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Review

Musculoskeletal Disorders, Vocal Health Conditions and Associated Factors in Teachers: An Integrative Review

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ABSTRACT

Introduction: Musculoskeletal and voice disorders are common among teachers. The prevalence of musculoskeletal disorders in these workers can reach 77.9%. In addition, they suffer from voice disorder two or three times more often than the general population. The aim of this study is to recognize musculoskeletal disorders, vocal health conditions, and associated factors present in teachers.

Material and methods: An integrative review with a comprehensive search of literature was carried out in seven databases: Embase, Medline Complete, ProQuest, PubMed, ScienceDirect, Virtual Health Library and Web of Science. Articles published in Spanish, English and Portuguese related to the topic of interest were considered.

Results: The two studies that met the inclusion criteria and were analyzed in this review were conducted in Brazil. According to the results of the studies included, teachers are a population at risk of developing musculoskeletal disorders and voice disorders. Teachers with or without voice disorders report musculoskeletal pain in all body regions.

Conclusions: Teachers are a profession with a high prevalence of musculoskeletal and voice disorders, but little is known about this relationship. Therefore, more research is needed to understand the behavior of occupational risk factors that can generate these problems during their daily activities to prevent possible occupational diseases through actions in safety and health at work.

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Trastornos musculoesqueléticos, afecciones de salud vocal y factores asociados en docentes: una revisión integral

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RESUMEN

Introducción: Los desórdenes musculoesqueléticos y de voz son comunes en los profesores. La prevalencia de los desórdenes musculoesqueléticos puede alcanzar el 77,9%. Además, sufren desórdenes de voz dos o tres veces más a menudo que la población general. El objetivo de este estudio es reconocer los síntomas musculoesqueléticos, las condiciones de salud vocal y los factores asociados presentes en los profesores.

Material y métodos: Se realizó una revisión de alcance con búsqueda exhaustiva de la literatura en siete bases de datos: Biblioteca Virtual de Salud, Embase, Medline Complete, ProQuest, PubMed, ScienceDirect y Web of Science. Se consideraron artículos publicados en español, inglés y portugués relacionados con el tema de interés sin límite al momento de la publicación.

Resultados: Los dos estudios que cumplieron con los criterios de inclusión y que fueron analizados en la presente revisión se realizaron en Brasil. Es común que los profesores presenten desórdenes musculoesqueléticos y de voz de acuerdo con los resultados de los estudios incluidos. Los profesores con o sin desórdenes de voz presentan dolor musculoesquelético en todas las regiones del cuerpo.

Conclusiones: Los profesores son una ocupación con alta prevalencia de desórdenes musculoesqueléticos y de voz, pero poco se conoce sobre esta relación, por lo cual se necesita más investigación para comprender el comportamiento de los factores de riesgo laboral que pueden generar estos problemas durante sus actividades diarias con el fin de prevenir posibles enfermedades laborales por medio de acciones en seguridad y salud en el trabajo.

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1. INTRODUCTION

Musculoskeletal disorders (MSDs) are a common and important problems in teachers, representing a high prevalence, 77.9% [1] and 74.5% [2]. It is recognized that lower back, shoulders, neck, knee, upper back, and foot are the most affected parts [1] and some authors indicate that legs (56.5%) and lower back (56%) are the regions having the highest prevalence [2]. Other data also show that of the 64.9% of teachers who have a musculoskeletal disorder (MSD), 55.5% present pain located mainly in the neck region [3].

Stressful and repetitive work [4], working more than 14 years, working two or more shifts, having a workload greater than 20 hours and having multiple employment contracts are different occupational risk factors that influence the development of MSD in teachers [5]. Sex, teaching experience, quality of life, anxiety, and depression, and coping styles [6], job seniority ≥ 20 years, perception of inadequate school infrastructure [7], inadequate furniture,

poor posture, and tendency to lift and carry objects are other important risk factors [8].

On the other hand, teachers also experience voice disorders (VDs) two to three times more often than the general population [9] and 58.3% acknowledge to have experienced them at least once during their career, and female teachers experience them more frequently than male teachers [10]. Furthermore, it has been found that teachers have a significantly higher incidence of VDs compared to other occupations [11], recognizing common vocal symptoms such as hoarseness (37.9%) and dry throat (26.9%) [12]. In this occupation there are common risk factors that can influence the development of a VD and have an important impact on their work, among them, the use of the voice, lifestyle, and environmental factors [13], gender, upper respiratory problems, caffeine consumption, speaking loudly, number of classes per week and experience of resignation due to VDs [14]. At the same time, it has been emphasized that 28% of teachers have been absent between 1 and 3 days and 9% for more than 3 days, with women reporting longer recovery times and more days of absence

during the teaching year [15]. Considering above and recognizing that MSDs and VDs in teachers occur frequently, the present review aimed to recognize MSDs, vocal health conditions, and associated factors present in teachers.

