MAXIMUM PHONATION TIME OF FUTURE PROFESSIONAL VOICE USERS

Tempo máximo de fonação de futuros profissonais da voz

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ABSTRACT

Purpose: to check the maximum phonation time (MPT) of vowels and to correlate the results of the relations between /e/ voiceless and sound (ė/e ratio), s/z ratio and MPT obtained/predicted (MPTO/MPTP), according to the gender, ratio in future professional voice adults users with normal voice. **Method:** selection through the vocal evaluation by the RASATI scale; collection of MPT /a, i, u, e, s, z/, the /e/ voiceless and vital capacity; calculation of the s/z, ė/e, and MPTO/MPTP ratio of 50 women (average 21,42 years old) and 12 men (average 24,25 years old). **Results:** in both sexes, the MPT were significantly inside or below the normality, suggesting balance or air escape during the phonation. The s/z ratio significantly normal, ė/e ratio significantly increased when compared to the reduce results, and MPTO/MPTP ratio without significant differences. It showed balance or hyper of vocal folds during the phonation. Significant positive correlation between the s/z and ė/e ratio, showing that they grow proportionally and what the MPTO/MPTP ratio does, is not correlated with them. **Conclusion:** the future professional voice adults users with normal voice studied presented the MPT of vowels inside or below the normality, the s/z ratio normal and the ė/e ratio above the normality, when compared to the group with decreased values, suggesting pneumo-phono-articulatory incoordination. The positive correlation between the s/z and ė/e ratio suggests that both supply compatible results, but it doesn't occur the same with the MPTO/MPTP ratio.

KEYWORDS: Voice; Phonation; Occupational Health; Health Evaluation

INTRODUCTION

The phonoaudiological performance, referring to the health of future voice professionals, requires early intervention to prevent possible cases of communication disorders[1-4]. Thus, it would prevent speech therapy only in the presence of voice disorder, that is, when the work performance has been hampered because of some dysphonia[2,5,6]. This could facilitate the development of more targeted actions to minimize problems and maximize the potentialities of this public[5,7,8].

According to literature, the professions with the highest risk for the development of dysphonia are vendors, teachers, singers, telemarketers, receptionists, health professionals, followed by actors, priests and other professionals[6]. The vocal care in these groups should not be overlooked, including workers who have not shown symptoms of dysphonia because pneumophonoarticulatory incoordination, during the professional voice use, may generate more significant damage[6,9,10]. Any impairment of the air function can exert a direct effect on speech and voice in the aspects of intensity, pitch and quality[11-14]. The integrity of the laryngeal muscles and mucosa vocal folds is essential for a proper phonation [9,10,15-18].

The research on this integrity and functionality can be accomplished through the voice evaluation, considered as a starting point for the diagnosis and

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treatment of any voice disorder as well as voice enhancement. The importance of vocal assessment keeps throughout the treatment/enhancement as a means of measuring the possible evolutions of the patient and ensure proper timing of therapeutic discharge[10,15,16,18-21].

The measurement of maximum phonation time (MPT) is used to obtain pneumophonic data, being one of the most used in the practice of clinical voice assessment, because it is easily measured and is considered an objective acoustic measurement of glottic efficiency[9,10,15-17,19,20,22].

The MPT indicates the efficiency of the coordination between the levels of breathing and phonation, since, for maximum sustained phonation, the individual uses the maximum of her/her vital capacity (VC) to maintain a phoneme for as long as possible, reflecting the neuromuscular control and aerodynamic vocal production[10,16,17,19,20]. The VC can also change the values of MPT[9,11,16-18].

The extent of MPT can be used by phonoaudiologists, otolaryngologists and singing teachers as a pre-assessment to other forms of qualitative or quantitative assessment[9,16,19,20].

From the MPT, relationship measures between some of them have been developed. As the relationship between the voiceless vowels /e/ (/ė/) and voiced /e/ (/e/) (ė/e relationship),[11,18,23] the relationship between the fricatives /s/ and /z/ (s/z relationship)[5,9,10,15,22] and the relationship between obtained and predicted MPT (OMPT/PMPT relationship) that assess the dynamics of breathing and glottal efficiency[9,22].

