ORIGINAL ARTICLE

Epidemiological voice health map of the teaching population of Granollers (Barcelona) developed from the EVES questionnaire and the VHI

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Abstract

The aim of this research project was to carry out an epidemiological study on the voice health of the teaching population in Granollers (Barcelona) using the EVES questionnaire and to relate the collected data to the VHI results. The study sample consisted of 233 teachers from Granollers (Barcelona). The EVES questionnaire, which includes the VHI-10, was conducted online. A high percentage of the teachers consulted suffered voice disorders, which ranged from minor to more serious cases. In regard to the data obtained using the VHI, in 28.77% of the cases there was a moderate or a serious perception of voice problems. Out of these cases only one person, who had a moderate perception of their problem, was undergoing voice therapy with a speech therapist. There are three questions in the EVES questionnaire that can efficiently indicate the existence of a voice disorder in a straightforward manner, and the results for these were similar to those recorded for the VHI group of questions. Therefore, it may be argued that questions that refer to the perception of the degree of pleasantness of one’s own voice should be included, because they would provide a useful way to indicate whether there is a voice problem at a preliminary screening stage.

Key words: Epidemiological study, risk factors, teachers, voice disorders, Voice Handicap Index

Introduction

Studies show us that teachers, because of the constant use and necessary demands placed on their voices in the work-place, have a heightened risk of developing voice-related disorders (1–3) and that this risk is higher than that in other professions (4). According to the International Workers Organization and recent studies conducted on epidemiology and health in the work-place (5,6), teachers are one of the work-forces most affected by voice disorders, which can lead to a decline in their quality of life. This is evident both physically and psychologically, since the extent of the dysfunction affects the seriousness of the symptomatology and the individual’s own perception and reaction to their condition (7). In addition, its social and economic consequences have to be taken into consideration, as they have a direct impact on the teaching task and, by extension, on the overall functioning of the education system (5,8). Studies conducted in the United States (9) estimate that the financial impact caused by teacher sick leave, plus the resulting expenditures on medical treatments add up to approximately 2.5 billion dollars a year. The impact on the life quality of the dysphonic and on their work performance is even more dramatic. Roy et al. (6) indicate that persons in the teaching profession experienced a higher number of days in which they reduced their activities or interactions as a consequence of voice-related disorders than those of any other professional group.

The above has led to the promotion of several epidemiological studies providing information on the voice health of teachers. Particularly noteworthy are the studies conducted in the United States (6,10), Australia (11), Poland (12), Holland (1), Spain (13,14), Belgium (2,15), China (4), United Kingdom (16,17), Puerto Rico (18), South Korea (19), Sweden (20), Singapore (21), and Brazil (22,23). Some researchers have even been able to define a
teacher profile at risk of suffering from a voice disorder—woman, aged between 40 and 59, with 16 years or more of work experience, and with a family history of voice disorders (6). It must be said that the conclusions of these research projects not only make reference to the scope of voice disorders and to the profile of those at risk of suffering from them—and to the repeated assertion that teachers are a group at high risk of suffering from dysphonias—but now they also emphasize the need to carry out training programmes at teacher training level as a good tool for preventing problems.

Subjects and methods

This epidemiological study—conducted in collaboration with Granollers County Council and with the support of the Department of Prevention Services at the Department of Education of the Generalitat (autonomous government) of Catalonia—is part of a more ambitious project provided in combination with an experimental voice education programme aimed at preventing voice-related disorders. Therefore, firstly, a new questionnaire has been created to collect information on the general voice health of teachers, the EVES-QUEST (EVES is the research group name of Educació per a una Veu Eficient i Sana, in English: Education for a Healthy and Efficient Voice). Once it was validated by experts in the areas of phoniatrics and speech therapy, it was implemented as a pilot test with the objective of making it reliable. Once the questionnaire’s degree of reliability had been calculated (Cronbach’s $\alpha = 0.824$) it is then deemed a stable measuring tool, i.e. when alpha is calculated without taking into account each one of the items, no significant data movement is detected. It is important to note that the questionnaire includes the VHI-10 (the 10-question Voice Handicap Index), a standardized test. The authors of the VHI-10 have allowed the EVES group to use both the Catalan and Spanish versions within the corresponding linguistic areas (24). Secondly, the EVES group from the Universitat Autònoma de Barcelona (UAB) have carried out a training programme, which has been developed on the back of previous programmes they created. The questionnaire has been used both as an epidemiological study and as a means to observe its study subjects’ evolution in the above-mentioned training programme. In this regard, the data from the training programme is being currently analysed. This article presents an important part of the data obtained from the implementation of the questionnaire on the teaching population of Granollers, the capital of Valles Oriental comarca, which belongs to the province of Barcelona.

