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ORIGINAL ARTICLE

Neck circumference and acoustic parameters of the voice☆

Lourdes Bernadete Rocha de Souza*, **Gabriela da Silva Rocha**, **Deysianne Meira da Silva Lima**

Department of Speech Therapy of the Federal University of Rio Grande do Norte, Natal-RN, Brazil

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KEYWORDS
Voice;
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Abstract
Introduction: Obesity is recognized as a worldwide epidemic. As such, it has consequences for the quality of life of a person and is related to physiological changes that modify body functioning, including vocal production and its normal parameters.
Objective: To investigate the relationship between neck circumference and the acoustic parameters of the voice in women with morbid obesity.
Method: An observational, cross-sectional comparative study was conducted on a sample of 23 morbidly obese women and 19 women without obesity. Voice recording was performed using the acoustic analysis software ANAGRAF® on a laptop with attached external microphone. To extract the values of the fundamental frequency, jitter, shimmer, and harmonic noise ratio, participants were requested to sustain the emission of the vowel [a], with the usual intensity and pitch. To extract the maximum phonation time, the participants were asked to prolong the vowels [a], [i] and [u] in the usual intensity and pitch. The neck circumference was measured using a paper measuring tape placed perpendicular to the long axis of the neck just below the larynx prominence. The Mann–Whitney test was performed on the data in order to detect differences between groups in relation to the study variables.
Results: The variables that had a significant difference between the groups were, the maximum phonation time and the shimmer acoustic parameter. The fundamental frequency and jitter showed different values in the obese group, although this relationship was not statistically significant.
Conclusion: The increase in neck circumference can produce changes in the acoustic parameters of the voice of morbidly obese women.

☆ This study was carried through in the Department of Speech Therapy of the Federal University of Rio Grande do Norte – Natal-RN, Brazil and SCODE – Obesity Surgery and Related Disorders Center of the University Hospital Onofre Lopes, Federal University of Rio Grande do Norte – Natal-RN, Brazil.

* Corresponding author.
E-mail address: hsouza660@gmail.com (L.B.R. Souza).

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PALABRAS CLAVE
Voz;
Calidad de voz;
Obesidad mórbida;
Cuello

Circunferencia del cuello y parámetros acústicos de la voz

Resumen
Introducción: La obesidad es reconocida como una epidemia de carácter mundial. Tiene consecuencias en la calidad de vida de una persona y se relaciona con los cambios fisiológicos que modifican el funcionamiento del cuerpo, incluyendo la producción vocal y sus parámetros acústicos.
Objetivo: Investigar la relación entre la circunferencia del cuello y los parámetros acústicos tradicionales de la voz en las mujeres con obesidad mórbida.
Método: Estudio comparativo observacional, transversal. La muestra consistió en las emisiones de 25 mujeres con obesidad mórbida y 23 mujeres sin obesidad. La grabación de voz se realizó utilizando el software de análisis acústico ANAGRAF®. Para extraer los valores de la frecuencia fundamental, jitter, shimmer, y la relación de ruido armónico, se solicitó a las participantes que sostuvieran la emisión de la vocal [a] durante 3 o 4 segundos con la intensidad y tono habitual. Para extraer el tiempo máximo de fonación los participantes prolongaron la emisión de las vocales [a], [i] y [u]. La circunferencia del cuello se midió por medio de una cinta colocada perpendicularmente al eje longitudinal del cuello justo debajo de la laringe. Los datos se procesaron con la prueba de Mann–Whitney para detectar diferencias entre los grupos en relación con las variables de estudio.
Resultados: Las variables que tuvieron diferencias significativas entre los grupos fueron: el tiempo máximo de fonación y el parámetro acústico shimmer. La frecuencia fundamental y el jitter presentan valores diferentes en el grupo de obesas, aunque este cambio no fue estadísticamente significativo.
Conclusión: El aumento de la circunferencia del cuello puede producir cambios en algunos parámetros acústicos de la voz de las mujeres con obesidad mórbida.

Introduction

A balanced voice occurs through the joint action of all the muscles responsible for its production, being dependent on the physiology and integrity of structures that form the vocal tract (Souza, 2010). Habits related to general health, adjustments used in the vocal tract and the relationship body, voice and personality can characterize the vocal patterns of each individual (Bortolotti & Andrada e Silva, 2005).

The morphological characteristics of the vocal tract as length, cross-sectional area, proportion of the oral cavity in relation to the pharynx are determining factors of the voice quality of an individual, thus changes in the vocal tract configuration reflect changes in voice quality (Colton, Casper, & Leonard, 2010).

One of the factors that affect the body–voice relationship, according to literature is the body weight. Excessive weight may influence the breathing to voice production, variations in tissue mass of the vocal cords, vocal resistance and contribute to general fatigue and in extreme cases it can influence the voice resonance, as excess fat can change the size and configuration of the aerodigestive tract, reducing significantly the lumen of the pharyngeal region located above the glottis (Celebi et al., 2013; Sapienza & Ruddy, 2008).

Several hypotheses have been tested to verify the relationship between body weight and voice production. With the aim of investigating the perceptual, acoustic and aerodynamic parameters of voice in obese subjects, a study by Celebi et al. (2013) found that increased adiposity interferes with respiratory function and reduces maximum phonation time. Another study by Barsties, Verfaillie, Roy, and Maryn (2013) which aimed to investigate the impact of weight and body fat volume on the vocal quality, tessitura and vocal aerodynamic parameters of females, concluded that weight and body fat volume seem to influence certain objective measures of voice quality, vocal aerodynamics and vocal tessitura performance, but found reduced shimmer values, a result that disagrees with values found by Cunha, Passerotti, Weber, and Zilberstein (2009).

Studies conducted by Souza, Pernambuco, Santos, and Santos (2016) aimed to evaluate the average acoustic voice parameters in a group of obese women before and after bariatric surgery. After weight loss there was a reduction in neck circumference and significant changes in MPT values. In contrast, Solomon, Helou, Dietrich-Burns, and Stojadinovic (2011) examined vocal function after bariatric surgical procedures, and found no significant differences between groups in preoperative evaluation and over time.

Gonçalves, Lago, Godoy, Fregonezi, and Bruno (2011) found in their research that obese individuals with a wider neck circumference had greater respiratory muscle strength and lower respiratory muscle endurance. The authors concluded that neck fat seems to hinder the deployment capability of the airflow in comparison to overall adiposity.

There are various anthropometric markers, which are commonly used to determine whether an individual is above, below or within their expected weight. Among the most