

Risk factors and prevalence of voice disorders in different occupational groups – a review of literature

Występowanie zaburzeń głosu w różnych grupach zawodowych – przegląd piśmiennictwa

JOANNA MORAWSKA, EWA NIEBUDEK-BOGUSZ

Audiology and Phoniatics Department Nofer Institute of Occupational Medicine

Z roku na rok na świecie wzrasta liczba osób zawodowo posługujących się głosem. Wraz z pojawianiem się nowych zawodów wymagających ponadprzeciętnej sprawności narządu głosu, coraz więcej grup zawodowych wymaga objęcia ich opieką i profilaktyką zawodowych zaburzeń głosu. W pracy dokonano przeglądu piśmiennictwa dotyczącego występowania zawodowych zaburzeń głosu w poszczególnych grupach zawodowych, opisano najważniejsze czynniki ryzyka i scharakteryzowano specyfikę pracy głosem w wybranych zawodach. Autorki zwracają szczególną uwagę na konieczność prowadzenia w Polsce badań na innych niż nauczyciele grupach osób zawodowo posługujących się głosem, gdyż takie badania do tej pory nie były prowadzone.

Słowa kluczowe: zawodowe zaburzenia głosu, występowanie zaburzeń głosu, czynniki ryzyka, głos zawodowy

In today's world there is a growing number of occupational voice users. With the emergence of new professions which require above-average efficiency of the vocal organ, there is a need to provide prophylaxis and care for these professional groups. The paper presents review of literature on the prevalence of voice disorders in particular professions, summarizes the main risk factors of occupational voice disorders and describes the character of work in vocally demanding professions. The authors underline the need to conduct studies on occupational voice groups, other than teachers, because such studies have not yet been conducted

Key words: occupational voice disorders, prevalence of voice disorders, risk factors, occupational voice

© Otorynolaryngologia 2017, 16(3): 94-102

www.mediton.pl/orl



Adres do korespondencji / Address for correspondence

Joanna Morawska
Audiology and Phoniatics Department
Nofer Institute of Occupational Medicine
91-348 Lodz, Saint Teresa Str. 8
tel. + 4842 63 14 534

Background

In modern society there is an increasing demand for communication in many professions and the importance of the voice as an occupational tool in a number of occupations is unambiguous. It is estimated that around one third of the workers in the industrialized societies use voice as the principal tool at work [1, 2-5]. In the United States this accounts for nearly one-quarter of the workforce [6] and about one-third in other industrialized societies [2, 7]. Given that the service sector continues to grow and society is becoming increasingly dependent on verbal communication, it is estimated that these figures will grow [1].

Occupational voice

The term occupational voice refers to those occupations where voice is an essential tool. The people in these occupations often suffer from voice symptoms to varying extents [6, 8-10]. Casper [11] underlines that the term occupational voice is attributed to “those professions in which voice is paramount to the performance of the job itself”. According to the INRS (the Institut National de Recherche et de Securite) professions most exposed to vocal risk include teachers, telemarketers, salespersons and nurses [12].

There is no clear-cut distinction between the terms ‘professional voice and ‘occupational voice’

and they have often been used interchangeably. However, the first one primarily refers to singers and actors, while the latter includes all employment categories in which a clear, dependable, adequately strong or pleasant voice is a prerequisite [11]. Moreover, recent publications tend to employ the term occupational voice when dealing with safety and health in the workplace and professional voice when referring to specific personal conditions [13].

Vocally demanding professions

There are many activities and professions that require excessive use of the voice. The most common professional voice user groups are teachers, ministers, salesmen, telemarketers, actors, singers, radio/TV announcers and attorneys. Their livelihoods depend partially or wholly on the ability to produce voice [14, 15]. Although vocal sophistication, voice quality, and vocal load may vary, professional voice users are all dependent on vocal endurance [16].

A job can be classified with regard to its voicing task or vocal load. Vocal load is the amount of voice work needed in a given job – for instance teaching a lesson, giving a lecture, performing in an acting role, singing a role [17]. As proposed by Titze [6], regarding vocal load, jobs can be classified into four groups (Table I). The first group are elite vocal performers – professional singers and actors who depend on a consistent, special or appealing voice quality as a primary tool of their trade. Sometimes members of this group are referred to as vocal athletes because of the superior quality, pitch range and loudness that they are capable of achieving. The second group, the largest one, spoken voice professions are professional voice users such as lecturers, teachers, barristers, members of clergy, and call center operators. The voice constitutes an integral part of the roles of these professions. They frequently require substantial vocal stamina over prolonged periods. Additionally, they often have to make themselves heard by large groups of listeners. If their voice is impaired even at a low level, it means that the job cannot be performed adequately. Jobs with only some tasks in voice, or non-vocal professionals – group three, include professions such as physicians, lawyers or business executives. Representatives of this group would still be able to perform their jobs if affected by slight to moderate voice disorder, however, severe dysphonia would prevent them from carrying out their roles successfully. Finally, in group four, non-vocal non-professionals, there are jobs with no task in voice and they are mainly clerical or administrative professions. In this case a voice disorder would be unlikely to prevent the workers from fulfilling their

professional commitments adequately. However, in the age of communication, there seems to be fewer and fewer jobs which do not require verbal communication.

