Direct and indirect vocal interventions for teachers: a systematic review of the literature

Intervenções vocais diretas e indiretas em professores: revisão sistemática da literatura

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**ABSTRACT**

**Purpose:** The aim of this work is to verify the efficacy of direct and indirect vocal interventions in preventing voice disorders, with specific and combined strategies, by a systematic review of the literature.

**Research strategies:** Articles published from January, 1980 to April, 2013 were searched in the electronic databases MEDLINE (accessed through PubMed), PubMed, LILACS, SciELO, Scopus and Web of Science. **Selection criteria:** All the articles that presented randomized controlled studies with some type of vocal intervention with teachers as their primary aim were included. Articles that presented subjects with larynx and voice alterations were excluded. **Results:** As a result of the initial search, 677 studies were identified, five of which followed the inclusion criteria. Four more articles, found in the references of the studies selected for reading of the full text, were included. **Conclusion:** The combined intervention (direct and indirect) presented a significant improvement in vocal quality parameters and self-assessment, even in a short period of time. In other studies, which focused on the comparison between combined and specific interventions (direct or indirect), no differences were observed, although improvements in some of the assessed vocal parameters were described. A limitation of this review is the restriction of the methodological design of the studies, including only randomized clinical trials. The combined vocal intervention presented more significant results than the specific intervention.

**Keywords:** Voice; Faculty; Voice Training; Voice Disorders; Larynx; Occupational Health

**RESUMO**

**Objetivo:** Verificar a eficácia das intervenções vocais diretas e indiretas, de forma isolada e combinada, na prevenção de distúrbios vocais em professores, por meio de revisão sistemática da literatura. **Estratégias de pesquisa:** Foram pesquisados artigos de janeiro de 1980 a abril de 2013, nas bases de dados eletrônicas MEDLINE (acessado pelo PubMed), PubMed, LILACS, SciELO, Scopus e Web of Science. **Critérios de seleção:** Foram incluídos todos os artigos que tinham como objetivo principal algum tipo de intervenção com professores e que fossem ensaios controlados randomizados. Excluí-se artigos que apresentavam indivíduos com alterações de laringe e voz e que estivessem afastados de sua profissão. **Resultados:** Como resultado da busca inicial, foram identificados 677 estudos, dentre os quais, cinco atendiam aos critérios de inclusão. Somou-se a esses mais quatro artigos, encontrados nas referências bibliográficas dos estudos selecionados para a fase de leitura do texto completo. **Conclusão:** A intervenção combinada (direta e indireta) apresentou melhora significativa em parâmetros da qualidade vocal e na autoavaliação da voz, mesmo em curto período de tempo. Em outros estudos, cujo foco era a comparação entre a intervenção combinada e intervenções isoladas (direta ou indireta), não foram observadas diferenças significativas, apesar de serem descritas melhores em alguns dos parâmetros vocais avaliados. Como limitação desta revisão, pode-se incluir a restrição quanto ao desenho metodológico dos estudos, incluindo apenas ensaios clínicos randomizados. A intervenção vocal combinada apresenta resultados mais expressivos do que a intervenção isolada.

**Descritores:** Voz; Docentes; Treinamento da Voz; Distúrbios da Voz; Laringe; Saúde do Trabalhador

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**Conflict of interests:** No

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INTRODUCTION

Considered a relevant factor for the socializing process, the voice can have an impact on a person’s quality of life, especially when it is used professionally\(^{(9)}\). Therefore, researches involving the professional use of the voice have received increasing attention in recent years\(^{(2,3)}\). It is known that teachers present a higher risk of developing vocal alterations compared with subjects from the general population\(^{(4)}\), and at least 50% of them regularly suffer from voice disorders, limiting their performance at work\(^{(5)}\).

The aim of voice care, both in prevention and treatment, is to recover the voice, making it functional for professional use and communication in general. Thus, the interventions designed to prevent voice disorders can be divided into direct and indirect strategies\(^{(6)}\). The direct strategy provides a change in the vocal functioning, offering vocal technique instructions, in order to stimulate a more effective voice production, thereby protecting the individual from developing voice disorders. On the other hand, the indirect strategy helps the individual to understand the use of the voice, the psychological and environmental factors that can lead to voice alterations, and to develop strategies to minimize such risk factors\(^{(7)}\).

