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Voice therapy for older adults during the COVID-19 pandemic in Brazil

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TITLE PAGE

Title: Voice therapy for older adults during the COVID-19 pandemic in Brazil

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ABSTRACT

Objective: To characterize the clinical practice of Brazilian speech-language-hearing therapists regarding voice therapy for older adults during the COVID-19 pandemic. **Methods:** Cross-sectional survey conducted remotely. Data were collected through a form shared online with approximately 1.500 speech-language-hearing therapists. The form included voice therapy practice with older adults during the COVID-19 pandemic. It was responded by 155 voice experts. **Results:** Most respondents were females with over 21 years' experience in vocal health care, working with both in-person therapy and

teletherapy. Obtaining acoustic parameters and using therapy strategies for breathing and body training were the most reported changes in remote therapy during the pandemic. The main difficulties involved wearing masks in in-person therapy and assessing the voice in teletherapy. Patient adherence and goals reached were deemed positive by most participants. Associations were found between place and format of service; between patient adherence and goals reached; and between difficulties in teletherapy and use of complementary therapeutic resources. **Conclusion:** The COVID-19 pandemic led Brazilian speech-language-hearing therapists to change their clinical practice with older adults in both remote and in-person therapy. The main changes involved wearing masks in in-person therapy and assessing the voice in teletherapy. Remote therapy proved to be a safe and effective possibility.

Keywords: Voice; Aged; COVID-19; Voice Training.

Introduction

The new coronavirus disease appeared in 2019, thus being named COVID-19. The World Health Organization (WHO) declared it a pandemic following the alarming increase in the number of cases and deaths in various countries ^[1]. People of all age groups suffered from the disease, whose main clinical symptoms are fever, cough, and respiratory discomfort ^[2-5]. In this context, older adults were considered a risk group because of their immunosenescence and susceptibility to inflammatory changes ^[6-7].

The number of older adults in Brazil has been steadily growing, which points to the need for measures and actions to ensure active, effective, and healthy aging [8-9]. In speech-language-hearing (SLH) therapy, attention to patients in the field of voice stands out in two modalities – in-person therapy and speech-language teletherapy –, selected according to the patients' profile, the therapist's experience in handling the modalities, access possibilities, and/or geographical distance between patient and therapist [10-12].

SLH therapy format choice has been changing since 2020, due to the new coronavirus (COVID-19) pandemic. This worldwide emergency changed both in-person therapy and teletherapy. In-person care requires personal protective equipment and reinforced hand and environmental hygiene to avoid virus dissemination. Exercises also had to be carefully chosen to prevent aerosols produced by the patients. During this period, activities were conducted individually rather than in groups to meet health recommendations, avoid crowds, and keep distance between people [11, 13-15].

Some barriers are faced in speech-language teletherapy, which was conceived as an alternative to maintain therapy without physical contact. Particularly, professionals lack training to carry out this modality, as many of them are used to working with in-person patients and have no experience with online care. Also, professionals must cope with the lack of equipment for virtual care, as well as the patients' refusal or resistance, often due to scarce technological resources and help from others to manage online care [4-5].

Given the above, the format of voice therapy used by SLH therapists in Brazil is going through changes, particularly during the COVID-19 pandemic – which affected healthcare management and even human life worldwide. Addressing older people as a risk group, it is necessary to know clinical experiences in the different modalities of voice therapy to ensure both safety and therapeutic effectiveness. Hence, the objective of this study was to characterize the clinical practice of Brazilian SLH therapists providing voice therapy to older adults during the COVID-19 pandemic.

Materials and Methods

This cross-sectional survey was approved by the Research Ethics Committee under no. 4.478.408.

The authors initially surveyed the literature to develop the first version of a research form, which was judged and improved by SLH therapists. These judges were professors specialized in voice, with at least 3 years' clinical and teaching experience. They were indicated by administrators of public and private institutions from various regions of Brazil. Only six of them agreed to assess the form.