Table I. Job classification with regard to voice load (modified from Titze [6])

Vocal load	Classification	Professions
I group	Vocal performer	Singers, actors
II group	“Spoken voice” profession	Teachers, lecturers, sales representatives, clergy, coaches and trainers, call center workers, barristers
III group	Job with some tasks in voice	Doctors, business executives, lawyers
IV group	Job with no tasks in voice	Administrative workers, clerks

Because of the fact that professional voice users are now employed in a wide range of disciplines, vocal demands vary greatly between the professions.

Teachers, the most frequently studied group of voice professionals [18-20] need not solely a resilient voice, but also a unique communicative competence to attract students and maintain their attention [13]. The greatest vocal demand is placed on those teachers who lecture or discipline children in monologue fashion for 5-7 hours a day, often getting louder and more emphatic as the day wears on [21]. All teachers, however, need a functional voice in order to be effective in establishing classroom control and in developing effective working relationships with students [18].

In case of salespeople effective voice, being the first impression given by these professionals to their clients, is crucial for success in sales. Ticket and travel agents spend large portions of their day speaking with clients, both face-to-face and over the telephone.

Receptionists and public relations specialists are the up-front faces and voices for their organizations and businesses. They are responsible for greeting people and serving as the interfaces with the media and the general public. Journalists and politicians work in professions which require an expressive and dynamic discourse [22].

The clergy represent a unique group of voice users who are required to perform at a professional level. What makes this group of professional voice users particularly interesting is the fact that cultural norms create great diversity regarding the style of delivery and typical venues [23].

Psychologists, counselors and speech-language therapists constitute a group of occupational voice users for whom one-on-one oral communication is a primary part of the workload [6].

In certain jobs, for instance call centre employers, voice is not just the tool for communication transmission, it is directly related to the working ability and efficiency of the single most sought after attribute sourced by employers in this industry – effective verbal communication and interaction [24]. Call center agents do not only exchange vocal information with phone-based customers, but simultaneously process requested data on a visual display unit. Nevertheless, it is their voice that is the most important instrument to deliver service, as they rely entirely on their voice, without the benefits of body language and written communication skills. Moreover, it is hard to find another occupation where the entire working shift requires the articulation of almost the same vocal patterns in such a repetitive and uninterrupted way [25].

Aerobic instructors are required to give verbal instructions to their clients in noisy environment, like loud background music exceeding 100 dB, at the same time as performing often strenuous exercises, which makes control of breathing and airflow movement more difficult [26].

Radio broadcasters, who primarily use their voices to communicate with the listeners, are generally employed for commercial or public networks based on the criteria that ensure they are socially accessible and marketable to their target listeners. Because they utilize only verbal communication when interacting with their audiences and competing in the radio marketplace, radio performers’ occupational attractiveness is increased by the use of a “good” voice, that is a voice that meets their individual needs in terms of stamina, power, intelligibility, and the ability to convey specific moods and attitudes or be perceived positively by listeners [27-29]. It is essential to stress that each of the jobs mentioned demands peak performance to ensure longevity [13].

Based on mode of voice usage voice professionals can be additionally classified into two major subgroups – primarily non-speaking voice professionals (NSVP) and primarily speaking voice professionals (SVP) [15]. The first group consists chiefly of singers, further divided depending on the type of singing. The subgroup of primarily speaking voice professionals includes the rest of voice professionals. This classification is presented in Figure 1.

Etiopathogenesis

Vocal disorders may be characterized as abnormal production or absence of vocal quality, pitch, loudness, and resonance according to a person’s

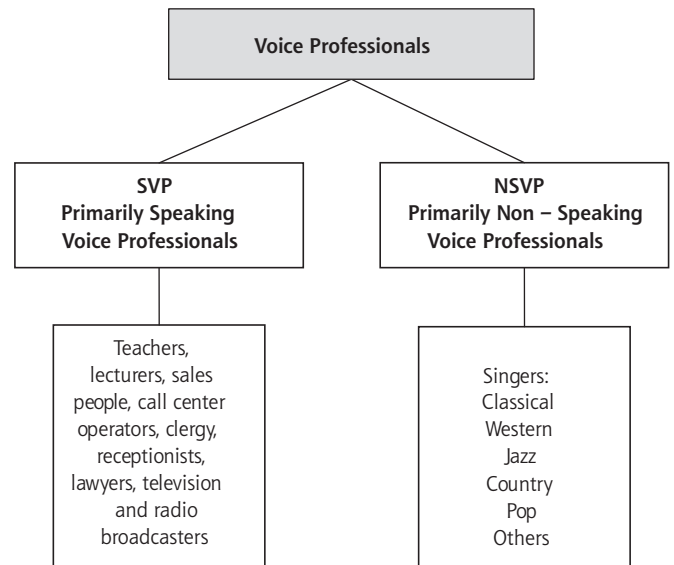


Fig. 1. The classification of Primarily Speaking Voice Professionals and Primarily Non-Speaking Voice Professionals

age or sex. They arise from a series of risk behaviors and biological mechanisms, from straining or injuring the vocal folds by excessive talking, throat clearing, coughing, screaming, yelling, inhaling irritants, smoking [30]. Additionally, stressful situations such as dealing with complaints, fear of losing one’s job, or strained relationships with colleagues can all add strain on voice production, making the voice problem worse. Oftentimes voice disorders are caused by a combination of both personal and external occupational factors. Main risk factors associated with occupational disorders can be divided into two broad categories: ergonomic (environmental) and extra-occupational (individual) risk factors (Table II).

