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Consensus Auditory-perceptual Evaluation of Voice (CAPE-V) and GRBASI: digital format adaptation

Protocolo Consensus Auditory-perceptual Evaluation of Voice (CAPE-V) e GRBASI: adaptação em formato digital

Consensus Auditory-perceptual Evaluation of Voice (CAPE-V) y GRBASI: adaptación en formato digital

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Abstract

Introduction: Auditory-perceptual assessment scales are widely used in clinical vocal practice. The purpose of this paper work is to present a proposal of a tool for digital analysis of the CAPE-V and the GRBASI scale. **Description:** The digital protocol was developed using Microsoft Excel® software for Microsoft 365® based on the culturally adapted version of CAPE-V for Brazilian Portuguese and on the Japanese GRBASI scale. The tool was organized into four combined worksheets, one for general data, two for recording parameter assessments and one for comparing pre- and post-intervention assessments. **Final considerations:** Regarding the CAPE-V, the tool produced is able to automatically measure the visual-analog scales of each parameter evaluated and perform the necessary sums. With GRBASI it is possible to complete the scale considering the degrees of altered parameters, which can range from absent

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Authors' contributions:
VSB: Conceived and created the digital spreadsheet, wrote the article.
EGB: Performed literary research and write the article.
EHMA: Co-supervised the preparation of the digital spreadsheet, corrected and revised the article.
MFG: Guided, revised and requested insertions in the preparation of the digital spreadsheet, wrote, corrected and revised the article.

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(zero) to accentuated (three). Graphics and tables are generated and help in the clinical analysis of both CAPE-V and GRBASI. We believe that this tool can contribute in several ways, such as: accessible and digital tool for clinical and research use; used for perceptual auditory training; useful to demonstrate to the patient, through the generated graphics, the feedback about their evolution in speech therapy; it can facilitate the information flow obtained in the evaluation, in addition to contribution of the reduction of paper use. The download is available for free.

Keywords: Voice Disorders; Clinical Protocols; Protocols; Voice Quality; Voice.

Resumo

Introdução: As escalas de avaliação perceptivo-auditiva são amplamente utilizadas na clínica vocal. O objetivo desta comunicação é apresentar uma proposta de ferramenta para análise digital do CAPE-V e da escala GRBASI. **Descrição:** O protocolo digital foi elaborado utilizando o software Microsoft Excel® para Microsoft 365® com base na versão adaptada culturalmente do CAPE-V para o português brasileiro e na escala japonesa GRBASI. A ferramenta foi organizada em quatro planilhas conjuntas, sendo uma de dados gerais, duas para anotar as avaliações dos parâmetros e uma para comparar as avaliações pré- e pós-intervenção. **Considerações finais:** Em relação ao CAPE-V, a ferramenta produzida é capaz de mensurar, de forma automática, as escalas analógico-visuais de cada parâmetro avaliado e realizar as somatórias necessárias. Com a GRBASI é possível o preenchimento da escala considerando-se os graus dos parâmetros alterados, que podem variar de ausente (zero) a acentuado (três). São gerados gráficos e tabelas que auxiliam nas análises clínicas tanto do CAPE-V como da GRBASI. Acreditamos que esta ferramenta possa contribuir de diversas formas, como: ferramenta acessível e digital para uso clínico e para pesquisa; pode ser utilizada para treinamento perceptivo-auditivo; pode ser útil para demonstrar ao paciente, por meio dos gráficos gerados, o *feedback* sobre sua evolução em fonoterapia; pode facilitar o fluxo de informações obtidas na avaliação, além de contribuir para a redução do uso de papel. O *download* está disponível gratuitamente.

Palavras-chave: Distúrbios da Voz; Protocolos Clínicos; Protocolos; Qualidade da Voz; Voz.