The form items were analyzed based on the following criteria: relevance, clarity, objectivity, and content. The specialists could make considerations and suggestions regarding the items whenever they deemed necessary. Judges gave each item a score from 1 to 4 points (1 = completely disagree, 2 = partially disagree, 3 = completely agree, and 4 = partially agree) to calculate the content validity index (CVI)^[16] – whose formula was the number of responses 3 and 4 divided by the total number of responses^[17]. If the result was equal to or above 70%, the item was approved; if it was below 70%, it was reformulated^[18]. After the judgment, the final version was developed in Google Forms (Appendix) and made available with a link.

Participants were selected according to a sample calculation based on the number of voice specialists registered at the Federal SLH Council – the agency that regulates and inspects the activities of SLH therapists in Brazil. By January 2021, there were 1,138 such therapists; it was established that 75% of them attended older adults during the pandemic in Brazil. Considering a 20% loss, 50% frequency, 10% margin of error, and 95% confidence interval, the minimum sample size was 138 subjects. However, the final research sample was 155 responses from SLH therapists who met the legibility criteria and accessed the link to Google Forms.

To be eligible as respondents in this research, SLH therapists had to be experts in voice – i.e., those who had been given the title of voice specialist by the Federal SLH Council or had at least finished a specialization course on voice. They also had to inform their experience (at least 3 years) caring for older people, providing voice therapy to them in in-person therapy or teletherapy.

The website of the Federal SLH Council was searched to obtain the name of the voice specialists registered in Brazil. They were contacted via social networks (Facebook, Instagram), telephone, message application (WhatsApp), and e-mail addresses available on the Internet.

Besides searching for the names of voice specialists, this research was also publicized and shared in WhatsApp groups including SLH therapists specializing in voice. As the forms were sent to the specialists, they were invited to help by sharing and publicizing it to their fellow SLH therapists who met the preestablished criteria. The researcher also sent this instrument to undergraduate and postgraduate professors of voice in SLH Sciences programs in Brazil to reach SLH therapists specializing in voice; it was also sent to SLH therapists in nursing homes, SLH clinics, voice laboratories, the Brazilian SLH Society, SLH syndicates, Regional SLH Councils in Brazil, specialization courses on the voice or whose faculty included voice specialists, otorhinolaryngologists and otorhinolaryngology institutions. These last ones were also invited to share it with acquainted SLH therapists. The form was available from March 24, 2021, to June 18, 2021.

Statistical analysis

Individual responses were initially analyzed in Google Forms. This platform shows descriptive results in graphs and charts, with absolute (n) and relative (%) frequencies for the categorical variables.

Besides the descriptive data, an inferential analysis was made associating categorical variables, using the chi-square independence test in R software, considering the 95% confidence interval. Some alternatives were not checked by the respondents; therefore, their frequency was zero and was not considered in the association analysis.

The following variables were tested: the place of service and therapy format; time since graduation and therapy format; educational attainment and therapy format; patient adherence and therapy format; patient adherence and goals reached; speech-language teletherapy before the pandemic and frequency of teletherapy during the pandemic; difficulties in teletherapy and complementary therapeutic resources.

Results

A total of 264 responses were received from the SLH therapists who filled out the form. Of these, 155 gave voice therapy to older adults during the pandemic – 95 voice specialists registered in the Federal SLH Council and 60 SLH therapists with a postgraduate specialization in voice. Most respondents were women (57.1%), aged 41 to 50 years (20.1%), residents of the states of São Paulo and Rio de Janeiro (19.7%/8.3%), who had been working in SLH therapy for 21 or more years (31.5%), using both therapy formats for older adults (35.4%).

The main general therapy data are described in Table 1. The places most used by SLH therapists were the home and private offices. Speech-language teletherapy was not a predominant practice before the pandemic, whereas its frequency increased among respondents during the pandemic. Biosafety measures were maintained in this period.

