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Vocal fatigue in professors at the beginning and end of the school year

Fadiga vocal em professores universitários no início e ao final do ano letivo

Keywords

Health Evaluation
 Fatigue
 Faculty
 Occupational Health
 Voice

Descritores

Avaliação em Saúde
 Docentes
 Fadiga
 Saúde do Trabalhador
 Voz

ABSTRACT

Purpose: To characterize and to compare the perception of vocal fatigue in professors at the beginning and at the end of the school year. **Methods:** Observational, analytical, prospective cohort study was carried out. A total of 115 professors participated with a mean age of 40 years old, 71 women and 44 men, employees of 28 higher education institutions in the south and southeast regions of Brazil. All answered to the Vocal Fatigue Index (VFI) at the beginning (February or March) and at the end (October or November) of the Brazilian school year. The VFI results for both assessed moments were statistically compared ($p < 0.05$). **Results:** The professors' mean scores obtained in the factors of tiredness of voice and avoidance of voice use ($p < 0.001$) and improvement of symptoms with rest ($p = 0.001$) increased at the end of the school year. **Conclusion:** Professors reported higher perception of vocal fatigue at the end of the school year, which influenced the avoidance of voice use and improvement of symptoms with the rest.

RESUMO

Objetivo: Caracterizar e comparar a percepção de fadiga vocal em professores universitários no início e ao final do ano letivo. **Método:** Estudo observacional, analítico, de coorte prospectivo. Participaram 115 professores universitários, idade média de 40 anos, sendo 71 mulheres e 44 homens, funcionários de 28 instituições de ensino superior das regiões sul e sudeste do Brasil. Todos responderam ao Índice de Fadiga Vocal (IFV) no início (fevereiro ou março) e ao final (outubro ou novembro) do ano letivo. **Resultados:** Os resultados obtidos no IFV nos dois momentos foram comparados estatisticamente ($p < 0,05$). Resultados: Os escores médios obtidos nos domínios fadiga e restrição vocal ($p < 0,001$) e recuperação com repouso vocal ($p = 0,001$) dos professores universitários aumentaram ao final do ano letivo. **Conclusão:** Professores universitários referiram maior percepção de fadiga vocal ao final do ano letivo, o que influenciou na restrição vocal e na recuperação com repouso vocal.

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Received: October 02, 2018.

Accepted: April 10, 2019.

Study conducted at Universidade Estadual do Centro-Oeste – UNICENTRO - Irati (PR), Brasil.

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Financial support: Scholarship from Fundação Araucária (91/2017).

Conflict of interests: nothing to declare.



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INTRODUCTION

Vocal fatigue (VF) is a potentially debilitating and frequently puzzling symptom in vocal clinic, thus it is a complex phenomena⁽¹⁾. VF can be defined as a progressive increase in the perception of phonatory effort together with a decrease in vocal performance⁽²⁾.

The concept of fatigue comes from the physiology of exercise. In this field, there is a consensus that fatigue occurs when the oxygen supply to the muscle and brain is inadequate for the energy demands of active tissues during a certain task performance. Thus, the insufficient oxygen supply would cause performance decrements over time. Two factors can explain this: neuromuscular inefficiency and cardiovascular recovery deficit⁽³⁾. Regarding VF, neuromuscular inefficiency could involve the recruitment of more muscles than needed for task performance or “incorrect pattern” of muscle activation, considering that both will lead to greater energy demands. On the other hand, the inadequate cardiovascular recovery is related to the time course that physiological functions return to the baseline homeostatic state after vocal use⁽³⁾, which could be affected by lack of training, as well as the possibility of a genetic disposition that could cause low efficiency of laryngeal repairing mechanism^(4,5).

The VF most frequent signs and symptoms are: tiredness after voice overuse, misuse or vocal abuse; reduced vocal projection, increased effort in voicing, strained voice quality, reduced vocal projection, laryngeal discomfort, throat dryness and loss of voice, with worsening of symptoms during voicing day and improvement of symptoms with rest^(1,5). Frequent episodes of VF may even affect emotional, psychosocial and work conditions⁽⁵⁾. This is even more frequent in professional voice users and VF may be debilitating⁽³⁾.