Resumen

Introducción: Las escalas de evaluación auditivo-perceptiva son ampliamente utilizadas en la práctica vocal clínica. El propósito de este estudio es presentar una propuesta de herramienta para el análisis digital del CAPE-V y la escala GRBASI. **Descripción:** El protocolo digital fue desarrollado usando el software Microsoft Excel® para Microsoft 365® basado en la versión adaptada culturalmente de CAPE-V para portugués brasileño y en la escala japonesa GRBASI. La herramienta se organizó en cuatro hojas de trabajo combinadas, una para datos generales, dos para registrar evaluaciones de parámetros y una para comparar evaluaciones previas y posteriores a la intervención. **Consideraciones finales:** En relación al CAPE-V, la herramienta producida es capaz de medir automáticamente las escalas visual-analógicas de cada parámetro evaluado y realizar las sumas necesarias. Con GRBASI es posible completar la escala considerando los grados de los parámetros alterados, que pueden ir desde ausentes (cero) a acentuados (tres). Se generan gráficos y tablas que ayudan en el análisis clínico del CAPE-V y de la GRBASI. Creemos que esta herramienta puede contribuir de varias formas, tales como: herramienta accesible y digital para uso clínico y de investigación; se puede utilizar para el entrenamiento auditivo perceptivo; puede ser útil para demostrar al paciente, a través de los gráficos generados, la retroalimentación sobre su evolución en logopedia; puede facilitar el flujo de información obtenida en la evaluación, además de contribuir a la reducción del uso de papel. El download está disponible de forma gratuita.

Palabras clave: Trastornos de la Voz; Protocolos Clínicos; Protocolos; Calidad de la Voz; Voz.

Introduction

Widely used to categorize and measure vocal quality, the auditory-perceptual assessment (APA) of the voice is performed from different scales and protocols, including a wide range of items from different phonatory and/or speech tasks, as proposed in the literature and used in speech-language pathology clinic[1-3].

In this sense, the Consensus Auditory-perceptual Evaluation of Voice (CAPE-V) is one of the most applied protocols in clinical and research into voice, which was developed with the assistance of specialists in auditory perception of the human voice. The protocol assesses elements of vocal production, knowledge of psychometric scales, psychoacoustic data and peculiarities of human perception. With the support and guidance of the American Speech-Language Hearing Association, the protocol is revised on a regular basis to be up-to-date with new knowledge[1].

In addition to involving a large amount of vocal parameters, CAPE-V protocol allows investigating not only aspects related to the glottal source, but also filter aspects. Sustained vowel, connected speech and spontaneous speech samples are analyzed together and the instrument allows marking additional parameters, if necessary, according to the clinician's opinion. The marking of each one of the parameters is done on a 100 mm visual analog scale (VAS), in which the closer to the maximum score, the greater the vocal deviation[4].

A recent study evaluated the reliability of the culturally adapted version of the CAPE-V in Brazilian Portuguese, investigating the intra- and inter-examiner reliability that performed APAs using the CAPE-V and GRBAS. Assessing the relationships between the two scales, the authors investigated the internal consistency and validity of the CAPE-V. As the findings showed that the CAPE-V provides better inter-rater reliability than the GRBAS scale, the CAPE-V seems to contribute more to reduce the subjectivity of the APA. In addition, the CAPE-V's standardized registration with pre-established tasks facilitates communication between experts and a greater exchange of information. However, both scales offer reliability to the evaluator and can be used by the clinician in the auditory-perceptual analysis, depending on its purpose[5].

In turn, the GRBAS, which was developed by the Committee for Phonatory Function Testing of the Japan Society of Logopedics and Phoniatrics (JSLP) and published in 1981 by Hirano[6], is a standardized vocal assessment scale, restricted to the glottal source, with a subjective character, practical application and whose intra- and inter-evaluator reliability has already been evidenced in a previous study[7]. After the inclusion of the vocal parameter "instability" in the scale, as proposed by Dejonckere et al.[7] and by Piccirillo et al.[8], the scale was renamed GRBASI, as it is used today. It is a Likert-type scale with 4 points ranging from 0 to 3, with 0 corresponding to "normal or absent", 1 to "mild", 2 to "moderate" and 3 to "severe".