The aerodynamic control of the emission with the progressive exit of the expiratory air can be quantitatively evaluated by the value of MPT/s/ and MPT /ė/, voiceless phonemes do use the vibration of the vocal folds, thus underlining the performance of breathing level phonation. The oscillatory component can be measured by the value of MPT/z/ and MPT /e/, as it is voiced phonemes that have vibration on vocal folds, showing the performance of the glottic level or phonatory to the emission. The relationship s/ z and the relationship ė/e, therefore, provide the assessment of the phonatory dynamics and laryngeal efficiency and respiratory[5,9-11,15,16,18,19,23,24].

Through the OMPT/ PMPT relationship it is possible to check the occurrence of glottic hypercontraction or air leak to phonation, because the PMPT is a prediction about the time that the subject should sustain the emission based on the values of VC, and OMPT is time that it was effectively performed by the subject (MPT /a/)[9,22].

Based on the above, this research is justified by the lack of studies with the population of future voice professionals, as it is a population that has presents the tendency to voice problems and the referred measures propose to show coordination between the levels of voice production[1].

Thus, the present study aimed to verify the MPT of the vowels and correlate the results of the ė/e, s/z relationships and OMPT/ PMPT, according to gender, in future adult voice professionals with normal voice.

METHOD

The study was a transversal analytical type, with quantitative character.

The target population was composed of all subjects who sought a Phonoaudiology school clinic to perform vocal improvement, from March 2009 to July 2010.

To compose the study group it was adopted the following inclusion criteria: signing of the Informed Consent Form (ICF), being a student of course that would require professional use of the voice in the future profession[1,3,10]; auditory thresholds within the normal range[5,17-19,23, 25-28], aged from 18 to 40, avoiding hormonal and structural changes of the period of voice change and aging[9,10,17,27] and present the average degree of zero to 0.9 in the aspects evaluated by RASATI[18, 19].

Exclusion criteria were: present reported history of neurological and/or psychiatric conditions that could interfere with the understanding of the orders during evaluation[1], endocrinological, gastric and respiratory diseases[9,10,17,18,23,27,28] or stomatognathic system deviations that could influence vocal performance[8,17,18,27]; presenting influenza and/or respiratory allergies at the time of the phonoaudiological assessment, because both can cause vocal fold edema limiting performance evaluations, with results which do not correspond to the usual standards of the subjects[5,10,17,23,27]; hormonal changes due to pregnancy or the menstrual and premenstrual periods[9,10,23,27]; having done therapy and/or previous ENT; sing in choirs ruling out the possibility the subject having received vocal and respiratory training with vocal techniques[17,18,27]; complaints such as vocal voice failures; burning sensation in the throat, vocal fatigue and/or hoarseness because they could suggest disorders in laryngeal level and interfere with the results of the study[27].

Audiometric screening was performed by means of the scan of pure tones by air conduction at frequencies of 500, 1000, 2000 and 4000 Hz, 25 dB in a soundproof booth (with Fonix, model FA –12, type I)[18,19,25]. An evaluation of the stomatognathic system verified aspect, tone, posture and mobility of the structures and their functions in order to apply the exclusion criteria above[3].

Considering that the scale RASATI is an effective tool in identifying perceptive auditory voice disorders related to irregular vibration of the vocal folds (glottal source)[29] and having as methodological basis in other studies[19,21,30,31], the criteria used to classify the voices in this research was based on the average responses of three phonoaudiologist judges with expertise in voice, for each parameter in the RASATI scale. In this study it was established as a criterion of vocal normality, the average degree of 0.9 to the aspects evaluated by RASATI[19, 26].

The judges performed the analysis with specific protocol for RASATI, independent of each other and ignoring the research objectives. The largest MPT of vowel /a/ of each subject was doubled and the total of those emissions was organized and presented randomly for each judge, unmarked and without knowing that they were evaluating the same emission twice[5,9,29,30].

To check the intra and inter rater agreement it was applied in calculating the Kappa coefficient on the average responses of each judge for each RASATI parameter, obtaining the average coefficient of intra and inter rater. Results were considered to be between 0.8 and 1, almost perfect agreement; between 0.6 and 0.8, good agreement; between 0.4 and 0.6, moderate, between 0.2 and 0.4, regulate, among zero and 0.2, slight; between –1 and zero poor[22]. The judge one obtained Kappa coefficient of 0.7, Judge two 0.68 and Judge three 0.71. The judges 1 and 2 obtained inter rater agreement of 0.66,to 1 and 3, out of 0.68, and the 2 and 3 out of 0,62.