Teachers are professionals that have many VF symptoms⁽⁶⁻⁹⁾, generally related to their high vocal load⁽⁶⁾. Despite the differences in the environmental and organizational work conditions of university professors, many studies^(6,9,10) have shown their high vocal load in teaching activities, presence of noise in work environment and high number of students per classroom, in addition to problems related to overall work overload, competitiveness and recognition in the academic community. All these factors contribute to the presence of VF symptoms in university professor. In this sense, the literature shows that teachers, generally, do not have vocal complaints during the holidays, but only during the school year⁽¹¹⁾, and that the vocal demand of their teaching work day leads to vocal function deviations. However, little is known about the perception of VF during the school year.

Considering the VF debilitating condition⁽³⁾, its high frequency of occurrence and the vocal complaints being related to vocal load, it is important to verify the perception of the VF in university professors during the school year. Such data may provide important information about the needs of this population and improve clinical performance in VF prevention and treatment. The initial hypothesis of the present study was: H1 - There is a higher perception of fatigue at the end of the school year when compared to the beginning of the school year.

Therefore, the aim of the present study was to characterize and to compare the perception of VF in university professors at the beginning and at the end of the school year.

METHODS

This is an observational, analytical and prospective cohort study. It was accepted by the Committee for Ethics in Research (*Comitê de Ética em Pesquisa*, COMEP) of the the *Universidade Estadual do Centro-Oeste* (protocol number 1.639.096). All participants signed the informed consent form (*Termo de Consentimento Livre e Esclarecido*, TCLE).

The participants contact information were obtain via email to different public and private higher education institution in the months of January and February 2017. In addition, an invitation link was posted and shared on social network. The inclusion criteria were: teach in higher education level and have a contract, male and females who have signed the informed consent form. The exclusion criteria were: not be actively working due to any reason; not have signed the informed consent form; have self-reported neurological problems, previous head and neck surgery with laryngeal or vocal impairment and/or history of organic dysphonia. In order to avoid bias due to the different workload from the beginning to the end of the school year, participants who reported any change in their workload or work routine were also excluded from the study. The selected participants had to answer to a questionnaire previously elaborated in the SurveyMonkey platform; the link was sent via email to all volunteers. The included participants also answered the same questionnaire at the second moment of data collection.

The estimation of the minimum required number of participants was performed with a sample calculation by hypothesis comparison test performed between two means of dependent groups based on an initial sample of 30 participants. The estimation method considered the highest standard deviation of the difference between the means of the beginning and the end of the semester, which was 7.5 points in the factor of tiredness of voice and avoidance of voice use. The significance level was set at 5% and the test power at 80% to detect the minimum differences between the both scores of the Vocal Fatigue Index (VFI). The minimum sample size was 112 participants, without accounting for losses.

The data collection happened in two steps: first step – beginning of the school year, months of February and March of 2017; second step – end of the school year, months of October and November of 2017. At both moments the participants filled out the same protocol, that was the translated and adapted version to the Brazilian Portuguese of the Vocal Fatigue Index (VFI)⁽¹²⁾. The participants also answered to an identification questionnaire with socio-demographic information, data related to vocal complaints and work conditions. The Brazilian version of the VFI has 19 questions divided into three factors: tiredness of voice and avoidance of voice use; physical discomfort symptoms and improvement of symptoms with rest. For each question the participants had to refer the frequency of occurrence using a five-point Likert scale, where zero indicates “never” and four

indicates “always”. The simple sum of the questions of each factor gives the questionnaire score.

Participants who answered only to the questionnaires in the first step of the research were excluded and not considered in the data analysis. Data were analyzed using descriptive and inferential statistics. The Shapiro-Wilk test was used to check for normal distribution of the VFI factors and showed that the variables had non-normal distribution. Thus, the two dependent groups were compared using the nonparametric Wilcoxon test. The significance level was set at 5% ($p < 0.05$). The Statistics software, version 17.0 (Stat Soft Inc.) was used.

RESULTS

A total of 235 university professor fulfilled the inclusion criteria. However, there was a loss of 120 professors over the course of the study. Therefore, the final sample of the present study counted with 115 professors from the south and southeast regions of Brazil. There were 71 females and 44 males, with ages between 26 and 64 years old (mean age of 40 years old), employees of 28 higher education institutions. The weekly hours lecture of the participants was 15.13 ± 9.30 hours.

University professors have higher scores in the factors of tiredness of voice and avoidance of voice use ($p < 0.001$) and improvement of symptoms with rest ($p = 0.001$) in the end of the school year (Table 1) when compared to the beginning of the school year.