All evaluative instruments developed to date have strengths and weaknesses, which means that there is no instrument with 100% sensitivity and specificity in the literature. The weaknesses of the GRBASI scale are related to two aspects: its high degree of subjectivity, as the evaluator does not have visual support to measure the component structures of the vocal tract; and the rater's dependence on auditory training and clinical experience to increase the reliability of the assessment[9]. In turn, the strengths of the scale are the simplicity and speed of its application, economically accessible, which makes it widely used all over the world[3].

On the other hand, the GRBASI scale is fast, simple and easily accessible, but on the other hand, despite carrying out a more complete assessment and facilitating scientific communication the CAPE-V protocol demands more time from the clinician to be properly analyzed. This is in line with a study that found greater sensitivity for CAPE-V, while GRBASI presents faster application[5]. This difference in the time required for the analysis may lead the professional to choose one scale over the other, which confirms the lack of new resources to speed up the application and analysis of the CAPE-V protocol.

Based on our experience, the relevance of the practicality of applying the CAPE-V protocol and the GRBASI scale in digital format can be explained in the different contexts of the speech-language pathologist's work, especially at the outpatient and bedside level, where a faster care routine is required. Furthermore, a virtual instrument may be able to simplify the flow of information, modernizing access to electronically stored vocal health data.

As the rater's experience is essential to perform the APA efficiently, the beginning of the training of

auditory skills is crucial for the qualification of the Speech-Language Pathologist and must be continuously improved. According to the study by Silva, Zenari and Nemr[10], the APA was improved after the auditory training of Speech-Language Pathology students. Based on our experience, having a digital analysis tool would facilitate auditory training, as it could be used in the context of virtual teaching, in undergraduate and graduate courses, which includes many digital files, in addition to research, in which the analysis requires tabulated data.

APA data can be developed and presented to the patient in many different ways, and it would be beneficial for the clinicians to explore effective ways to show and apply feedback in their clinical practice. It should be noted that feedbacks are important monitoring procedures in therapy sessions and aim to promote better performance , both for the patient, who is able to objectively understand the evolution of their case based on visual feedback, and for the therapist, who is able to continuously assess the results of the proposed therapeutic plan and the effectiveness of communication, in addition to readjusting the goals set as they follow the progress[11,12].

Therefore, this communication aims to present a proposal for a tool for digital analysis of the CAPE-V and the GRBASI scale.

Description

The CAPE-V protocol in digital format was first designed to support the auditory training of undergraduate students in speech-language pathology at a Brazilian federal university, which took place in an online course during the second half of 2020. Later, some aspects were improved to promote and make available the material developed free of charge, in order to help specialists in the field with a facilitating digital tool.

Microsoft Excel® for Microsoft 365® MSO (16.0.13426.20270) 32 bits was used to adapt the CAPE-V protocol and the GRBASI scale in digital format, which allowed the creation, development and sharing of personalized worksheets. The culturally adapted version for Brazilian Portuguese was used as the basis for the elaboration of the CAPE-V[4].

The file was prepared in four worksheets together, as follows:

1. General data: place to enter information collected by the clinician during the anamnesis, such as patient/client name, age, profession and vocal complaint. In addition, the speech tasks that must be collected are properly described, as well as in the printed protocol, and it is possible to record the date on which the protocol was applied (Figure 1).