2. MATERIAL AND METHODS

This integrative review considered the five stages proposed by Crossetti [16]: 1) formulation of the problem, 2) data collection or definitions based on the literature search, 3) data evaluation, 4) data analysis, and 5) presentation and interpretation of the results.

2.1.1. FORMULATION OF THE PROBLEM

The guiding question of this review was: How are MSDs, vocal health conditions, and associated factors characterized in teachers?

2.1.2. DATA COLLECTION OR DEFINITIONS ON LITERATURE SEARCH

To answer the guiding question, a comprehensive search of literature was carried out in seven databases: Embase, Medline Complete, ProQuest, Pubmed, Sciencedirect, Virtual Health Library (VHL) and Web of Science (WOS). The terms musculoskeletal disorders, musculoskeletal pain, voice disorders and teachers were used to construct the following search equations:

- musculoskeletal disorders AND voice disorders AND teachers and,
- (“musculoskeletal disorders” OR “musculoskeletal pain”) AND (“voice disorders”) AND (teachers).

2.1.3. DATA EVALUATION

During data evaluation stage, bibliographic manager Zotero version 6.0.36 was used to eliminate duplicate records. The title, abstract and keywords were read to include the studies according to the following inclusion and exclusion criteria. Inclusion criteria: a) original research on teachers; b) worldwide studies related to MSDs, vocal health conditions and associated factors present in teachers; and c) articles published in Spanish, English and Portuguese without limit at time of publication. Exclusion criteria: a) research that took information on MSDs and vocal health conditions separately; b) research related to the topic in university professors; c) studies published in languages other than Spanish, English and Portuguese; d) records like conference proceedings, letters to the editor, book chapters, books,

dissertations, theses, review articles, opinion or reflection articles; and, e) articles that did not allow downloading or full text reading.

2.1.4. DATA ANALYSIS

For data analysis of the studies included, information was extracted in a Microsoft Excel Office 365 spreadsheet considering the following variables: main author, year of publication, country, objective, methodology and main results.

2.1.5. PRESENTATION AND INTERPRETATION OF RESULTS

The presentation and interpretation of the results was presented narratively following four categories: a) MSDs, b) vocal health conditions, c) MSDs and vocal health conditions, and d) factors associated with MSDs and vocal health conditions.

3. RESULTS

After exhaustive search of the scientific literature in the seven databases, 231 records were identified, which were distributed as follows: 14 in Embase, 7 in Medline Complete, 109 in ProQuest, 78 in ScienceDirect, 17 in VHL and 38 in WOS. Of the 231 records identified, 65 duplicates were removed, leaving 166 for screening, of which 158 did not meet the inclusion criteria and were excluded. During the eligibility stage, full text reading of eight studies was performed and finally, only two were included and analyzed (Figure 1).

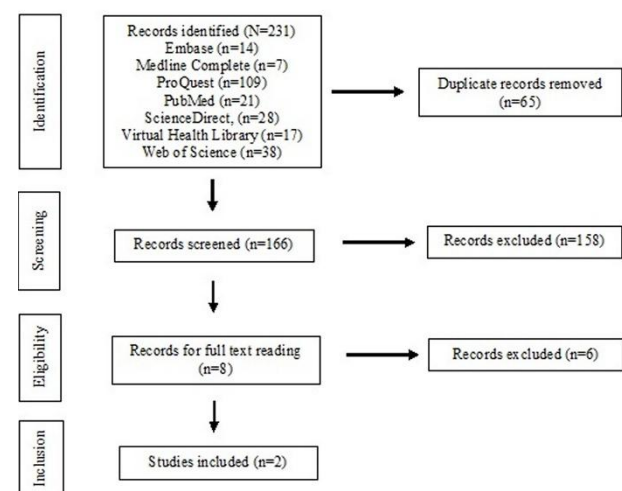


Figure 1: Flow chart of studies included.

Results show that the studies included in this review have been carried out in Brazil and have been published in English in the Journal of Voice in 2017 [17] and 2024 [18]. The institutional affiliations of the main authors were University of São Paulo [17] and Federal University of Santa Maria [18]. Two research included were cross-sectional quantitative studies, taking a sample of 43 (female teachers)

(mean 22.07) were above the normative values (mean 19) [34]. Concerning VoiSS total scores (mean 37) in one of studies [18] prove to be above normative values (mean 16) [34]. In VTD scale, it was found that teachers have a mean frequency score of 2.33 and a mean of severity score of 2.32 in one of the studies included [18]. Table 1 shows the synthesis of the studies included.