The results of this assessment were decisive in the classification of voices as normal or altered and hence an inclusion criterion, because it was not possible to hold the ENT examination in all subjects. It judged the perceptive auditory analysis of MPT procedure most suitable and reliable for the selection of subjects for the presence or absence of dysphonia, since the MPT is widely described in the scientific literature with emphasis on the detection of diseases in glottic level[5,9,11,18,19,23,31].

We evaluated 86 subjects. One was excluded for having hearing loss, five were younger than 18 years, and 18 were excluded because their average grade above 0.9 on the RASATI parameters.

Therefore, the study group included 62 subjects, 12 men aged from 20 to 35 years old (average 24,25) and 50 women aged from 18 to 29 years old (average 21,42). Although the group of men has been outnumbered, we chose to keep them in the study for the enrichment of the data, taking care to not make comparisons of results between the genders due to the numerical difference between the groups.

After the selection of the study group was collected the VC in the bipedal standing position, with dry spirometer *Fami-Itá®,* the subject was asked to conduct a maximal inspiration and maximal expiration into the device, positioned at the height of the patient[9,28]. It was considered for this study, the highest value obtained among the six collected samples, three with and three without nasal occlusion[28].

In the collection of MPT each subject was instructed to emit the phonemes [a:], [i:], [u:], [i:], [z:], [e:], [e:] after a deep inspiration in frequency loudness and usual quality, standing erect, with arms extended along the body in one expiration[5, 11]. It was asked to each volunteer who held three times each sound, being considered the highest timed mark[10,15-20,22,23,27,30,32].

To record the voices it was used a professional stereo digital recorder with unidirectional microphone (Zoom brand, model H4N), placed four inches from their mouth, with an angle of 90 ° directional pickup[17,19,30], in a room with ambient noise less than 50 dB SPL, measured by digital sound pressure level meter *Instrutherm*, model-Dec 480[9,27,30,31].

As normal range for MPT, we used the interval of 15 to 25s for women, and 25 to 35s for men[9,16,27]. Values under these intervals were considered indicative of air escape during phonation and higher values indicate excessive coaptation in the vocal folds[9,16,19,27].

We calculated the s/z ratio by dividing the larger MPT/s/ by the higher MPT /z/, considering the normality between 0.8 and 1.2. Values below 0.8 indicate excessive coaptation of the vocal folds and values above 1, 2 indicate air leakage during phonation. According to literature, the same values are considered for the evaluation of both genders, therefore, these measures, the group has been reported as a whole and not divided by gender [5,9-11,15,19,22,27,28].

The ė/e relationship, division of the higher MPT/ė/ by the higher MPT /e/, was classified with the same intervals of normality of the s/z relationship[23].

The OMPT/PMPT relationship was calculated starting by multiplying the VC by the value 0.0051 for female subjects, and by multiplying the VC by the value 0.0057 for the male subjects, obtaining the value of the MFT each subject[9]. After OMPT, or the largest value of MPT /a/ was divided by the PMPT values were considered within the normal range between 0.9 and 1.1. Lower values were considered suggestive of air escape during phonation and higher values suggestive of excessive coaptation in the vocal fold [9].

The study was approved by the Ethics Committee in Research (016945/2010-76) and the

ICF was written as recommended the 196/96 rule of the National Commission of Ethic in Research (CONEP/1996).

After tabulating of the data, we tested the normality of the variables (Lilliefords test) and opted for the Spearman correlation test to correlate the results of the relationships of s/z, ė/e and OMPT/ PMPT. To compare two proportions we used the binomial test. The level of significance was 5% ($p \leq .05$).

The classification of the correlation values obtained was: very weak correlation (0 to 0.19); weak correlation (0.20 0.39), moderate correlation (0.40 to 0.69), a strong correlation (0.70 to 0.89); very strong correlation (0.90 to 1.00).

As the variables were not normally distributed, it was not used average values in the tabulation of results.