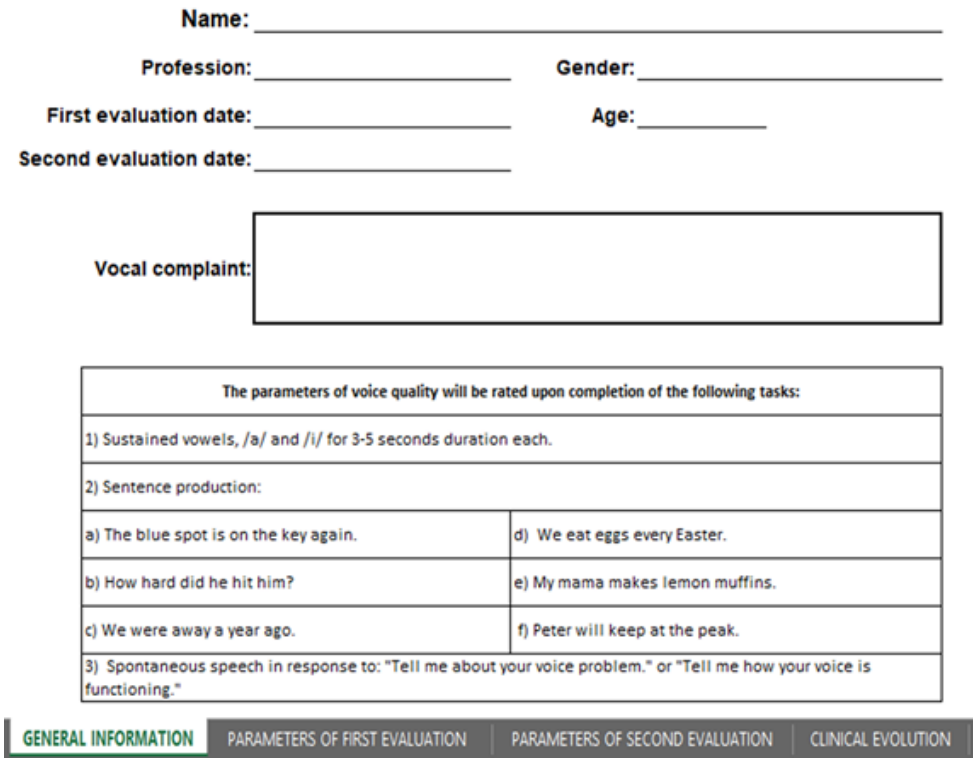


Figure 1. General.

2. Two identical worksheets with the parameters to be completed named as "Parameters of first evaluation" and "Parameters of second evaluation". Eight visual analog scales (VAS) were arranged in each worksheet, the first six being for: Evaluation of the General Degree of Dysphonia, Roughness, Breathiness, Strain, Pitch and Loudness and two others for the evaluator to add other identified parameters. To indicate the values, the evaluator will handle a line from 0 to 100 points and the numerical data will be completed on the right side of the scale (e.g.: 70/100). In addition, two checkboxes were placed next to each VAS to indicate each parameter as "consistent" or "intermittent" based on the analysis of the speech tasks. As with the original protocol, there is a space below each VAS to enter notes on resonance, additional relevant features, and clinical data. There was also a space just below the CAPE-V so that the evaluator could record the values of the auditory-perceptual assessment of the voice based on the GRBASI scale, since this scale is often used in speech-language pathology clinic, as reported above (Figure 2).

A chart is automatically created from the VAS scores in order to facilitate the understanding of the information, making it possible to make comparisons between the parameters in an agile and dynamic way. A table below the chart compares the values obtained in the clinical evaluation with the reference values available in the study by Yamasaki et al.[13] through conditional formatting of Excel cells (Figure 3). With conditional formatting, the comparison is performed by the automatic colors of the cells, so that each parameter's cell receives a certain color that varies with respect to the reference values.

