

Effects of aging on vocal function: A systematic review



<https://doi.org/10.56238/sevened2023.004-047>

Victor Hugo Tetilla Moreira

Highest academic degree: Higher education completed – Medicine

E-mail: victortetilla@gmail.com

Mario Pinheiro Esposito

Tarcisio Redes Xavier

Rayna Gonçalves Ferrer

Izabela Pinheiro Esposito

Thales Victor Fernandes Ferreira

Karina Alencastro dos Santos

ABSTRACT

Introduction: Aging is a natural and inevitable process that affects all areas of the body, including vocal function. The voice plays an important role in communicating and expressing emotions. A variety of physiological and biomechanical changes can impair vocal function with aging. In view of the above, this study is justified by its academic, scientific, and social relevance, with the aim of exploring in detail the effects of aging on vocal

function, including associated structural and physiological changes and their social and emotional implications. **Objective:** To demonstrate, through the scientific literature, the effects of aging on vocal function. **Methodology:** This is a systematic review research, carried out according to the indications of the PRISMA method. Data collection took place in the scientific bases: LILACS, SCIELO and MEDLINE. **Results and Discussion:** The discussion about the effects of aging on vocal function is crucial for us to understand how the natural aging process affects such a fundamental aspect of human communication. It was evidenced through the analysis of the selected sample, the main aspects for the present discussion. The natural aging of the voice occurs progressively in parallel with other bodily functions and is influenced not only by the anatomy and physiology of the body, but also by the lifestyles that individuals lead throughout their lives. **Conclusion:** Understanding the effects of aging on speech function has advanced significantly, but knowledge gaps still need to be filled. More research is needed to validate the effectiveness of different therapeutic interventions and to develop innovative approaches to facilitate voice quality improvement in older adults.

Keywords: Aging, Voice, Vocal chords.

1 INTRODUCTION

Aging is a natural and inevitable process that affects all areas of the body, including vocal function. The voice plays an important role in communicating and expressing emotions. A variety of physiological and biomechanical changes can impair vocal function with aging. As life expectancy increases in many parts of the world, understanding the impact of aging on speech function is becoming increasingly important (Fernandes *et al.*, 2023).

The voice is produced through a complex interaction of multiple organs and structures, including the vocal cords, larynx, lungs, nervous and muscular systems. In the aging process, there may be changes in speech-related structures, such as thinning and atrophy of the vocal cords, and it can lead to loss of muscle mass and resistance to vocalization (Madeiro *et al.*, 2021).



Additionally, the elasticity of the vocal cords decreases with age, resulting in a decreased ability to regulate frequencies, making it difficult to reproduce higher pitches. This can lead to hoarseness, tremors, and reduced intelligibility, which can affect the clarity and comprehension of speech (Seixas; Chamber, 2022).

In addition to these structural changes, the aging process can also affect the coordination of the muscles involved in vocalization, making it difficult to produce certain sounds and articulate words. These changes can make the voice weaker, less expressive, and affect the ability to convey emotional nuances in communication (Fernandes *et al.*, 2023).

Another relevant aspect is the psychosocial effects of aging on speech function. Voice is an important part of an individual's identity and age-related vocal changes can lead to self-esteem issues, social isolation, and difficulty interacting with others (Fernandes *et al.*, 2023).

With the increase in life expectancy in many parts of the world, the understanding of the effects of aging on vocal function becomes of great relevance, both for the early identification of possible vocal dysfunctions in the elderly, and for the development of therapeutic and preventive strategies that promote a healthy and functional voice in old age (Leão *et al.*, 2022).

In view of the above, this study is justified by its academic, scientific and social relevance, with the aim of exploring in detail the effects of aging on vocal function, including associated structural and physiological changes and their social and emotional implications. A deeper understanding of this process will allow us to devise more effective strategies to prevent and treat age-related vocal disorders and improve the quality of life of the elderly.

2 OBJECTIVE

To show, through the scientific literature, the effects of aging on vocal function.

3 METHODOLOGY

This study was carried out through a systematic review carried out between June and July 2023, with the aim of investigating updates regarding the aging process and its impacts on vocal function. All the steps developed in this review were independently developed by the authors of the research. For this, the recommendations based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method were followed.

The systematic review of the literature is a type of study that aims to answer a specific question, in an objective, complete and impartial way about the topic in question. To this end, this type of study uses systematic methods for identification, selection, data extraction, analysis and discussion of results.

As this was a systematic review and meta-analysis, there was no need to submit the project to the Ethics Committee (CEP) for consideration.



