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ORIGINAL ARTICLE

Influence of smoking isolated and associated to multifactorial aspects in vocal acoustic parameters[☆]

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KEYWORDS

Smoke;
Voice;
Acoustics

Abstract

Introduction: Smoking affect voice quality in a long period of time, but other factors may compromise it, such as professional using of voice, habits, alcohol dependence and GERD. The aim was associate the influence of these factors on vocal parameters.

Study design: Contemporary cohort study with cross-sectional.

Materials and methods: Eighty adults of 35 to 60 years old had participated in this study, they had been divided into two groups, smokers (GF) and control (GC). There was application of questionnaire and voices were recorded. Praat software has been used for voice assessment and Man-Whitney, chi-square and logistic regression has been used for statistical analysis.

Results: The GF had a higher incidence of alcohol dependence, coughing, throat clearing and professional voice using. Respecting to the acoustic parameters: noise-to-harmonic ratio (NHR), jitter and shimmer, the GF presented higher values. Relating these data to the questionnaire, it's noticed that female gender have influence over all acoustic parameters, GERD have influence over jitter and smoking can affect fundamental frequency, jitter, shimmer and NHR.

Conclusion: Smoking interferes in acoustics parameters isolated and associated with alcohol dependence, GERD, cough, throat clearing, gender and professional using of voice.

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PALAVRAS-CHAVE

Tabagismo;
Voz;
Acústica

Influência do tabagismo isolado e associado a aspectos multifatoriais nos parâmetros acústicos vocais

Resumo

Introdução: O fumo pode interferir negativamente na qualidade vocal e outros fatores associados, como o uso profissional da voz, hábitos, etilismo e refluxo gástrico-esofágico, podem potencializar essa interferência. O objetivo do estudo foi analisar a associação do tabagismo e dos demais fatores aos parâmetros acústicos vocais.

Forma de estudo: Estudo de coorte contemporâneo com corte transversal.

Materiais e métodos: Participaram do estudo 80 adultos, entre 35 e 60 anos, classificados nos

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grupos fumante (GF) e controle (GC). Foi realizada aplicação de questionário e gravação das vozes. A avaliação acústica foi realizada com o software Praat. Foram utilizados os testes Mann-Whitney, qui-quadrado e regressão linear simples.

Resultados: O GF apresentou maior prevalência de etilismo, tosse, hábito de pigarrear e uso profissional da voz, assim como apresentou valores aumentados para relação ruído-harmônico (NHR), *jitter* e *shimmer*. Foi estabelecida correlação entre o gênero feminino e todos os parâmetros acústicos, assim como entre o RGE, o aumento do *jitter* e o hábito de fumar, o agravamento da frequência fundamental, o aumento do *jitter*, o *shimmer* e a NHR.

Conclusão: O fumo interfere nos parâmetros acústicos de modo isolado e/ou associado ao etilismo, tosse, hábito de pigarrear, RGE e uso profissional da voz.

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Introduction

The World Health Organization has declared that smoking is a public health problem, a habit that was popularized in the last century and persists today.¹ Smoking causes chemical and psychological addiction, and can result in physiological changes, including vocal alterations.²

Prolonged exposure of the laryngeal mucosa to smoking compromises the mucociliary movement of the mucosa, changes voice quality, and causes a burning sensation, throat clearing, and the presence of secretions. Changes in voice quality were highlighted in the study by Sorensen and Horri³ and by Duarte et al.,⁴ who concluded that cigarette smoking modifies the voice, the histology of the region of the vocal folds, and favors the incidence of hyperplasia and metaplasia, contributing to the onset of cancer in this region.

Much is known about the isolated influence of smoking on voice quality changes; however, there have been few studies regarding this influence associated with other factors, such as age, gender, habits, professional voice use, alcohol abuse, upper airway infections, and gastroesophageal reflux (GER), factors that may enhance voice changes.

Alcohol consumption, whether or not associated with smoking, may contribute to the development of laryngeal cancer and reduce the life expectancy of its users.⁵⁻⁷ Regarding vocal habits, such as coughing and throat clearing, studies have found that the presence of these habits is common among smokers, and they are considered as risk factors for dysphonia.^{8,9} Another factor that can cause voice changes is the excessive vocal demand by professional use of the voice, which contributes to the incidence of vocal disorders.^{10,11}

The aforementioned factors alone have an effect on voice quality; when associated with smoking, they may enhance vocal alterations, which are also observed when GER is considered.

GER causes vocal alterations, among them: hoarseness, laryngospasm, idiopathic subglottic stenosis, and other symptoms that also influence voice quality, such as chronic cough and phlegm.¹²⁻¹⁴ It is known that objective tests for the diagnosis of GER are necessary and are regularly used, but some articles suggest that pH monitoring, esophagogram, flexible laryngoscopy, and upper digestive endoscopy (UDE), used for this diagnosis, do not have overall accuracy when used alone. According to Ronkainen et al., 40% of subjects diagnosed with GER have no endoscopic abnormalities, suggesting that other mechanisms must be involved in the pathogenesis of the disease.¹⁵⁻¹⁹ In turn, Eckley et al.²⁰ suggested that symptoms

associated with GER should be considered, as they can favor and may aggravate the disease.

Studies have demonstrated that gastroesophageal reflux may be associated with salivary pH and volume of saliva, responsible for maintaining the homeostasis of the oral cavity, pharynx, and upper digestive tract. Thus, both interfere with the digestive process and maintain a correlation with reflux symptoms.²¹ By correlating smoking, saliva, and the presence of GER, the studies by Rourk et al.²² and Konturek et al.²³ demonstrated that smoking modifies the concentration of the epidermal growth factor in the saliva. In turn, Eckley (2004) suggested that the deficiency of this factor contributes to GER disease (GERD).²⁴

The voice is the subject of several studies because it is related to quality of life, social interaction, and is a working tool for many professionals, so it is necessary to identify the isolated influence of smoking on voice quality, as well as associated with other factors that can aggravate it, so that these factors can be considered from the point of view of treatment/rehabilitation. The aim of this study was to evaluate the influence of smoking as an isolated factor and as a factor associated with factors such as coughing and throat clearing habit, GER, alcoholism, and professional use of the voice on vocal acoustic parameters.

Sample

The study was submitted to and approved by the Research Ethics Committee of the Faculdade de Ciências Médicas da Universidade Estadual de Campinas (CEP # 387/2010). A comparative clinical study was carried out for this purpose.

The sample consisted of 80 adult subjects aged 35 to 60 years from the city of Campinas, state of São Paulo, Brazil and surrounding region, of whom 40 were smokers (20 men and 20 women), and 40 were non-smokers (20 men and 20 women), comprising the smoker group (SG) and the control group (CG), respectively.

Adults aged between 35 and 60, who signed the informed consent, had normal hearing levels or mild to moderate hearing loss, no history of asthma or bronchitis, and who did not smoke or had smoked for less than 1 year were included in the CG. The SG included individuals that had smoked for over 20 years, with normal hearing or mild to moderate hearing loss, and no history of asthma or bronchitis.

Individuals that had smoked for less than 20 years, current non-smokers that had smoked for more than 1 year, and

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