Voice training and therapy aim at preventing and treating voice disorders by changing vocal habits. The voice training makes the use of the voice easier, avoids vocal fatigue and inadequate practice and provides a better preparation to perform the activity which requires the use of the voice\(^{(7)}\). Furthermore, voice training exercises increase the blood flow and improve breathing, allowing the increase of muscle contractions and elasticity\(^{(8)}\). Several studies have shown positive effects of voice therapy and training in parameters assessed by acoustic and auditory-perceptual analyses in terms of decreased perturbation (jitter and shimmer), increased signal-to-noise ratio and a better vocal quality\(^{(9)}\). However, few prevention programs are designed for teachers and future teachers\(^{(7)}\).

Considering that the vocal assessment has been privileged in Brazilian researches\(^{(10)}\), studies on the effects of interventions on such professionals are more recent. They can provide a better understanding of the complex reality of voice use in teaching and guide future interventions. Systematic reviews are recognized as important in health sciences and, although not frequent in Speech, Language Pathology and Audiology, they have increased in the last decade, highlighting that topics and new perspectives from these analyses should be taken into consideration.

OBJECTIVES

The objective of this study is to verify the efficacy of direct and indirect vocal interventions, with specific and combined strategies, in preventing voice disorders in teachers.

RESEARCH STRATEGY

The following electronic databases were searched for articles published from January, 1980 to April, 2013: MEDLINE (accessed through PubMed), PubMed, LILACS, SciELO, Scopus and Web of Science. The search terms were: voice, faculty and randomized controlled trial and their related terms in Portuguese, English and Spanish. Words regarding the outcomes of interest were not included, in order to increase the sensitivity of the search. There was no restriction regarding the types of interventions employed in the studies.

SELECTION CRITERIA

All randomized controlled trials that presented some type of vocal intervention with teachers as their primary aim were included. We chose to restrict the experimental design, since randomized clinical trials are the most reliable source of scientific evidence and allow the greatest validity of the results in a systematic review. Exclusion criteria for this review were: studies that included subjects with previous larynx and voice alterations, and studies with teachers who were no longer in professional activity or away from work for some reason. There was no age limit, nor restrictions of gender and intervention time.

DATA ANALYSIS

In the first phase, the titles and abstracts of all the articles identified through the search strategy were assessed by the investigators. In the next phase, all the abstracts that did not present enough information regarding inclusion and exclusion criteria and contained information about interventions for teachers were selected for assessment of the full text. In the third phase, the assessment of the full texts was performed by two previously trained reviewers, who independently rated the articles, filling out a standardized form and selecting them according to the eligibility criteria. The references sections of these articles were also reviewed, aiming to find works that, for some reason, had not shown up in the initial search. The discordances, in every phase, were settled by consensus. Then, the primary data regarding the method of vocal intervention for teachers were collected.

The quality of the studies was assessed using the Cochrane Handbook\(^{(11)}\), which classifies the studies into A, B, or C, according to low, moderate or high risk of biased primary studies, respectively. Such classification is based on the internal validity of the studies, the randomization procedures and the way of preventing bias. The quality assessment was complemented with the use of the Jadad scale\(^{(12)}\), an instrument for quality assessment, which consists of five questions regarding randomization, masking, double blinding, losses and exclusions.
RESULTS

As a result of the initial search, 677 studies were identified, among which five\(^5,9,13-15\) fulfilled the inclusion criteria and were considered relevant for the sample of this work. Four more articles\(^5,4,16,17\), found in the references of the studies selected for the reading of the full text, were added as additional references. Therefore, a total of nine articles were included in this review for a more rigorous analysis (Figure 1).

All the articles were published in English, and 44.4% of the studies were carried out in Finland. In the nine studies, 543 subjects with mean ages between 24 and 42 years were included. Some studies\(^3,9,13,16\), with poor to good quality, included only female subjects. Self-evaluation of voice was the most employed parameter (in 87.5% of the studies) to assess the effects of the interventions.

The main characteristics of the included studies, such as authors, year of publication, country of origin, original language, type of intervention, number of participants, and age and gender of the sample, are given in Table 1.

The quality of the studies ranged from poor to good, as shown in the complete assessment (Table 2).

DISCUSSION

In the literature, some classical studies\(^5,13\) recommend direct interventions, which apply directly to the vocal tract, and indirect interventions, such as consulting or education on voice hygiene and improvement of acoustic conditions of the workplace\(^6\).

Four studies included in this review compared direct and indirect vocal interventions\(^4,5,11,13\). One of them\(^13\) verified the effect of vocal intervention for women, assessed by self-evaluation, after direct and indirect voice training. The authors observed that both interventions presented positive effects. However, they were not effective in improving the participants’ self-perception of vocal function. The authors suggested that it would be interesting to investigate the effects of increased time of training in improving the knowledge of the participants about voice care.