Changes in therapy sessions, patient adherence, and goals reached are listed in Tables 2 to 7. The need for changing individual therapy and therapeutic strategies for the body and breathing stood out. The mask was pointed out as the main hindrance in in-person therapy, while voice assessment was the main barrier in speech-language teletherapy. Patient adherence and goals reached were reportedly positive for most respondents in either format.

Association data are shown in Tables 8 to 14. Significant associations were found between the place of service and therapy format, between patient adherence and goals reached, and between difficulties in speech-language teletherapy and the use of complementary therapeutic resources, as shown in Tables 8, 12, and 14.

Discussion

The COVID-19 outbreak led humanity to change the therapeutic process in both in-person and speech-language teletherapy formats, including assistance to older adults, who belong to the risk group for worse coronavirus sequelae. During the pandemic, changes in both therapy formats have been

recorded, particularly regarding the use of masks in in-person therapy and voice assessment in the remote modality.

Females are strikingly present in the field of health, as pointed out in previous studies^[12-15]. The predominance of this public originates in the beginnings of undergraduate SLH Sciences programs in Brazil and may be related to the role of caregiving^[16]. Another characteristic of the respondents was their age and time in the profession – the surveyed public had greater life and professional experience.

The states in the Southeast Region of Brazil predominated, possibly because of its greater territory and socioeconomic importance, attracting more SLH therapists^[24]. Rio de Janeiro and São Paulo may also have more SLH therapists active in social networks, which were widely used to collect responses in this research.

The therapy formats appeared in the following order: both formats, in-person therapy, and speech-language teletherapy. This result may be related to the pandemic situation experienced by Brazilian SLH therapists at the time the questionnaires were answered, between March and June 2021. At the beginning of 2020, since little was known about the virus and the case and mortality rates were high, health professionals substituted in-person with virtual therapy as a prevention measure^[18-19]. Then, as case, hospitalization, and mortality rates decreased in some parts of Brazil, everyday activities were partially normalized, following the health authorities' instructions^[20-21]. This new situation indicates that, during the COVID-19 pandemic in Brazil, speech-language teletherapy prevailed in the first months of 2020, whereas by the end of the first semester of 2020 some professionals returned from virtual to in-person therapy. This created three realities^[22] that remained in 2021, namely: maintaining some virtual therapies to ensure a small number of patients; returning to in-person therapy, following the known safety measures; and using a hybrid format – both virtual and in-person therapy.

Private offices predominated among participating professionals as the place of in-person service, as it meets the requirements of clinical voice treatment^[26-29]. On the other hand, the home stood out as the setting for speech-language teletherapy, given the need to continue rehabilitation while

following social distancing recommendations during the COVID-19 pandemic [26,30-31]. Remote voice therapy for older adults was already increasing before the pandemic, especially for Parkinson's disease patients, applying the Lee Silverman method [27-28] – although this situation was not significantly present in this research.

Regarding the frequency of speech-language teletherapy during the pandemic, SLH therapists who adhered to virtual care sought to continue therapy in this format to follow up their patients' progress.

Health professionals already practiced biosafety measures involving personal protective equipment use [29] before the outbreak of the new coronavirus. Hence, their use was reinforced by the pandemic. The most reported resources were masks (indispensable mouth and nose protection accessories for all citizens) and face shields (additional equipment during the pandemic to protect the eyes from contact with secretion) [8]. Two recurrent practices also stood out – firstly, 70% alcohol was used to disinfect equipment, therapeutic resources, and surfaces [30]. Secondly, hands were washed more rigorously after having contact with secretions or body fluids, to ensure it was clean from such direct contact [30].

As for evaluative parameters, these professionals may have started assessing with adapted resources – e.g., recording voices with the smartphone instead of using acoustic analysis software and visually analyzing body structure instead of using muscle palpation. However, some participants changed the evaluative process; in speech-language teletherapy, the resources used to obtain acoustic measures stood out, probably due to unfeasible remote assessment for the lack of a microphone and speech processor [31].