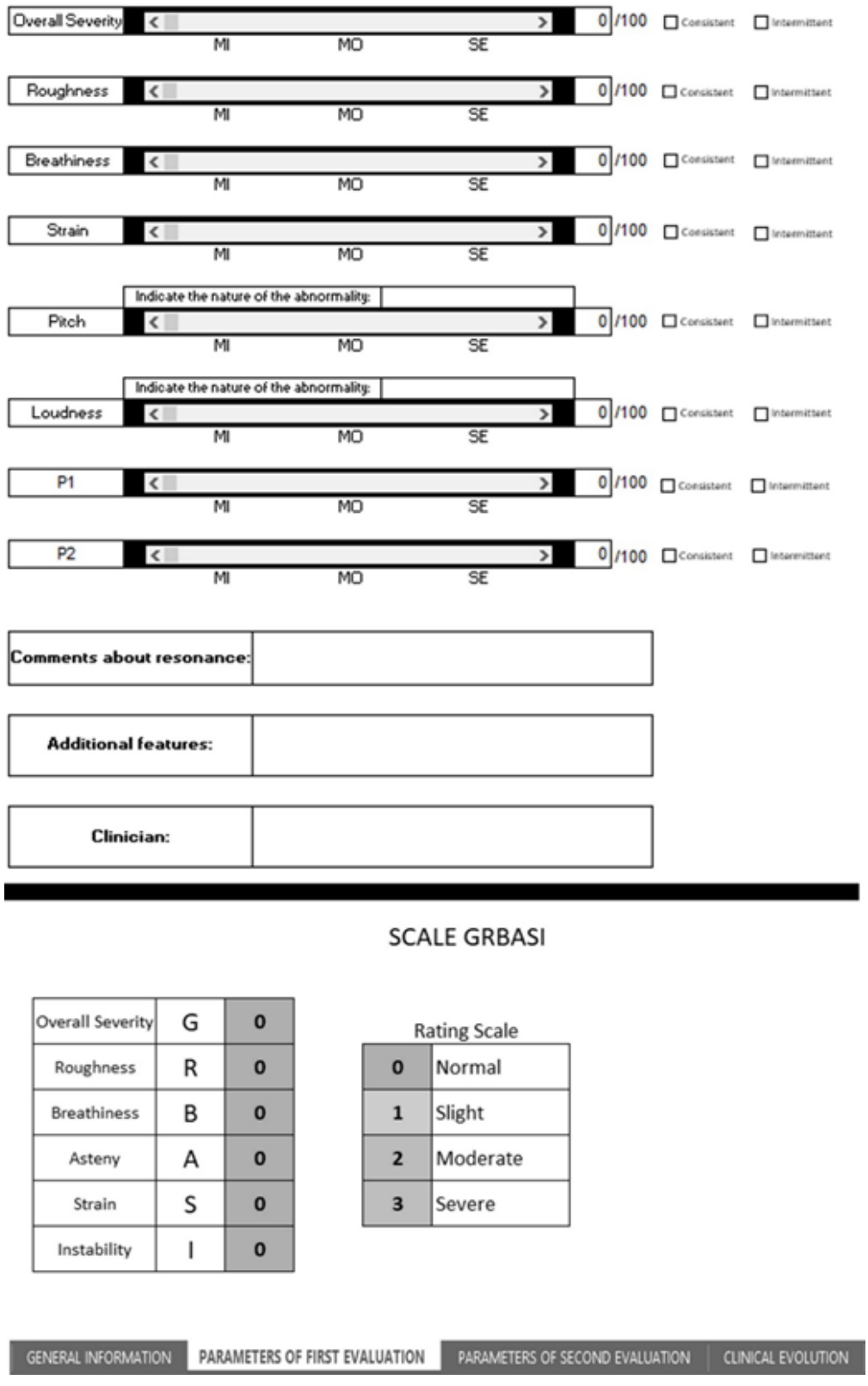
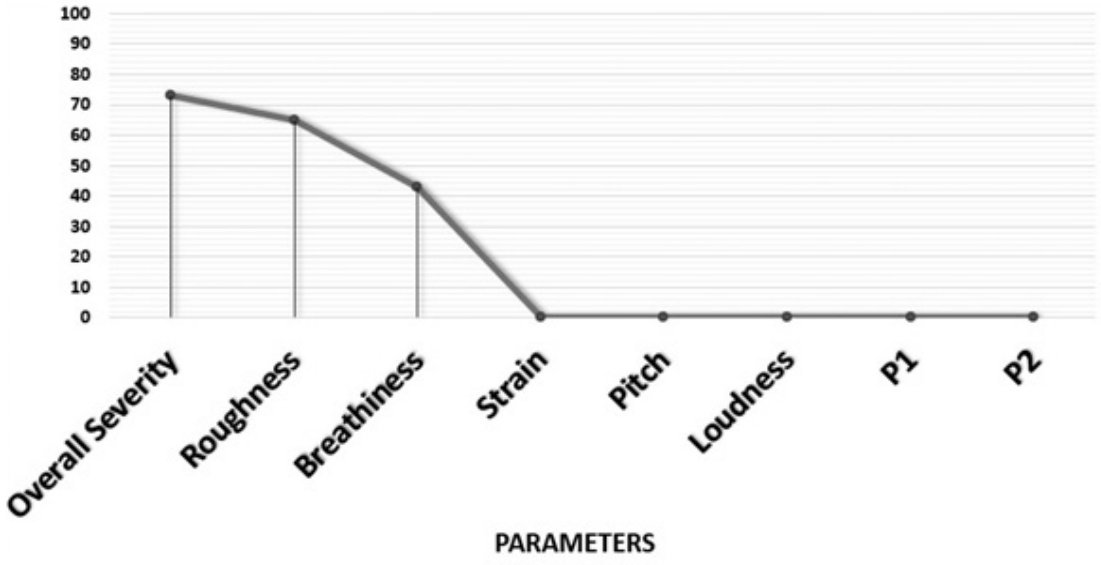