RESULTS

Table 1 – Differences between the diminished results, increased and within normal ranges for the variables MPT /a/, /i/ and /u/ in female and male

n(%)	n(%)	p-value
Female MPT /a/		
Decreased	Normal	0,583
22 (44,0)	26 (52,0)	
Decreased	Increased	0,283
22 (44,0)	2 (4,0)	
Normal	Increased	0,0202*
26 (52,0)	2 (4,0)	
Male MPT /a/		
Decreased	Normal	0,022*
11 (92,0)	1(8,0)	
Decreased	Increased	0,0001*
11 (92,0)	0 (0,0)	
Normal	Increased	0,324
1(8,0)	0 (0,0)	
Female MPT /i/		
Decreased	Normal	0,085
18 (36,0)	31 (62,0)	
Decreased	Increased	0,002*
18 (36,0)	1 (2,0)	
Normal	Increased	0,0001*
31 (62,0)	1 (2,0)	
Male MPT /i/		
Decreased	Normal	0,152
9 (75,0)	3 (25,0)	
Decreased	Increased	0,0001*
9 (75,0)	0 (0,0)	
Normal	Increased	0,0083*
3 (25,0)	0 (0,0)	
Female MPT /u/		
Decreased	Normal	0,105
19 (38,0)	31 (62,0)	
Decreased	Increased	0,0005*
19 (38,0)	0 (0,0)	
Normal	Increased	0,0001*
31 (62,0)	0 (0,0)	

n(%)	n(%)	p-value
Male MPT /u/		
Decreased	Normal	0,0001*
10 (83,3)	1 (8,3)	
Decreased	Increased	0,0001*
10 (83,3)	1 (8,3)	
Normal	Increased	-
1 (8,3)	1 (8,3)	

Binomial Test
*statistically significant values

Table 2 – Differences between the diminished, increased and within normality results for the variables: s/z relationship, ė/e relationship and OMPT/ PMPT relationship

n(%)	n(%)	p-value
s/z Relationship		
Decreased	Normal	0,0027*
6 (9,6)	46 (74,2)	
Decreased	Increased	0,737
6 (9,6)	10 (16,1)	
Normal	Increased	0,001*
46 (74,2)	10 (16,1)	
ė/e Relationship		
Decreased	Normal	0,339
9 (14,9)	20 (32,2)	
Decreased	Increased	0,048*
9 (14,9)	33 (53,2)	
Normal	Increased	0,142
20 (32,2)	33 (53,2)	
OMPT/ PMPT Relationship		
Decreased	Normal	0,834
17 (27,4)	19 (30,6)	
Decreased	Increased	0,325
17 (27,4)	26 (41,9)	
Normal	Increased	0,442
19 (30,6)	26 (41,9)	

Binomial Test
*statistically significant values
Legend: OMPT/ PMPT – maximum phonation time obtained / maximum phonation time predicted

Table 3 – Correlations between variables: OMPT/ PMPT relationship, s / z relationship, and the ė/e relationship

	R	p-value
	OMPT/ PMPT relationship	
s/z relationship	-0,032	0,802
ė/e relationship	-0,014	0,917
	s/z relationship	
ė/e relationship	0,421	0,001*

Spearmann Test
Legend: r – correlation coefficient. OMPT/ PMPT – maximum phonation time obtained / maximum phonation time predicted
*statistically significant values

DISCUSSION

In the present study, most female presented normal MPT /a/, however, this value was only significant when compared to the increased values. It's possibly due to the proximity in the distribution of normal and reduced MPT /a/ (Table 1). On MPT /i/ there were significant decreased and normal values compared to the increased values (Table 1). For the MPT /u/, there was a significant difference in favor of the diminished results, and increased when compared to normal values when compared to the reduced (Table 1). Thus, it was found that the MPT from most of the studied future voice professionals showed normal values, suggesting equilibrium (pneumophonoarticulatory coordination), followed by decreased MPT values with the probable presence of air leakage during phonation (uncoordination).

A similar result was found in a study of adult women with and without vocal nodules. In the group of ten women with vocal nodules, 30% showed prevalence of aerodynamic phonation, 70% were normal and none was above. In the group without vocal nodules, 10% of women had a predominance of aerodynamic phonation, 90% were normal and none was increased, however, there was not significant statistic[27].

For most male subjects, MPT /a/ showed lower values. The differences were statistically significant when compared to increased normal values (Table 1). On MPT /i/ there was significant difference in favor of diminished results and normal values when compared to the increased values. In MPT /u/ there was a significant difference between the decreased values when compared to normal and elevated ones (Table 1).