Another research\(^4\) investigated the effectiveness of orientations for voice hygiene and vocal function exercises in reducing vocal symptoms in primary school teachers. The subjects of the
group which received orientation and performed vocal function exercises reported an improvement in vocal characteristics and voice knowledge after the intervention. The control group, however, showed persistent difficulties in voice knowledge, vocal behavior at work, vocal symptoms and maximum phonation time. The indirect intervention was significantly more beneficial when compared to the direct intervention. However, this result are in disagreement with the findings in the literature\(^5\), which showed that voice hygiene interventions are not as effective as voice training programs, with or without voice care orientation.

A research\(^{17}\) carried out in Finland concluded that vocal function exercises are more effective than isolated voice hygiene instructions. The group that performed vocal exercises presented a reduction in the fundamental frequency and in the means of jitter and shimmer, along with easier phonation and improved vocal quality. On the other hand, the group which received orientations about voice hygiene presented a higher fundamental frequency and increased difficulty of phonation. Such result can be explained by the fact that voice hygiene only provides orientation on voice care, and the effectiveness of this type of intervention depends on the subject's ability to assimilate the information and put it into practice during the professional use of the voice.

Other studies included in our review assessed the effectiveness of combined direct and indirect interventions. In one study\(^{14}\) there were no clinically significant differences between the experimental and the control groups regarding auditory-perceptual assessment. However, for voice quality parameters, measured by the Voice Symptom Severity Index\(^{18}\), several significant differences were identified. The subjects in the voice training group were able to increase their vocal range and alter the vocal behavior. The authors concluded that even a short combined voice training program can present a positive impact in teachers’ voices. Yet it was not clear to which extent a longer training program might show promising results.

A study\(^{15}\) indicated that the combination of direct and indirect voice training results in better reports from the subjects regarding their voice symptoms and voice care, as well as a significant improvement of voice symptoms and knowledge, especially when the therapist works with a small group of subjects. The authors also suggest that the therapist’s qualities may be a determining variable for the effectiveness of the treatment.

In one research\(^5\), the effectiveness of combined voice training was demonstrated, although the positive effect was slightly reduced one year after the course. The experimental group presented amelioration in aspects such as glottal dysphonia, maximum phonation time, jitter and shimmer. There were no significant differences in glottal-to-noise excitation ratio and fundamental frequency. The authors highlight that better acoustics of classrooms, use of sound amplification devices during professional activity and voice orientation programs are essential aspects for the primary prevention of voice disorders in teachers.

Other studies\(^{3,9,16}\) aimed to compare direct, indirect and combined vocal interventions. In the first study\(^3\), the groups which received voice massage, voice training and lectures on voice hygiene did not differ in the 6 and 12 months follow-ups. The group that received only orientations presented satisfactory results regarding voice hygiene knowledge. The group that received voice training emphasized, at first, the importance of adequate voice production and vocal rest, and, after 12 months, the importance of adequate voice use. All the groups presented reduced vocal fatigue symptoms one year after the course, showing that, in different degrees, every intervention is worthy for the improvement of teachers’ vocal well-being.

In another research\(^9\), positive effects were reported after all the interventions, though more significantly after voice training and massage than after a lecture on voice hygiene. The result of self-evaluation before and after a working day, however, was not able to show a significant effect of the interventions.

A study\(^{16}\) revealed that the group which received orientations on voice hygiene and the group which received voice massage did not differ when compared to the self-evaluation and to the perceptual and electro-acoustical voice parameters. This can be due to the short duration of the intervention, which is an important variable to verify the effectiveness. Positive effects were significantly reported after voice massage, leading to

### Table 2. Assessment of quality of the studies

<table>
<thead>
<tr>
<th>Study (year)</th>
<th>Randomization</th>
<th>Allocation sequence</th>
<th>Concealment of allocation</th>
<th>Masking</th>
<th>Loss to follow up</th>
<th>Jadad scale (1996)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bovo et al. (2006)</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
<td>3</td>
</tr>
<tr>
<td>Leppanen et al. (2009)</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>2*</td>
<td></td>
</tr>
<tr>
<td>Laukkanen et al. (2009)</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>2*</td>
</tr>
<tr>
<td>Timmermans et al. (2011)</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Gillivan-Murphy et al. (2006)</td>
<td>A</td>
<td>A</td>
<td>C</td>
<td>B</td>
<td>3</td>
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<tr>
<td>Leppanen et al. (2010)</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>B</td>
<td>3</td>
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</tr>
<tr>
<td>Pasa et al. (2007)</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>3</td>
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<tr>
<td>Ilomaki et al. (2008)</td>
<td>A</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>3</td>
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*poor classification according to the Jadad Scale (1996)

Note: A = appropriate description; B = not described; C = inappropriate description

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the conclusion that this type of treatment may help the teachers in maintaining their vocal well-being during professional activity. One limitation of this study may be the absence of a control group.