Table 1: Synthesis of studies included

Reference	Objective	Methodology	Main results
da Silva Vitor J (2017), Brazil [17]	To compare musculoskeletal pain perception in teachers with voice disorders and in those with healthy voices, and to investigate the relationship between musculoskeletal pain and occupational variables (ie, work journey per week and working period)	Observational, cross-sectional, and prospective study. 43 classroom teachers; 32 dysphonic group 29 women and 3 men (voice complaints and voice disorders) and 11 non dysphonic group (voice complaints and who are vocally healthy)	The present study showed that classroom teachers did not report any difference regarding musculoskeletal pain frequency and intensity comparing DG and NDG. The results of this study show that musculoskeletal pain should be considered in the lives of classroom teachers, and more studies need to be developed to better understand this symptom in the labor activity of this population
Colla CN (2024), Brazil [18]	To collect and evaluate responses of self-assessment protocols of teachers with normal larynges and vocal and musculoskeletal complaints, and compare them with the normative value	Cross-sectional, quantitative, and retrospective study. 57 classroom female teachers.	The evidence obtained from this research may alert the clinician to the deviant aspects of the self-assessment of teachers with normal larynges, preventing the evolution of complaints to possible lesion in the vocal folds.

[17] and 57 [18] in vocally healthy and voice complaints classroom teachers. Sequentially, data collection considered self-administered questionnaires to know musculoskeletal symptoms and vocal health conditions. The questionnaires used were Nordic musculoskeletal questionnaire [19], Vocal activity and participation profile (VAPP) [20], Voice-related quality of life (V-RQOL) [21], Voice handicap index (VHI) [22], Voice symptom scale (VoiSS) [23] and Vocal tract discomfort (VTD) scale [24] in its versions in Brazilian Portuguese [25, 29-33]. The presence of pain in the last 12 months on the upper back, lower back, and neck was referred in the second study [18] according results with Nordic musculoskeletal questionnaire. On the other hand, in one of studies included the total score of VAPP was in 66.64 and in the subscores for effects on work (mean 10.73) and effects on emotion (mean 18) were significantly above the normative values adopted. However, the effects on daily communication (mean 29.52) self-perceived severity, and participation restriction score (mean 20.6) were significantly below the normative values ($p < 0.001$) which imply that the presence of vocal symptoms produces a negative effect on the teacher's professional performance [18]. In relation to V-RQOL, results in the physical scale (mean 76.09) and the total subscores (mean 82.5) [18] were significantly lower than their normative values (means 89.60 and 91.25 respectively) [34]. Regarding the VHI [18] total scores

4. DISCUSSION

The purpose of this integrative review was to recognize MSDs, vocal health conditions, and associated factors present in teachers. Two articles met the inclusion criteria and were analyzed in this review. Results are presented narratively following four categories: a) MSDs, b) vocal health conditions, c) MSDs and vocal health conditions, and d) factors associated with MSDs and vocal health conditions. Below are the main findings according to categories.

4.1.1. MUSCULOSKELETAL DISORDERS

Findings of the studies show that MSDs are common in teachers [17-18]. In the first study, teachers reported pain intense on neck, shoulders, cervical, temporal, lumbar and laryngeal regions [17]. In case of secondary teachers have reported that the most affected body regions in the last 12 months were neck (54.2%), lower back (43%) and shoulders (35%) [26], which is similar from one of the studies included [18]. In turn, it has been found that prevalence of musculoskeletal pain in any region of the body was 68.5% (95% CI 63.6-73.2) and prevalence of lower back pain was 43.4% (95% CI 38.3-48.8) [27]. The above findings

confirms that MDs is a highly prevalent problem in teachers and influence negatively their quality of physical and mental life according to previous results in schoolteachers [28].

4.1.2. VOCAL HEALTH CONDITIONS

Previous results show that VAPP scores are higher in the group of teachers with voice disorders than in the normal group ($p < 0.001$) [35], recognizing a relationship between the presence of laryngeal signs and symptoms with the type of teacher and the VAPP [36]. Furthermore, it has also been shown that teachers who present higher scores in VAPP or number of weekly vocal fatigue symptoms were associated with increased voice-related activity limitation or participation restriction [37]. Therefore, the VAPP is favorable to carry out a self-report of vocal health conditions with the auditory-perceptual voice assessment, being considered an excellent predictor of vocal deviation according one of studies included [18]. Some authors have also mentioned that the high prevalence of proprioceptive vocal symptoms such as fatigue after prolonged use of the voice, dry throat, throat clearing and burning in teachers showed a positive correlation ($p < 0.001$). These findings indicates that when more vocal symptoms are present there is a greater self-perception of the intensity of the impact of dysphonia on the quality of life of teachers [38]. Moreover, it is also suggested that perceives the influence of the impact of voice disorders on the quality of life according to the results of the VAPP in another study [39].

