in order to determine the long-term impact of the implementation of preventive vocal hygiene education with teachers. Ideally, research could be conducted in school districts globally where Employee Occupational Health and Safety Voice Care programs for teachers currently exist (e.g. "Voice Care for Teachers Program", Department of Education and Early Childhood Development, State of Victoria, Australia). This research could potentially reveal the optimal treatment protocols for effective preventive vocal hygiene training for teachers.

Clinical Implications

In collaboration with Speech-Language Pathologists and Employee Occupational Health and Safety boards, the professional development of teachers in Voice Care Programs should be considered by administrators in education. As a part of their professional preparation, student teachers would ideally be required to participate in primary prevention vocal hygiene training within faculty of education programs.

References

Bermudez de Alvear, R.M. Bron, F.J., & Martinez-Arquero, A.G., (2011) School teachers' vocal use, risk factors, and voice disorder prevalence: guideline to detect teachers with current voice problems. Folia Phoniatrica et Logopaedica, 63(4);209-15.

Bovo, R., Galceran, M., Petruccelli, J., & Hatzopoulos, S. (2007) Vocal problems among teachers: evaluation of a preventative voice program. *Journal of Voice,* 21(6):705-22.

Chan, R.W. (1994) Does the voice improve with vocal hygiene education? A study of some I instrumental voice measures in a group of kindergarten teachers. *Journal of Voice,* 8(3):279-91.

Duffy, O.M., & Hazlett, D.E. (2004) The impact of preventative voice care programs for training t teachers: a longitudinal study. *Journal of Voice,* 18(1):63-70.

Gaskill, C.S. & Weems, W.H (2009, July 01). Occupational Vocal Health An Emerging Workplace Wellness Issue. Occupational Health and Safety.

Greenhalgh, T. (2010) How to Read a Paper: The basics of evidence-based medicine- Fourth Edition. Wiley-Blackwell, Oxford, UK.

Ilomaki, I., Laukkanen, A.M., Leppanen, K., & Vilman, E. (2008) Effects of voice training and voice hygiene education on acoustic and perceptual speech parameters and self-reported vocal well-being in female teachers. *Logopedicas Phoniatrics Vocology,* 33(2):83-92.

Mattiske, J.A., Oates, J.M., & Greenwood, K.M., (1998) Vocal problems among teachers: a review of prevalence, causes, prevention, and treatment. Journal of Voice, 12(4):489-99.

Nanjundeswaran, C., Li, N.Y., Chan, K.M., Wong, R.K., Yiu, E.M., & Verdolini-Abbott, K. (2012) Preliminary data on prevention and treatment of voice problems in student tteachers. *Journal of Voice,* 26(6):816.e1-12.

Pasa, G., Oates, J., & Dacakis, G. (2007) The relative effectiveness of vocal hygiene training and vocal function exercises in preventing voice disorders in primary school teachers. *Logopedicas Phoniatrics Vocology,* 32(3):128-40.;

Pizolato, R.A., Beltrati Cornacchioni Rehder, M.I., dos Santos Dias, C.T., de Castro Meneghim, M., Bovi Ambrosano, G.M., Mialhe, F.L., & Pereria, A.C. (2013) Evaluation of the effectiveness of a voice training program for teachers. *Journal of Voice,* 27(5):603-10.

Roy, N., Merrill, R.M., Thibeault, S., Parsa, R.A., Gray, S.D. & Smith, E.M., (2004) Prevalence of Voice Disorders in Teachers and the General Population. Journal of Speech,

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Language, and Hearing Research, 47:281-293.

Roy, N. & Tanner, K. (2013, March 01) All Talked Out. The ASHA Leader.

Simberg S., Sala E., Vehmas K. &, Laine A., (2005) Changes in prevalence of vocal symptoms among teachers during a 12-year period. Journal of Voice,19:95-102.

State of Victoria (Department of Education and Early Childhood Development),(2009) Voice Care for Teachers Program, Melbourne, Australia).

Timmermans, B., Coveliers, Y., Wuyts, F.L., & Van Looy, L. (2012) Voice Training in teacher education: the effect of adding an individualized microteaching session of 30 minutes to the regular 6-hour voice training program. *Journal of Voice,* 26(5):669.e1-9.

Van Houtte, E., Claeys, S., Wuyts, F., & Van Lierde, K. (2011) The impact of voice disorders among teachers: vocal complaints, treatment-seeking behavior, knowledge of vocal care, and voice-related absenteeism. Journal of Voice, 25(5):570-5.

Vaughan, J. (1993). Early Childhood Education in China .Association for Childhood Education International.