3.1 ELIGIBILITY CRITERIA

To ensure the eligibility of the results presented, the selected articles followed the following inclusion criteria: Free papers, available in full, in the Portuguese language, published in the last 3 years and that met the proposed objective. The exclusion criteria were: Incomplete articles, duplicates in more than one database, monographs, abstracts and theses.

3.2 BIBLIOGRAPHIC SEARCH STRATEGY

The bibliographic survey was carried out through searches in the following scientific databases: Latin American and Caribbean Health Sciences Literature (LILACS), *Scientific Electronic Library Online (SCIELO)* and Medical Literature Analysis and Retrieval System Online (*MEDLINE*), through the applicability of the *Health Sciences Descriptors (DECS)* and (*MeSh*): Aging; Voice and Vocal Cords/ Aging; Voice; Vocal Strings mediated by the Boolean operator AND.

3.3 SELECTION OF STUDIES

To ensure the eligibility of the selected studies, in the first instance, through analysis of the titles, articles that were not related to the theme were manually excluded. Therefore, by reading the abstracts, studies that did not meet the defined eligibility criteria were excluded. After reading it in full, new exclusions were made, selecting only those studies with relevant results that answered the research problem.

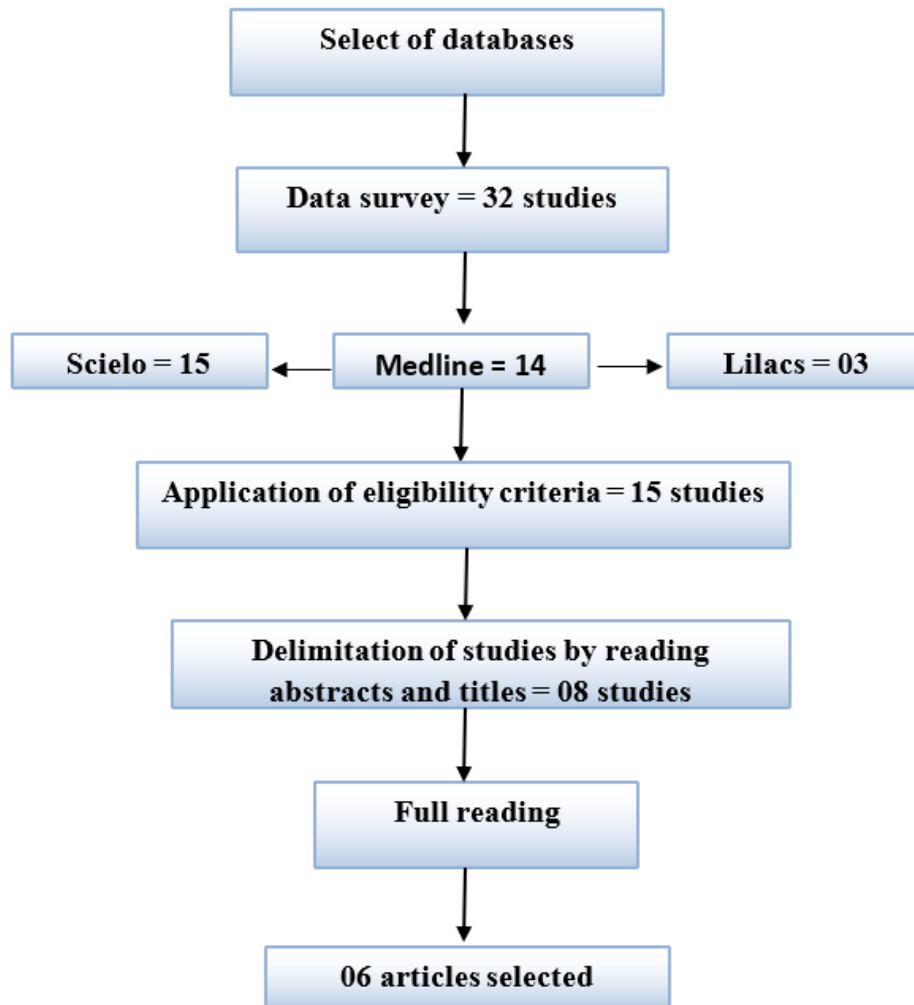
3.4 ASSESSMENT OF THE QUALITY OF STUDIES

In the final analysis, it can be seen that the quality of the studies was similar, and for this finding, validated instruments from the scientific literature were used. The instrument, taken as a reference by the Joanna Briggs Institute, evaluates the specific characteristics of each methodological design, evaluates the eligibility criteria, sampling, population, as well as analysis of variables.