The results, both for males as for females, resemble the findings of other studies, in which the values of MPT subjects of both genders considered with normal vocal quality, showed up decreased[7,32].

Decreased MPT values are suggestive of transglottic air escape during phonation and increased values suggest increased glottal closure and increased muscle tension or phonation[6,7,9-11,15,16-18,20,22]. In the present study, the significant majority of men had decreased MPT values and the significant majority of women was within normal or decreased values (Table 1).

In this research, the s/z relationship showed normal statistical significance when compared to the increased values and when compared to lower values (Table 2), which met the literature that has studies with results of the s/z within normality in different groups of individuals[7,27,32]. In research with subjects without laryngeal affections, the majority percentage of the group presented results of the s/z within the normal range[7]. In another study, conducted with adult women, with and without vocal nodules, there was a similar result, as the group without vocal nodules, 100% presented results of normal s/z relationship and in the group with vocal nodules, 70% had normal values 30% aerodynamic prevalence and no women had increased values[27]. The s/z relationship is proposed to verify the occurrence of muscle hyper component and lack of coaptation of the vocal cords of the relevant data for dysphonia[5,9,22,28].

Through the results obtained in this study, it was observed that the s/z relationship of the study group was significantly as expected, suggesting proper coordination between breathing (Table 2). The data are similar to those obtained in other studies, such as in a survey of 40 undergraduate students, which compared the results of the s/z relationship in men and women (20 men and 20 women) with normal voices and found s/z relationship values close to one, with no significant difference between the genders, although the isolated MPT /s/ and /z/ were significantly higher in men[5]. But in a study with seven women, future teachers of physical education, three evaluations were performed, one at the beginning of the semester in which the academic began the internship, the other during the midterm and the last at the end of the semester. In the first evaluation, we found the average s/z of 1.15, 1.22 in the second, and in the last 1.90, suggesting increased incoordination between breathing with increased vocal demand without adequate preparation[25].

It is important to note that a measure should not be interpreted in isolation, but in conjunction with others, since altered MPT /s/ and /z/ may result in a relative normal s/z, leading to false negative[19,28].

This study showed a significant difference in favor of the increased values of the ė/e, when compared to lower values, showing that most of the studied group concentrates with increased values, suggesting air leakage during phonation (Table 2), being different from those results found in s/z relationship.

As the study group did not have voice problems or a history of problems in breathing level, MPT results and s/z and e/ė relationships, suggest pneumophonoarticulatory incoordination. This may be a risk factor for the development of dysphonia with increasing vocal demand, which is likely to occur at the time that future voice professionals begin their professional activities[5,6,8].

Another important finding in this study was that the relationships s/z and ė/e presented moderate positive significant correlation, showing that its results correspond. Indeed expected, since

both are proposed to evaluate the phonotory dynamic and laryngeal and respiratory efficiency (Table 3)[5,9-11,15,16,18,19,23-25]. The different distribution between decreased, normal and increased results, the two measures may relate to differences articulation of phonemes used in calculations of relations. These articulation differences can cause variations in time, since the production of fricatives occurs when there is air current constriction in the front of the vocal tract (friction) with partial occlusion of the oral cavity[9,18,19,24] while in the vowels /e/ and /ė/ there is no obstacles to the passage of air during its production, which can generate smaller time supporting[11,18,23].

In a study that correlated the MPT of the voiceless phonemes /s/ and /ė/ found a positive correlation between these variables, despite this, the MPT /s/ was significantly higher than the value of the MPT /ė/ due to articulatory alveolar constriction that occurs during the emission of the /s/ sound, which allows control of the air output level of articulation, as well as respiratory level[18].

Contrary to expectations, there was no correlation between OMPT/ PMPT and the s/z and ė/e relationships, showing that there is a non-linear or random distribution between the OMPT/ PMPT measure with the others (Table 3). The literature suggests that the three relationships are proposed to measure the interaction between aerodynamic lung forces and laryngeal myoelastic during speech[5,9-11,15,18,19,23-25,32], however, in this work only the correlated s/z and ė/e values with each other, not the case with OMPT/ PMPT.

Thus, it is possible that the difference between the OMPT/ PMPT relationship and the others is due to the fact that it does not exactly assess the same as the s/z and ė/e relationship due to any of its components is voiceless or even possible that the predicted normality values[9] are not satisfactory. However, future research may bring greater clarity to this result, since no studies were found in the literature concerning the OMPT/ PMPT relationship.