The EVES-QUEST

The EVES-QUEST (see Supplementary Appendix available online at http://informahealthcare.com/doi/abs/10.3109/14015439.2014.934278) aims to explore the voice health of the teaching population and has been created to carry out epidemiological studies on voice disorders in teachers. In this case, it has been used for the data collected from schools of Granollers. As the aetiology of voice disorders is so diverse and multidimensional (4), multiple factors relating to the dysphonias suffered by teachers have been taken into account when making the questionnaire. The EVES-QUEST gives us general information such as the professional and academic profiles of the participants, their work environment, and specifically data on their general health, with special emphasis on voice health. The questionnaire hereby allows for the analysis of those variables which are less common in similar questionnaires, such as habitual body tensions suffered by teachers, voice use in the classroom, and voice training, which will be soon adequately analysed. Many questions relate to one’s own self perception of one’s own voice. The use of these kinds of questions allows us to assess realistically the prevalence of teacher voice disorders. It also becomes a practical tool when working with various education centres and therefore with a large sample of teachers (21).

The EVES-QUEST has 30 questions. There are different kinds of questions. It depends on the content and the data which can be obtained. There are questions with closed text answers, multiple choice questions, and others require an answer which falls within an ordinal scale with five Likert item discriminations, which in turn offer five possible options formulated according to the content and the type of data desired. On the one hand we use: 0, never; 1, rarely; 2, sometimes; 3, often; and 4, always. On the other hand, we use: 0, not at all; 1, almost not at all; 2, a little; 3, quite a lot; and 4, a lot. It depends on if we are asking how often or how much do they do or feel something.

The questionnaire is divided into several sections:

- **Identifying data.** Here essential personal contact details are asked should the person need to be contacted and to determine the level of participation in each education centre.
- **General profile and training.** Here data referring to age and gender are collected, whether or not they have received voice training, and if so where and in what context (singing, theatre, university, etc.), whether they found this training to be useful, and finally the perception they have about their own voice (whether they like it, whether they consider that it is healthy, and if they
consider it to be an efficient tool in terms of communication).

- **Working environment.** Here the collected data tell us what level they teach, their role or teaching profile, their working conditions, and the number of years they have been teaching.

- **General health.** Here the questions are about illness and health disorders suffered which can directly and indirectly affect the voice. They are also asked about their degree of tiredness and general stress as well as the tensions they perceive in different parts of their body in stressful situations.

- **Voice health.** The data collected in this section are on diagnosed voice pathologies, possible voice therapy with a speech therapist, important voice disorders over the last 2 years, and self-perception of voice disorders. With reference to this last point, the participants are asked which variables they think can affect their voice. An authorized Catalan translation of the Voice Handicap Index 10 (VHI-10) has also been used.

- **Voice use in the classroom.** Here they are asked how they use their voice in the classroom, their awareness of the adequate or inadequate use of their voice, the resources they have at their disposal to solve problems, and the degree of fatigue they feel during the course of the week.

- **Singing voice.** This section is aimed only at nursery school teachers, preschool teachers, and music teachers. Here the data is collected on how these teachers perceive their own singing voice.

- **Final assessment.** Created to obtain an evaluation of the questionnaire.

In the 2010–2011 school year, the teaching population of Granollers was 1,004. They belonged to 36 schools. They were all asked to answer the online version of the EVES-QUEST which would take 10 minutes. A total of 233 questionnaires were completed, representing 23.21% of the teaching population.

**Results**

The statistical software package SPSS20 was used to analyse the data collected from the EVES questionnaire. The statistical treatments used were descriptive for the specific variables, as well as for the variable cross-tabulation. With regard to each item, the factors, and the questionnaire in general, the chi-square test was used to compare proportions. The data have been presented by grouping the five existing categories into three groups: firstly, we grouped them according to ‘never–rarely’; secondly, we upheld the ‘sometimes’ group; and, finally, the last group according to ‘often–always’.

**Participants**

The average sample profile is a 42-year-old woman who has been teaching for more than 10 years (68.2%) in a state school (67.4%) as a general (52.79%) primary (42.1%) teacher and is permanently employed (83.69%).