Based on this, the studies that presented information related to the study may have limitations in relation to the objective that this research intends to achieve. However, with regard to the quality of the research, there was no exclusion of studies, although the limitations highlighted in the discussion of the results were presented. The description of the selected sample is described in figure 1:



Figure 1: Flowchart for the selection of studies selected for the sample.



Source: Prepared by the authors, 2023.

4 RESULTS AND DISCUSSIONS

With the data collection, 06 articles were selected for final analysis. For a better understanding, the studies were organized in Charts 1 and 2, subdivided into the main information of: Title, author, year of publication, study objective, journal in which the work was published, and country of origin referring to the publication. On the other hand, the results organized in Chart 2 were subdivided between the specialty of the work and the main outcomes found.



Table 1: Description of the selected sample.

N°	TITLE	AUTHOR/YEAR	OBJECTIVE	NEWSPAPER	COUNTRY OF ORIGIN
1	Voice disorders associated with aging.	Rosendo <i>et al.</i> , 2022	Present the possible vocal disorders associated with aging.	Neurosciences Journal	Brazil
2	Effect of aging on vocal muscle atrophy.	Peres, 2022	To evaluate the effect of aging on thyroarytenoid muscle.	Cefac Magazine	Brazil
3	Lifelong vocal changes: cepstral analysis.	Spazzapan, 2022	OBJECTIVE: To investigate the characteristics of voice production in elderly individuals.	Cefac Magazine	Brazil
4	Voice of the elderly: does advancing age generate different impacts?	Gomes <i>et al.</i> , 2021	To verify whether there are differences in vocal aspects among elderly people with presbyphonia, divided into three age groups.	Brazilian Society of Speech-Language Pathology and Audiology	Brazil
5	Vocal therapy with respiratory approach in the elderly: practice of Brazilian speech-language pathologists.	Leo, 2021	Evidence of changes that may compromise voice and breathing.	UFP	Brazil
6	Comparison of the immediate impact of the techniques of sonorized high-frequency oral oscillation and sonorized blowing with a resonance tube in elderly women.	Piragibe <i>et al.</i> , 2020	To verify and compare the vocal quality of elderly women.	Brazilian Society of Speech-Language Pathology and Audiology	Brazil

Source: Authors, 2023.

Of the studies selected for the sample and detailed in Table 1, regarding methodological aspects, 17% (n=1) were quantitative studies, 34% (n=2) were exploratory studies, and 51% (n=3) were qualitative studies.



Chart 2: Description of the main points highlighted in the research.

Nº	SPECIALTY	MAIN OUTCOMES
1	Speech therapy	In this study, it was observed that among the speech disorders associated with aging, the classifications identified include spastic and flaccid dysarthria, followed by shortness of breath, excessive vocal tension, instability of vowel emission, and slowness of speed.
2	Medicine	In this study, it was evidenced that sarcopenia consists of an age-related muscle alteration with progressive loss of mass and function that is common in the elderly and also occurs in the larynx. In the anterior larynx, atrophy of the vocal folds, prominence of the vocal folds, glottic cleft and pseudosulcus are observed.
3	Speech therapy	According to the effects of aging, vocal changes that affect the individual from childhood to old age can be perceived and can be detected in acoustic analysis.
4	Speech therapy	Some auditory-perceptual aspects have a significant deviation in the elderly, which is an important consideration both in the evaluation of the effects of aging on the voice and in the development of interventions to minimize voice loss. The need to consider these peculiarities is reinforced.
5	Medicine	In this study, some specific exercises were used to maintain and improve voice quality in elderly people who suffered impairment in phonation. The results obtained from the research were positive.
6	Speech therapy	In this research, it was found that vocal quality in the elderly is relatively compromised due to the aging process. However, it has also been observed in research that sounding blowing exercises with a resonance tube can be indicated to improve vocal quality.

Source: Authors, 2023.

The discussion of the effects of aging on vocal function is crucial to understanding how the natural aging process affects such a fundamental aspect of human communication. In this section, we will analyze the main findings of the research and how they relate to vocal changes resulting from aging.

Through the analysis of the selected sample, the main aspects for the present discussion were evidenced. Thus, 17% (n=1) studies in the scientific literature showed that natural voice aging occurs progressively in parallel with other bodily functions and is influenced not only by the anatomy and physiology of the body, but also by the lifestyles that individuals lead throughout their lives (Piragibe *et al.*, 2020).

Thus, it was also found from 51% (n=3) of the studies that, with the impairment of vocal function according to aging, it can result in calcification and ossification of the laryngeal cartilage and may be associated with reduced mobility, with possible atrophy and changes in the covering of



the vocal folds, leading to the appearance of fusiform fissures. In this population, supraglottic narrowing may also occur to compensate for changes in the Gothic level. Age-related changes in the voice and larynx impair physical function, can lead to social avoidance, and negatively impact quality of life in older adults (Spazzapan, 2022; Rosendo *et al.*, 2022; Leo, 2021;).