Figure 2. Worksheet example.



Parameters	Values	
Overall Severity	73	Consistent
Roughness	65	Consistent
Breathiness	43	Consistent
Strain	0	
Pitch	0	
Loudness	0	
P1	0	
P2	0	

CAPE-V reference values*

	Mín	Máx
Normal variability of voice quality	0	35,5
Mild to Moderate	35,6	50,5
Moderate	50,6	90,5
Severe	90,6	100

* Yamasaki R, Madazio G, Leão SHS, Padovani M, Azevedo R, Behlau M. Auditory-perceptual Evaluation of Normal and Dysphonic Voices Using the Voice Deviation Scale. J Voice. 2017 Jan; 31(1):67-71.

Figure 3. Graph and table examples.

3. The results of the parameters of the first and second evaluation of the CAPE-V protocols (Figure 4) and of the GRBASI scales (Figure 5) are automatically compared in the worksheet entitled "Clinical evolution", through tables and charts. This tool helps the clinician in comparing pre- and post-intervention assessments and can serve as visual feedback for patients to follow their therapeutic evolution in a more illustrative way.

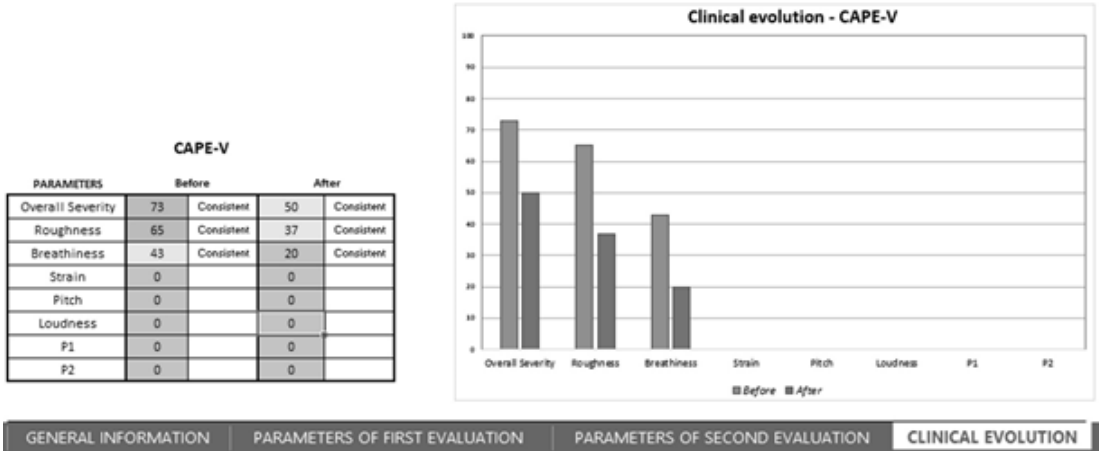


Figure 4. Graph and table for comparing the Consensus Auditory-perceptual Evaluation of Voice (CAPE-V).