The primary risk factors for voice disorders in occupational voice users include the need for prolonged voice use and factors in the working environment that can affect the voice production [2, 31-35]. The main workplace-related contributing factors are background noise, poor room acoustics, and poor indoor air quality [36]. Amplified and

Table II. Main risk factors associated with occupational voice disorders

Ergonomic (environmental) risk factors	Extra-occupational (individual) risk factors
Vocal loading	Incorrect voice technique
Work-related stress	Extra-occupational vocal activities
Poor working posture	Co-existing disorders
Air quality, dryness, dust	(inflammatory diseases of respiratory ways, allergies, hormonal disorders, reflux etc.)
Background noise	Personality/anxiety disorders
Poor room acoustics	Lifestyle habits (smoking, caffeine, alcohol intake)

prolonged vocal intensity as well as competing with ambient noise are considered vocal loading activities. Female speakers tend to be more prone to vocal overload in such conditions [37, 38]. Such activity triggers increase of voice intensity and increase of fundamental frequency, which in turn result in hyperfunctional phonation [39].

Stress, psychological tension and other psychological factors may also play a role in voice problems among professional voice users. Sometimes these individuals enter a vicious circle in which psychological factors exacerbate voice pathology, and poor voice quality affects the psychological well-being in a negative way [40, 41].

Limited knowledge of the principles of voice care and a lack of training in effective use of the speaking voice and voice projection are thought to contribute to the problem of occupational voice disorders [18, 42]. Although singing and acting professions often receive training in voice care and preservation, the vast majority of professional voice users, such as teachers, are unaware of how to maintain or improve on their voice which is their greatest professional asset and communication tool. The literature on the subject demonstrates that one of the main factors contributing to the high prevalence of voice disorders is the lack of voice training, in case of teachers especially during teaching training courses [43, 44].

Prevalence of occupational voice disorders

In the last two decades the definition of voice disorders as occupational diseases for those who work in professions that place high demands on vocal performance has become an important issue [2, 5, 31, 45]. The characterization of what defines a voice problem is difficult. What may be an acceptable voice to one individual, may be a significant handicap to another [46]. However, from an occupational point of view a voice disorder exists if the individual's voice does not meet the occupational criteria and demands [5]. We talk about an occupational voice disorder, sometimes also referred to as work-related voice disorder (WRVD) [47] in case of laryngeal pathology which results from excessive vocal loading on a work post.

In the area of human voice, professional voice users have gained special interest not only because they use their voice in their work but also because of the physical, emotional and professional burden that a chronic dysphonia places on the individual [48]. Individuals who require the use of their voice as part of their occupations are at highest risk for developing voice problems [26, 49]. Given that voice

is a key tool for professional voice users, its disorders may result in significant communication handicap for those affected [8]. Occupational voice disorders are a multifold problem, involving social, economic and public health aspects. It should be underlined that this problem is of particular importance in Poland, because occupational voice disorder is both a medical and a legal term. If there is a certified case of an occupational voice disorder, it entitles the patient to a single financial compensation or even a pension, if partial or complete work disability is confirmed. Occupational voice disorders have been included in the list of occupational diseases according to the legal regulations in Poland since 1974 [50].

Occupational voice health is becoming more important as more people rely on their voices for work. A number of studies have identified certain occupational groups at increased risk of developing voice disorders [44, 26, 51].

The most commonly studied group of professional voice users are teachers [19, 20, 52, 53]. This is understandable, because they occupy a privileged position in society, playing an important role in human development and the educational process [54]. As numerous studies suggest, they constitute the largest professional group depending on voice [10, 32, 54-59] and are characterized by a high occurrence of voice disorders due to the occupation's intense vocal demands and unfavourable work environment, such as poor acoustics in classroom and noise in and outside the classroom, chalk use, presence of curtains, carpet, or air conditioning [60, 61]. They often use their voice with high intensity, for a long time and without suitable breaks [3]. Furthermore, in the teaching profession both the endurance of voice and its quality in speech-communication situations are both of great importance. The prevalence of voice disorders in teachers is much higher than in the general population. This is reflected in the large literature base and number of sessions at voice conferences. A number of prevalence studies have focused solely on the teaching profession [3, 18, 33, 55, 58-74]

Table III presents major publications on the prevalence of voice disorders in teachers, published in the years 1997-2016.