Regarding strategies used in in-person care, SLH therapists asked patients to temporarily remove their masks to assess and work out respiration and phonation. In speech-language teletherapy, not all procedures (for instance, body assessment) could be carried out without physical contact.

Moreover, attention is called to changes in breathing intervention in in-person therapy, probably because of aerosols produced by patients and their difficulties breathing while wearing the mask [11]. Another modified strategy was

the use of body methods since virtual care does not enable physical contact between therapists and patients ^[12].

Regarding individual and group activities, all professionals who used individual therapy kept a 1.8-meter distance from subjects ^[18] and wore personal protective equipment ^[4]. The predominance of individual sessions in teletherapy was possibly due to the need for individual monitoring in the remote format.

Most participants reported the patients' profile as the main factor for changes in voice therapy exercises. This information reinforces the importance of therapeutic planning based on the patients' needs in specific contexts ^[36-37].

Most respondents did not indicate changes in the use of therapeutic resources, programs, or methods in either format. It is inferred that professionals tried to maintain the clinical practices and equipment they were previously using, while following the recommendations to avoid contamination. For instance, professionals could choose not to use breathing activities in specific methods and programs, though using other components in voice training.

Even though it was necessary, wearing a mask hindered in-person therapeutic management ^[11,26]. Some professionals even recommended temporarily removing it for assessment and rehabilitation – which is contrary to public health recommendations, posing a risk of infection by the new coronavirus.

One of the difficulties presented in speech-language teletherapy was voice recording, in which there was no control over environmental noise ^[26,38-39]. Thus, a comprehensive voice assessment could not be made, as it was impossible to multidimensionally analyze the voice regarding body and acoustic aspects in this specific pandemic period ^[12,35].

Another relevant point in therapy was adherence. Despite the therapeutic adversities, patients were careful to follow the therapists' recommendations to ensure greater satisfaction with their voice. Most volunteers reported reaching the goals of therapy, although in exclusively in-person therapy they were partially reached. This probably reflects previously mentioned difficulties in in-person care, which prevented such successful therapy.

As for the relationship between study variables, the place of service was associated with the therapy format, probably because COVID-19 changed the work setting. Professionals sought the therapy modality that made it possible to continue the rehabilitation process [10-11,14-15,25-26].

Patient adherence associated with goals reached may be related to the recommendations followed by the patients, leading them to perceive voice quality improvements [40]. On the other hand, changes in the usability of therapeutic resources were also associated with difficulties in speech-language teletherapy. This result may be explained by the characteristic absence of physical contact in remote therapy [12,41] and the impossibility of assessing patients comprehensively in a virtual setting [26,35].

Limitations of the study particularly include the non-heterogeneous sample distribution, as SLH therapists were mostly from the Southeast Region of Brazil. There was also a risk of type I error in association analyses due to the multiple comparisons between variables with more than two categories. This restriction resulted from the type of survey used for data collection.

Concerning future recommendations, further research on speech-language teletherapy should include all age groups to find how remote voice therapy is used in different life cycles. Moreover, since assessment is essential to voice rehabilitation, other studies should use assessment in teletherapy to find new ways to evaluate patients and thus potentialize this stage in the virtual mode and compare pre- and post-therapy data.

This research shows that SLH therapists used the teletherapy format more often, according to the professionals'/patients' preferences and the clinical case analysis. Thus, voice therapy for older adults may be indefinitely maintained. This practice was strengthened as a vestige of the world health context and will possibly lead professionals to broaden their therapy possibilities for older adults, maintaining positive therapy results.

Conclusion

SLH therapists predominantly provided voice therapy for older adults during the COVID-19 pandemic in Brazil in both formats. In in-person therapy, mask use hindered rehabilitation. In speech-language teletherapy, voice assessment difficulties stood out. Adherence to the therapy was reportedly

positive in both formats, despite the adversities. Speech-language teletherapy may be a feasible and safe option, with older adults participating actively in the therapeutic process.