**Working environment**

The average age of the sample group was 42.02 ± 10.1 years. If the sample is split by gender, the average woman’s age was 42 ± 10.2 years, and the men’s age was very similar, 42 ± 9.8 years. As far as gender is concerned, a very high percentage were women, 82.2%, whilst men accounted for 17.2%. Primary school teachers accounted for 42.1% of the sample, secondary school teachers accounted for 32.6%, nursery teachers accounted for 16.3%, and preschool teachers for 9%. Most of the individuals consulted were general teachers (52.79%); of the specialist teachers 5.58% were foreign-language teachers, 3.86% music teachers, 3.43% physical education teachers, and 3% were special-needs teachers. Most of the teachers questioned worked in state schools (67.4%), 24.5% in semi-private schools, and 8.2% in private nursery schools. In terms of their employment status, 83.69% were permanently employed, whilst 16.31% were supply teachers or employed on a temporary basis. Finally, the majority had worked as teachers for more than 10 years (68.2%), while 20.2% had done so for between 5 and 10 years, 9% for between 2 and 4 years, whilst only 1.3% stated that they had been working for 1 year or less.

**General health and voice health**

With regard to the data on health disorders, it is important to note that a large percentage suffered from some kind of health disorder, which ranged from minor to more serious cases: only 3.49% claimed never to suffer from colds, 13.1% claimed never to suffer from anxiety or stress, and 17.18% never suffered from pharyngitis. We want to draw attention to the high frequency of colds and more specifically of pharyngitis. It is striking that 17.18% never suffered from pharyngitis, which indicates that almost 4 out of 5 teachers did suffer from it. Pharyngitis is of particular importance as it can lead to further voice disorders. However, only 13.1% stated that they never suffered from anxiety/stress. Therefore, the presence of these disorders is very generalized.
With regard to the level of tiredness, 46.35% claimed to have recently felt tired, and just over half the sample (51.93%) claimed that of recent they had been sleeping less than they would like to. It was also established that a third of the teachers (32.76%) had recently felt stressed. From the full sample, 7.3% of teachers had a diagnosed voice disorder, while only one person was undergoing voice therapy with a speech therapist. When asked whether or not they had suffered from voice problems in the last 2 years, 56.65% had not experienced any problems, 33.05% occasional or sporadic problems, 4.72% more frequent and persistent problems, and 5.58% frequent problems. In the case of voice fatigue it was observed that 49.35% of those working in the teaching profession suffered from a weekly accumulation of vocal fatigue (30.04% by the end of the day and 19.31% especially by Friday), while 2.15% felt their voice to be permanently tired. When taking into consideration variables related to factors or situations that may be perceived as harmful to voice health, the percentage of answers was very high. More than half of the sample felt that the following factors were quite or very detrimental to their voice: air conditioning (65.50%), a noisy environment (59.03%), and tobacco smoke (56.57%). On the other hand, social activities (47.01%), fatigue (46.72%), temperature fluctuations (44.30%), classroom acoustics (40%), stressful situations (38.42%), cold drinks (37.17%), and body tensions (37.17%) were perceived as quite or very detrimental by a high percentage of teachers.

Perception of one’s own voice

In relation to the teachers’ own perception of their own voice, 12.61% perceived their voice as not very healthy compared to 62.61% who perceived their voice to be healthy. On the other hand, when asked if their voices are an effective means of communication, 84.91% answered ‘quite a lot–a lot’. When asked if they liked their voice, only 11.79% say they did not.

VHI

The score for the VHI-10 can range from 0 to 40, and it is based on the total of the numerical scores given for each of the 10 questions. In order to be able to segment the sample into dysphonia perception levels, it is stipulated that when a VHI-10 score is less than 9 (25), this indicates a lack of a voice disorder perception. A score of above 9 indicates the existence of a voice disorder perception. If the score obtained is in the range of 10 to 15, this indicates a perception of a moderate disorder, whilst a score of over 15 indicates a serious one. The data obtained revealed that in 71.22% of cases there was no perception of problems (NPP); in 19.81% there was a moderate perception of problems (MPP); in 8.96% there was a serious/grave perception of problems (GPP). However, it must be stressed that 9.4% scored 0.