However, since the area of professional voice has grown with regard to our understanding of the specifics of the professional voice user [13], there has been growing interest in researching other particular professional groups. Only in the last decade a number of distinct voice professions have received increased attention from researchers

Table III. Major publications on the prevalence of voice disorders in teachers

Author	Publication	Methodology	Results
Smith et al., USA	Frequency and effects of teachers' voice problems. <i>J Voice</i> , 1997	Questionnaires	Teachers were more likely to report having a voice problem in comparison to individuals employed in other occupations (15% vs. 6%).
Russel et al., Australia	Prevalence of voice problems in teachers. <i>J Voice</i> , 1998	Questionnaires	16% of the teachers reported voice problems on the day of the survey, 20% reported problems during the current teaching year, and 19% reported problems at some point during their career.
Thibeault et al., USA	Occupational risk factors associated with voice disorders among teachers. <i>Ann Epidemiol</i> , 2004	Questionnaires	Out of 1243 surveyed teachers 58% reported voice disorders at a certain point of their career.
Roy et al., USA	Prevalence of voice disorders in teachers and the general population. <i>J Speech Lang Hear Res</i> , 2004	Questionnaires	1243 teachers and 1288 non-teachers were surveyed. The prevalence of current voice problems was greater in teachers compared to non-teachers (11.0% vs 6.2%). The prevalence of voice disorders during their lifetime was greater for teachers (57.7% vs 28.8%).
De Jong et al., the Netherlands	Epidemiology of voice problems in Dutch teachers. <i>Folia Phoniatr Logop</i> , 2006	Questionnaires	1878 Teachers and 239 controls were surveyed. Over 50% of the teachers reported voice problems during their career. 1/5 had a history of absence from work due to voice problems. Over 20% teachers sought medical help or had been treated for voice problems.
Sliwinska-Kowalska et al., Poland	The prevalence and risk factors for occupational voice disorders in teachers. <i>Folia Phoniatr Logop</i> , 2006	Questionnaires and phoniatic examination	425 female full time teachers and 83 female non-teachers were examined. Overall lifetime vocal symptoms were reported by 69% teachers and 36% of non-teachers.
Munier C & Kinsell R, Ireland	The prevalence and impact of voice problems in primary school teachers. <i>Occup Med (Lond)</i> , 2008	Questionnaires	550 primary school teachers were surveyed with the response rate of 55%. 27% of the teachers suffered from a voice problem, 53% reported an "intermittent" voice problem, while only 20% reported no voice problem.
Angelillo et al., Italy	Prevalence of occupational voice disorders in teachers. <i>J Prev Med Hyg</i> , 2009	Questionnaires	504 teachers and 402 controls were surveyed. The prevalence of current voice problems greater in teachers than in non-teachers (8.7% vs 2.9%). Similarly, the prevalence of voice disorders during their lifetime was greater in teachers (51.4% vs 25.9%)
Nerrière et al., France	Voice disorders and mental health in teachers: a cross-sectional nationwide study. <i>BMC Public Health</i> , 2009	Questionnaires	3646 teachers in activity were surveyed. 50% of female teachers and 26% male teachers reported voice disorders
De Alvear et al., Spain	An interdisciplinary approach to teachers' voice disorders and psychosocial working conditions. <i>Folia Phoniatr Logop</i> , 2010	Questionnaires	282 kindergarten and elementary teachers were surveyed. 62.7% of the subjects were experiencing occupational voice disorders.
Da Costa et al., USA	Voice disorders in primary school teachers and barriers to care. <i>J Voice</i> , 2012	Questionnaires	237 primary school teachers were surveyed. 22% reported hoarseness at the moment of interview. 58% reported having been hoarse at one point. 23% missed work because of voice problems.
Behlau et al., Brazil	Epidemiology of voice disorders in teachers and nonteachers in Brazil: prevalence and adverse effects. <i>J Voice</i> 2012	Questionnaires	1651 teachers and 1614 nonteachers were surveyed. 11.6% of teachers and 7.5% nonteachers reported a current voice disorder. 63% teachers and 35.8% nonteachers reported having a voice problem at some point during their lifetime.
Van Houtte et al., Belgium	Voice disorders in teachers: occupational risk factors and psycho-emotional factors. <i>Logoped Phoniatr Vocol</i> , 2012	Questionnaires	994 teachers and 290 controls were surveyed. The prevalence of voice problems was greater in teachers than in controls (51.2% vs 27.4%).
Leão et al., New Zealand	Voice problems in New Zealand Teachers: A National Survey. <i>J Voice</i> 2014	Questionnaires	1879 primary and secondary school teachers were surveyed. Prevalence of self-reported vocal problems in teachers was 33.2% during their teaching career, 24.7% over the teaching year, and 13.2% on the day of the survey.
Hamid et al., Egypt	Dysphonia in teachers: is it only a matter of voice misuse? <i>Egypt J Otolaryngol</i> , 2014	Questionnaires	250 primary school teachers were surveyed. The prevalence of dysphonia in the sample under study was 23.2%.
Seifpanahi et al., Iran	Prevalence of Voice Disorders and Associated Risk factors in teachers and Nonteachers in Iran. <i>J Voice</i> , 2015	Questionnaires	104 teachers and 41 non-teachers were surveyed. 54.6% of teachers reported having experienced vocal problems during their work in comparison to 21.1% of nonteachers.
Trinite B., Latvia	Epidemiology of Voice Disorders in Latvian teachers. <i>J Voice</i> , 2016	Questionnaires	522 teachers were surveyed. 66% of the teachers experienced voice problems. 82% of teachers first faced voice problems in their professional career.
Devadas et al., India	Prevalence and Risk Factors of Voice problems Among Primary School Teachers in India. <i>J Voice</i> , 2016	Questionnaires	Out of 1082 teachers who participated in the study, 188 teachers reported voice problems. This accounts for a prevalence rate of 17.4%