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Table 1 – Description of general voice therapy data given to older adults during the COVID-19 pandemic (n = 155)

	Format			
	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)
General data				
Place of service				
Home	19(51.4)	18(64.3)	38(41.8)	55(60.4)
Outpatient center	5(13.5)	1(3.6)	26(28.6)	10(11)
Nursing home	3(8.1)	1(3.6)	3(3.3)	1(1.1)
Private office	25(67.6)	6(21.4)	62(68.1)	56(61.5)
Teaching clinic	4(10.8)	0(0)	12(13.2)	7(7.7)
University or college health care center	1(2.7)	0(0)	7(7.7)	2(2)
Others	4(10.9)	6(21.6)	8(8.8)	5(5.5)
Freq. Teletherapy Pandemic				
Always	0(0)	18(64.3)	0(0)	18(19.8)
Almost always	0(0)	8(28.6)	0(0)	27(29.7)
Sometimes	0(0)	2(7.1)	0(0)	36(39.7)
Rarely	0(0)	0(0)	0(0)	9(9.9)
Never	0(0)	0(0)	0(0)	1(1.1)
Teletherapy before pandemic				
Yes	0(0)	3(10.7)	0(0)	18(19.8)
No	0(0)	25(89.3)	0(0)	73(80.2)
Biosafety				
Washing hands before the session	35(94.6)	0(0)	73(80.2)	0(0)
Washing hands after the session	34(91.4)	0(0)	70(76.9)	0(0)
Washing hands after contact with secretions	32(86.5)	0(0)	52(57.1)	0(0)
Mask	35(94.6)	0(0)	82(90.1)	0(0)
Face shield	27(73)	0(0)	64(70.3)	0(0)
Safety goggles	12(32.4)	0(0)	30(33)	0(0)
Medical gloves	34(91.4)	0(0)	65(71.4)	0(0)
Surgical gown	19(51.4)	0(0)	31(34.1)	0(0)
White coat	27(73)	0(0)	54(59.3)	0(0)
Medical cap	18(48.6)	0(0)	37(40.7)	0(0)
Cleaning equipment with alcohol	26(70.3)	0(0)	50(61.5)	0(0)
Acrylic shield barrier	2(5.4)	0(0)	10(11)	0(0)
I continued using the same biosafety measures	4(10.8)	0(0)	18(19.8)	0(0)

Legend: Freq. teletherapy pandemic = Frequency of speech-language teletherapy sessions during the pandemic; Teletherapy before pandemic = Whether had given speech-language teletherapy before the pandemic; Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities.

Table 2 – Description of changes in care regarding evaluative parameters, therapeutic strategies, and individual or group voice therapy for older adults during the COVID-19 pandemic (n=155)

Changes in care	Format			
	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)
Evaluative parameters				
Self-assessment of voice	1(2.7)	1(3.6)	4(4.4)	10(11)
APA	1(2.7)	2(7.1)	4(4.4)	16(17.6)
Acoustic assessment	4(10.8)	15(53.6)	15(16.5)	36(39.6)
MPT	2(5.4)	4(14.3)	7(7.7)	6(6.6)
I continued using the same parameters	31(83.8)	11(39.3)	71(78)	50(54.9)
Others	0(0)	0(0)	2(2)	2(2)
Therapeutic strategies				
Body	8(2.1)	12(42.9)	23(25.3)	29(31.9)
Speech/articulation	11(29.7)	8(28.6)	27(29.7)	18(19.8)
Breathing	16(43.2)	8(28.6)	40(44)	25(27.5)
Phonation exercises	11(29.7)	7(25)	36(39.6)	19(20.9)
Prosody	2(5.4)	3(10.7)	7(7.7)	11(12.1)
Resonance	2(5.4)	4(14.3)	16(17.6)	15(16.5)
I continued using the same strategies	14(37.8)	12(42.9)	40(44)	46(50.5)
Individual or group therapy				
Individual	30(81.1)	18(64.3)	66(72.5)	56(61.5)
Group	1(2.7)	6(21.4)	7(7.7)	7(7.7)
Individual care was not changed	10(27)	9(32.1)	23(25.3)	33(36.3)
Group care was not changed	0(0)	0(0)	0(0)	3(3.3)

Legend: APA = Auditory-perceptual assessment; MPT = maximum phonation time; Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities.