In one of the studies included, V-RQOL scores were lower [18] than normal values. In this sense, some authors highlighted that the results with dance teachers show that they are aware of vocal symptoms and can detect changes in their voice, but they do not consider them significant enough to affect their quality of life. [40]. However, other results show that teachers with voice disorders have a poor vocal quality of life, with greater impairment in women than in men [41].

Although VHI scores in one of the studies included [18] are above normal values [34] they are lower than those found by other authors, in Croatian teachers [42], in Polish teachers [43] and in Iranian University Professors with vocal complaints. These studies reveals that both schoolteachers and university professors are exposed to voice disorders and, consequently, to complaints that affect their careers. [44]. Furthermore, other results indicate that women have greater vocal impairment than men do, which represents a higher risk of voice disorders in this population [45].

In relation to VoiSS scores are higher than normal values in one of the studies included [18], which has also recently been found in English teachers, demonstrating a statistically

significant association between voice symptoms and wellbeing. It implies that when wellbeing increases, vocal symptoms decrease [46], and suggest that the VoiSS is a questionnaire that detects high-risk vocal disorders in teachers. [47].

The VTD results found in one of the studies included [18] are far below those reported in another study in Iran [48] in primary school teachers who were significantly higher than secondary schoolteachers were. In addition, some authors have reported that preschool, and elementary schoolteachers present scores above healthy voices [49]. Besides, other findings report a correlation between self-perceived voice and VTD scale and an association between VTD and specific voice signs/symptoms that might indicate an incipient VD in teacher [33]. It demonstrate that VTD scale is a questionnaire that detects teachers at high risk of developing VDs and could be useful for a preventive voice program according to a study conducted in Italy [47].

4.1.3. MUSCULOSKELETAL DISORDERS AND VOCAL HEALTH CONDITIONS

Some recent results in literature have indicated that people with dysphonia have a higher frequency and intensity of pain in regions near the larynx and a poorer voice-related quality of life than non-dysphonic [50]. This is similar with the results of the two studies included in the present review [17–18]. In the first study, it was found that both teachers with and without dysphonia reported pain in all body regions (neck, shoulders, upper back, elbows, hands, lower back, hips/thighs, knees, feet, temporal, masseter, submandibular, larynx and neck) [17]. Furthermore, it is recognized that once dysphonia starts, the musculoskeletal pain in the laryngeal region appears more often and more intensely, according to the increasing work journey in teachers [17]. Likewise, in telemarketers has also been recognized that musculoskeletal pain has a negative impact on voice-related quality of life and increase vocal fatigue during oral communication, regardless of professional voice use [51]. In the second study, the results recognize that most teachers with normal larynx and with vocal and musculoskeletal discomfort presented a high presence of vocal, musculoskeletal, and emotional discomfort/symptoms in their self-assessment results, compared to the reference values [18]. The above exposes this occupation to a high prevalence of MSD and VDs, therefore, it is necessary periodic occupational medicine examinations, training, and the implementation of ergonomic interventions related to risk factors that can cause MSDs in teachers [52] and at the same time carry out actions to promote vocal health and prevent VDs that could affect teaching career [53].

4.1.4. FACTORS ASSOCIATED WITH MUSCULOSKELETAL DISORDERS AND VOCAL HEALTH CONDITIONS

Regarding associated factors with MSDs and VDs, one of the studies found that the environmental factors, work and organization conditions might also to influence the presence and perception of the frequency and intensity of musculoskeletal pain in teachers [17]. Moreover, the second study included found that overload in the cervical region due to stress and long working hours under irregular postural conditions, directly affects teacher's vocal performance and consequently, excessive voice use, overload on the body muscles, including the larynx and the vocal tract, and emotional changes impact teacher's quality of life [18]. These results show that MSDs in teachers have different associated risk factors as reported by other authors, who found that in schoolteachers the main risk factors were age, workload, and low physical activity [54]. Additionally, a positive relationship and a statistically significant association between MSDs and stress symptoms and general stress ($p < 0.01$) has been found in university professors [55]. On the other hand, it has also been mentioned that poor posture, prolonged sitting or standing, and repetitive movements also contribute to neck pain in teachers [54].

After obtaining the results, some limitations can be noted. Studies published in English, Spanish, and Portuguese were included in the search, therefore, it is unknown whether any publications have been published in languages other than those mentioned. Studies included were conducted less than 10 years ago indicating that it is a recent topic and very little research has been done on it, despite that MSDs and VDs are common in teachers.

In conclusion, teachers suffer from both musculoskeletal and voice disorders, however, very little is known about the relationship between MSDs and VDs. It is important to conduct further studies on the topic of this review to gain a deeper understanding of the influence of MSDs on teachers' vocal health since they are an occupation at risk of developing occupational diseases due to exposure to various risk factors during their daily activity.

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6. CONFLICT OF INTERESTS

The authors have no conflict of interest to declare. The authors declared that this study has received no financial support.

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