Table IV. Major publications on the prevalence of voice problems in different occupational groups

Author	Publication	Study Group – profession	Results
Hocevar-Boltezar I., Slovenia	Prevalence and risk factors for voice problems in priests. Wien Klin Wochenschr. 2009	Priests	A total of 340 Catholic priests were surveyed. 85.6% of them reported having voice problems during their career; 15.9 % experienced frequent voice problems.
Rechenberg et al., Brazil	Impact of call center work in subjective voice symptoms and complaints - an analytic study. J Soc Bras Fonoaudiol, 2011	Telemarketers	Research conducted on a study group of 124 telemarketers and a control group of 109 administrative workers. Prevalence of vocal symptoms in 33% of telemarketers in comparison to 21% in control group.
Piwowarczyk et al., Brazil	Vocal Symptoms, Voice Activity, and Participation Profile of Call Center Operators. J Voice, 2011	Call center operators	The mean number of current symptoms (6.8) was greater in the surveyed operators (n=157) than data for the general population (1.7).
Devadas U & Rajashekhar B, India	The prevalence and impact of voice problems in call center operators. J Laryngol Voice, 2013	Call center operators, India	1093 call center workers were surveyed. Prevalence of vocal complaints reported by 59% of call center operators.
Rumbach AF, Australia	Vocal problems of group fitness instructors: diagnosis, treatment, perceived and experienced attitudes and expectations of the industry. J Voice 2013	Group Fitness Instructors	Out of 38 fitness instructors 78.95% men and 70.91% women reported acute and chronic voice symptoms.
Buckley KL, Australia	Occupational Vocal Health of Elite Sports Coaches: An Exploratory Pilot Study of Football Coaches. J Voice 2015	Football Coaches	From 12 surveyed football coaches 25% reported a voice problem during the “current season.” and 33% during their careers.
Johns-Fiedler H & van Mersbergen M, USA	The prevalence of voice disorders in 911 emergency telecommunicators. J Voice 2015	Emergency 911 dispatchers	76.4% of the surveyed 911 Dispatchers (n=79) reported one or more voice symptoms.
Penteado et al., Brazil	Voice, stress, work and quality of life of soccer coaches and physical trainers. Codas, 2015	Soccer Coaches and Physical Trainers	Data analyzed on 13 physical trainers 13 coaches confirmed voice complaints and lack of preparation for voice care.
Gunasekaran et al., India	Voice Needs and Voice Demands of Professional Newsreaders in Southern India. J Voice 2016	Newsreaders	19% of the surveyed 47 professional newsreaders (n=47) reported a voice problem and identified a number of voice symptoms.
Fellman D & Simberg S, Finland	Prevalence and Risk Factors for Voice Problems Among Soccer Coaches. J Voice, 2017	Soccer Coaches	Of all the participants (n=108), 28.4% reported two or more (out of 6) frequently occurring vocal symptoms.

and a number of studies have been conducted (Table IV) to address the particular groups with a view of assessing the prevalence and impact of voice problems within them. The above mentioned groups included call center operators [48-50], soccer coaches [51-53], fitness instructors [54, 55], physical trainers [52], elite sports coaches, radio performers, professional newsreaders [56], 911 emergency telecommunicators [57], priests [23, 58].

Implications

The findings of the present review show that professional voice users are a heterogenous group and effective and healthy voice is a primary need for many professions. The awareness of voice disorders as work-related diseases has increased over the last decades and voice disorders have been accepted as occupational disorders in some European countries, including Poland [5]. However, so far research in

Poland has concentrated mainly on teachers. Given the extent of voice problems among other vocally-demanding professions documented in literature on the subject, it is important to raise awareness of voice use and vocal problems among the remaining professions.

Voice problems experienced by professional voice users may lead to problems for the employee as well as for the employer. The consequences are vocal, professional, and socio-economic. Employees may exhibit reduced productivity, decreased work quality, and restriction of daily activities and social function, with subsequent reduction in quality of life. All of these may in turn increase stress levels, resulting in deteriorated quality of life. Employers may see increases in absenteeism and employer turnover, as well as raised costs for substitute workers, medical treatment and workers' compensation claims [59-61].

Occupational voice problems may threaten working ability as well as occupational health and safety of workers [24]. Laryngeal injuries caused by high vocal loading can lead to absence at work or cancelled performances, lost income, prolonged rehabilitation periods, and in extreme cases, change of profession or early retirement [59]. Therefore,

from the point of view of occupational medicine, future studies should be directed at thorough examination of those professions in which vocal problems may pose a threat not only to the affected individuals themselves, but also to occupational health and safety.