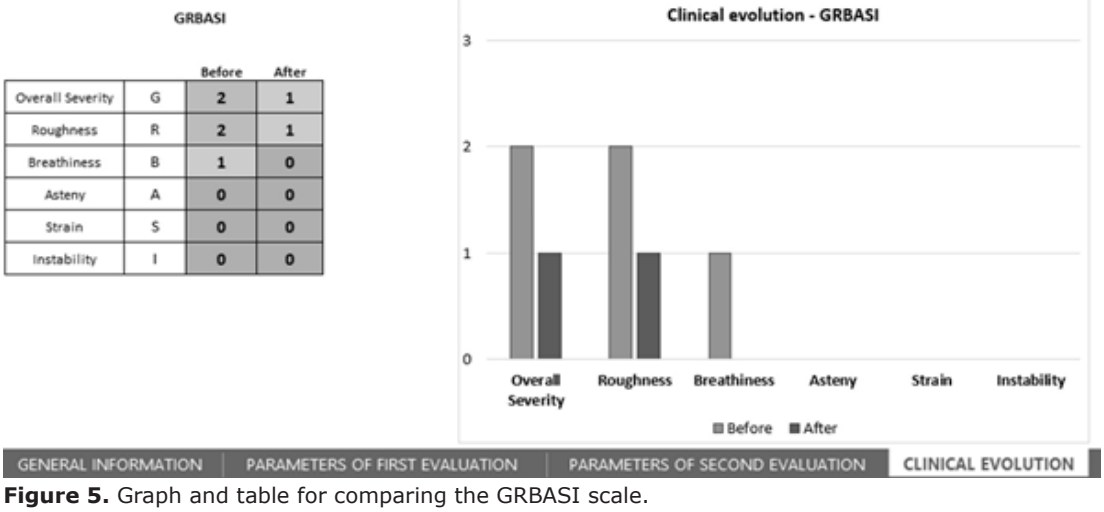


Figure 5. Graph and table for comparing the GRBASI scale.

Final Considerations

The tool produced by the study is capable of automatically measuring the VAS of each parameter evaluated by the CAPE-V, in addition to performing the sums necessary for the analysis. In turn, the GRBASI scale is completed according to the degrees of altered parameters, which can vary from absent (zero) to severe (three).

These data result in tables and charts that allow quick and dynamic analysis of each isolated parameter and obtain a comparison between the evaluated parameters, both for the CAPE-V protocol and for the GRBASI scale.

As it is an accessible tool, we believe that its use can benefit both the academic and the clinical areas. In the current pandemic scenario, in which virtual learning is a reality in teaching, the use of the tool proves to be effective and beneficial, since the auditory training of students takes place through digital means. In addition, the tool can favor the analysis of academic research, as it allows for faster and more efficient data tabulation. In turn, in the clinical area, the tool offers a new alternative of visual feedback regarding the moments before and after therapy and the therapeutic evolution of the case, which can be useful for both the clinician and their patients.

Furthermore, the tool can be used as an electronic method of storing data obtained in the vocal assessment, thus modernizing and optimizing the access and flow of this information. It should also be noted that our digital tool helps to reduce paper usage as it does not require any printing.

The tool produced is available for free download, requiring only the completion of an online form at the following link: <https://forms.gle/LK4xUfcQeL6DSkFa6>, and having Microsoft Excel® 15.0 (Office 2013) or later. The link to complete the download is available at the end of the questionnaire.

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