In addition, 32% (n=2) of research studies show that aging results in changes in the vocal folds, such as thinning and atrophy of tissues. The reduced elasticity of the vocal folds in old age also affects the capacity for vocal modulation, making it difficult to vary the frequency and produce higher tones. This loss of control can lead to a monotonous and less expressive voice, making it difficult to communicate emotionally and convey nuances in speech (Peres, 2022; Gomes *et al.*, 2021).

These structural changes directly impact vocal production, reducing the ability to generate adequate tension and control crease vibration. This can lead to a weaker voice, less projection, and even the occurrence of vocal disorders such as senile dysphonia (Piragibe *et al.*, 2020).

Voice is an essential part of personal identity, and age-related vocal changes can cause self-esteem issues, social anxiety, and isolation. Older adults may avoid situations of social interaction or have difficulties in expressing themselves adequately, which affects their quality of life and emotional well-being. Thus, it is essential that society as a whole is aware of the challenges faced by older adults in relation to vocal function and communication (Rosendo *et al.*, 2022).

Education about the effects of aging on the voice should be disseminated among health professionals, family members, and even among the elderly themselves, so that they feel encouraged to seek help and adopt preventive measures. With a multidisciplinary approach that is sensitive to individual needs, it can be ensured that older adults continue to enjoy clear, expressive, and meaningful communication, providing them with a better quality of life as they age (Peres, 2022).

Based on this, vocal therapy is characterized as an important tool in reducing the negative effects of aging on speech function. Targeted vocal exercises strengthen the speech muscles and improve the coordination of the vocal organs. For older people who want to improve voice quality and function, it may make sense to seek treatment from a speech pathologist who specializes in gerontology (Piragibe *et al.*, 2020).

5 CONCLUSION

In summary, the effects of aging on vocal function are multifaceted and can significantly affect communication and quality of life in older adults. Awareness of these changes and the search for preventive and therapeutic measures are essential to preserve vocal health and ensure effective communication at all stages of life. Interdisciplinarity between speech-language pathologists, physicians, and technology professionals is critical to developing comprehensive approaches that address the specific vocal needs of the elderly population.



Understanding the effects of aging on speech function has advanced significantly, but knowledge gaps still need to be filled. More research is needed to validate the efficacy of different therapeutic interventions and to develop innovative approaches to facilitate improved voice quality in older adults.



REFERENCES

- GOMES, Anna Beatriz de Paiva; SIMÕES-ZENARI, Marcia; NEMR, Kátia. Voz do idoso: o avanço da idade gera diferentes impactos?. Sociedade Brasileira de Fonoaudiologia, 2021.
- LEÃO, Rebeca Lins de Souza. Terapia vocal com abordagem respiratória em idosos: prática de fonoaudiólogos brasileiros. UFP, 2021.
- LEÃO, Rebeca Lins de Souza et al. Terapia vocal com abordagem respiratória em idosos: revisão integrativa da literatura. Revista CEFAC, v. 24, 2022.
- MADEIRO, Lays Bezerra et al. Aspectos cognitivos e auditivos: o efeito do envelhecimento no declínio do reconhecimento de fala. Distúrbios da Comunicação, v. 33, n. 4, p. 695-704, 2021.
- PERES, André de Carvalho Sales. Efeito do envelhecimento na atrofia do músculo vocal. Revista Cefac. 2022.
- PIRAGIBE, Paloma Cristine et al. Comparação do impacto imediato das técnicas de oscilação oral de alta frequência sonorizada e sopro sonorizado com tubo de ressonância em idosas vocalmente saudáveis. Sociedade Brasileira de Fonoaudiologia, 2020. p. e20190074.
- POLIDO, Angélica Malena et al. Percepção do envelhecimento vocal na terceira idade. Revista Cefac, v. 7, n. 2, p. 241-251, 2005.
- ROSENDO, Beatriz Vitorio Ymai et al. Distúrbios vocais associados ao envelhecimento. Revista Neurociências, v. 30, p. 1-20, 2022.
- SEIXAS, Máyra; ALEXANDRE CÂMARA, Carlos. Estética da fala. Revista Clínica de Ortodontia Dental Press, v. 21, n. 3, 2022.
- SPAZZAPAN, Evelyn Alves. Mudanças vocais ao longo da vida: análise cepstral. Revista Cefac. 2022.