With regard to the specific VHI statements chosen by a high percentage of people, who also ticked the boxes to state that they ‘always’ or ‘often’ experience these specific problems, the following results need to be mentioned: the ‘always’ or ‘often’ boxes for the statement ‘I feel as though I have to strain to produce voice’ was ticked by 10.08%; the statement intended to determine whether or not individuals experienced difficulties in predicting the clarity of their own voice was ticked by 9.37%, and the statement regarding whether or not they were worried about their voice problems was ticked by 9.37%, and the statement regarding whether or not they were worried about their voice problems was ticked by 9.37%. To be able to read the data obtained through the EVES questionnaire, variable cross-tabulations have been carried out in order to establish an interrelation between some of the results. The most relevant are as follows (Table I):

Table I. VHI results.

| VHI results (n = 233) | % never | % rarely | % sometimes | % often | % always | % total |
|----------------------|---------|----------|------------|---------|----------|---------|
| I feel as though I have to strain to produce voice | 24.56 | 40.35 | 25 | 7.89 | 2.19 | 100 |
| The clarity of my voice is unpredictable | 28.13 | 37.05 | 24.45 | 7.14 | 2.23 | 100 |
| I feel left out of conversations because of my voice | 77.68 | 16.97 | 4.46 | 1.79 | 0 | 100 |
| My voice makes me feel handicapped | 65.77 | 21.17 | 10.81 | 2.25 | 0 | 100 |
| My voice makes it difficult for people to hear me | 61.84 | 26.32 | 10.53 | 0.43 | 0.88 | 100 |
| People have difficulty understanding me in a noisy room | 40.71 | 29.20 | 24.34 | 3.54 | 2.21 | 100 |
| People ask, ‘What’s wrong with your voice?’ | 65.93 | 19.47 | 9.73 | 4.87 | 0 | 100 |
| My voice difficulties restrict my personal and social life | 71.74 | 19.13 | 6.96 | 2.17 | 0 | 100 |
| My voice problem causes me to lose income | 84.35 | 13.48 | 1.3 | 0.87 | 0 | 100 |
| My voice problem upsets me | 41.13 | 22.51 | 19.48 | 11.26 | 5.63 | 100 |
**VHI and profile**

**VHI and gender.** Here the results show a similar level of perception of voice disorders in the NPP group for women (71.3%) and men (71.05%). In the MPP group there were more women (20.7%) than men (15.8%), but there were more men (13.15%) than women (8.0%) in the GPP group.

**VHI and stage of education.** In the case of nursery schools, the highest percentage was found in the NPP group (84.2%). In the case of preschool teachers the highest percentage (58.8%) also fell within the NPP group. Therefore, this trend was the same as for teachers working in nursery schools, with the only difference being that in preschool education a number of GPP cases were encountered. The same trend was repeated with primary school teachers, but there was a higher number of NPP cases (70.3%). Finally, secondary school teachers maintained this trend: 75% belonged to the NPP group.

**VHI and years worked.** Regarding the correlation between the years worked and voice disorders, we have observed that teachers who belonged to the NPP group represented 66% of those who were in their first year of employment, 89.5% of the teachers who had worked for between 2 and 4 years, 71.1% of those who had been working for between 5 and 10 years, and 68.5% of those who had worked in the teaching profession for more than 10 years. The results also reveal an absence of GPP cases amongst those who have been working for less than 5 years. However, it should be pointed out that the highest percentage of teachers with a GPP was concentrated in the group who had been working for more than 10 years (11.9%).

**VHI and voice health.** If the VHI sample results are interrelated with the results for those undergoing voice therapy with a speech therapist, we find that 100% (n = 147) of the NPP group and 100% (n = 17) of those with a GPP did not go to a speech therapist nor did 97.6% of those with an MPP. With regard to the VHI results and whether or not they had a diagnosed voice pathology, 21.4% of those that did were to be found in the NPP group, 28.6% had a GPP, and 50% had an MPP. Therefore, it is important to note those in the NPP group who had a diagnosed pathology, as well as the fact that the number of individuals in the PPG group who had been diagnosed with a voice disorder was lower than those who had a PPM and a diagnosed disorder.