Piśmiennictwo

1. Carding P. Occupational voice disorders: Is there a firm case for industrial injuries disablement benefit? *Logoped Phoniatr Vocol* 2007; 32(1): 47-8.
2. Vilkmán E. Voice problems at work: A challenge for occupational safety and health arrangement. *Folia Phoniatr Logop* 2000; 52(1-3): 120-5.
3. Angelillo M, Di Maio G, Costa G, Angelillo N, Barillari U. Prevalence of occupational voice disorders in teachers. *J Prev Med Hyg* 2009; 50(1): 26-32.
4. Verdolini K, Ramig LO. Review: occupational risks for voice problems. *Logoped Phoniatr Vocol* 2001; 26(1): 37-46.
5. Vilkmán E. Occupational safety and health aspects of voice and speech professions. *Folia Phoniatr Logop* 2004; 56(4): 220-53.
6. Titze IR, Lemke J, Montequin D. Populations in the U.S. workforce who rely on voice as a primary tool of trade: a preliminary report. *J Voice* 1997; 11(3): 254-9.
7. Hummel C, Scharf M, Schueetzenberger A, Graessel E, Rosanowski F. Objective voice parameters and self-perceived handicap in dysphonia. *Folia Phoniatr Logop* 2010; 62(6): 303-7.
8. De Jong F. An introduction to the teacher's voice in a biopsychosocial perspective. *Folia Phoniatr Logop* 2010; 62(1-2): 5-8.
9. Koufman JA, Blalock PD. Vocal fatigue and dysphonia in the professional voice user: Bogart-Bacall syndrome. *Laryngoscope* 1988; 98(5): 493-8.
10. Fritzell B. Voice disorders and occupations. *Logoped Phoniatr Vocol* 1996; 21(1): 7-12.
11. Casper JK. Treatment outcomes in occupational voice disorders. (w) *Occupational Voice: Care and Cure*. Dejonckere PH (red.). Kugler Publications, The Hague 2001: 187-99.
12. Eluard PF. Troubles de la voix chez les enseignants. INRS Institut National de Recherche et de Sécurité pour la prévention des accidents du travail et des maladies professionnelles. Documents pour le Médecin du Travail 2004; 98(2): 221-38.
13. Behlau M, Zambon F, Madazio G. Managing dysphonia in occupational voice users. *Curr Opin Otolaryngol Head Neck Surg* 2014; 22(3): 188-94.
14. Wingate JM, Brown WS, Shrivastav R, Davenport P, Sapienza CM. Treatment outcomes for professional voice users. *J Voice* 2007; 21(4): 433-49.
15. Chitguppi C, Raj A, Meher R, Rathore PK. Speaking and Nonspeaking Voice Professionals: Who Has the Better Voice? *J Voice* 2018; 32(1): 45-50.
16. Sataloff RT. *Professional Voice: The Science and Art of Clinical care*. 2nd ed. San Diego, CA: Singular Publishing Group; 1997.
17. Calcinoni O, Niebudek-Bogusz E. Occupational Voice. (w) *Diagnosis and treatment of Voice disorders 4th*. Rubin J, Sataloff R, Korovin G (red.). Plural Publishing, San Diego 2014: 735-62.
18. Matisse JA, Oates JM, Greenwood KM. Vocal problems among teachers: a review of prevalence, causes, prevention, and treatment. *J Voice* 1998; 12(4): 489-99.
19. Martins RH, Pereira ER, Hidalgo CB, Tavares EL. Voice disorders in teachers. A review. *J Voice* 2014; 28(6): 716-24.
20. Pereira ER, Tavares EL, Martins RH3. Voice Disorders in Teachers: Clinical, Videolaryngoscopic, and Vocal Aspects. *J Voice* 2015; 29(5): 564-71.
21. Titze IR. Voice Research and Technology: Vocal Demands on Teachers. *Journal of Singing*. *Journal of Singing* 2007; 64(1): 67-9.
22. Rodero E, Diaz-Rodriguez C, Olatz L. A Training Model for Improving Journalists' Voice. *J Voice* 2017 Jun 6. pii: S0892-1997(16)30533-1 [Epub ahead of print].
23. Reed JP, Sims HS. Comparative Analysis of Characteristics of Voice Use Amidst Clergy. *J Voice* 2017; 31(2): 256.e7-256.e11.
24. Hazlett DE, Duffy OM, Moorhead SA. Occupational voice demands and their impact on the call-centre industry. *BMC Public Health* 2009; 9: 108.
25. Schneider-Stickler B, Knell C, Aichstill B, Jocher W. Biofeedback on voice use in call center agents in order to prevent occupational voice disorders. *J Voice* 2012; 26(1): 51-62.
26. Williams NR. Occupational groups at risk of voice disorders: a review of the literature. *Occup Med (Lond)* 2003; 53(7): 456-60.
27. Warhurst S, McCabe P, Madill C. What makes a good voice for radio: perceptions of radio employers and educators. *J Voice* 2013; 27(2): 217-24.
28. Warhurst S, Madill C, McCabe P, Ternström S, Yiu E, Heard R. Perceptual and Acoustic Analyses of Good Voice Quality in Male Radio Performers. *J Voice* 2017; 31(2): 259.e1-259.e12.
29. Warhurst S, McCabe P, Yiu E, Heard R, Madill C. Acoustic characteristics of male commercial and public radio broadcast voices. *J Voice* 2013; 27(5): 655.e1-7.
30. Merrill RM, Anderson AE, Sloan A. Quality of life indicators according to voice disorders and voice-related conditions. *Laryngoscope* 2011; 121(9): 2004-10.
31. Vilkmán E. Occupational risk factors and voice disorders. *Logoped Phoniatr Vocol* 1996; 21(3-4): 137-41.
32. Assunção AA, Bassi IB, de Medeiros AM, Rodrigues Cde S, Gama AC. Occupational and individual risk factors for dysphonia in teachers. *Occup Med (Lond)* 2012; 62(7): 553-9.