Table 3 – Description of changes in care regarding voice therapy program or method for older adults during the COVID-19 pandemic (n=155)

Changes in care	Format			
	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)
Voice program or method				
VTE	0(0)	0(0)	0(0)	0(0)
VFE	0(0)	0(0)	0(0)	0(0)
PhoRTE	1(2.7)	0(0)	4(4.4)	1(1.1)
LSVT	0(0)	2(7.1)	3(3.3)	6(6.6)
I continued using the same programs and methods during the pandemic	32(86.5)	23(82.1)	77(84.6)	77(84.6)
I have never used these programs or methods	4 (10.8)	4 (14.3)	7 (7.7)	8 (8.8)

Legend: VTE = Voice Therapy for the Elderly; VFE = Vocal Function Exercises; PhoRTE = Phonation Resistance Training Exercise; LSVT = Lee Silverman Voice Treatment; Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities.

Table 4 – Description of changes in care regarding complementary resources in voice therapy for older adults during the COVID-19 pandemic (n=155)

	Format			
	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)
Changes in care				
Complementary Therapeutic Resources				
Electrostimulation	5(13.5)	0(0)	10(11)	1(1.1)
Flexible and/or hard tube	6(16.2)	5(17.9)	16(17.9)	13(14.3)
Massager	5(13.5)	0(0)	14(15.4)	1(1.1)
Incentive spirometer	10(27)	2(7.1)	16(17.6)	16(17.6)
Shaker	8(21.6)	2(7.1)	19(20.9)	18(19.8)
Power Breathe	2(5.4)	1(3.6)	10(11)	20(22)
EMST-150	2(5.4)	0(0)	11(12.1)	16(17.6)
I continued using the same therapeutic resources during the pandemic	25(67.6)	17(60.8)	46(50.5)	47(51.6)
I have never used these resources	0(0)	2(7.1)	0(0)	4(4.4)
Any instrument that made contagion easier was eliminated	1(2.7)	0(0)	0(0)	0(0)
Other (laser)	0(0)	1(3.6)	2(2.2)	1(1.1)
Other (I make adaptations)	0(0)	2(7.1)	0(0)	1(1.1)
Other (nebulizer)	0(0)	0(0)	2(2.2)	0(0)
Other (individual equipment)	0(0)	0(0)	4(4.4)	0(0)
Other (I keep some distance during exercises)	0(0)	0(0)	1(1.1)	0(0)
Other (acoustic analysis, voice recording, and articulation are impaired)	0(0)	0(0)	0(0)	1(1.1)
Other (individual use)	0(0)	0(0)	0(0)	2(2.2)
Other (laser therapy and cutaneous electrostimulation)	0(0)	0(0)	0(0)	1(1.1)
Other (electrostimulation, tape, and laser)	0(0)	0(0)	0(0)	1(1.1)

Legend: EMST-150 = Expiratory muscle strength trainer; Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities.

Table 5 - Description of changes in care regarding the substitution of voice therapy exercises for older adults during the COVID-19 pandemic (n=155)

	Format			
	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)
Changes in care				
Voice exercise substitution				
Patient's profile	18(48.6)	15(53.6)	51(56)	45(49.5)
Difficulty understanding the exercise	9(24.3)	5(17.9)	24(26.4)	37(40.7)
Difficulty doing the exercise	10(27)	12(42.9)	29(31.9)	43(47.3)
Exercise done inadequately	5(13.5)	6(21.4)	20(22)	34(37.4)
Not applicable	9(24.3)	6(21.4)	22(24.2)	22(24.2)

Legend: Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities.