**VHI and one's own voice perception.** As mentioned above, when the individuals in the sample were given the chance to choose the statement ‘my voice is to my liking’, 17.79% did not choose this option. When the VHI data is crossed with this statement, it becomes clear that more than 75% of those who liked their voice belonged to the NPP group, while 5.35% belonged to the GPP. On the other hand, 67.8% of those belonging to the NPP group liked their voice compared to only 10.1% who did not. However, only 33.4% of those with a GPP liked their voice, which represents half of those who chose this option and belonged to the NPP group. Finally, it is important to note that there were three times more people who did not like their own voice and had a GPP (33.4%), than those who chose this option and belonged to the NPP group (10.1%). With regard to the variable cross-tabulation between the VHI results and the statement ‘my voice is healthy’, the most noticeable results show that 73.1% of the NPP group said that they had a healthy voice, whilst 52.7% of those with a GPP did not choose this option. However, 6.7% of those belonging to the NPP group did not say that their voice was healthy, while 50.8% of those who had a GPP did, which signals a reverse percentage trend. As a result, a higher percentage of those in the NPP group considered their voice to be healthier than those in the GPP group. Finally, if the VHI results are crossed with the statement ‘My voice allows me to communicate efficiently’, the results offer a very similar interpretation to that described in the ‘Voice health’ section. It is important to note that 92.1% of those in the NPP group considered that they can communicate efficiently using their voice. Therefore 7.9% did have difficulties in doing so. This latter percentage increased to 47.3% in the case of those with a GPP, that is, almost half the group found it difficult to communicate efficiently.

**Questionnaire assessment**

The questionnaire has been rated as positive because its questions are quick and easy to answer and because answering the questionnaire has proved to be beneficial to the study subjects. Therefore, 50.69% thought that the questionnaire was quite quick and easy to answer, and 27.65% thought that it was very quick and easy. The latter data can be linked to the 48.02% of the sample who did not think that the questionnaire was difficult in the slightest and the 35.15% who thought it was not very difficult. Finally, 37.44% thought that the questionnaire was quite beneficial, and 7.76% thought it was very beneficial.

**Discussion**

Attention needs to be drawn to some aspects of the EVES questionnaire. It has been evaluated very pos-
processes of groups at risk of suffering voice disorders could be useful as a starting-point in the selection related to the perception of their own voice health (31). Although it level of acceptance increases at the same rate as that own voice (31). The most notable changes is a better acceptance of one's programmes have been implemented, one of the of voice disorders. This explanation would probably be based on a antness of one's own voice and its degree of dyspho order to explain the relationship between the pleas...nians. This research highlights the importance of the work that remains to be done in phoniatic health education. It has demonstrated that one thing is the perception teachers have of their own voice disorders and the other is a proper medical diagnosis. A large part of the teaching population at risk of voice disorders do not have easy access to health education programmes and speech therapy. A final datum which is as worrying as the above data is that only one teacher was undergoing treatment with a speech therapist and that he did not belong to the PPG group, but to the MPP group.

Conclusions
The results once again confirm that a high percentage of the teaching population experience voice health disorders. The results of the VHI-10 questionnaire verify that a substantial number of teachers in...
Granollers—almost one in three—perceived themselves as having a moderate or serious voice disorder. What is most worrying is the lack of voice care programmes available to teachers (there was only one person undergoing such treatment). Greater awareness of this issue would encourage teachers to contact the medical system when suffering from voice disorders and would also enable more precise diagnoses of existing cases of dysphonia to be made, as well as for effective monitoring to be conducted through speech therapy.

Three of the questions in the EVES questionnaire are very important because they are clearly associated with the results obtained from the VHI-10 questionnaire: ‘My voice is to my liking’, ‘My voice is healthy’, and ‘My voice allows me to communicate efficiently’. These questions deal with the self-perception of voice health, communicative efficiency, and voice pleasantness. The individuals who gave a positive answer to these three questions were usually the ones who did not perceive themselves as having a voice disorder and vice versa. Therefore, these three questions could indicate, in a preliminary screening, the existence of a voice disorder in a quick and simple way.

In terms of this sample of teachers’ quality of life, solutions are needed to minimize these problems, and these should be provided by both the schools and the state. It should also be noted that, apart from the large number of people who catch colds, four out of five teachers suffered from pharyngitis or from anxiety or stress, which may be interpreted as generalized disorders and therefore as risk factors for voice problems. In addition, a very high number of teachers (half of the sample) suffer from voice fatigue, which is a possible symptom of voice disorders. A professional who recurrently suffers from fatigue cannot perform well at work. Therefore, steps should be taken to improve teachers’ quality of life.

Finally, what is shown by this study is that a significant number of this sample of teachers had not received voice training, despite this being essential for the prevention and minimization of cases of dysphonia, the improvement of individuals’ quality of life and efficient oral communication. To build on this work, further research and study is needed with regard to two issues: whether or not the voice training that is provided is in fact the correct training, and to what extent it results in the prevention of voice disorders.

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Supplementary material available online

Supplementary Appendix available online at http://informahealthcare.com/doi/abs/10.3109/14015439.2014.934278