33. Sebastian S, Suresh B, Simon S, Ballraj A. Risk Factors for Hyperfunctional Voice Disorders Among Teachers. *Online J Health Allied Sci* 2012;11: 6.
34. Sala E, Laine A, Simberg S, Pentti J, Suonpää J. The prevalence of voice disorders among day care center teachers compared with nurses: a questionnaire and clinical study. *J Voice* 2001; 15(3): 413v23.
35. Duffy OM, Hazlett DE. The impact of preventive voice care programs for training teachers: a longitudinal study. *J Voice* 2004; 18(1): 63-70.
36. Rantala LM, Hakala SJ, Holmqvist S, Sala E. Connections between voice ergonomic risk factors and voice symptoms, voice handicap, and respiratory tract diseases. *J Voice* 2012; 26(6): 819.e13-20.
37. Whitling S, Lyberg-Åhlander V, Rydell R. Long-time voice accumulation during work, leisure and a vocal loading task in groups with different levels of functional voice problems. *J Voice* 2017; 31(2): 245.e1-246.e10.
38. Jónsdóttir VI, Boyle BE, Martin PJ, Sigurdardóttir G. A comparison of the occurrence and nature of vocal symptoms in two groups of Icelandic teachers. *Logoped Phoniatr Vocol* 2002; 27(3): 98-105.
39. Bermudez de Alvear RM, Martinez-Arquero G, Javier Baron F, Hernandez-Mendo A. An Interdisciplinary Approach to Teachers' Voice Disorders and Psychosocial Working Conditions. *Folia Phoniatr Logop* 2010; 62: 24-34.
40. Bovo R, Galceran M, Petruccelli J, Hatzopoulos S. Vocal problems among teachers: evaluation of a preventive voice program. *J Voice*. 2007; 21(6): 705-22.
41. Kooijman PG, Thomas G, Graamans K, de Jong FI. Psychosocial impact of the teacher's voice throughout the career. *J Voice* 2007; 21(3): 316-24.
42. Niebudek-Bogusz E, Fiszer M, Kotyło P, Ziatkowska E, Śliwińska-Kowalska M. Zapobieganie chorobom narządu głosu u nauczycieli. *Otorynolaryngologia* 2003; Supl. 1: 94.
43. Thibeault SL, Merrill RM, Roy N, Gray SD, Smith EM. Occupational risk factors associated with voice disorders among teachers. *Ann Epidemiol* 2004; 14(10): 786-92.
44. Niebudek-Bogusz E, Sznurowska-Przygocka B, Fiszer M, Kotyło P, Modrzewska M, Sinkiewicz A, Sliwińska-Kowalska M. The effectiveness of voice therapy for teachers with dysphonia. *Folia Phoniatr Logop* 2008; 60: 134-41.
45. Dejonckere PH, Bradley P, Clemente P, Cornut G, Crevier-Buchman L, Friedrich G, et al. Committee on Phoniatics of the European Laryngological Society (ELS). A basic protocol for functional assessment of voice pathology, especially for investigating the efficacy of (phonosurgical) treatments and evaluating new assessment techniques. Guideline elaborated by the Committee on Phoniatics of the European Laryngological Society (ELS). *Eur Arch Otorhinolaryngol* 2001; 258(2): 77-82.
46. Gilbert MR, Gartner-Schmidt JL, Rosen CA. The VHI-10 and VHI Item Reduction Translations-Are we all Speaking the Same Language? *J Voice* 2017; 31(2): 250.e1-250.e7.
47. Przysieszny PE, Przysieszny LT. Work-related voice disorder. *Braz J Otorhinolaryngol* 2015; 81(2): 202-11.
48. Rechenberg L, Goulart BN, Roithmann R. Impact of call center work in subjective voice symptoms and complaints – an analytic study. *J Soc Bras Fonoaudiol* 2011; 23(4): 301-7.
49. Piwowarczyk TC, Oliveira G, Lourenço L, Behlau M. Vocal symptoms, voice activity, and participation profile and professional performance of call center operators. *J Voice* 2012; 26(2): 194-200.
50. Devadas U, Rajashekhar B. The prevalence and impact of voice problems in call center operators. *J Laryngol Voice* 2013; 3(1): 3-9.
51. Buckley KL, O'Halloran PD, Oates JM. Occupational Vocal Health of Elite Sports Coaches: An Exploratory Pilot Study of Football Coaches. *J Voice* 2015; 29(4): 476-83.
52. Penteado RZ, Silva NB, Montebello MI. Voice, stress, work and quality of life of soccer coaches and physical trainers. *Codas* 2015; 27(6): 588-97.
53. Fellman D, Simberg S. Prevalence and Risk Factors for Voice Problems Among Soccer Coaches. *J Voice* 2017; 31(1): 121.e9-121.e15.
54. Rumbach AF. Voice problems of group fitness instructors: diagnosis, treatment, perceived and experienced attitudes and expectations of the industry. *J Voice* 2013; 27(6): 786.e1-9.
55. Heidel SE, Torgerson JK. Vocal problems among aerobic instructors and aerobic participants. *J Commun Disord* 1993; 26(3): 179v91.
56. Gunasekaran N, Boominathan P, Seethapathy J. Voice Needs and Voice Demands of Professional Newsreaders in Southern India. *J Voice* 2016; 30(6): 756.e9-756.e20.
57. Johns-Fiedler H, van Mersbergen M. The prevalence of voice disorders in 911 emergency telecommunicators. *J Voice* 2015; 29(3): 389.e1-10.
58. Hocevar-Boltezar I. Prevalence and risk factors for voice problems in priests. *Wien Klin Wochenschr* 2009; 121(7-8): 276-81.
59. Epstein R, Remacle A, Morsomme D. From reactive intervention to proactive prevention: The evolution of occupational dysphonia. *Perspect Voice* 2011; 21(2): 48-55.
60. Spina AL, Maunsell R, Sandalo K, Gusmão R, Crespo A. Correlation between voice and life quality and occupation. *Braz J Otorhinolaryngol* 2009; 75(2): 275-9.
61. Roy N, Merrill RM, Gray SD, Smith EM. Voice disorders in the general population: prevalence, risk factors, and occupational impact. *Laryngoscope* 2005; 115(11): 1988-95.
62. Cantor Cutiva LC, Vogel I, Burdorf A. Voice disorders in teachers and their associations with work-related factors: A systematic review. *J Commun Disord* 2013; 46(2): 143-55.
63. Smith E, Gray SD, Dove H, Kirchner L, Heras H. Frequency and effects of teachers' voice problems. *J Voice* 1997; 11(1):81-7.
64. Thibeault SL, Merrill RM, Roy N, Gray SD, Smith EM. Occupational risk factors associated with voice disorders among teachers. *Ann Epidemiol* 2004; 14(10): 786-92.
65. De Jong FI, Kooijman PG, Thomas G, Huinck WJ, Graamans K, Schutte HK. Epidemiology of Voice Problems in Dutch Teachers. *Folia Phoniatr Logop* 2006; 58(3): 186-98.
66. Sliwińska-Kowalska M, Niebudek-Bogusz E, Fiszer M, Los-Spychalska T, Kotyło P, Sznurowska-Przygocka B, Modrzewska M. The prevalence and risk factors for occupational voice disorders in teachers. *Folia Phoniatr Logop* 2006; 58(2): 85-101.

