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ORIGINAL ARTICLE

Body mass index and acoustic voice parameters: is there a relationship ☆,☆☆

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KEYWORDS

Body mass index;
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Abstract

Introduction: Specific elements such as weight and body volume can interfere in voice production and consequently in its acoustic parameters, which is why it is important for the clinician to be aware of these relationships.

Objective: To investigate the relationship between body mass index (BMI) and the average acoustic voice parameters.

Methods: Observational, cross-sectional descriptive study. The sample consisted of 84 women, aged between 18 and 40 years, an average of 26.83 (± 6.88). The subjects were grouped according to BMI: 19 underweight; 23 normal ranges, 20 overweight and 22 obese and evaluated the fundamental frequency (f0) of the sustained vowel [a] and the Maximum Phonation Time (MPT) of the vowels [a], [i], [u], using PRAAT software. The data were submitted to the Kruskal–Wallis test to verify if there were differences between the groups regarding the study variables. All variables showed statistically significant results and were subjected to non-parametric test Mann–Whitney.

Results: Regarding to the average of the fundamental frequency, there was statistically significant difference between groups with underweight and overweight and obese; normal range and overweight and obese. The average MPT revealed statistically significant difference between underweight and obese individuals; normal range and obese; overweight and obese.

Conclusion: Body mass index influenced the average fundamental frequency of overweight and obese individuals evaluated in this study. Obesity influenced in reducing MPT average.

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☆ This study was conducted at the Department of Speech, Language and Hearing Pathology, UFRN and Obesity surgery and associated diseases services of a university hospital (SCODE).

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PALAVRAS-CHAVE

Índice de Massa
Corporal;
Obesidade;
Fonação;
Voz

Índice de massa corporal e parâmetros acústicos de voz: existe uma relação?

Resumo

Introdução: Elementos específicos como peso e volume corporal podem interferir na produção da voz e, conseqüentemente, em seus parâmetros acústicos, razão pela qual é importante que o médico esteja ciente dessas relações.

Objetivo: Investigar a relação entre o Índice de Massa Corporal (IMC) e os parâmetros acústicos médios da voz.

Método: Estudo observacional, transversal, descritivo. A amostra foi composta por 84 mulheres, com idade entre 18 e 40 anos, uma média de 26,83 ($\pm 6,88$). Os indivíduos foram agrupados de acordo com o IMC: 19 abaixo do peso; 23 com intervalos normais, 20 com sobrepeso e 22 obesos e avaliou a frequência fundamental (f_0) da vogal sustentada [a] e o Tempo Máximo de Fonação (TMF) das vogais [a], [i], [u], utilizando o programa PRAAT. Os dados foram submetidos ao teste de Kruskal-Wallis para verificar se havia diferenças entre os grupos quanto às variáveis estudadas. Todas as variáveis apresentaram resultados estatisticamente significativos e foram submetidas ao teste não-paramétrico de Mann-Whitney.

Resultados: Em relação à média da frequência fundamental, houve diferença estatisticamente significativa entre os grupos com baixo peso e sobrepeso e obesos; faixa normal e excesso de peso e obesos. O TMF médio revelou diferença estatisticamente significativa entre indivíduos com baixo peso e obesos; faixa normal e obesos; sobrepeso e obesidade.

Conclusão: O Índice de Massa Corporal influenciou a frequência fundamental média de indivíduos com sobrepeso e obesidade avaliados neste estudo. A obesidade influenciou na redução do TMF médio.

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Introduction

The clinical assessment includes a number of possibilities to evaluate voice production and perception. Among the parameters evaluated in the acoustic analysis of voice are the fundamental frequency and the maximum phonation time (MPT), measurements of interest in voice evaluations.^{1,2}

The fundamental frequency (f_0), one of the main measures used to characterize the human voice, is directly related to the mass, elasticity and length of the vocal folds, and depends on the subglottic pressure and the configuration of the individual vocal tract.³ It provides information about the speaker's characteristics, such as gender, age, emotional state, hormonal competence and body size.⁴⁻⁶

Several studies seek to understand the influence of body mass index (BMI), muscle mass gain and menopause in acoustic parameters of voice.

D'haeseleer et al.⁷ conducted a study in order to verify the correlation between the BMI and the fundamental frequency of speech in a group of pre and post-menopausal women with and without hormone treatment. The results showed that in post-menopausal women not undergoing hormone treatment increased BMI was correlated with increased f_0 of speech. This correlation is explained by the authors through the higher amount of estrogen production in the adipose tissue in women with higher BMI.

In order to analyze the correlation between the acoustic parameters of voice and body height, weight and composition of body mass in young male adults another study was

carried out. The results showed no correlation between the composition and distribution of body mass with f_0 at the usual pitch.⁴

However, as regards BMI, few studies^{1,2,8} state that body weight interferes with f_0 values, which is lower in obese individuals and higher in underweight women.⁹

Another verified measure in voice evaluation is the Maximum Phonation Time (MPT). It is an acoustic, complementary measure, quantified in seconds and used in the diagnosis of patients with dysphonia as well as to check treatment progress. It provides information on respiratory support, glottal efficiency and neuromuscular and aerodynamic balance of voice production.^{3,10}

The MPT performance can be influenced by vital capacity and varies according to age, gender and body height and weight.¹¹ The MPT values can be impacted in low body weight individuals given their bad performance in lung capacity tests, which can be explained by their physical condition and less muscular firmness.¹²⁻¹⁴

Salomon et al.¹⁴ reported on their studies a weak correlation between lung capacity and MPT, but a strong correlation between larynx airway resistance and MPT. Studies^{2,9,15,16} with the purpose of assessing the MPT in individuals with or without voice changes, regardless of age and sex, should consider the interference of the BMI due to the impact of excessive body weight in abdominal breathing support for voice production.

These measurements, available at a reasonable cost,¹⁷ have been successful in comparing the data obtained pre and post-speech therapy, thus allowing to understand patient

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