Table 6 - Description of changes in care regarding in-person and remote voice therapy for older adults during the COVID-19 pandemic (n=155)

	Format
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	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)
Changes in care				
In-person difficulties				
Wearing a mask and managing therapeutic resources	27(73)	0(0)	61(67)	0(0)
Wearing a mask and doing the exercises	20(54.1)	0(0)	61(67)	0(0)
Impossibility to remove the mask	19(51.4)	0(0)	44(48.4)	0(0)
Small, closed environments	5(13.5)	0(0)	14(15.4)	0(0)
Lack of AIIR	2(5.4)	0(0)	9(9.9)	0(0)
Aerosol	10(27)	0(0)	25(27.5)	0(0)
Distance	13(35.1)	0(0)	31(34.1)	0(0)
I have no difficulties	3(8.1)	0(0)	16(17.6)	0(0)
Others	2(5.4)	0(0)	4(4.4)	0(0)
Teletherapy difficulties				
Change the degree of difficulty or resistance of the resource	0(0)	7(25)	0(0)	40(44)
Voice assessment	0(0)	8(28.6)	0(0)	35(38.5)
Voice recording	0(0)	12(42.9)	0(0)	67(73.9)
Therapeutic dosage	0(0)	0(0)	0(0)	0(0)
Therapeutic test	0(0)	1(3.6)	0(0)	28(30.8)
Progress monitoring	0(0)	5(17.9)	0(0)	21(23.1)
I have no difficulties	0(0)	1(3.6)	0(0)	1(1.1)
Others	0(0)	4(16)	0(0)	2(2.2)

Legend: AIIR = airborne infection isolation room; Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities.

Table 7 – Description of patient adherence and goals reached in voice therapy for older adults during the COVID-19 pandemic (n=155)

	Format			
	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)
Patient adherence				
Yes	32(86.5)	28(100)	83(91.2)	83(91.2)
No	5(13.5)	0(0)	8(8.8)	8(8.8)
Goals reached				
Yes	15(40.5)	19(67.9)	59(64.8)	52(57.1)
Partially	22(59.5)	9(32.1)	32(35.2)	38(41.8)
No	0(0)	0(0)	0(0)	1(1.1)

Legend: Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities.

Table 8 – Association between place of service and voice therapy format for older adults during the COVID-19 pandemic (n=155)

	Format				Total	p-value
	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)		

Place of service						
Home	19(51.4)	18(64.3)	38(41.8)	55(60.4)	130	0.0019*
Outpatient center	5(13.5)	1(3.6)	26(28.6)	10(11)	42	
Nursing home	3(8.1)	1(3.6)	3(3.3)	1(1.1)	8	
Private office	25(67.6)	6(21.4)	62(68.1)	56(61.5)	149	
Teaching clinic	4(10.8)	0(0)	12(13.2)	7(7.7)	23	
University or college health care center	1(2.7)	0(0)	7(7.7)	2(2.2)	10	
Others	4(10.8)	6(21.6)	8(8.8)	5(5.5)	23	
Total	61	32	156	136	385	

Legend: Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities; * Chi-square test

Table 9 – Association between time since graduation and voice therapy format for older adults during the COVID-19 pandemic (n=155)

	Format				Total	p-value
	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)		
Time since graduation						
3 to 6 years	3(23.1)	3(23.1)	7(53.8)	7(53.8)	20	0.7329*
7 to 10 years	4(23.5)	2(11.8)	11(64.7)	11(64.7)	28	
11 to 20 years	13(28.9)	5(11.1)	27(60)	27(60)	72	
21 or more years	17(21.2)	18(22.5)	45(56.2)	45(56.2)	125	
Total	37	28	90	90	245	

Legend: Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities; * Chi-square test

Table 10 – Association between educational attainment and voice therapy format for older adults during the COVID-19 pandemic (n=155)