67. Munier C, Kinsella R. The prevalence and impact of voice problems in primary school teachers. *Occup Med (Lond)* 2008; 58(1): 74-6.
68. de Alvear RM, Martínez-Arquero G, Barón FJ, Hernández-Mendo A. An interdisciplinary approach to teachers' voice disorders and psychosocial working conditions. *Folia Phoniatr Logop* 2010; 62(1-2): 24-34.
69. Da Costa V, Prada E, Roberts A, Cohen S. Voice disorders in primary school teachers and barriers to care. *J Voice* 2012; 26(1): 69-76.
70. Behlau M, Zambon F, Guerrieri AC, Roy N. Epidemiology of voice disorders in teachers and nonteachers in Brazil: prevalence and adverse effects. *J Voice* 2012; 26(5): 665.e9-18.
71. Leão SH, Oates JM, Purdy SC, Scott D, Morton RP. Voice Problems in New Zealand Teachers: A National Survey. *J Voice* 2015; 29(5): 645.e1-645.e13.
72. Seifpanahi S, Izadi F, Jamshidi AA, Torabinezhad F, Sarrafzadeh J, Sobhani-Rad D, Ganjuie M. Prevalence of Voice Disorders and Associated Risk Factors in Teachers and Nonteachers in Iran. *J Voice* 2016; 30(4): 506.e19-23.
73. Trinite B. Epidemiology of Voice Disorders in Latvian School Teachers. *J Voice* 2017; 31(4): 508.e1-508.e9.
74. Devadas U, Bellur R, Maruthy S. Prevalence and Risk Factors of Voice Problems Among Primary School Teachers in India. *J Voice* 2017; 31(1): 117.e1-117.e10.