Still, there was no significant difference between the decreased, normal and increased values the OMPT/ PMPT relationship, although most percentage have focused on the increased values, indicative of hyper glottal phonation, showing once again the importance of interpretation of the results obtained in the evaluations (Table 2). In regard to gender, the study group was composed by a significantly majority of women. The female form the largest population of acting voice professional, especially in relation to school activities that they carry out in greater numbers than the male population[33], agreeing with the results of this work.

Another study found that voice problems in Phonoaudiology graduate students through vocal screening also showed that most were women participants (94%). Yet, out of the 104 subjects who participated, 14 had two or more voice disorders, which show the importance of vocal working with future voice professionals[8].

Note that the structural and hormonal differences between the genders suggest that women are at greater risk for the development of dysphonia because of the greater concentration of fibronectin precursor to scarring that may favor the development of vocal nodules[6,9-10,12,15,17,18,23,25]. In addition to the low rates of glottic proportion that are often accompanied by incomplete glottic closure. Characteristics such as behaviors associated with misuse or increased vocal demand may predispose vocal disorders[6,9,10,12,15,17,18,23,25]. Points to high occurrence of vocal disorders in women voice professional[25].

In a study with 197 women, future voice professionals, during the undergraduate degree, showed that 29% had risk factors for the development of dysphonia. The most frequent complaints reported were vocal fatigue (40%), hoarseness (31%) and irritation of the larynx (25%). Despite such complaints, the first year in which they were evaluated, the majority showed an average MPT /a/ of 20.9 s, in the second year, 19.4 s, in the third, MPT /a/ of 20. 5s and in the last year, 20.6 s; being within the normality[1]. Corroborating the results of this study in which the majority of MPT were also within normality.

Overall, this research has highlighted the lack of pneumophonoarticulatory coordination from the group of future voice professionals studied and suggests the implementation of a program of vocal improvement with this population before effectively working when the vocal demand will be higher, so that there is no prejudice in the profession[1,8,34].

CONCLUSION

In this work, the future voice professionals, men and women, showed most of MPT vowels with normal or decreased values, the s/z relationship to normal values and the increased ė/e values when compared to the group with lower values, suggesting the presence of pneumophonoarticulatory incoordination, even in the absence of disturbances that could affect the vocal performance.

The positive correlation between the ė/e and s/z relationships suggests that both provide results compatible with each other, not the case with OMPT/ PMPT.

RESUMO

Objetivo: verificar os tempos máximos de fonação (TMF) de vogais e correlacionar os resultados das relações entre /e/ áfono e sonoro (ė/e), s/z e TMF obtido/previsto (TMFO/TMFP), conforme o sexo, em futuros profissionais da voz adultos com voz normal. **Método:** seleção por meio de avaliação vocal pela escala RASATI; coleta dos TMF /a, i, u, e, s, z/, do /e/ áfono (/ė/) e da capacidade vital; cálculo das relações s/z, ė/e e TMFO/TMFP de 50 mulheres (média 21,42 anos) e 12 homens (média 24,25 anos). **Resultados:** em ambos os sexos, os TMF estiveram significantemente dentro da normalidade ou com valores diminuídos, sugerindo equilíbrio ou escape aéreo à fonação. Relação s/z significantemente normal, relação ė/e significantemente aumentada quando comparada aos resultados diminuídos e, relação TMFO/TMFP sem diferenças significantes. Resultados que apontaram equilíbrio ou hipercontração de pregas vocais à fonação. Correlação positiva significante apenas entre as relações ė/e e s/z mostrando que crescem proporcionalmente e que a relação TMFO/TMFP não se correlaciona com elas. **Conclusão:** os futuros profissionais da voz adultos e com voz normal estudados em sua maioria apresentaram os TMF de vogais dentro da normalidade ou diminuídos, a relação s/z normal; a relação ė/e com valores aumentados quando comparada ao grupo com valores diminuídos, sugerindo a presença de incoordenação pneumofonoarticulatória. A correlação positiva entre as relações ė/e e s/z sugere que ambas fornecem resultados compatíveis entre si, não ocorrendo o mesmo com a relação TMFO/TMFP.

DESCRITORES: Voz; Fonação; Saúde do Trabalhador; Avaliação em Saúde

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