	Format				Total	p-value
	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)		
Educational attainment						
Specialization	22(28.9)	14(18.4)	40(52.6)	40(52.6)	116	0.1652*
Master's degree	11(24.4)	6(13.3)	28(62.2)	28(62.2)	73	
Doctoral degree	2(6.7)	8(26.7)	20(66.7)	20(66.7)	50	
Postdoctoral degree	2(50)	0(0)	2(50)	2(50)	6	
Total	37	28	90	90	245	

Legend: Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities; * Chi-square test

Table 11 – Association between patient adherence and voice therapy format for older adults during the COVID-19 pandemic (n=155)

	Format				Total	p-value
	In-person N(%)	Teletherapy N(%)	Both (in person) N(%)	Both (teletherapy) N(%)		
Patient adherence						
Yes	32(14.3)	28(12.5)	82(36.6)	82(36.6)	224	0.2837*
No	5(23.8)	0(0)	8(38.1)	8(38.1)	21	
Total	37	28	90	90	245	

Legend: Both (in person) = Responses regarding in-person therapy from speech-language-hearing therapists who conducted both care modalities; Both (teletherapy) = Responses regarding speech-language teletherapy from speech-language-hearing therapists who conducted both care modalities; * Chi-square test

Table 12 – Association between patient adherence and goals reached in voice therapy for older adults during the COVID-19 pandemic (n=155)

Patient adherence	Goals reached			Total	p-value
	Yes N(%)	Partially N(%)	No N(%)		
Yes	141(97.9)	83(83)	0(0)	224	0.0000*
No	3(2.1)	17(17)	1(100)	21	
Total	144	100	1	245	

* Chi-square test

Table 13 – Association between speech-language teletherapy before the pandemic and frequency of speech-language teletherapy during the pandemic in voice therapy for older adults during the COVID-19 pandemic (n=155)

Teletherapy before the pandemic	Frequency of speech-language teletherapy sessions during the COVID-19 pandemic					Total	p-value
	Always N(%)	Almost always N(%)	Sometimes N(%)	Rarely N(%)	Never N(%)		
Yes	5(25)	8(40)	7(35)	0(0)	0(0)	20	0.5341*
No	30(30.6)	27(27.6)	31(31.6)	9(9.2)	1(1)	98	
Total	35	35	38	9	1	118	

* Chi-square test

Table 14 - Association between difficulties in speech-language teletherapy and complementary voice therapy resources for older adults during the COVID-19 pandemic (n=155)

Difficulties teletherapy	Resources								Total	p-value
	Elect N(%)	Tube N(%)	Mass N(%)	Spirom N(%)	Shaker N(%)	EMST N(%)	Power N(%)	Other N(%)		
Change degree	0(0)	7(14)	0(0)	10(20)	11(22)	10(20)	12(24)	0(0)	50	
Assessment	0(0)	14(31.8)	1(2.3)	8(18.2)	8(18.2)	5(11.4)	7(15.9)	1(2.3)	44	0.0254*
Recording	2(2.9)	13(18.6)	0(0)	14(20)	12(17.1)	1(15.7)	14(20)	4(5.7)	60	
Dosage	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0	
Test	0(0)	4(12.9)	0(0)	6(19.4)	7(22.6)	6(19.4)	7(22.6)	1(3.2)	31	
Monitoring	1(4.8)	4(19)	0(0)	4(19)	4(19)	3(14.3)	3(14.3)	2(9.5)	21	
Others	1(25)	1(25)	0(0)	0(0)	0(0)	0(0)	0(0)	2(50)	4	
Total	4	43	1	42	42	25	43	10	210	

Legenda: Difficulties teletherapy = Difficulties in speech-language teletherapy; Change degree = change degree of difficulty in resources; Assessment = Voice assessment; Recording = Voice recording; Dosage = Therapeutic dosage; Test = Therapeutic test; Monitoring = Progress monitoring; Elect = Electrostimulation; Tube = flexible tube; Mass = Massager; Spirom = incentive spirometer; EMST = Expiratory Muscle Strength Trainer; Power = Power Breathe; * Chi-square test

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