DISCUSSION

The university professors VFI scores were high in all three factors; it was higher than the average scores of American English⁽¹⁾ and Persian⁽¹³⁾ speakers vocal healthy individuals in both assessed moments. On the other hand, the scores were lower than the average scores of dysphonic American English⁽¹⁾ and Persian⁽¹³⁾ speakers, also in both assessed moments. To the best of our knowledge there are no studies that characterized the VFI scores in Brazilian Portuguese speakers.

The present study data showed changes in university professors' VF perception throughout the school year in the factors of tiredness of voice and avoidance of voice use and improvement of symptoms with rest. To the best of our knowledge, the literature does not provide data on the VF perception of university professors throughout the school year. However, a study with university professors showed that the frequency of stress and physical symptoms are more evident at the end of the semester, which is due to increase work overload⁽¹⁴⁾ and

may contribute to more vocal and overall fatigue⁽¹⁵⁾. To our knowledge, there are no studies that applied the VFI in a similar population as in the present study.

Authors infer that VF perception improves with adequate rest⁽¹²⁾. However, the present study outcomes showed that the improvement of symptoms with rest decreased at the end of the school year when compared to the beginning. Considering that VF is due to insufficient oxygen supply for the energy demands of the vocal task⁽³⁾, it is believed that neuromuscular inefficiency due to incorrect pattern of muscle activation⁽³⁾, which is common in this population^(7,8,10), added to cardiovascular recovery issues due to lack of adequate vocal training⁽³⁾, also common in this population^(8,10), may have contributed to the increase in fatigue in these professors during the school year.

Vocal fatigue is directly related to increase in phonatory effort and progressive loss of phonatory abilities⁽²⁾. Thus, it is expected that professional voice users have vocal restriction; they give many hours lecture which increases their perception of fatigue and they have recovery deficit after vocal use⁽²⁾. However, considering frequent episodes or chronic VF in professors, vocal restriction may generate occupational impairments in addition to emotional and psychosocial impairments⁽⁵⁾. This condition must be closely observed once VF can be debilitating⁽³⁾. On the other hand, the physical discomfort symptoms scores did not change during the school year, which suggests that vocal fatigue does not cause physical discomfort, considering the sample analyzed in the present study.

These data show the need of speech language pathologist therapy and/or training with university professors once an individual with adequate training for his vocal demand will have less chances of reporting vocal fatigue.

The study limitation consists on not controlling the reason why some participants were excluded in the second step of the assessment. The participants answered to the protocols via SurveyMonkey and the system was programmed to stop data collection in case any individual filled any one of the exclusion criteria. Further studies must be performed in order to analyze vocal fatigue perception of university professors in other moments of the school year; in addition to considering the vocal load, work conditions and objective data of the laryngeal and vocal assessment. It is hypothesized that such data may bring scientific evidence of cause and effect relationship in addition to other factors and possible confounding elements. Hence, this could contribute to deepen the discussion on this topic and better support the speech language pathologist therapy/training with this population.

Table 1. Comparison of the Vocal Fatigue Index scores from the beginning and the end of the school year in university professors

Factor	Beginning of the school year			End of the school year			p-value
	Mean	Median	SD	Mean	Median	SD	
Tiredness and avoidance of voice use	9.7	9.0	8.2	13.0	13.0	8.4	<0.001*
Physical discomfort symptoms	2.9	2.0	3.4	3.2	2.0	3.2	0.302
Improvement of symptoms with rest	6.0	6.0	4.4	7.2	9.0	4.0	0.001*

* $p < 0.05$ – Wilcoxon Test

Caption: SD = Standard-Deviation

CONCLUSION

Professors reported higher perception of vocal fatigue at the end of the school year than in the beginning, which influenced the avoidance of voice use and improvement of symptoms with rest. Thus, the hypothesis of the present study is accepted.

ACKNOWLEDGMENTS

To *Fundação Araucária*, for the Scholarship granted to Gabrieli Cristina Santos Cercal.

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Author contributions

GCSC – study delimitation, data collection, data analysis, writing of the manuscript; *ALP* – study delimitation, data collection, data analysis, writing of the manuscript; *JMMN* – study delimitation, data collection, data analysis, writing of the manuscript; *VVR* – data analysis, writing and revision of the manuscript; *APDL* – study delimitation, data analysis, writing and revision of the manuscript.