In this review, it was possible to observe that in part of the researches\(^{(1,6,10)}\) there were only female subjects. This is due to the fact that, in addition to women being the majority in this profession, teachers are known to present elevated prevalence of voice disorders due to their occupation. Professional activities demand the prolonged use of the voice, frequently loudly and in acoustically unfavorable places. A gender difference was observed\(^{(5)}\), showing that the larynx and vocal folds structures may also be a cause for the vulnerability of women to voice disorders and vocal fold trauma. The insufficient adduction in the dorsal part of the vocal folds and the curved shape of the edge increase the mechanical stress in the anterior third, where nodules can develop. A reduced amount of hyaluronic acid was observed on the surface of women’s vocal folds, in comparison to men’s, being implicated in less protection against mechanical trauma to the vocal folds.

The evaluation of voice symptoms and voice-related quality of life was also used to compare the results before and after the voice interventions, since it is possible, through self-assessment questionnaires, to analyze the impact of the alterations in the quality of life of individuals with voice symptoms, according to gender, age and professional voice use\(^{(6)}\). Furthermore, the individuals can be classified as having healthy or dysphonic voices\(^{(19)}\). For reliable results of the intervention effectiveness, it is essential to combine the use of self-evaluation questionnaires, auditory-perceptual analyses and acoustic parameters. Some studies\(^{(1,17)}\) observed an increase in maximum phonation time, but such measure cannot be considered relevant in the clinical sense, since there is no confirmed relation between this parameter and voice disorders\(^{(20)}\).

In every study included in this review, the subjects had professional supervision while performing the exercises. The experience of the professional was revealed to be an important factor for the interventions\(^{(16)}\). In this regard, there is little information in the literature, especially in Brazil, where a large number of researches have been carried out with this population. The prevailing studies, however, emphasize vocal assessments\(^{(10)}\).

Despite the fact that teachers have a prolonged use of the voice and frequently use it with high intensity due to the classroom acoustics, there are no complete and reliable data from researches performed in ideal conditions about the most adequate intervention strategies for this public, as shown by our review. Few randomized clinical trials were found on this matter, although the search strategy was broad.

From the studies we have found, we concluded that the combined (direct and indirect) intervention presented a significant improvement in voice quality parameters and voice self-evaluation. In studies that focused on the comparison between combined and specific (direct or indirect) interventions, we could observe that the specific intervention did not present significant differences, although there were improvements in some of the parameters assessed. In another study\(^{(6)}\), there was no evidence of efficacy of direct or indirect training, or a combination of both, in ameliorating vocal performance or voice self-assessment when compared to the group that did not receive interventions, showing that more studies are required, with an appropriate methodology and a measurement of results that better reflects the aim of the interventions.

To assess the quality of the studies, the CONSORT (Consolidated Standards of Reporting Trials) statement was employed. The quality ranged from poor to very good, as shown in Table 2. This data show the need for efforts to perform more researches in ideal conditions. Among the limitations of this review is the restriction of the methodological design of the studies, including only randomized clinical trials. Other reviews could be important, including other professionals who need an effective vocal performance during work and present intensive voice use, such as telephone operators\(^{(6,17)}\). No systematic reviews about preventive vocal interventions with teachers were found, emphasizing the lack of national and international literature on this subject. Moreover, although the restricted number of articles included in this review does not allow a generalization of the data, it highlights the relevance of the results.

**CONCLUSION**

This study elucidated the types of vocal interventions used with teachers and their main features. We observed that the combined strategy revealed more expressive results when compared to the specific intervention and, also, that the effectiveness of voice training in preventing voice disorders in teachers has not been widely studied.

The quality of the studies ranged from poor to good and there were some limitations, such as the low number of publications in the field, the sample sizing and the short duration of the interventions. None of the studies took place in Brazil, highlighting the lack of randomized controlled clinical trials with prospect for prevention in the Brazilian population. It is important to notice that this fact may be due to the reduced number of studies on this subject under ideal research conditions, or some studies could have been non-indexed in the searched databases. Therefore, we emphasize the need for more researches under ideal conditions, both national and international, in order to facilitate the choice for the most adequate types of interventions for people who use their voices professionally.

**REFERENCES**


